No. MEF-43AAE

TCM

WORKSHOP MANUAL

FORKLIFT TRUCK

FD35C9 FD35T9
FD40C9 FD40T9
FD45C9 FD45T9
FD50T9

FG35T9
FG40T9

TCM WORKSHOP MANUAL

FD35C9-FD50T9 FG35T9 FG40T9

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TCM CORPORATION

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IMPORTANT

⚠ For detailed procedures about operating the lift truck, see the lift truck “OPERATION AND MAINTENANCE MANUAL.” Improper operation of the lift truck might cause serious bodily injury or death to you or fellow workers.

⚠ The decals on your lift truck indicate the level of hazard, such as “⚠ CAUTION,” “⚠ WARNING,” and “⚠ DANGER.” They are intended to alert the operator and service personnel to potentially dangerous conditions in the operation and servicing of the lift truck. Failure to follow the instructions in the message can lead to serious personal injury or death, or damage to the lift truck or other property.

⚠ The “1. GENERAL DESCRIPTION” in this Workshop Manual describes basic safety instructions for servicing the lift truck. Before starting, study the safety instructions carefully and become completely familiar with the procedures for servicing the lift truck as well as the various points to be kept in mind. Improper techniques can lead to injury to oneself or others.

⚠ Service personnel must be completely familiar with the systems and components of the lift truck, and the tools to be used, as well as the correct service procedures.
Read this Workshop Manual and the lift truck Service Manual thoroughly, and become completely familiar with the lift truck.

The following safety symbol is used in this manual and on the decals found on the truck. If you see this safety symbol, pay special attention to the instructions and messages. Otherwise there is a likelihood of personal injury or death and of damaging the lift truck.

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INTRODUCTION

TCM offers a wide variety of lift trucks which have been enthusiastically welcomed by users all over the world. The lift trucks covered in this Workshop Manual have also been developed through years of research and experience, and they feature high quality designs and parts.

However, to get the most out of their performance, it is necessary to service, inspect and adjust them at regular intervals, as well as to operate them properly.

The purpose of this workshop manual is to serve as a guide to proper service, inspection and adjustment techniques for the major components of your TCM lift truck. Study this manual carefully before servicing or inspecting the major components of your lift truck. For details about the construction and operating principles of the components, see the lift truck Service Manual. We hope this manual will serve as a useful guide to your service and inspection work.

Please note that the descriptions and specifications in this manual are subject to change without prior notice.

July 2009

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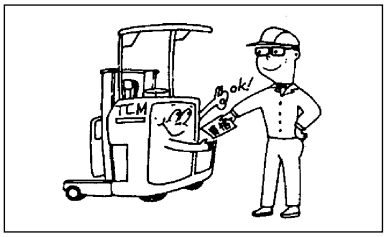
1. GENERAL DESCRIPTION

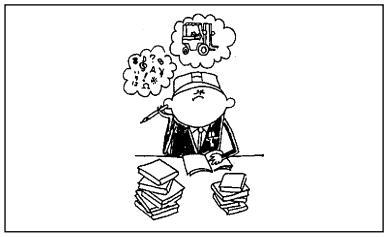
1.1 SAFETY INSTRUCTIONS

1.1.1 Introduction

■ Lift trucks should only be operated by qualified operators



(1) A qualified operator must have training and possess any required licenses to operate this truck.
(2) The operation of a crane or performing any welding must be only attempted by qualified personnel.



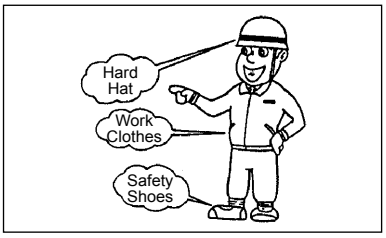
■ Make a good plan

(1) Perform all service and inspections as planned.
(2) Any worker who is fatigued, feeling unwell, or intoxicated must not be allowed to do this work.
(3) Locate the correct cause of any problem.

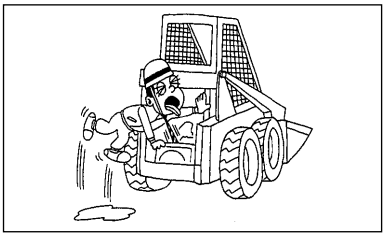
■ Keep the work area clean and orderly

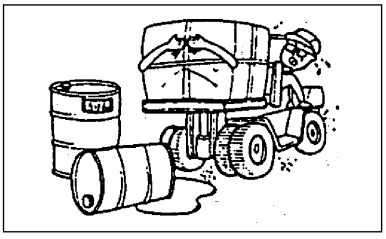
(1) Make sure the work area is organized before starting to service the lift truck.
Arrange the tools and replacement parts so they can be reached easily.
(2) Avoid working in a hazardous or cluttered area.
(3) Wipe up any oil, grease, or water in the work area. Do not work on an incline.
(4) Before starting to service the lift truck, make sure there is no one around the truck except a guide or helper.

1.1.2 Protective gear



(1) Wear all the protective clothing and personal safety gear devices called for by the job conditions, such as a hard hat, gloves, safety shoes, safety glasses/goggles, and other.
(2) Shirts and pants should have tight cuffs.
(3) Wear a rubber apron and gloves when handling corrosive material.
(4) Do not touch electric devices or power tools with wet hands.
(5) Keep sparks and open flames away from the work area. This is especially important if your clothing is contaminated with a lubricant.
(6) Do not put a knife or any other sharp object in your pocket.
(7) Do not wear any jewelry, such as rings, pendants or bracelets, that can become easily entangled in the machinery. Entanglement causes serious personal injury. Do not wear a necktie or a watch.
(8) Do not wear gloves when checking rotating parts.
(9) Wear a safety belt when working in an elevated location.
(10) Keep your shoes clean, free of grease, oil, and mud.





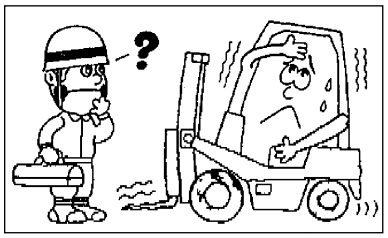
1.1.3 Organize the work area

(1) Select a flat work area that is wide enough for the job.
(2) Organize the work area before starting to service the truck.
(3) Clean up any water, oil or grease on the floor. Take all necessary measures to prevent accidents from slipping, such as by sprinkling sand on the floor surface.

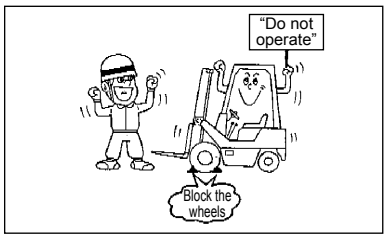
(4) Clear away any obstructions or hazards from the work area.
(5) Do not stack unstable objects. Take any necessary measures to prevent any stacks of objects from collapsing.
(6) Keep the areas around the switchboard, fire extinguisher, stairs, and emergency exits clear of obstacles.
(7) Hazardous objects must only be stored in specified areas, surrounded by a white line.
(8) Remove any waste or unnecessary objects from the work area immediately.
(9) Do not bring any personal objects into the work area.
(10) Arrange the tools and replacement parts so they can be reached easily.

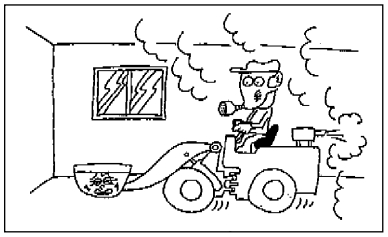
1.1.4 Maintenance precautions (before starting to work)

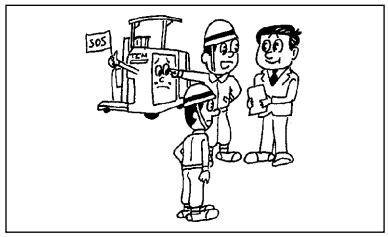
(1) Service personnel should keep safety in mind at all times, and work in an orderly manner.
(2) Make sure you have read the Operation and Maintenance Manual and any other relevant technical documents concerning the truck you are going to service, and get familiar with the construction and operation of the truck.



(3) Always attach a sign in the control area stating DO NOT OPERATE when the truck is being repaired.
(4) In principle, you should not run the engine while servicing the truck. Remove the ignition key when leaving the truck unattended.
(5) Keep yourself in good shape before and during work.
(6) If you are overworked, fatigued or feeling unwell, do not operate or service the truck.
Report to the specified supervisor.
(7) Make sure there is good ventilation when working in an enclosed area.
(8) Before starting the service, make a work plan and make sure you understand the work procedures well.
(9) Make certain you have all the necessary replacement parts, materials and tools at hand.



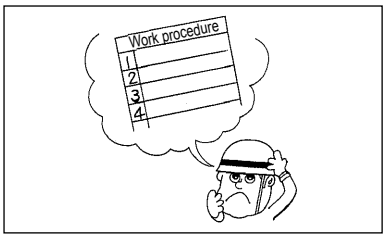


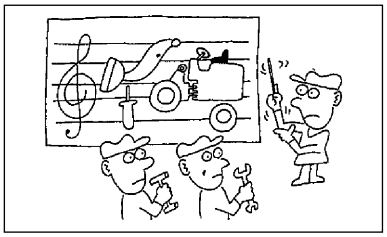


(10) When working in a group, discuss the details with all personnel involved and make sure everyone understands the meaning of any hand signals and the communication methods that will be used.
(11) Check the equipment and tools you are going to use in advance. In particular, wipe off any oil or grease. Check the power tools, such as drills, for electrical cable problems.
(12) Take the necessary measures to prevent the directional and load handling control levers from moving unexpectedly.
(13) Read the caution decals carefully and obey the instructions written on them.

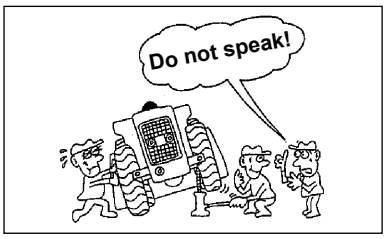
1.1.5 Maintenance precautions (while working)

(1) Follow the specified work procedure.
(2) Do not remove any covers or components other than those necessary to do the job.

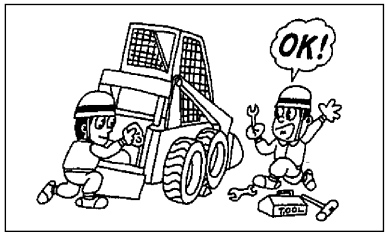




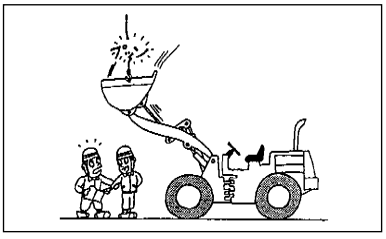
(3) Do not allow people other than service personnel to enter the work area.
Do not speak to service personnel while they are working.



(4) When working in a group, pay attention to the safety of your fellow worker(s) as well as to your own safety. Do not try to perform tasks other than the ones specified in advance.
(5) Sound an alarm immediately if you notice a danger.
(6) Do not toss tools or parts to a fellow worker. Hand them over with care.
(7) When leaving the equipment unattended during maintenance, turn it off.
If the power fails, turn off the power switch on the equipment. For example,
• Lower any raised load to the ground
• Turn off the switch to any power tools, such as drills, grinders or welders.
(8) Do not use unstable objects, such as a box or a component, as a step-ladder.
(9) Do not spill oil or grease on the floor. Wipe up any spilled oil or grease on the floor right away.
(10) Clean the oil fill ports and grease fittings before adding oil or grease.
(11) Lubrication and oil level checks should always be performed with the truck parked on a level surface.
(12) Do not stand or walk under raised forks, buckets or hoists.
When using a jack or hoist, do not exceed its rated capacity.



Always keep safety in mind when servicing the machine.

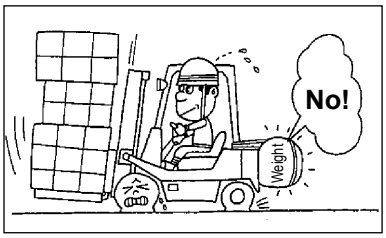


1.1.6 Maintenance precautions (after servicing)

(1) Clean the equipment and tools.
(2) After servicing, return the work bench, truck carriage, tools and pallets to their designated positions.
(3) Wipe up any contaminants, spilled oil or grease in the work area.
(4) Discard waste such as waste oil, used waste cloth, and glass at the specified place.
You should always have in mind that the environment must be protected.
(5) Neutralize any spilt battery electrolyte with sodium bicarbonate or wash it away with a large amount of water.
(6) Make certain all the switches on the electrical equipment you used have been turned off.
(7) Use only TCM approved replacement parts and lubricants.
(8) After servicing, make sure the truck operates properly.

1.1.7 Modifications to the truck might void your warranty

Do not try to modify your truck. Modifications to your truck which affect the performance, safety or strength of the truck might cause an accident and will void your warranty as well.

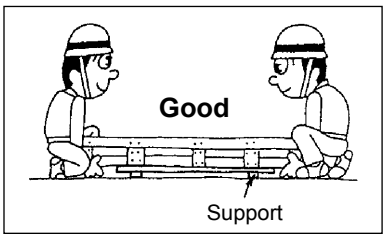


1.1.8 When working in an elevated place

If you need to work in an elevated place, refer to the “Safety Instructions for Working in Elevated Locations.”

1.1.9 When working in a group

(1) Pick a group leader.
(2) Make sure everyone understands the meaning of any hand signals and the communication methods that will be used.
(3) Work in an orderly manner that is specified in advance.
(4) Lift heavy loads as a group of two or more or using mechanical aids. Put a support on the ground before lowering the load to prevent your hands from getting pinched.
(5) Before moving a load handling lever, sit down properly in the operator’s seat and make sure all your fellow workers know you are going to move the loading system.

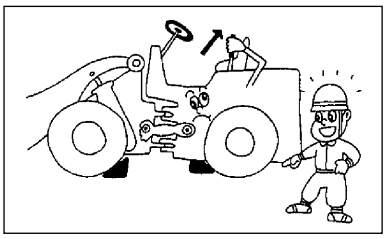


1.1.10 Safety rules for maintenance

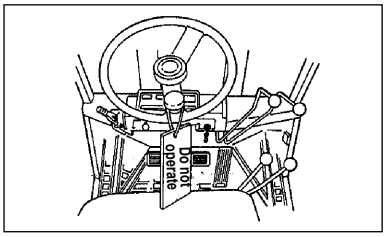
<Before starting maintenance>

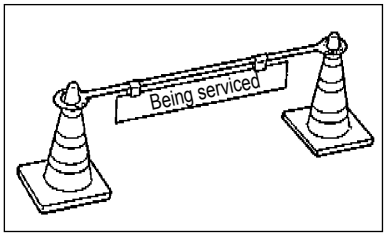
Before starting maintenance service, make sure:

(1) The travel and load handling control levers are in neutral.
(2) The parking brake is securely applied.
(3) The wheels are blocked.

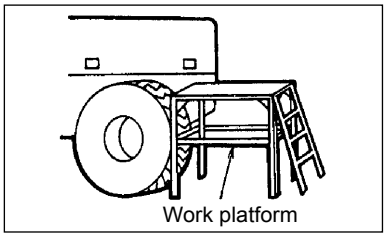


(4) Put a sign stating “Do not operate” on the truck or mark the off-limits area around the truck with traffic cones or chains to keep people away from the work area.
(5) Lower the forks or bucket to the ground. If you need to work with the forks or bucket raised, use supports to prevent the forks or bucket from lowering unexpectedly.
(6) Clean the floor surface and the truck steps, floorboard, engine hood and tires of the truck before starting, to prevent an accident caused by slipping.
(7) Do not try to repair the truck while it is on a trailer.



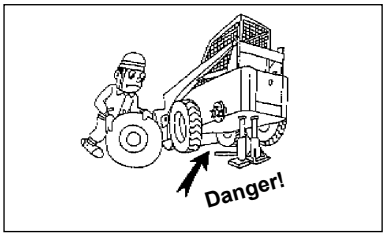


(8) Do not try to work while sitting on a tire. Use a suitable step stool or an elevating work platform.
(9) If you must go under the truck, use goggles or safety glasses to prevent dust from getting into your eyes.
(10) Remove any caked-on mud from the truck and forks with a hammer before cleaning the truck with water.



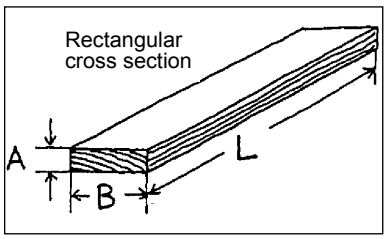
<Jacking up or hoisting the truck>

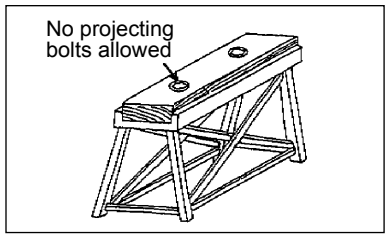
(1) When jacking up or hoisting the truck, make sure there is no one near the truck.
(2) Place the jack directly under the part of the truck that it should contact when it is raised.
Jack up the truck slowly and only high enough to service the truck.
Before you begin to work, wiggle the truck a little to make sure that it is resting securely on the jack.
(3) Jacks are used only to get a truck off the ground. They should never be used to hold a truck in place. You must use jack stands when you work underneath a truck.



(4) Use jack stands, supporting blocks or a bench suitable for supporting the truck:
- Do not use square timbers as supporting blocks.
- Use only specified jack stands, supporting blocks or platform.
- Use jack stands, supporting blocks and a bench that have enough strength for the purpose.
- Test the jack stands, supporting blocks or bench before using them and make sure you understand their weight limit.
- Use hard timbers such as apitong or pine as supporting blocks. Check them for cracks, deformation, or corrosion at regular intervals, and replace them if necessary.

(5) When inserting jack stands or supporting blocks under the truck, use caution not to get your hands or fingers pinched.



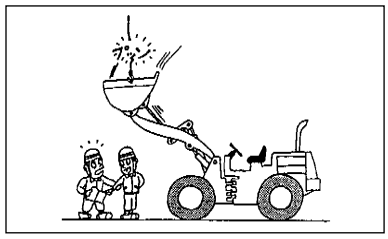


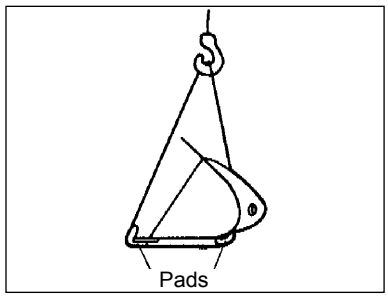
<Crane>

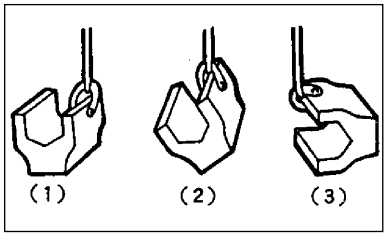
(1) Operation of cranes with a lifting capacity of 5 tons or more or mobile cranes (excluding a floor type crane) must be only performed by a qualified operator.

(2) Setting up a sling for a load of 1 ton or more must be performed by a person qualified to do so.

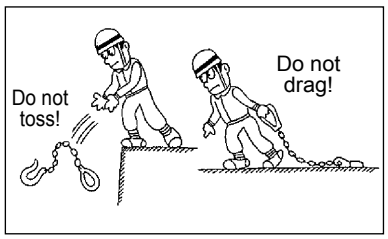
(3) Basic rules of sling work:
- Do not exceed the rated capacity of the crane. As a rough guide, assume the capacity of the crane is 20 percent less than the rated capacity.
- Lift the truck from two points or more, never from a single point. The lifting angle of the chains or cable must be less than 60 degrees and the position of the center of gravity of the load must be low as possible.
- Do not exceed the specified capacity for the wire ropes.
- Position the hook directly over the load you are going to lift.
- Attach pads to any sharp areas on the load where the wires might come in contact with the load.
- Do not hook the lifting cables on a slippery area or any area from which the hook can be easily disengaged.
- Do not lift at an angle and do not pull horizontally.
- Stop lifting the load when it is about 10 cm above its resting position and check for stability and the center of gravity of the load.
- Have a guide at a position clearly visible by the worker, and let him give instructions for the work.
- Make sure everyone understands the meaning of any hand signals and the communication methods that will be used.
- Do not ride on a load being lifted. Do not allow anyone to stand or walk under a raised load.
- Use a guide rope when lifting a long load.
- Before lifting the load off the ground, reposition the main hook just above the load's center of gravity, to prevent the load from rolling.

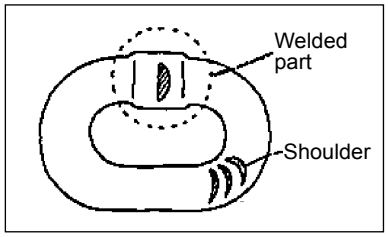


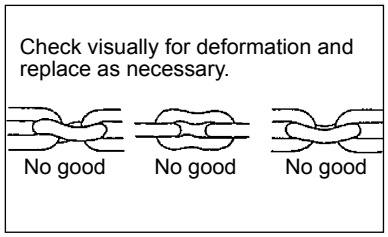




(4) Chain blocks
- Do not toss or drag a chain block. If a block becomes wet, wipe away the moisture and lubricate it properly. An elongated or deformed hook should not be used.
- Make sure that the hook and other lifting equipment is working properly before use.
- Do not use a chain block with any cracks or deformation in the welds or shoulders.

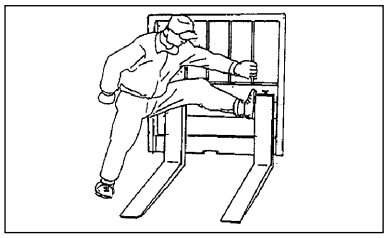




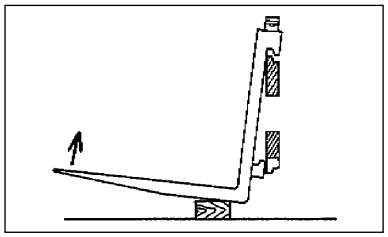


<Installing and removing forks>

(1) With the forks raised a little off the ground, place blocks under the root of the forks. Bring both fork prongs to the center by alternately pushing on the top and bottom (heel) of the fork face. Do not use your hands. Otherwise you might get your hands or fingers pinched.

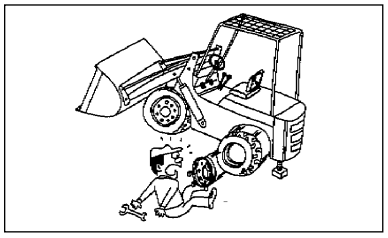


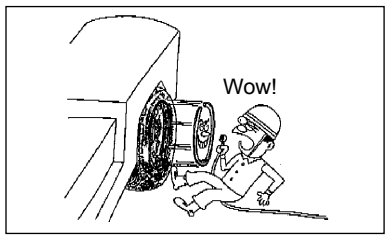
(2) Put blocks under the root of the forks. Lower the forks to disengage the forks from the carriage.
(3) Lift the tip of each fork prong to remove it from the carriage.



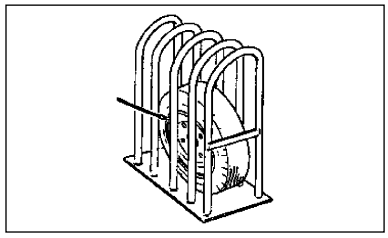
<Removing and reinstalling tires and rims>

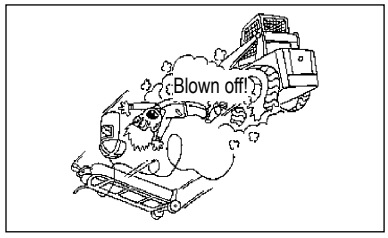
(1) Deflate the tire before loosening the bolts connecting the rims (for the split rim type) or before removing the side ring or lock ring (for the side ring type).
(2) It is particularly dangerous if you try to remove an inflated tire from the truck with the split-rim having a loose or missing rim connecting bolt. When connecting the rims, tighten them to the specified torque with the tire deflated.



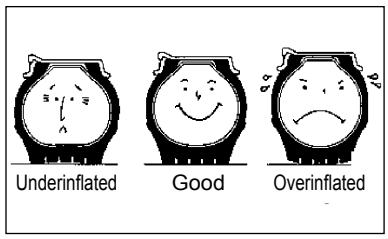


(3) Use a safety cage for inflating the tire. If one is not available, place the tire on the ground or floor with the lock ring or side ring facing down.
(4) Do not weld or cut the rim while the tire is on the truck.
(5) Deflate the tire before trying to remove any nail or other foreign object from the tire.
(6) Do not use a damaged tire or rim. Do not use a mismatched tire and rim assembly.



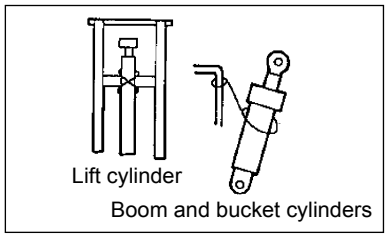


(7) Inflate the tires to the specified pressure by using an air compressor.

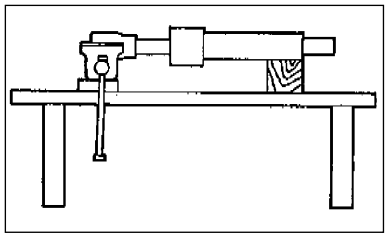


<Precautions to take when overhauling cylinders>

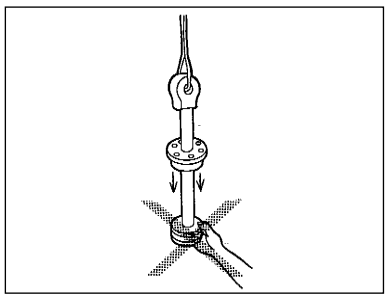
(1) Do not try to overhaul cylinders while they are mounted on the truck. Remove the cylinder assembly and overhaul it in a workshop.
(2) When removing a cylinder from the truck, secure it to a mast connecting member with rope, to prevent it from falling. Do not try to hold it in your hands.
(3) Do not try to lift a cylinder by hand. Your hands might get crushed under the cylinder if you can't hold it or if you lose your balance.



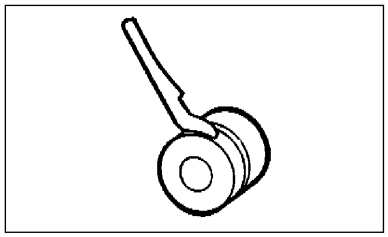
(4) Put the cylinder you are going to overhaul on a work bench and hold in a vise. The work bench should be equipped with a V groove to prevent the piston rod from rolling off the bench.
(5) Remove the piston rod from the cylinder. If the piston rod is hard to remove by hand, apply compressed air from the tail side of the cylinder to push the piston rod out.
(6) When using compressed air, fit a cylinder cap over the piston rod, to prevent the piston rod from popping out. Be very careful not to be injured by the piston rod extending unexpectedly.



(7) When removing the piston rod with a crane, the cylinder cap might drop onto the piston. Use caution not to get your hands pinched. Hold the side of the piston or hold the piston with a rope.
(8) For cylinders used in lift trucks with a capacity over 8 tons, secure the cylinder tail to a pole in the room and remove the piston rod using a sling hook and a lift truck.

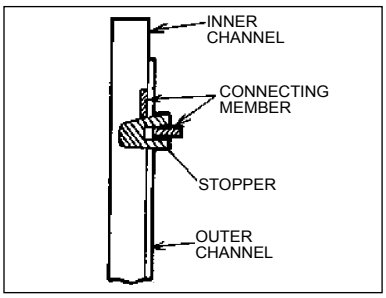


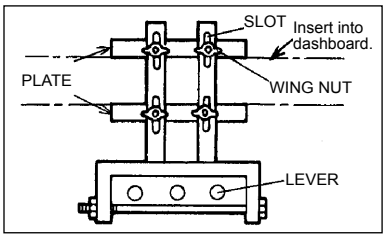
(9) When replacing the piston seal with a new one, use a special spatula to remove the old seal. (Do not use a prick punch. You might get injured and you may damage the piston.)



<Mast inspection>

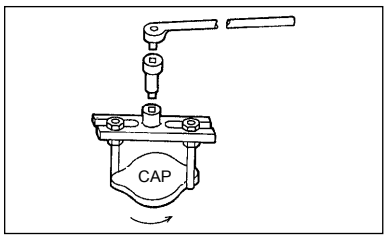
(1) Use a helper to inspect the mast operation: one person in the operator's seat operating the load handling levers and the other standing by the side of the mast checking the mast operation. Do not climb between the mast and the operator's compartment.
(2) Use a mobile or fixed elevating work platform when working on components at an elevated position. Do not climb between the mast and the operator's compartment.
(3) If you need to inspect the truck with the forks raised, install the load handling lever stoppers and/or the inner mast stopper.
(4) Do not put your hands or feet on or near the mast rails or connecting members of the mast.
(5) Never try to operate the hydraulic control levers in the operator's compartment from the mast side. In particular, do not try to operate them from in between the truck body and the mast.
(6) When working alone, use a crane to remove or reinstall the load backrest.
(7) When working with the mast raised, take the necessary steps to prevent the mast from falling unexpectedly, or install control lever stoppers.
(8) Apply genuine TCM Chain Coat chain lubricant to the lift chains from the front of the mast with the forks lowered to the ground. (You can use engine oil for this purpose. Do not use grease.)





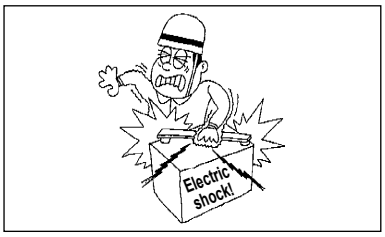
<Opening the radiator cap>

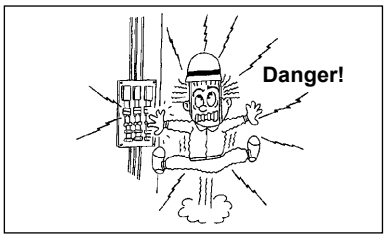
(1) If the radiator cap is equipped with a pressure reducing valve, reduce the pressure by lifting the lever before opening the radiator cap.
(2) If there is no pressure reducing valve, cool the engine by running it at idle speed for a while before opening the radiator cap. (If the engine is overheating, splash cold water on the engine.)
(3) If you need to open the radiator cap when the engine is hot:
- Wear leather welding gloves. Do not use cotton work gloves.
- Cover the radiator cap with a water-resistant material such as a piece of inner tube, to prevent hot water from splashing on your hands.
- Loosen the radiator cap slowly to allow the steam to escape.
- It is good practice to use a special tool for opening the radiator cap.



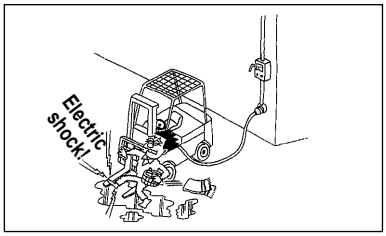
<Electrical system>

(1) Precautions when recharging batteries
- Make sure the power cable is securely connected before turning on the battery charger. Do not disconnect or reconnect the power cable while the battery charger is on.
- Loosen the cap on each cell in the battery.
- Do not remove the battery receptacle during recharging; otherwise there is danger of causing sparks.
- Do not try to check the battery voltage by shorting the poles of the battery.
- The battery must only be recharged in a well-ventilated space, with no flammable materials in the area.
- Charge batteries on an acid-resistant floor surface that is well drained, because the battery electrolyte might spill on the floor during recharging.
- Make sure that the charging equipment is equipped with a ground fault interrupter. (it must be grounded).





(2) Take the following precautions to prevent accidents such as electric shocks or shorts when repairing the electrical system on the truck:
- Make sure the power switch is turned off before starting any repairs or inspections.
  (Remove the grounding cable from the battery if the truck does not have a battery relay.)
- Make sure the cables are not wet or frayed. Avoid using any electric tool in a wet atmosphere.
- Be careful not to drop a wire, tools or parts inside the truck. If you drop something, make sure to remove it.



(3) Do not touch any switch which has a warning sign attached to it. Use special caution if you do need to touch it.

(4) Keep clear of broken wires.

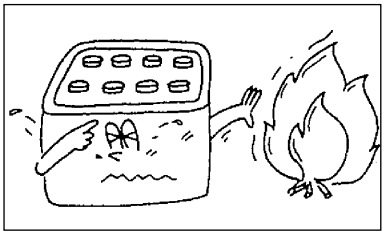
(5) Always attach a sign to the battery charging unit stating “Do not operate” when the electric system is being repaired.

(6) Write the name, rated voltage, and current of the power supply unit and the name of the person in charge of the battery charging unit near the power supply switch.

(7) Only use approved fuses for the power supply switch.

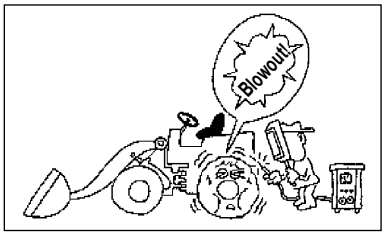
(8) If the battery charging unit fails to operate normally, turn off the power switch immediately and report to the supervisor.

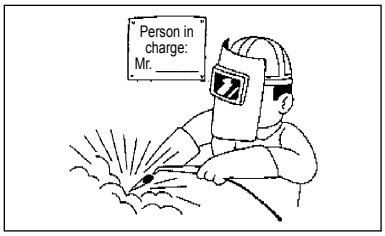
(9) Do not smoke near the battery. Do not use an open flame to check the battery electrolyte level. Explosive gases are always being released from the battery and there is a danger of causing an explosion.



(10) Keep the top surface of the battery case clean. If it is contaminated with dust or water, there is a danger that an explosion may occur due to an interfacial discharge occurring between the battery terminal and the truck frame.

<Welding>





(1) Observe the following conditions when welding:
- When welding near a tire, note that there is a danger of the tire exploding if it is heated excessively.
- Do not try to weld or gas cut any container or pipe containing fuel or oil. Remove the fuel or oil. It is good practice to put water in the object before welding it.

(2) Wear a welding mask to protect your eyes.

(3) Using a welding mask will obstruct your sight. Organize the work area properly before starting to weld or cut. In particular, move away anything that can fall easily or be tripped over.

(4) Wear safety gloves.

(5) Hold the welder above the work whenever possible. If the welder must be used below the work, wear a welder's hat.

(6) When using gas to cut the cutting edge of the bucket, keep distance between the cutting edge and the floor surface to less than 10 cm, to prevent your legs from getting crushed by the cutting edge if it falls.

(7) When welding a new cutting edge to the bucket, weld a piece of angle iron inside the bucket first, to prevent the bucket from being deformed. Do not use a jack instead of welding in a piece of angle iron. Using a jack creates the danger of the jack coming loose and popping out to cause serious personal injury.

(8) Keep any flammables away from the welding area.

(9) Observe the following precautions when arc welding:
- Arc welding should only be performed by a qualified person.
- Use a safety holder.
- Use a welding machine equipped with a voltage reducing device if welding is performed in a place where the welder might come into contact with a conductor.
- Use caution to keep the safety holder from coming in contact with the ground side. Do not place the safety holder on wet ground or a wet floor.
- When chipping off slag after welding, wear safety glasses to protect your eyes from flying slag.

<Press work>

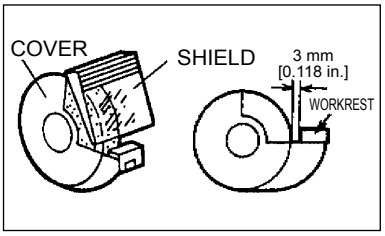
(1) Make sure the hydraulic press workrest does not have any cracks.

(2) Do not bring your face or hand close to the press during operation.

(3) Place the platform in a stable position and keep it in place during operation.

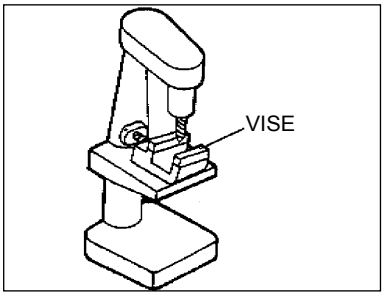
(4) Extend the ram as far as possible. Avoid using an intermediate jig.

<Grinding>



(1) Put the specified safety cover on the grinding wheel.
(2) The clearance between the workrest and the grinding wheel should be less than 3 mm.
(3) Install a shield to prevent grinding powder from flying off.
(4) Make a dry run on the grinding wheel for at least 1 minute before each use or for more than 3 minutes whenever the grinding wheel is replaced with a new one. During the dry run, do not stand in line with the grinding wheel direction of rotation; otherwise you could be injured by flying pieces of wheel if it breaks.
(5) Make sure the sander switch is turned off before connecting the power supply cable.
(6) Check the power tool cables for damage. Do not use any power tool with a damaged cable.
(7) Make sure there are no flammable gas leaks or flammable articles where grinding sparks will splash.
(8) Do not perform sanding with the sander switch locked.
(9) Wear safety glasses whenever you perform any sanding or grinding.
(10) Do not use the side of the grinding wheel.

<Drilling>



(1) When using a magnetic drill, remove any dust between the magnetic base and the work.
(2) Install a power shut-off device, such as a power switch, in a position where the worker can operate it without leaving his working position.
(3) Make sure the machine is turned off before cleaning, inspecting or repairing the machine or cutter.
(4) Use a suitable brush to remove cuttings from the cutter, or apply lubricant to the cutter.
(5) Do not wear cloth work gloves when using devices such as a drill mounted grinder.
(6) Hold the work in a vise when machining it with a drill mounted grinder.

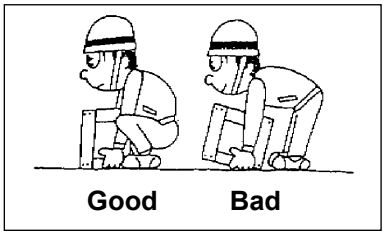
<Painting>

(1) Observe the following precautions when painting:
- Designate an organic solvent manager and put his or her name (including this job description) in a conspicuous position.
- Put up a sign stating “No fire. Do not enter within 5 m of the painting work area”. Install a fire extinguisher in the work area.
- Use explosion-proof fans and lights in a narrow space or an enclosed area.
- Provide a local ventilation system, where necessary.
- Do not bring more paint than necessary into the work area.
- Reinstall the cap on any paint container not being used.
- Wear a gas mask to prevent organic gas poisoning.
- Do not install any electrical switches inside the painting work area.
- Check the electrical system in the painting work area as necessary.

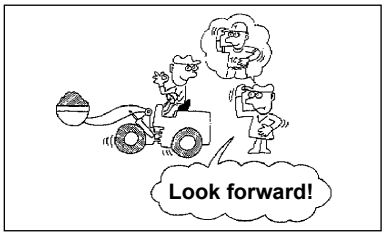
(2) Do not incinerate used spray cans. Make a hole in the can when disposing of it.

<Transporting>

(1) When a group is carrying a heavy load, make sure everyone understands the meaning of any hand signals and the communication methods that will be used. (Refer to "1.1.9. When working in a group".)



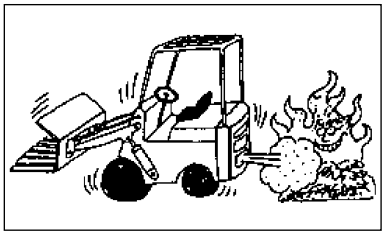
(2) Prevent back injuries. Use a diagonal foot position and get as close to the load as possible. Lift the load, keeping it as close to the body as possible while standing.
(3) Do not reduce the load suddenly or inadvertently.
(4) When loading or unloading the truck from a trailer, observe the following precautions:
- Wear gloves when handling a heavy load such as loading ramps.
- Check that the brake, tires and steering wheel are in good operating condition before loading or unloading from a trailer.
- Check the loading ramps for corrosion or cracks before starting.
- Put supports below the loading ramps when loading or unloading a heavy truck.
- When loading a forklift truck, drive it up backwards onto the trailer.
- When loading or unloading a forklift truck on a trailer by driving the forklift truck yourself, use a guide to keep an eye out for problems.



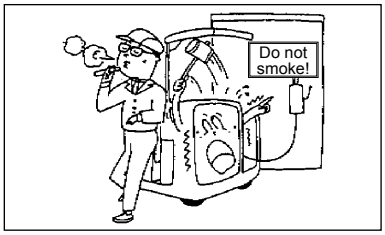
(5) When towing a truck, pay attention to the traveling speed and keep a safe distance from the truck being towed. It is necessary to have a driver's license even if the truck is towed.
(6) Make sure there is no one around the truck when you are starting up or operating the load handling equipment.

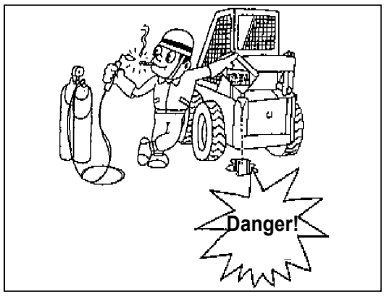
<Fire hazards>

(1) Do not park the truck where the exhaust or hot parts on the truck can contact flammable debris (leaves, paper, etc.).
(2) Do not carry loads which could cause a fire or explosion when they come in contact with each other.
(3) Do not use open flame at places other than specified.



(4) Do not smoke at places other than specified.
(5) Keep a fire extinguisher nearby when welding or grinding. After work, make sure the equipment is completely turned off.
(6) Before using an open flame, get permission to do so from your supervisor.
(7) Observe the following precautions when handling flammable or explosive materials :
- Put oily wastes in a non-combustible container and cover it.
- Do not heat an enclosed container containing flammable or explosive materials.
- Handle hazardous materials carefully and store them in a specified place.
- Do not use a heater or stove in a work area without prior permission.
- Handle solvents or chemicals carefully and make sure there is good ventilation when using them.
- Do not use an electric device that can cause sparks, near flammable or explosive materials.





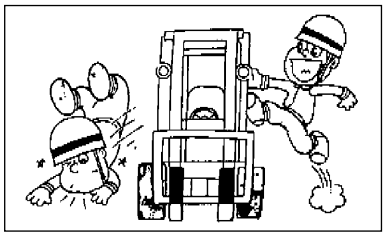
(8) Shut off the engine and turn off the electrical system when fueling or near fueling operations.
(9) Do not use an open flame (match, lighter, etc.) to check an item in a dark place, or to check the fuel level or battery electrolyte level.
(10) Know where the fire extinguisher and fire hydrant are located. The fire extinguisher or fire hydrant must not be blocked by equipment, clothing or other objects that could interfere with access in an emergency.

(11) If a fire breaks out, observe the following precautions:
- If a fire breaks out, give a loud warning to fellow workers immediately.
- If an electrical device catches fire, turn off the power switch before trying to fight fire.
- If an oil or lubricant catches fire, use a suitable fire extinguisher such as ABC dry chemical fire extinguisher, or sand.

(12) Avoid burning waste or anything else in the work area.

<Others>

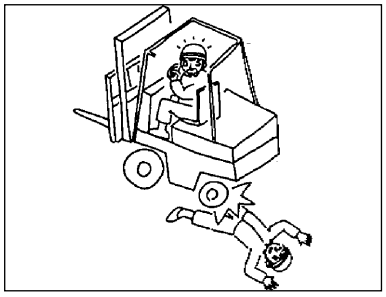
(1) Do not get on or off the truck while it is in motion. Do not grab the load handling levers or steering wheel when getting on or off the truck.



(2) Use the safety step(s) and safety handle when getting on or off a stationary truck.

(3) After removing a large component, put it on a work bench.

(4) Before trying to remove hydraulic lines, shut off the engine and operate the hydraulic control levers several times release any residual pressure.



(5) Do not heat a hydraulic line that contains fluid. If the connector on a corroded pipe sticks, loosen it using a penetrating agent, box wrench, and a long spanner.

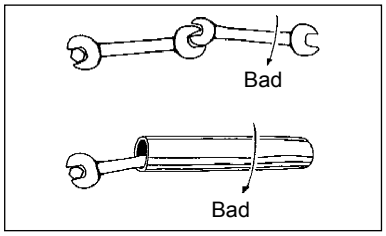
(6) When working in a group, make sure everyone understands the meaning of any hand signals and the communication methods that will be used. In particular, before you start the engine, let fellow workers know you are going to start the engine.

(7) Shut off the engine before trying to check for water or oil leaks.

(8) Use jigs suitable for the job. Do not use an inappropriate jig. Check the jig before use and repair any jig that is defective.

(9) Use screwdrivers suitable for the job.

(10) Do not connect two wrenches. If necessary, use a longer wrench or weld them properly.

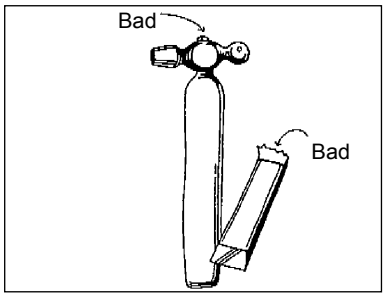


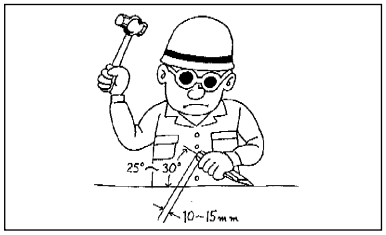
(11) A mallet should always have a wedge in the head. Do not wear a glove when using a mallet.

(12) Remove any burrs from the chisel head. Wear safety glasses when chipping materials.

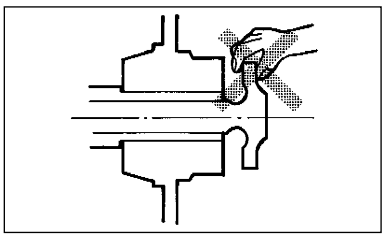
(13) Use a pressure gauge of suitable capacity to check the hydraulic pressure.

(14) When using an impact wrench, make sure that the pin which locks the socket has not come off.

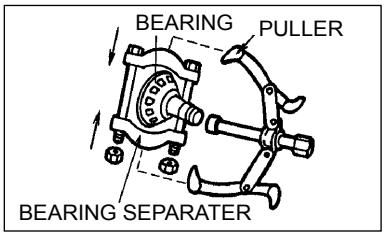




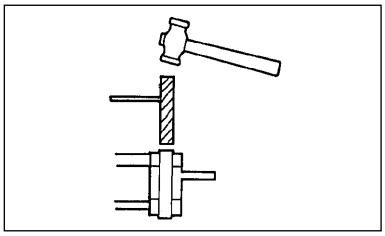
(15) The drive shaft and planet carrier should be installed by turning them. Do not push them or hit them. Be careful not to get your fingers pinched.



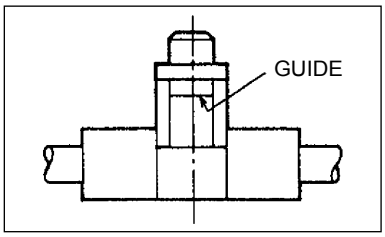
(16) If it is hard to remove the HST motor sprocket in a Bobcat loader, do not hit the puller with force. Only tap the puller lightly to turn the wrench.
(17) If you cannot engage the puller's jaws properly on the hub bearing in order to remove it, insert a bearing separator between the inner race and the flange and pull out the separator using the puller. (Do not use a chisel; otherwise the bearing might be damaged.)



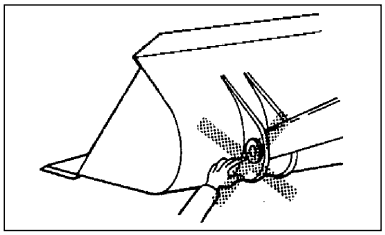
(18) Use a special jig with a handle to remove the king pin.



(19) Use a suitable tool with the correct diameter and a lock guide to install bushings.
(20) Use a round drift to install a quenched, or hardened pin. Do not hit the pin directly.



(21) Do not check the alignment of pin holes by inserting your fingers into the holes. Check by looking.
(22) Find out in advance where the waste disposal facility is located.
(23) Use non combustible solvents for cleaning. Do not use any flammable solvent, including gasoline. Do not use the cleaning fluid tank to store kerosene or diesel fuel.
(24) Make sure the nozzle valve is closed before turning on the car washer. If you need to remove your hands from the hose while spraying, close the nozzle valve.



1.2 BASIC SERVICING KNOWLEDGE

1. Installing bearings

When installing a bearing onto a shaft, tap its inner race with a mallet as shown in Figure 1.1. When installing a bearing into a case, tap its outer race.

When removing, use the same procedure as for installing.

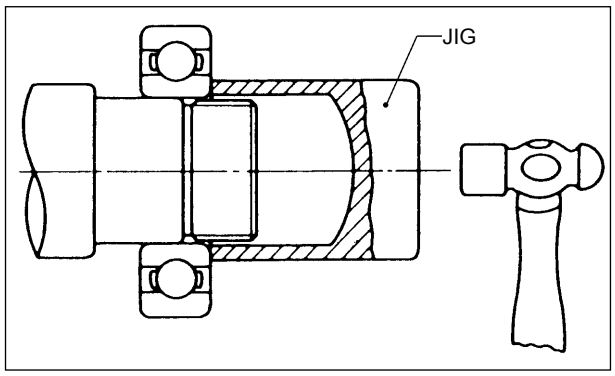


Fig. 1.1 Installing bearings

2. "O"-rings

① Use "O"-rings free from molding fault or damage.
② Clean "O"-rings and their mounting area and apply grease or hydraulic oil to them.
③ When installing "O"-rings, do not expand them so excessively that they suffer permanent deformation. Also do not roll them when installing; otherwise they might stay twisted, causing oil leakage.
④ When using an "O"-ring and back-up ring as a set, such as when hydraulic pressure is high, position the "O"-ring at the side which receives the oil pressure.

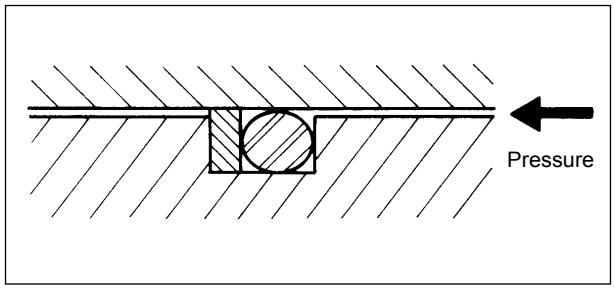


Fig. 1.2 "O"-ring location

3. Oil seals

① Oil seals should be installed with the seal lip pointed toward the lubrication or hydraulic oil.
② When installing an oil seal on a housing, apply a thin coat of packing cementing agent on the oil seal outer ring and inside the housing to prevent oil leakage through the fitting area. It is recommended to use a suitable jig to apply uniform pressure when mounting oil seals.

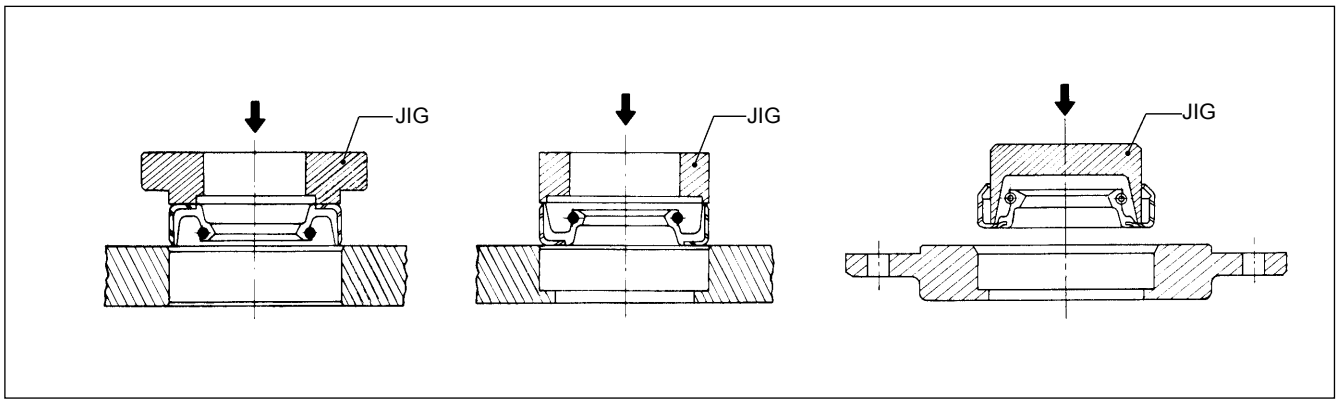


Fig. 1.3 Installing Oil Seal

③ When installing an oil seal onto a shaft, apply lubricating oil or grease to its seal lip and the mounting surface of the shaft. For a double-lip type, fill grease by 1/3 to 1/2 of the space between the lips. When inserting an oil seal into a case, use care to damage the seal lip. It is good practice to use a suitable conical sleeve.

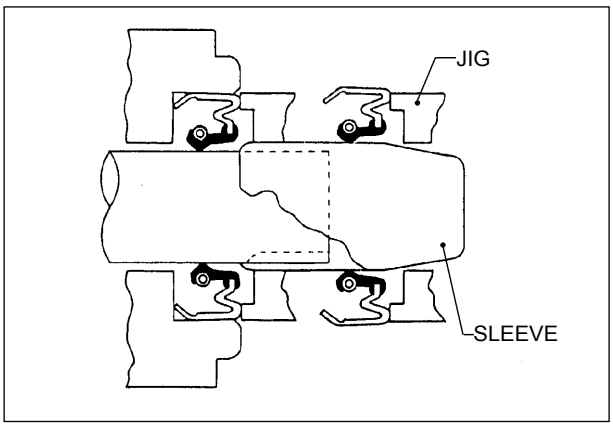


Fig. 1.4 Installing Oil Seal

4. Using LOCTITE

(1) Procedure for using LOCTITE

① Clean or degrease the surface of parts you are going to apply LOCTITE, using trichloroethylene, acetone, ether or alkaline solution.
② Blow dry them with compressed air or allow to air dry at room temperature sufficiently.
③ Apply specified LOCTITE.

(2) Removing parts

When removing parts which were installed with the application of LOCTITE, use tools such as a spanner, wrench, and pulley remover.

If you fear that a part may break due to the effect of LOCTITE if forcibly removed, heat the part to 200 to 250°C with a soldering iron or gas burner.

⚠ **Remember that parts are very hot after heating. Use caution not to get burnt when removing them.**

(3) Reinstalling parts

① When destroyed, LOCTITE remains as white powder on the threads of bolts. You can apply a new coat of LOCTITE again over their surface.

Note: For example, if a bolt turns slightly due to bolt torque checking, remove the bolt and apply LOCTITE again and reinstall.

② If LOCTITE is used for the surface of a flange, it is necessary to remove hardened LOCTITE with a wire brush when reinstalling the flange.

5. CLEANING

■ General metallic parts

① Clean parts thoroughly using cleaning fluid. It is recommended that parts be immersed in cleaning fluid and moved up and down slowly until all old lubricant and foreign material is dissolved and parts are thoroughly cleaned.
② Cast parts should be cleaned with cleaning solvent or steam cleaned.
③ If a part is severely contaminated, use a wire brush or a piece of wood or metal to scrape off contaminants from the part. Wash it in cleaning fluid once, before cleaning it completely. However, do not use a wire brush for cleaning sliding surfaces or machined surfaces.
④ Oil passages must be cleaned with a steam cleaner. After checking for clogging with a piece of wire, they also should be cleaned with cleaning fluid or with compressed air.
⑤ Some parts may be cleaned in hot solution tanks with mild alkaline solution. Parts should remain in solution long enough to be thoroughly cleaned and warmed.
This will aid the evaporation of the cleaning solution and rise water. Parts cleaned in solution tanks must be thoroughly rinsed with clean water to remove all traces of alkali.

⚠ **Care should be exercised to avoid skin rashes, fire hazards and inhalation of vapors when using solvent type cleaners.**

⑥ If alloy parts, such as bearing shells or bushings, are cleaned with alkaline solution, they are apt to corrode due to ionization. Such parts should be cleaned with kerosene, Tricrene solvent vapor or “Magnus” fluid.
⑦ After cleaning, parts must be thoroughly dried with compressed air.

■ Bearings

① To dislodge solidified particles of lubricant, immerse bearings in cleaning fluid and remove them from the fluid. On a clean work bench, tap the bearing softly with a soft mallet to dislodge solidified particles.
② When drying bearings, be careful to direct air stream across bearing to avoid spinning.

■ Rubber parts

① When rubber parts need to be cleaned, use alcohol or wipe them clean with a soft cloth.
② Never use gasoline, diesel fuel or kerosene for cleaning. Use the same kind of oil for which the rubber part will be used.

6. STANDARD BOLT TIGHTENING TORQUE

See the bolt torque charts on page 1-22 to 1-25 for the torques of standard bolts when they are used for general applications. Refer to the Shop Manual and Service Manual of your truck model when:

1) Special nuts are used.
2) Synthetic resin or rubber is used for tightening.
3) Specified tightening torque is given.

• Division by strength

Strength	Indication on bolt	Material
4.6		SS400 (The number may be omitted.)
6.8		S45C
8.8		SCM435
		Boron steel (“B” may be omitted.)
10.9		SCM435
		Boron steel (“B” may be omitted.)

Name	Shape	Thread size	Material	Division by strength	Surface treatment	Part number
Hex. head bolt	Normal	M4 - M8 coarse and M10 - M39 fine	SS400	4.6	Black	01101- Nominal symbol ⟷
			SS400	4.6	Yellow chromate	01100- "
			S45C	6.8		01103- "
			SCM435, Boron steel	8.8		01106- "
			SCM435, Boron steel	10.9		01107- "
			BsBME1	—		01108- "
	Coarse	M10 - M39 coarse	SS400	4.6	Black	01112- "
			SS400	4.6	Yellow Chromate	01110- "
			S45C	6.8		01113- "
			SCM435, Boron steel	8.8		01116- "
			SCM435, Boron steel	10.9		01119- "
	Full thread (normal, coarse)	M10 - M39 coarse	SS400	4.6	Black	01115- "
			SS400	4.6	Yellow Chromate	01111- "
			S45C	6.8		01114- "
			SCM435, Boron steel	8.8		01117- "
	Full thread (normal)	M4 - M8 coarse and M10 - M39 fine	SS400	4.6	Black	01121- "
			SS400	4.6	Yellow Chromate	01120- "
			S45C	6.8		01123- "
			SCM435, Boron steel	8.8		01126- "
			SCM435, Boron steel	10.9		01127- "
			BsBME1	—		01128- "
	w. socket head	M4 - M8 coarse and M10 - M39 fine	SS400	4.6	Black	01131- "
			SS400	4.6	Yellow Chromate	01130- "
			S45C	6.8		01133- "
			SCM435, Boron steel	8.8		01136- "
			SCM435, Boron steel	10.9		01137- "
	w. hole in threads	M4 - M8 coarse and M10 - M39 fine	SS400	4.6	Black	01161- "
			SS400	4.6	Yellow Chromate	01160- "
			S45C	6.8		01163- "
			SCM435, Boron steel	8.8		01166- "
			SCM435, Boron steel	10.9		01167- "

• Designation of screws: Each part number consists of a screw type designation and a nominal symbol.

Example: 01130-16050 (hex. bolt 4.6, M16 x 50, w. socket head)

Tightening torque chart (Division by strength: 4.6)

Class	Nominal size	Pitch	Dry				LOCTITE262				Lubricant			
			Target value		Allowable value		Target value		Allowable value		Target value		Allowable value	
			N・m	kgf・cm	N・m	kgf・cm	N・m	kgf・cm	N・m	kgf・cm	N・m	kgf・cm	N・m	kgf・cm
Metric, fine system	M 4	0.50	1.36	13.9	1.09 - 1.63	11.1 - 16.6	1.21	12.3	0.96 - 1.44	9.8 - 14.7	0.99	10.1	0.79 - 1.19	8.1 - 12.1
	M 5	0.50	2.87	29.3	2.30 - 3.44	23.5 - 35.1	2.53	25.8	2.02 - 3.00	20.6 - 30.9	2.08	21.2	1.66 - 2.50	16.9 - 25.5
	M 6	0.75	4.59	46.8	3.67 - 5.55	37.4 - 56.1	4.06	41.4	3.25 - 4.87	33.1 - 49.7	3.34	34.1	2.68 - 4.01	27.3 - 40.9
	M 8	1.00	10.9	111	8.69 - 13.3	88.6 - 133	9.62	98.1	7.70 - 1.15	78.5 - 117	7.93	80.9	6.34 - 9.51	64.6 - 97.0
	M 10	1.25	21.2	216	17.1 - 25.4	174 - 259	18.8	192	15.0 - 22.6	153 - 230	15.5	158	12.5 - 18.6	127 - 190
	M 12	1.25	39.1	399	31.4 - 47.1	320 - 480	34.5	352	27.7 - 41.5	282 - 423	28.4	290	22.7 - 34.1	231 - 348
	M 14	1.50	61.7	629	49.3 - 74.0	503 - 755	54.2	553	43.4 - 65.3	443 - 666	44.7	456	35.9 - 53.7	366 - 548
	M 16	1.50	95.9	978	76.8 - 115	783 - 1170	84.3	860	67.5 - 100	1688 - 1030	69.5	709	55.5 - 83.4	566 - 850
	M 18	1.50	141	1440	113 - 170	1150 - 1730	125	1270	99.1 - 148	1010 - 1510	102	1040	81.5 - 123	831 - 1250
	M 20	1.50	198	2020	159 - 238	1620 - 2430	175	1780	139 - 208	1420 - 2120	143	1460	114 - 172	1160 - 1750
	M 22	1.50	270	2750	216 - 324	2200 - 3300	235	2400	188 - 282	1920 - 2880	194	1980	155 - 233	1580 - 2380
	M 24	2.00	334	3410	268 - 401	2730 - 4090	293	2990	234 - 351	2390 - 3580	241	2460	193 - 289	1970 - 2950
	M 27	2.00	489	4990	391 - 587	3990 - 5990	429	4370	342 - 515	3490 - 5250	352	3590	282 - 424	2880 - 4320
	M 30	2.00	686	7000	550 - 824	5610 - 8400	600	6120	480 - 720	4890 - 7340	493	5030	395 - 592	4030 - 6040
	M 33	2.00	931	9490	744 - 1120	7590 - 11400	812	8280	650 - 974	6630 - 9930	669	6820	534 - 802	5450 - 8180
	M 36	3.00	1130	11500	903 - 1350	9210 - 13800	991	10100	792 - 1190	8080 - 12100	815	8310	652 - 979	6650 - 9980
	M 39	3.00	1460	14900	1170 - 1740	11900 - 17700	1280	13100	1020 - 1540	10400 - 15700	1050	10700	844 - 1270	8610 - 12900
Metric, coarse system	M 4	0.70	1.15	11.7	0.92 - 1.38	9.4 - 14.1	1.03	10.5	0.82 - 1.24	8.4 - 12.6	0.8	8.66	0.68 - 1.02	6.9 - 10.4
	M 5	0.80	2.36	24.1	1.89 - 2.82	19.3 - 28.8	2.11	21.5	1.70 - 2.53	17.3 - 25.8	1.7	17.8	1.39 - 2.08	14.2 - 21.2
	M 6	1.00	4.98	40.6	3.20 - 4.79	32.6 - 48.8	3.56	36.3	2.85 - 4.29	29.1 - 43.7	2.9	30.0	2.35 - 3.53	24.0 - 36.0
	M 8	1.25	9.81	100	7.84 - 11.7	79.9 - 119	8.74	89.1	7.00 - 10.5	71.4 - 107	7.2	73.5	5.77 - 8.65	58.8 - 88.2
	M 10	1.50	19.5	199	15.6 - 23.4	159 - 239	17.5	178	13.9 - 20.9	142 - 213	14.3	146	11.5 - 17.3	117 - 176
	M 12	1.75	34.2	349	27.5 - 41.1	280 - 419	30.4	310	24.4 - 36.6	249 - 373	25.1	256	20.1 - 30.1	205 - 307
	M 14	2.00	55.0	561	43.9 - 65.9	448 - 672	48.8	498	39.0 - 55.8	398 - 597	40.2	410	32.3 - 48.3	329 - 493
	M 16	2.00	86.9	886	69.5 - 104	709 - 1060	77.0	785	61.6 - 92.4	628 - 942	63.5	647	50.8 - 76.1	518 - 776
	M 18	2.50	118	1200	94.6 - 142	965 - 1450	105	1070	84.1 - 127	858 - 1290	86.6	883	69.3 - 104	707 - 1060
	M 20	2.50	171	1740	136 - 204	1390 - 2080	150	1530	121 - 180	1230 - 1840	125	1270	99.1 - 149	1010 - 1520
	M 22	2.50	234	2390	187 - 252	1910 - 2570	207	2110	165 - 248	1680 - 2530	171	1740	136 - 204	1390 - 2080
	M 24	3.00	293	2990	234 - 352	2390 - 3590	259	2640	208 - 312	2120 - 3180	214	2180	172 - 257	1750 - 2620
	M 27	3.00	436	4450	349 - 524	3560 - 5340	385	3930	308 - 463	3140 - 4720	318	3240	254 - 381	2590 - 3890
	M 30	3.50	588	6000	471 - 706	4800 - 7200	521	5310	417 - 624	4250 - 6360	429	4370	342 - 515	3490 - 5250
	M 33	3.50	810	8260	648 - 972	6610 - 9910	714	7280	572 - 857	5830 - 8740	588	6000	471 - 706	4800 - 7200
	M 36	4.00	1030	10500	828 - 1250	8440 - 12700	914	9320	731 - 1100	7450 - 11200	753	7680	602 - 903	6140 - 9210
	M 39	4.00	1350	13800	1080 - 1140	11000 - 11650	1190	12100	953 - 1430	9720 - 14600	981	10000	785 - 1180	8000 - 12000

Tightening torque chart (Division by strength: 6.8)

Class	Nominal size	Pitch	Dry				LOCTITE262				Lubricant			
			Target value		Allowable value		Target value		Allowable value		Target value		Allowable value	
			N・m	kgf・cm	N・m	kgf・cm	N・m	kgf・cm	N・m	kgf・cm	N・m	kgf・cm	N・m	kgf・cm
Metric, fine system	M 4	0.50	2.71	27.6	2.17 - 3.26	22.1 - 33.2	2.40	24.5	1.92 - 2.87	19.6 - 29.3	1.98	20.2	1.58 - 2.38	16.1 - 24.3
	M 5	0.50	5.74	58.5	4.59 - 6.87	46.8 - 70.1	5.05	51.5	4.04 - 6.06	41.2 - 61.8	4.15	42.3	3.33 - 4.98	33.9 - 50.8
	M 6	0.75	9.14	93.2	7.32 - 11.0	74.6 - 112	8.10	82.6	6.48 - 9.72	66.1 - 99.1	6.68	68.1	5.34 - 8.01	54.4 - 81.7
	M 8	1.00	21.7	221	17.4 - 26.0	177 - 265	19.2	196	15.4 - 23.0	157 - 235	15.8	161	12.7 - 19.0	129 - 194
	M 10	1.25	42.4	432	33.8 - 50.9	345 - 519	37.5	382	30.0 - 45.0	306 - 459	30.9	315	24.7 - 37.1	252 - 378
	M 12	1.25	78.3	798	62.6 - 93.9	638 - 957	68.9	703	55.1 - 82.7	562 - 843	56.8	579	45.5 - 68.2	464 - 695
	M 14	1.50	123	1250	98.1 - 148	1000 - 1510	109	1110	86.9 - 129	886 - 1320	89.4	912	71.6 - 107	730 - 1090
	M 16	1.50	192	1960	153 - 229	1560 - 2340	169	1720	135 - 202	1380 - 2060	139	1420	111 - 168	1130 - 1700
	M 18	1.50	282	2870	225 - 337	2290 - 3440	247	2520	198 - 296	2020 - 3020	203	2070	163 - 244	1660 - 2490
	M 20	1.50	396	4040	317 - 476	3230 - 4850	347	3540	278 - 416	2830 - 4240	285	2910	229 - 343	2330 - 3500
	M 22	1.50	537	5480	431 - 645	4390 - 6580	471	4800	376 - 565	3830 - 5760	386	3940	310 - 465	3160 - 4740
	M 24	2.00	668	6810	534 - 800	5440 - 8160	585	5970	469 - 702	4780 - 7160	481	4910	385 - 579	3930 - 5900
	M 27	2.00	978	9970	782 - 1170	7970 - 11900	855	8720	685 - 1030	6980 - 10500	704	7180	564 - 845	5750 - 8620
	M 30	2.00	1370	14000	1100 - 1650	11200 - 16800	1200	12200	958 - 1440	9770 - 14700	991	10100	788 - 1180	8040 - 12000
	M 33	2.00	1860	19000	1490 - 2330	15200 - 22700	1620	16500	1290 - 1950	13200 - 19900	1340	13700	1070 - 1600	10900 - 16300
	M 36	3.00	2250	22900	1790 - 2700	18300 - 27500	1980	20200	1580 - 2370	16100 - 24200	1630	16600	1290 - 1950	13200 - 19900
	M 39	3.00	2920	29800	2330 - 3510	23800 - 35800	2560	26100	2050 - 3070	20900 - 31300	2110	21500	1690 - 2530	17200 - 25800
Metric, coarse system	M 4	0.70	2.29	23.3	1.82 - 2.75	18.6 - 28.0	2.06	21.0	1.65 - 2.47	16.8 - 25.2	1.70	17.3	1.36 - 2.03	13.9 - 20.7
	M 5	0.80	4.72	48.1	3.77 - 5.66	38.4 - 57.7	4.21	42.9	3.36 - 5.06	34.3 - 51.6	3.47	35.4	2.78 - 4.17	28.3 - 42.5
	M 6	1.00	7.95	81.1	6.36 - 9.55	64.9 - 97.4	7.13	72.7	5.70 - 8.54	58.1 - 87.1	5.87	59.9	4.70 - 7.04	47.9 - 71.8
	M 8	1.25	19.6	200	15.7 - 23.4	160 - 239	17.5	178	14.0 - 21.0	143 - 214	14.4	147	11.5 - 17.3	117 - 176
	M 10	1.50	38.6	397	31.2 - 46.8	318 - 477	34.8	355	27.8 - 41.7	283 - 425	28.6	292	22.9 - 34.4	233 - 351
	M 12	1.75	68.4	697	54.6 - 82.1	557 - 837	60.9	621	48.6 - 73.1	496 - 745	50.2	512	40.1 - 60.1	409 - 613
	M 14	2.00	110	1120	87.8 - 132	895 - 1350	97.6	995	78.1 - 117	796 - 1190	80.3	819	64.2 - 96.4	655 - 983
	M 16	2.00	174	1770	139 - 208	1420 - 2120	154	1570	123 - 185	1250 - 1890	127	1290	101 - 152	1030 - 1550
	M 18	2.50	235	2400	189 - 282	1930 - 2880	210	2140	168 - 252	1710 - 2570	173	1760	138 - 208	1410 - 2120
	M 20	2.50	338	3450	271 - 407	2760 - 4150	300	3060	240 - 360	2450 - 3670	247	2520	198 - 297	2020 - 3030
	M 22	2.50	468	4770	374 - 562	3810 - 5730	413	4210	330 - 495	3370 - 5050	340	3470	272 - 409	2770 - 4170
	M 24	3.00	585	5970	469 - 702	4780 - 7160	519	5290	414 - 623	4220 - 6350	428	4360	341 - 513	3480 - 5230
	M 27	3.00	872	8890	697 - 1050	7110 - 10700	770	7850	616 - 924	6280 - 9420	634	6460	507 - 760	5170 - 7750
	M 30	3.50	1180	12000	940 - 1410	9580 - 14400	1040	10600	831 - 125	8470 - 12700	855	8720	685 - 1030	6980 - 10500
	M 33	3.50	1620	16500	1280 - 1940	13100 - 19800	1430	14600	1140 - 1710	11600 - 17400	1180	12000	940 - 1410	9580 - 14400
	M 36	4.00	2070	21100	1650 - 2480	16800 - 25300	1820	18600	1460 - 2190	14900 - 22300	1500	15300	1200 - 1790	12200 - 18300
	M 39	4.00	2700	27500	2160 - 3240	22000 - 33000	2380	24300	1900 - 2840	19400 - 29000	1960	20000	1570 - 2340	16000 - 23900

Tightening torque chart (Division by strength: 8.8)

Class	Nominal size	Pitch	Lubrication condition: Dry – Target value N·m	Dry – Target value kgf·cm	Dry – Allowable value N·m	Dry – Allowable value kgf·cm	LOCTITE262 – Target value N·m	LOCTITE262 – Target value kgf·cm	LOCTITE262 – Allowable value N·m	LOCTITE262 – Allowable value kgf·cm	Lubricant – Target value N·m	Lubricant – Target value kgf·cm	Lubricant – Allowable value N·m	Lubricant – Allowable value kgf·cm
Metric, fine system	M 4	0.50	3.62	36.9	2.89 - 4.34	29.5 - 44.3	3.20	32.6	0.26 - 0.39	26.1 - 39.3	2.64	26.9	2.12 - 3.17	21.6 - 32.3
	M 5	0.50	7.65	78.0	6.12 - 9.18	62.4 - 93.6	6.73	68.6	0.54 - 0.81	55.0 - 82.4	5.55	56.6	4.44 - 6.66	45.3 - 67.9
	M 6	0.75	12.2	124	9.78 - 14.7	99.7 - 150	10.8	110	0.87 - 1.30	88.2 - 133	8.91	90.9	7.13 - 10.7	72.7 - 109
	M 8	1.00	28.9	295	23.1 - 34.7	236 - 354	25.6	261	2.05 - 3.08	209 - 314	21.1	215	16.9 - 25.3	172 - 258
	M 10	1.25	56.5	576	45.2 - 67.9	461 - 692	50.1	511	4.01 - 6.01	409 - 613	41.3	421	33.0 - 49.5	337 - 505
	M 12	1.25	104	1060	83.6 - 126	852 - 1280	92.0	938	7.37 - 11.0	751 - 1120	75.8	773	60.6 - 90.9	618 - 927
	M 14	1.50	164	1670	131 - 197	1340 - 2010	145	1480	11.6 - 17.4	1180 - 1770	119	1210	95.4 - 143	973 - 1460
	M 16	1.50	256	2610	204 - 307	2080 - 3130	226	2300	18.0 - 27.0	1840 - 2750	185	1890	148 - 222	1510 - 2260
	M 18	1.50	377	3840	301 - 451	3070 - 4600	330	3360	26.4 - 39.5	2690 - 4030	271	2760	217 - 327	2210 - 3330
	M 20	1.50	529	5390	423 - 635	4310 - 6470	463	4720	37.0 - 55.5	3770 - 5660	381	3890	305 - 457	3110 - 4660
	M 22	1.50	718	7320	574 - 861	5850 - 8780	629	6410	50.2 - 75.3	5120 - 7680	517	5270	413 - 620	4210 - 6320
	M 24	2.00	890	9080	712 - 1070	7260 - 10900	782	7970	62.6 - 93.8	6380 - 9560	643	6560	514 - 773	5240 - 7870
	M 27	2.00	1300	13300	1040 - 1570	10600 - 16000	1140	11600	91.3 - 137	9310 - 14000	940	9590	752 - 1130	7670 - 11500
	M 30	2.00	1830	18700	1460 - 2190	14900 - 22300	1600	16300	128 - 192	13100 - 19600	1320	13500	1050 - 1580	10700 - 16100
	M 33	2.00	2480	25300	1980 - 2970	20200 - 30300	2160	22000	173 - 259	17600 - 26400	1780	18200	1420 - 2140	14500 - 21800
	M 36	3.00	3010	30700	2400 - 3610	24500 - 36800	2640	26900	211 - 316	21500 - 32200	2170	22100	1740 - 2610	17700 - 26600
	M 39	3.00	3900	39800	3120 - 4680	31800 - 47700	3410	34800	273 - 409	27800 - 41700	2810	28700	2260 - 3370	23000 - 34400
Metric, coarse system	M 4	0.70	3.06	31.2	2.45 - 3.67	25.0 - 37.4	2.7	27.9	2.19 - 3.30	22.3 - 33.6	2.27	23.1	1.81 - 2.71	18.5 - 27.6
	M 5	0.80	6.30	64.2	5.03 - 7.55	51.3 - 77.0	5.6	57.3	4.49 - 6.74	45.8 - 68.7	4.63	47.2	3.70 - 5.56	37.7 - 56.7
	M 6	1.00	10.6	108	8.50 - 12.7	86.7 - 130	9.5	96.9	7.60 - 11.4	77.5 - 116	7.85	80.0	6.28 - 9.40	64.0 - 95.9
	M 8	1.25	26.1	266	20.9 - 31.0	213 - 319	23.3	238	18.6 - 28.0	190 - 286	19.2	196	15.4 - 23.0	157 - 235
	M 10	1.50	52.1	531	41.6 - 62.5	424 - 638	46.4	473	37.1 - 55.7	378 - 568	38.2	390	30.6 - 45.9	312 - 468
	M 12	1.75	91.2	930	73.1 - 109	745 - 1110	81.2	828	64.9 - 97.4	662 - 993	66.9	682	53.5 - 80.3	546 - 819
	M 14	2.00	146	1490	117 - 177	1190 - 1800	130	1330	104 - 156	1060 - 1590	107	1090	85.8 - 1290	875 - 1320
	M 16	2.00	232	2370	185 - 279	1890 - 2840	205	2090	164 - 246	1670 - 2510	169	1720	135 - 203	1380 - 2070
	M 18	2.50	315	3210	252 - 379	2570 - 3860	280	2860	224 - 336	2280 - 3430	231	2360	185 - 278	1890 - 2830
	M 20	2.50	452	4610	362 - 543	3690 - 5540	401	4090	320 - 482	3260 - 4910	330	3370	264 - 396	2690 - 4040
	M 22	2.50	624	6360	499 - 749	5090 - 7640	551	5620	441 - 662	4500 - 6750	454	4630	363 - 545	3700 - 5560
	M 24	3.00	782	7970	626 - 938	6380 - 9560	692	7060	554 - 831	5650 - 8470	570	5810	456 - 685	4650 - 6980
	M 27	3.00	1160	11800	931 - 1400	9490 - 14300	1030	10500	821 - 123	8370 - 12500	846	8630	678 - 1020	6910 - 10400
	M 30	3.50	1570	16000	1260 - 1880	12800 - 19200	1390	14200	1110 - 1660	11300 - 16900	1140	11600	913 - 1370	9310 - 14000
	M 33	3.50	2160	22000	1730 - 2590	17600 - 26400	1900	19400	1520 - 2290	15500 - 23300	1570	16000	1260 - 1880	12800 - 19200
	M 36	4.00	2770	28200	2210 - 3310	22500 - 33800	2430	24800	1950 - 2920	19900 - 29800	2010	20500	1600 - 2410	16300 - 24600
	M 39	4.00	3600	36700	2880 - 4320	29400 - 44100	3170	32300	2540 - 3810	25900 - 38900	2610	26600	2090 - 3140	21300 - 32000

Tightening torque chart (Division by strength: 10.9)

Class	Nominal size	Pitch	Lubrication condition: Dry				LOCTITE262				Lubricant			
			Target value		Allowable value		Target value		Allowable value		Target value		Allowable value	
			N・m	kgf・cm	N・m	kgf・cm	N・m	kgf・cm	N・m	kgf・cm	N・m	kgf・cm	N・m	kgf・cm
Metric, fine system	M 4	0.50	5.33	54.3	4.26 - 6.38	43.4 - 65.1	4.71	48	3.77 - 5.65	38.4 - 57.6	3.87	39.5	3.11 - 4.66	31.7 - 47.5
	M 5	0.50	11.3	115	9.00 - 13.5	91.8 - 138	9.91	101	7.92 - 12.0	80.8 - 122	8.15	83.1	6.52 - 9.79	66.5 - 99.8
	M 6	0.75	17.9	183	14.3 - 21.6	146 - 220	15.9	162	12.7 - 19.0	130 - 194	13.0	133	10.5 - 15.7	107 - 160
	M 8	1.00	42.6	434	34.1 - 51.0	348 - 520	37.7	384	30.1 - 45.2	307 - 461	31.1	317	24.9 - 37.2	254 - 379
	M 10	1.25	83.1	847	66.5 - 100	678 - 1020	73.6	750	58.8 - 88.4	600 - 901	60.6	618	48.5 - 72.8	495 - 742
	M 12	1.25	154	1570	123 - 184	1250 - 1880	135	1380	109 - 162	1110 - 1650	112	1140	89.0 - 133	908 - 1360
	M 14	1.50	241	2460	193 - 289	1970 - 2950	213	2170	171 - 255	1740 - 2600	176	1790	140 - 210	1430 - 2140
	M 16	1.50	376	3830	300 - 450	3060 - 4590	330	3370	265 - 396	2700 - 4040	272	2770	218 - 327	2220 - 3330
	M 18	1.50	552	5630	442 - 663	4510 - 6760	484	4940	387 - 582	3950 - 5930	398	4060	319 - 479	3250 - 4880
	M 20	1.50	777	7920	621 - 933	6330 - 9510	681	6940	544 - 815	5550 - 8310	560	5710	448 - 672	4570 - 6850
	M 22	1.50	1060	10800	843 - 1270	8600 - 12900	922	9400	738 - 1110	7530 - 11300	759	7740	607 - 912	6190 - 9300
	M 24	2.00	1300	13300	1050 - 1570	10700 - 16000	1150	11700	919 - 1380	9370 - 14100	946	9650	756 - 1140	7710 - 11600
	M 27	2.00	1910	19500	1540 - 2300	15700 - 23500	1690	17200	1330 - 2020	13600 - 20600	1380	14100	1110 - 1660	11300 - 16900
	M 30	2.00	2690	27400	2160 - 3230	22000 - 32900	2350	24000	1880 - 2820	19200 - 28800	1930	19700	1550 - 2320	15800 - 23700
	M 33	2.00	3640	37100	2910 - 4370	29700 - 44600	3180	32400	2540 - 3810	25900 - 38900	2620	26700	2090 - 3140	21300 - 32000
	M 36	3.00	4420	45100	3530 - 5300	36000 - 54000	3870	39500	3110 - 4650	31700 - 47400	3190	32500	2550 - 3820	26000 - 39000
	M 39	3.00	5730	58400	4580 - 6860	46700 - 70000	5020	51200	4010 - 6020	40900 - 61400	4130	42100	3300 - 4950	33700 - 50500
Metric, coarse system	M 4	0.70	4.49	45.8	3.60 - 5.39	36.7 - 55.0	4.03	41.1	3.22 - 4.83	32.8 - 49.2	3.32	33.9	2.66 - 3.98	27.1 - 40.6
	M 5	0.80	9.24	94.2	7.40 - 11.1	75.5 - 113	8.26	84.2	6.60 - 9.91	67.3 - 101	6.81	69.4	5.44 - 8.18	55.5 - 83.4
	M 6	1.00	15.6	159	12.6 - 18.7	128 - 191	14.0	143	11.2 - 16.8	114 - 171	11.5	117	9.21 - 13.8	93.9 - 141
	M 8	1.25	38.3	391	30.7 - 46.0	313 - 469	34.3	350	27.4 - 41.1	279 - 419	28.2	288	22.6 - 33.8	230 - 345
	M 10	1.50	76.5	780	61.2 - 91.8	624 - 936	68.2	695	54.5 - 81.9	556 - 835	56.1	572	44.9 - 67.5	458 - 688
	M 12	1.75	133	1360	108 - 161	1100 - 1640	120	1220	95.4 - 143	973 - 1460	98.1	1000	78.8 - 118	803 - 1200
	M 14	2.00	216	2200	173 - 258	1760 - 2630	191	1950	153 - 230	1560 - 2350	158	1610	127 - 189	1290 - 1930
	M 16	2.00	341	3480	272 - 409	2770 - 4170	301	3070	241 - 362	2460 - 3690	249	2540	199 - 298	2030 - 3040
	M 18	2.50	463	4720	370 - 555	3770 - 5660	412	4200	330 - 493	3360 - 5030	338	3450	272 - 407	2770 - 4150
	M 20	2.50	665	6780	534 - 797	5440 - 8130	588	6000	471 - 707	4800 - 7210	485	4950	387 - 583	3950 - 5940
	M 22	2.50	918	9360	734 - 1100	7480 - 11200	810	8260	648 - 972	6610 - 9910	668	6810	534 - 802	5450 - 8180
	M 24	3.00	1150	11700	919 - 1380	9370 - 14100	1020	10400	814 - 1230	8300 - 12500	838	8550	670 - 1010	6830 - 10300
	M 27	3.00	1720	17500	1370 - 2050	14000 - 20900	1510	15400	1220 - 1800	12400 - 18400	1250	12700	991 - 1490	10100 - 15200
	M 30	3.50	2300	23500	1840 - 2770	18800 - 28200	2040	20800	1630 - 2440	16600 - 24900	1690	17200	1330 - 2020	13600 - 20600
	M 33	3.50	3170	32300	2540 - 3810	25900 - 38800	2800	28600	2240 - 3350	22800 - 34200	2300	23500	1840 - 2760	18800 - 28100
	M 36	4.00	4060	41400	3240 - 4860	33000 - 49600	3580	36500	2860 - 4300	29200 - 43800	2950	30100	2360 - 3530	24100 - 36000
	M 39	4.00	5290	53900	4240 - 6350	43200 - 64800	4660	47500	3740 - 5590	38100 - 57000	3830	39100	3070 - 4610	31300 - 47000

1.3 LIST OF LUBRICANTS

⚠ CAUTION

- Do not mix lubricants of different brands; otherwise the performance of the lift truck might be adversely affected.
- Use API Class CD or higher engine oil (Lub Life S-3, X-3) for the crankcase of a turbocharged engine.
- Use diesel fuel for the diesel engine; otherwise the engine might fail to operate normally. It is recommended to use JIS No.2 diesel fuel under general temperature conditions.

Location	Lubricant to be used	Grade of viscosity	Prevailing ambient temperature
Engine crankcase	Engine oil	TCM Lube Life C-1	-25°C to 35°C [-13°F to 95°F]
		TCM Lube Life S-3	0°C & above [32°F & above]
		TCM Lube Life X-3	0°C to -25°C [32°F to -13°F]
Hydraulic oil tank	Hydraulic oil	TCM Hydraulic Oil (wear resistance type)	-25°C & above [-13°F & above]
Automatic transmission	Engine oil	TCM Lube Life X-3	-25°C & above [-13°F & above]
		TCM TorCon Oil	-45°C & above [-49°F & above]
Manual transmission	Gear oil	TCM Gear Oil	
Drive axle	Gear oil	TCM Gear Oil	**Specified oil**
Grease fittings	Grease	TCM lithium-based oil	-25°C & above [-13°F & above]
Radiator	Coolant	TCM Long Life Coolant	50% or higher concentration
Fuel tank	Diesel fuel	JIS No.2 (Flow point: -10°C [14°F])	-5°C & above [23°F & above]
		JIS No.3 (Flow point: - 20°C [-4°F])	-15°C & above [5°F & above]
		JIS Special No.3 (Flow point: -30°C [-22°F])	-25°C & above [-13°F & above]
	Gasoline	JIS No.2 (Flow point: -10°C [14°F])	-5°C & above [23°F & above]
Brake oil reserve tank	Brake oil	TCM Brake Fluid DOT3	**Specified oil**

1.4 PRE-OPERATION INSPECTION

Component	Item to be checked	Checking procedure
Engine	① Oil level. ② Engine oil contamination. ③ Exhaust sound and color.	(A) Remove dipstick and wipe its end with clean cloth. Reinstall and keep it for about 1 minute. Remove it to check oil level. (B) Check for contamination of oil on the dipstick. (C) Start engine and check exhaust sound and color.
Radiator	① Cooling water level. ② Cooling water leakage.	(A) Check water level in reserve tank visually. (B) Check for water leakage from radiator or rubber hose.
Fuel tank	① Fuel level in fuel tank.	(A) Check the fuel indicator on the dash panel.
Clutch	① Clutch pedal freeplay, operation and slipping.	(A) Press clutch pedal until some resistance is felt to check for freeplay (normal range: 0 - 5 mm). (B) Press clutch pedal to the bottom to check for operation. (C) With parking brake applied, let up on clutch pedal while stepping on accelerator pedal to check for slipping of the clutch.
Master cylinder (brake oil tank)	① Brake oil level.	(A) Check brake oil level in reserve tank.
Service brake	① Brake pedal freeplay and braking effect.	(A) Press brake pedal until some resistance is felt to check for freeplay (normal freeplay: 10 mm). (B) Press brake pedal to the bottom to check clearance between brake pedal and floorboard surface. Check also for spongy brake, or air trapped in the system. (C) Drive slowly and press brake pedal to check for braking effect and uneven braking.
Parking brake	① Operating force and application.	(A) Pull the lever to the full to check that the lever is properly locked. (B) Operating force should be between 200 to 250 N {20 to 25 kgf}.
Tire	① Tire inflation pressure.	(A) Check tires for inflation pressure visually or using a hammer. (B) Check treads and side walls for excessive cracks, damage or undue wear.
Steering wheel	① Excessive play or looseness.	(A) With the engine running, turn steering wheel right and left to measure how far it moves before the wheels begin to turn (normal play: 20 to 30 mm). (B) Move steering wheel up and down, and back and forth to check bearings for looseness and horizontally to check main shaft and steering column rubber and bushing for installation.

Component	Item to be checked	Checking procedure
Steering wheel	① Wander, pull, hard steering.	(A) Run the truck at slow speed to check whether the truck wanders or pulls to one side or has hard steering.
Power steering	① Operation and oil leakage.	(A) Run the truck at slow speed and turn steering wheel to the right and left to check power steering for operation and oil leakage from piping.
Hub bolts and nuts	① Damage or looseness.	(A) Using a test hammer or visually check hub bolts and nuts for damage or looseness.
Horn and turn signal	① Operation.	(A) Check horn and turn signal for proper operation.
Rearview mirrors	① Full rear view	(A) Check whether you can gain full rear view when you are seated in operator's seat.
Lights (head, tail, license number plate, brake, side marker and other)	① Operation	(A) Turn each of the light switches to check for operation. (B) Any light which interlocks with other device should be checked in interlocked state. The back-up light should be checked for operation by shifting the gears in reverse.
Warning lights	① Operation	(A) All warning lights come on when starter switch is turned to position "1" and go out when engine starts.
Pumps	① Oil leakages and noise	(A) Start engine to check for oil leakage or noise from pumps.
Control valve	① Lever operation	(A) Start engine and operate valve levers to check if lift and tilt cylinders operate properly.
Hydraulic piping	① Oil leakage and damage	(A) Check piping and hose for oil leakage and damage visually.
Hydraulic cylinders (lift, tilt)	① Oil leakage ② Damage to cylinder rod	(A) Start engine and operate valve levers to check for oil leakage from cylinder or piping. (A) Operate cylinder to check cylinder rod for contamination and damage.
Lift chains	① Damage, deformation ② Tension	(A) Check lift chains for damage or deformation. (A) Lift forks about 50 mm off ground and push chain midway on the span with fingers. Normal deflection: 40 to 50 mm. (B) Check right and left lift chains for even tension.
Forks and mast	① Operation	(A) Start engine and operate valve levers to check that forks lift and lower properly and mast tilts forward and backward properly.
Any defects found by previous inspection	① Repaired properly?	(A) Check to see if defects found by previous inspection have been correctly repaired and the truck operates normally.

1.5 PERIODIC INSPECTIONS

Note: It is necessary to service your forklift truck at periodic intervals, in order to keep it in good operating condition and to prevent any problems from occurring.
Forklift trucks often play an important role in the production process and it is no exaggeration to say that preventive maintenance of forklift trucks working in the facility is one of the key factors to improvements in productivity.

(1) Daily inspection and service (pre-work inspection)

It is mandatory to inspect and service the specified items on the forklift trucks before starting the day's work or a new shift ("Article 47, Chapter 4 of the Road Trucking Vehicle Law" and "Article 151-25 of the Labor, Safety and Sanitation Regulations")

The items that must be inspected and serviced, and the procedures for doing so, are described in the TCM Inspection Service Notes. This requirement should be made clear to the customer when the forklift truck is delivered.

(2) Periodic service (monthly inspections)

In order to maintain the performance of a new truck and prevent any sudden problems from developing, TCM specifies that the forklift truck must be serviced every 200 hours (or once every month).

In addition, it is mandatory to keep records of inspections and maintenance performed for three years ("Article 151-22 and Article 151-23 of the Labor, Safety and Sanitation Regulations.")

(3) Periodic service (annual inspections)

However excellent the construction of a forklift truck may be, its components and parts will inevitably wear or deteriorate in the course of use. It is mandatory to perform annual maintenance and keep the records of this maintenance for three years ("Article 151-21 and Article 151-23 of the Labor, Safety and Sanitation Regulations.")

Periodic service is required to maintain the performance and durability of the forklift truck, as well as to ensure safe operation. It is recommended that periodic service should be performed without fail for your own benefit, to say nothing of the "mandatory laws and regulations".

Also, mandatory inspection and service of forklift trucks is required every 6 months for forklifts that have a "Vehicle Inspection" sticker. The inspection and service records must be kept for one year. ("Articles 48 and 49 of the Road Trucking Vehicle Law").

The details concerning items (1), (2) and (3) are described in the TCM Inspection Service Notes.

Periodic inspection items and intervals

System	Item	Procedure \ Interval: Hour	100	200	300	400	500	600	700	800	900	1000	1100	1200
		Month	1	2	3	4	5	6	7	8	9	10	11	12
Engine and allied parts	Engine oil	Oil level	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Engine oil	Contamination	X	X	X	X	X	X	X	X	X	X	X	X
	Fan belt	Tension	✓	✓	A	✓	✓	A	✓	✓	A	✓	✓	A
	Fan belt	Damage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Air cleaner element	Contamination	C	C	C	C	C	X	(Clean every 3 days or weekly)				C	X
	Radiator	Water leakage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Radiator -- cooling water	Water level	✓	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	X
	Cooling system -- water pump	Water leakage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Cooling system -- rubber hose	Water leakage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Cooling system -- rubber hose	Sign of damage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Battery -- electrolyte	Level	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Battery -- electrolyte	Specific gravity			✓			✓			✓			✓
	Battery -- case	Contamination	C	C	C	C	C	C	C	C	C	C	C	C
	Ignition plug	Space between electrodes						A						X
	Ignition plug	Contamination			C			C			C			C
	Distributor cap	Cracks			✓			✓			✓			✓
	Distributor cap	Damage			✓			✓			✓			✓
	Distributor rotor	Damage			✓			✓			✓			✓
	Distributor points	Clearance between points			A			A			A			X
	Governor oil	Level			✓			✓			✓			✓
	Governor oil	Addition			L			L			L			L
	Injection pump oil	Level			✓			✓			✓			✓
	Injection pump oil	Contamination			X			X			X			X
	Fuel filter -- element	Contamination	C	C	X	C	C	X	C	C	X	C	C	X
	Oil filter -- element	Contamination			X			X			X			X
	Valve clearance	Clearance						✓						✓
	Injection nozzle	Operation						✓						✓
	Injection nozzle	Seizure												✓
	Injection nozzle	Spray pattern												✓
	Crankcase breather	Contamination			C			C			C			C
	Fuel tank	Leakage from piping	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Fuel tank	Interior			C			C			C			C
	Fuel pump	Leakage from piping	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Symbol:

W: Disassemble
✓: Check
A: Adjust
O: Remove
X: Replace
T: Tighten
C: Clean
OH: Overhaul
Y: Weld
△: Repair
L: Lubricate

System	Item	Procedure \ Interval: Hour / Month	100 / 1	200 / 2	300 / 3	400 / 4	500 / 5	600 / 6	700 / 7	800 / 8	900 / 9	1000 / 10	1100 / 11	1200 / 12
Engine and allied parts	Fuel pump -- strainer (diesel trucks)	Contamination												C
	Starter motor brush -- commutator surface	Wear			✓			✓			✓			✓
	Generator brush -- commutator surface	Wear			✓			✓			✓			✓
	Carburetor	Fuel leakage			✓			✓			✓			✓
	Carburetor	Contamination			C			C			C			C
	Carburetor linkage	Looseness			✓			✓			✓			✓
	Ignition timing	Condition			✓			✓			✓			✓
	Exhaust muffler	Exhaust leakage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Exhaust muffler	Damage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Exhaust muffler -- mounting bolts	Looseness	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Engine	Rotation			✓			✓			✓			✓
	Engine	Noise			✓			✓			✓			✓
	Engine	Exhaust			✓			✓			✓			✓
	Engine	Oil leakage			✓			✓			✓			✓
	Engine -- max. speed under no load	Measure												✓
	Engine -- idle rpm	Measure												✓
	Engine -- compression pressure	Measure												✓
Power train	Shift lever	Operation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Shift lever	Looseness	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Clutch	Operation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Clutch pedal	Play	A	A	A	A	A	A	A	A	A	A	A	A
	Clutch pedal	Travel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Clutch linkage	Looseness	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Transmission	Noise	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Transmission	Oil leakage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Transmission gear oil	Level	✓	✓	✓	✓	✓	X	✓	✓	✓	✓	✓	X
	Torque converter	Noise	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Torque converter	Oil leakage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Torque converter oil	Level	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X
	Inline filter	Contamination						C						C
	Front axle	Noise	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Front axle	Oil leakage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Front axle -- mounting bolts	Looseness						✓						✓
Brake system	Brake	Braking effect	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Brake pedal	Play	✓	✓	A	✓	✓	A	✓	✓	A	✓	✓	A
	Brake pedal	Travel	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	A
	Brake oil	Level	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X
	Brake piping	Leakage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Symbol:

W: Disassemble
✓: Check
A: Adjust
O: Remove
X: Replace
T: Tighten
C: Clean
OH: Overhaul
Y: Weld
△: Repair
L: Lubricate

System	Item	Interval / Procedure	Hour	100	200	300	400	500	600	700	800	900	1000	1100	1200	Symbol:
			Month	1	2	3	4	5	6	7	8	9	10	11	12	
Brake system	Brake back plate	Deformation													✓	W: Disassemble
	Brake back plate	Cracks													✓	✓: Check
	Brake back plate	Damage													✓	A: Adjust
	Parking brake	Braking effect		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	O: Remove
	Parking brake lever	Travel		✓	✓	A	✓	✓	A	✓	✓	A	✓	✓	A	X: Replace
	Parking brake lever	Looseness		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	T: Tighten
	Parking brake rod and cable	Looseness		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	C: Clean
	Parking brake rod and cable	Play		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	OH: Overhaul
	Parking brake rod and cable	Damage		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Y: Weld
Steering and driving systems	Steering wheel	Operation		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	△: Repair
	Steering wheel	Play		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L: Lubricate
	Steering wheel knob	Looseness		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Steering wheel mounting bolts	Looseness				✓			✓			✓			✓	
	Tire	Inflation pressure		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Tire	Wear		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Tire	Damage		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Rim	Cracks		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Rim	Deformation		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Rim	Damage		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Rim mounting bolts	Looseness		✓	✓	✓	✓	✓	T	✓	✓	✓	✓	✓	T	
	Hub bolts and nuts	Looseness		✓	✓	T	✓	✓	T	✓	✓	T	✓	✓	T	
	Drive shaft mounting bolt	Looseness		✓	✓	T	✓	✓	T	✓	✓	T	✓	✓	T	
	Power steering	Operation		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Power steering	Oil leakage		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Power steering -- rod	Damage		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Rear axle	Wheel alignment													✓	
	Rear axle -- installation	Looseness		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Tie rod	Looseness		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Tie rod	Distortion		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Tie rod	Damage		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	King pin	Looseness		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

System	Item	Interval: Hour / Procedure: Month	100	200	300	400	500	600	700	800	900	1000	1100	1200	Symbol:
			1	2	3	4	5	6	7	8	9	10	11	12	
Electrical system	Lights	Operation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	W: Disassemble
	Switches	Operation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓: Check
	Warning lights	Function	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A: Adjust
	Horn	Function	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	O: Remove
	Turn signal	Function	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X: Replace
	Turn signal lever	Operation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	T: Tighten
Load handling system	Hydraulic oil	Level	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	C: Clean
	Hydraulic oil	Contamination	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X	OH: Overhaul
	Suction strainer	Contamination						C						C	Y: Weld
	Lift chain	Tension	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	△: Repair
	Lift chain	Lubrication	L	L	L	L	L	L	L	L	L	L	L	L	L: Lubricate
	Lift chain	Damage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Anchor pin	Deformation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Pump	Operation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Pump	Oil leakage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Pump drive	Operation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Pump drive	Looseness	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Pump -- piping	Damage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Control valve	Operation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Control valve	Oil leakage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Control valve levers	Operation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Control valve levers	Looseness	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Control valve piping	Damage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Control valve oil pressure	Measure						A						A	
	Mast	Operation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Mast	Cracks	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Mast	Distortion	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Sheaves	Operation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Carriage	Operation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Carriage	Cracks	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Carriage	Distortion	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	End rollers	Rotation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	End rollers	Damage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Side rollers	Rotation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Side rollers	Damage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Side roller mounting bolts	Looseness	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Retaining rollers	Rotation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Retaining rollers	Damage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

System	Item	Interval / Procedure	Hour	100	200	300	400	500	600	700	800	900	1000	1100	1200
			Month	1	2	3	4	5	6	7	8	9	10	11	12
Load handling system	Retaining roller mounting bolts	Looseness		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Lift cylinder	Operation		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Lift cylinder	Oil leakage		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Lift cylinder rod	Damage		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Tilt cylinder	Operation		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Tilt cylinder	Oil leakage		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Tilt cylinder rod	Damage		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Tilt cylinder locknut	Looseness		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Lift cylinder natural drop	Measure													✓
	Tilt cylinder natural drop	Measure													✓
	Forks	Distortion		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Forks	Cracks		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Fork stopper	Distortion				✓			✓			✓			✓
	Fork stopper	Wear				✓			✓			✓			✓
	Overhead guard	Cracks		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Overhead guard	Deformation		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Overhead guard mounting bolts	Looseness		✓	✓	T	✓	✓	T	✓	✓	T	✓	✓	T
	Load backrest	Cracks		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Load backrest	Deformation		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Load backrest mounting bolts	Looseness		✓	✓	T	✓	✓	T	✓	✓	T	✓	✓	T
	Mast support mounting bolts	Looseness							✓						✓
Others	Operator's seat	Damage							✓						✓
	Operator's seat mounting bolts	Looseness							✓						✓
	Grease fittings	Lubrication		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Symbol:

W: Disassemble
✓: Check
A: Adjust
O: Remove
X: Replace
T: Tighten
C: Clean
OH: Overhaul
Y: Weld
△: Repair
L: Lubricate

2. REMOVING/REINSTALLING

2.1 ELECTRICAL PARTS

2.1.1 HEAD LAMP

■ REMOVAL

① Disconnect the connector of the head lamp from the connector of the wire harness (1) on the overhead guard.

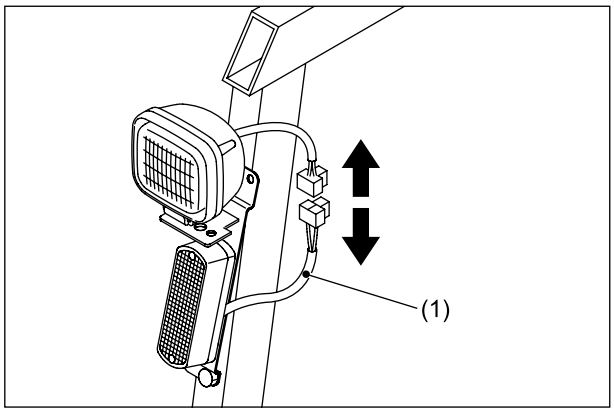


Fig. 2.1

② Remove the nut (1) and the washer (2). Remove the head lamp (4) from the overhead guard (3).

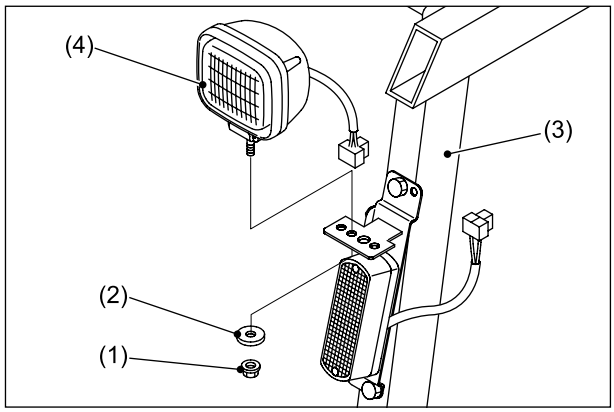


Fig. 2.2

■ REINSTALLATION

① Install the head lamp (2) on the overhead guard (1) using the nut (3) and washer (4).

7.8 - 11.7 N-m {0.8 - 1.2 kgf-m} [5.8 - 8.6 lbf-ft]

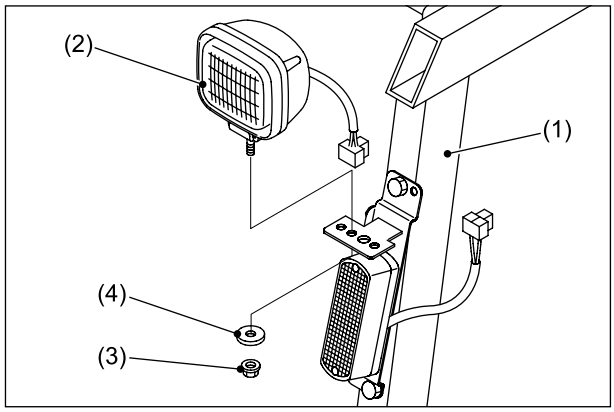


Fig. 2.3

② Connect the connector (2) of the head lamp to the connector of the wire harness (1) on the overhead guard.

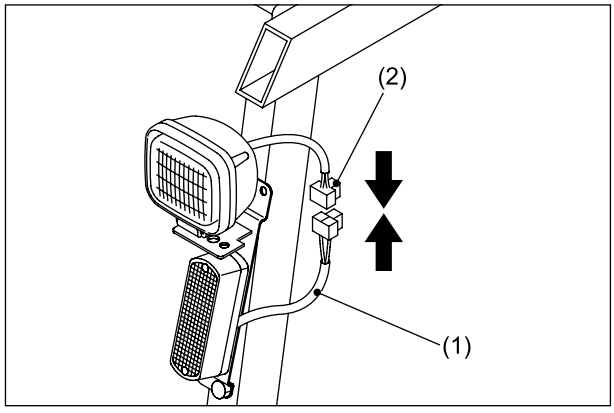


Fig. 2.4

2.1.2 FRONT COMBINATION LAMP

■ REMOVAL

① Disconnect the connector of the front combination lamp from the connector of the wire harness (1) on the overhead guard.

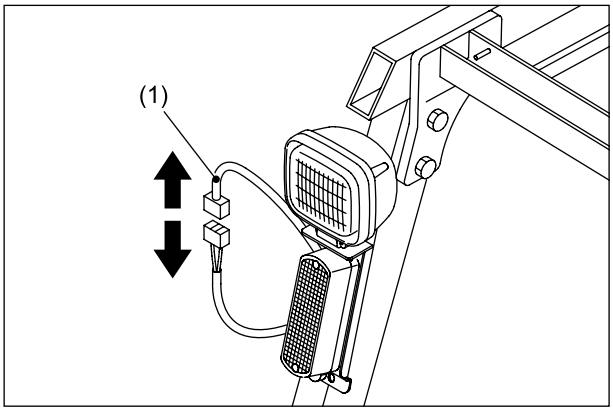


Fig. 2.5

② Remove the two screws (1) and then remove the front combination lamp (3) from the overhead guard (2).

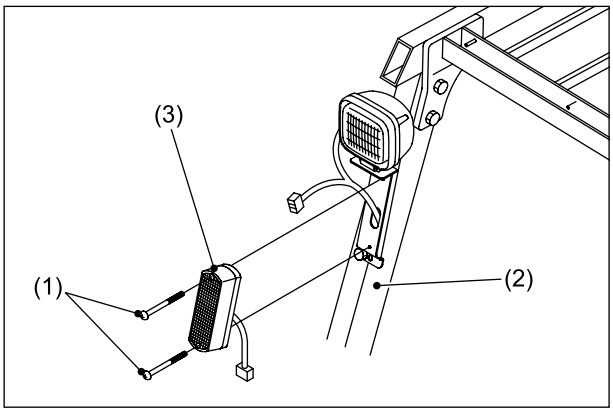


Fig. 2.6

■ REINSTALLATION

① Install the front combination lamp (2) on the overhead guard (1) using the two screws (3).

1.9 - 2.8 N-m {0.2 - 0.3 kgf-m} [1.4 - 2.1 lbf-ft]

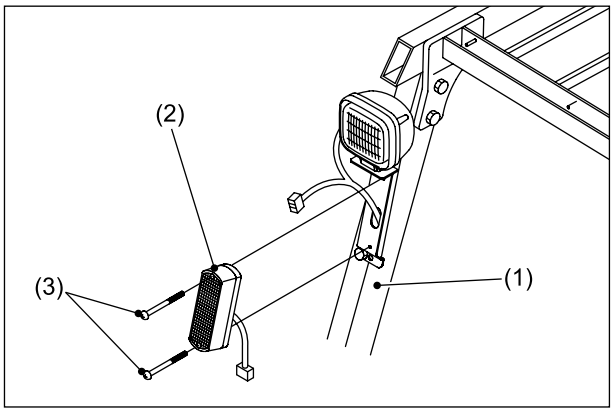


Fig. 2.7

② Connect the connector (2) of the front combination lamp to the connector of the wire harness (1) on the overhead guard.

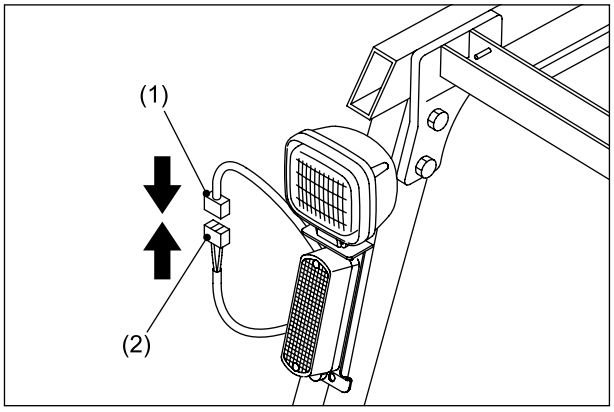


Fig. 2.8

2.1.3 REAR COMBINATION LAMP

■ REMOVAL

① Remove the screws (1) and then remove the rear combination lamp (2) from the overhead guard (3).

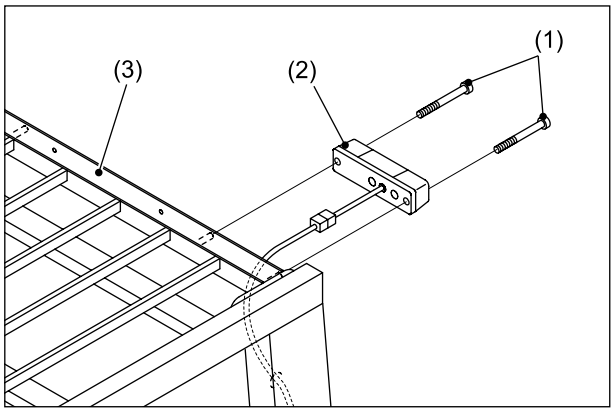


Fig. 2.9

② Disconnect the connector of the rear combination lamp (2) from the connector of the wire harness (1) on the overhead guard.

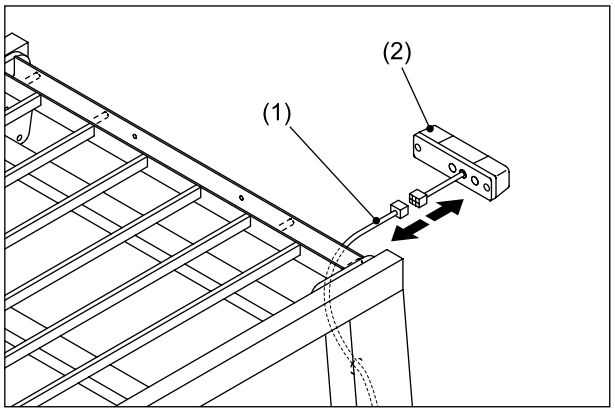


Fig. 2.10

■ REINSTALLATION

① Connect the connector (2) of the rear combination lamp to the connector of the wire harness (1) on the overhead guard.

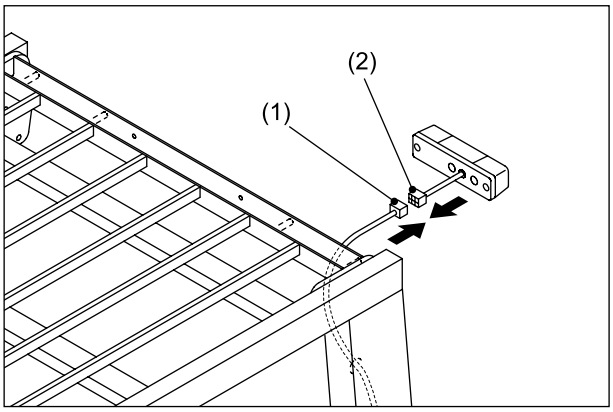


Fig. 2.11

② Install the rear combination lamp (2) on the overhead guard (1) using the screws (3).

1.9 - 2.8 N-m {0.2 - 0.3 kgf-m}
[1.4 - 2.1 lbf-ft]

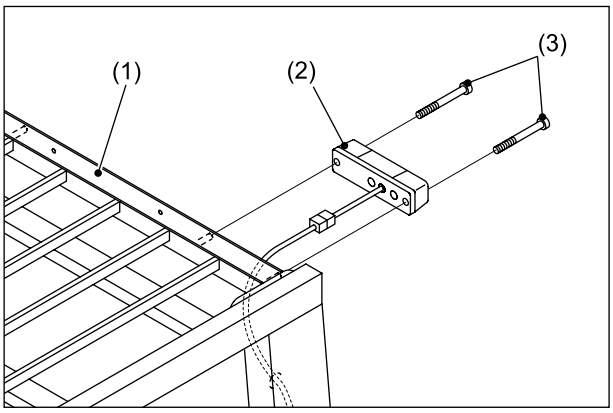


Fig. 2.12

2.1.4 BATTERY

■ REMOVAL (diesel trucks)

① Disconnect the negative (-) battery cable (3) from the negative (-) terminal (2) of the battery 2 (1).

⚠ **Make sure to disconnect the negative (-) battery cable first.**

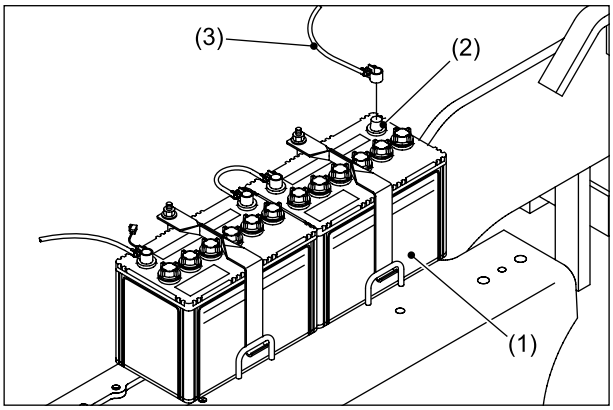


Fig. 2.13

② Disconnect the positive (+) battery cable (3) from the positive (+) terminal (2) of the battery 1 (1).

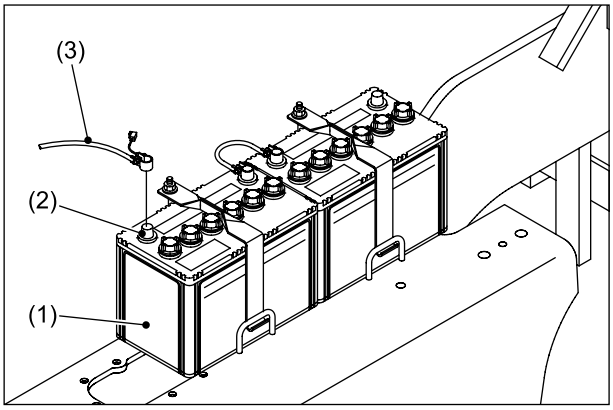


Fig. 2.14

③ Remove the battery cable (3) from the battery 1's negative (-) terminal (1) and the battery 2's positive (+) terminal (2).

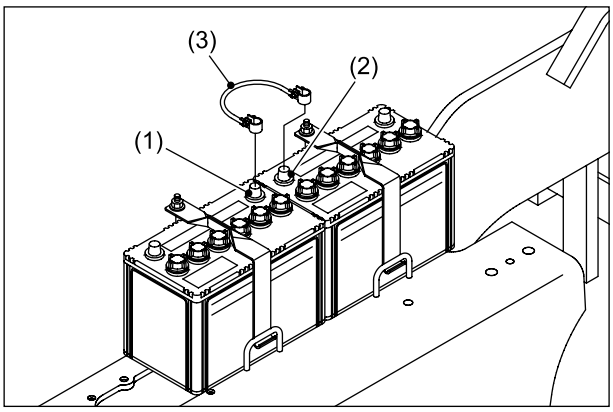


Fig. 2.15

④ Remove the nut (2), spring washer (3) and washer (4) from the battery 1's anchor bolt (1), and then remove the battery holder (5).

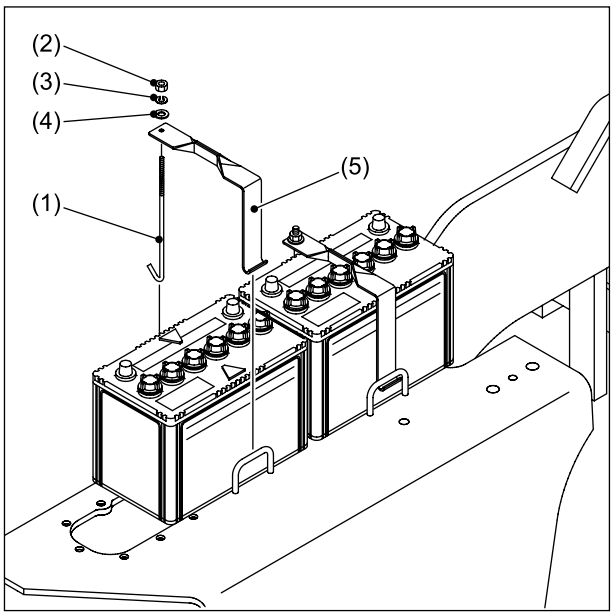


Fig. 2.16

⑤ Remove the nut (2), spring washer (3) and washer (4) from the battery 2's anchor bolt (1), and then remove the battery holder (5).

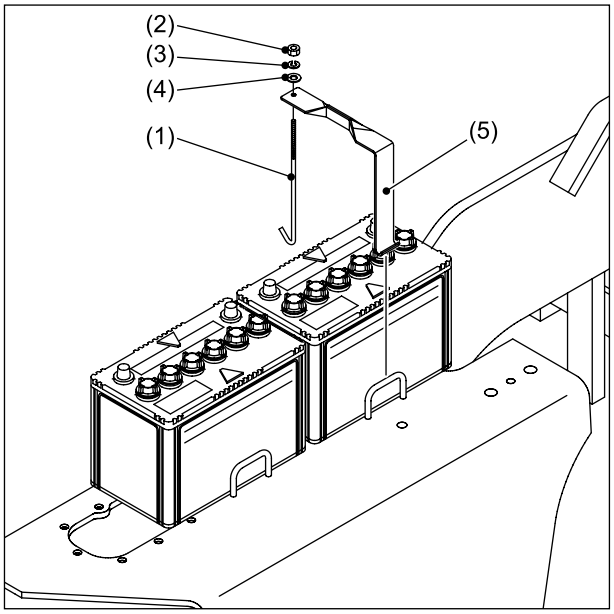


Fig. 2.17

⑥ Remove the batteries 1 (1) and 2 (2).

18.5 kg [40.8 lbs] (243C2-40151)

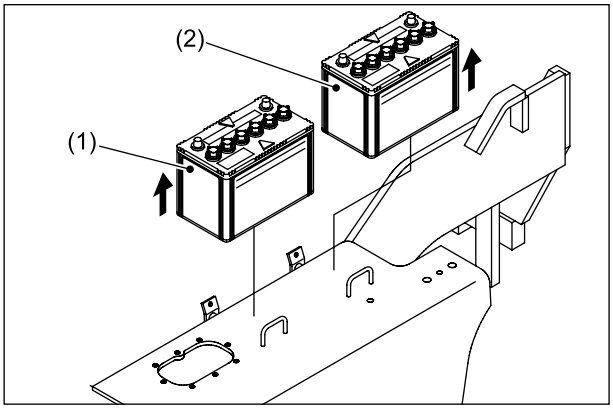


Fig. 2.18

■ REINSTALLATION (diesel trucks)

① Put the batteries 1 (1) and 2 (2) in place.

⚠ **Pay attention to the direction of the terminals.**

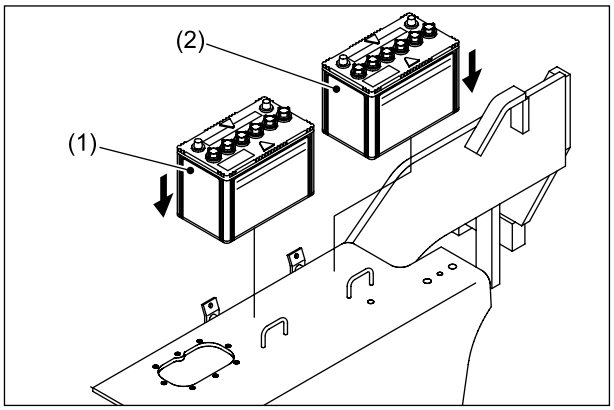


Fig. 2.19

② Install the battery holder (2) and anchor bolt (3) on the battery 2 (1), and secure them using the nut (4), spring washer (5), and washer (6).

2.9 - 4.8 N-m {0.3 - 0.5 kgf-m}
[2.4 - 3.5 lbf-ft]

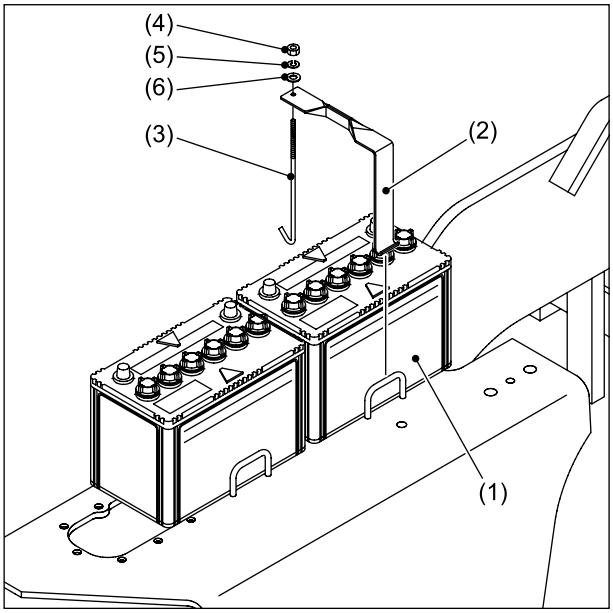


Fig. 2.20

③ Install the battery holder (2) and anchor bolt (3) on the battery 1 (1), and secure them using the nut (4), spring washer (5), and washer (6).

2.9 - 4.8 N-m {0.3 - 0.5 kgf-m}
[2.4 - 3.5 lbf-ft]

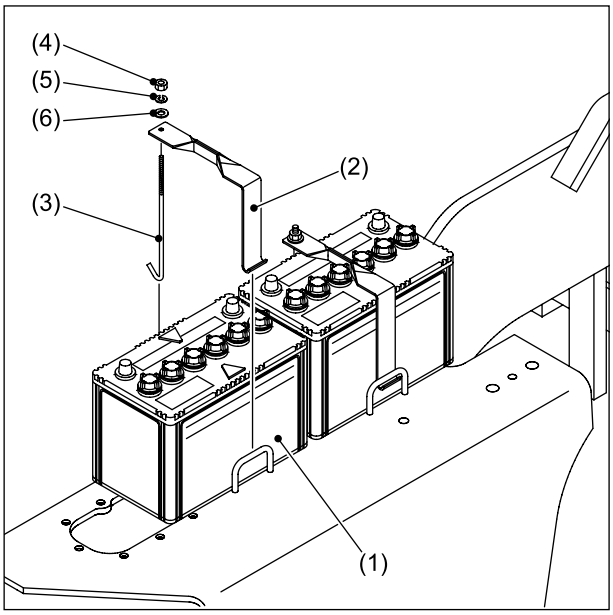


Fig. 2.21

④ Connect the battery cable (3) to the battery 1's negative (-) terminal (1) and the battery 2's positive (+) terminal (2).

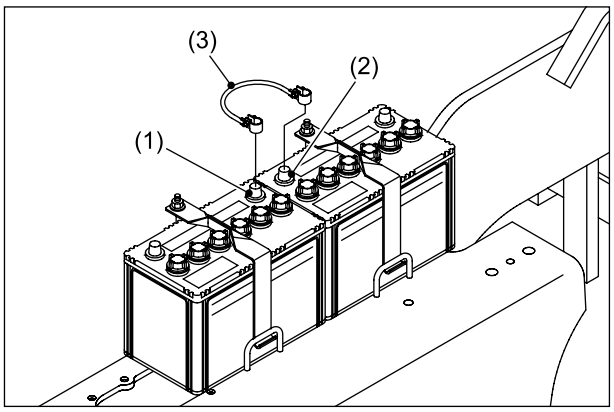


Fig. 2.22

⑤ Connect the positive (+) battery cable (2) to the battery 1's positive (+) terminal (1).

⚠ **Make sure to connect the battery cable to the positive (+) terminal of the battery first.**

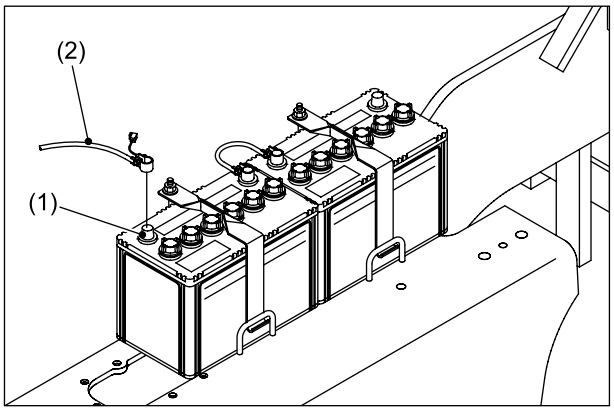


Fig. 2.23

⑥ Connect the negative (-) battery cable (2) to the battery 2's negative (-) terminal (1).

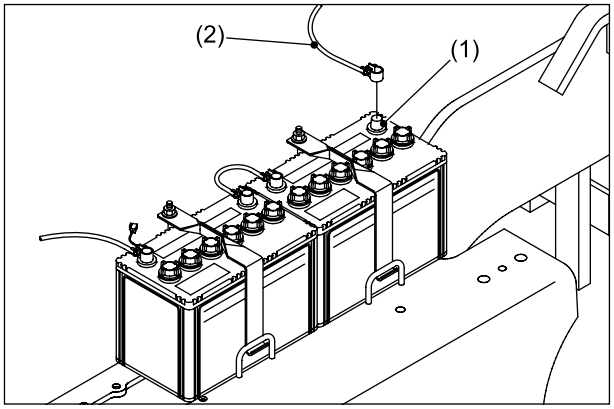


Fig. 2.24

■ REMOVAL (gasoline trucks)

① Disconnect the negative (-) battery cable (2) from the battery's negative (-) terminal (1).

⚠ **Make sure to disconnect the negative (-) battery cable first.**

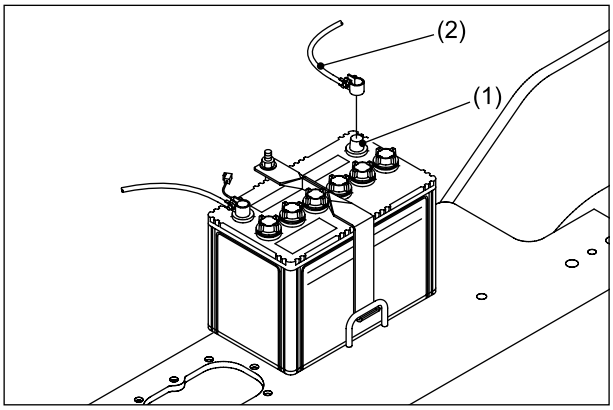


Fig. 2.25

② Disconnect the positive (+) battery cable (2) from the battery's positive (+) terminal (1).

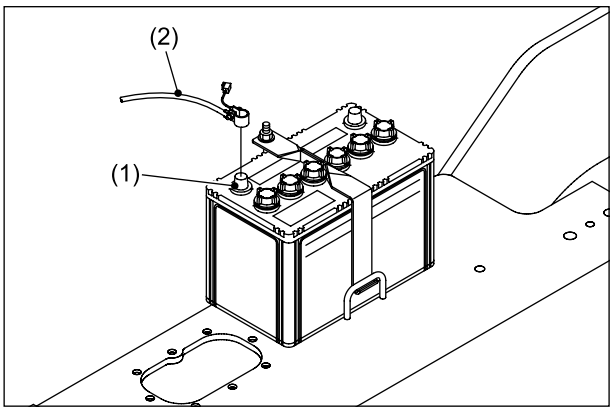


Fig. 2.26

③ Remove the nut (2), spring washer (3), and washer (4) from the anchor bolt (1). Then remove the battery holder (5).

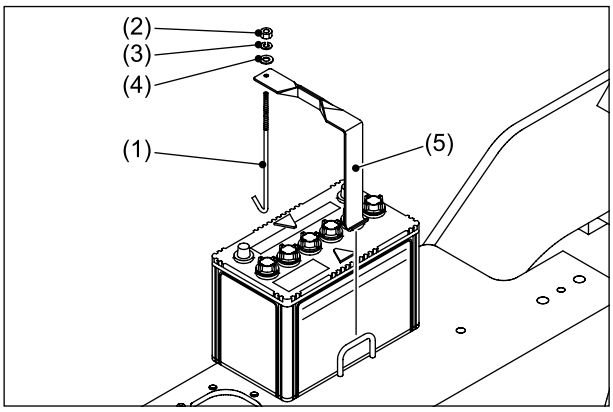


Fig. 2.27

④ Remove the battery (1).

19.7 kg [43.4 lbs] (225N2-42031)

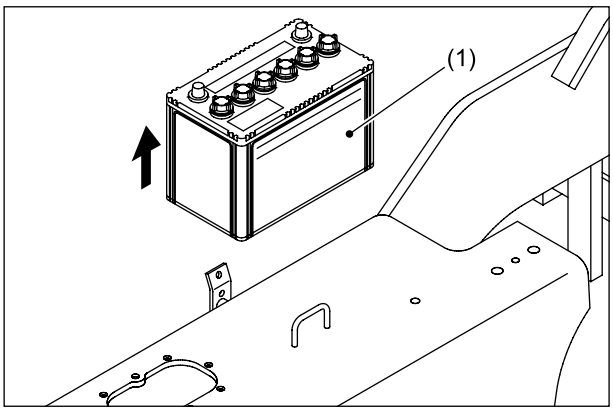


Fig. 2.28

■ REINSTALLATION (gasoline trucks)

① Put the battery (1) in place.

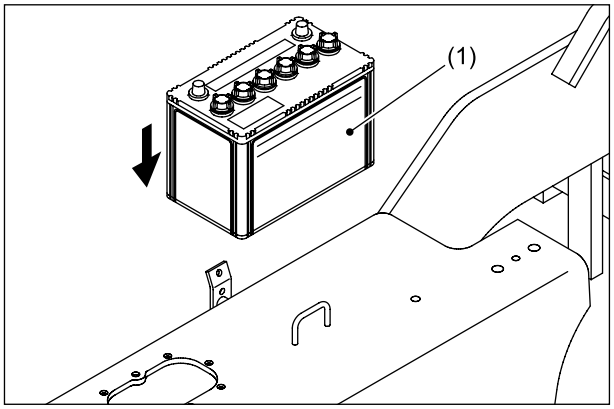


Fig. 2.29

② Install the battery holder (1) and anchor bolt (2), and secure them using the nut (3), spring washer (4), and washer (5).

2.9 - 4.8 N-m {0.3 - 0.5 kgf-m} [2.1 - 3.5 lbf-ft]

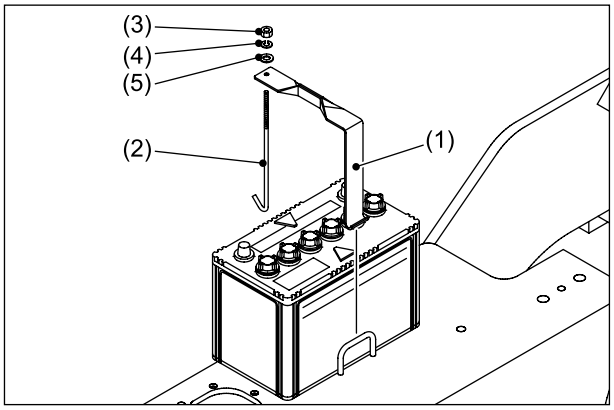


Fig. 2.30

③ Connect the positive (+) battery cable (2) to the positive (+) terminal (1) of the battery.

⚠ **Make sure to connect the battery cable to the positive (+) terminal of the battery first.**

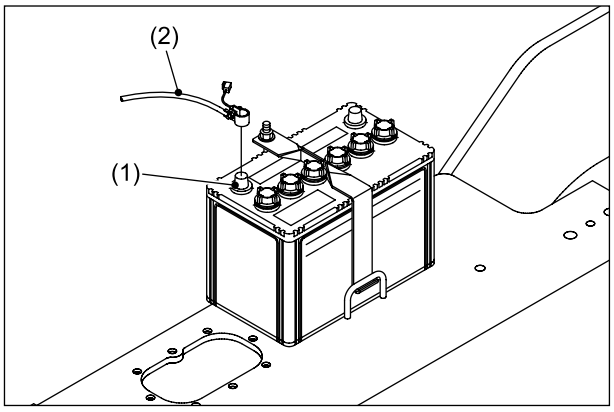


Fig. 2.31

④ Connect the negative (-) battery cable (2) to the negative (-) terminal (1) of the battery.

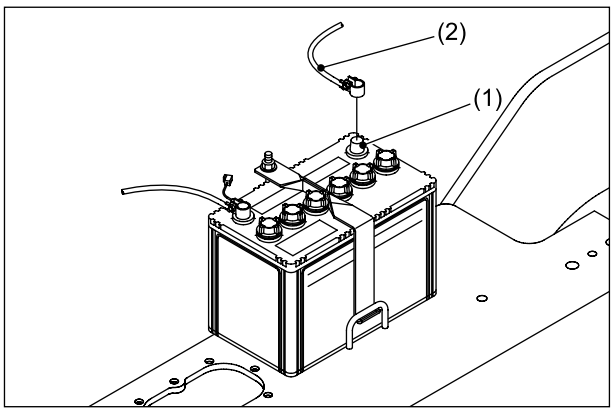


Fig. 2.32

2.2 HOOD AND OVERHEAD GUARD

The following procedure involves removing the fuel tank hose. Make sure to keep flammable materials away from the area.

■ REMOVAL

① Park the truck according to the specified procedure.
(See "1.1.10 Safety rules for maintenance", <Before starting maintenance>)

② Remove the air cleaner. (See "2.7 AIR CLEANER.")

③ Open the engine hood (1). Keep the engine hood open by fastening it to the overhead guard (2) using a rope.
44 kg [97 lbs]

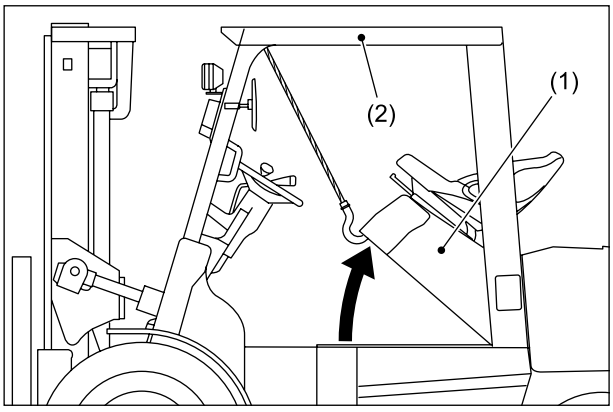


Fig. 2.33

④ Remove the plastic duct (1) from between the air cleaner and the overhead guard's right rear leg.

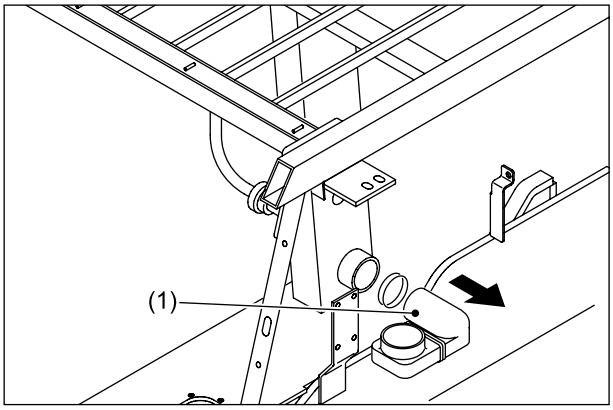


Fig. 2.34

⑤ Remove both side covers (1) from the front guard.

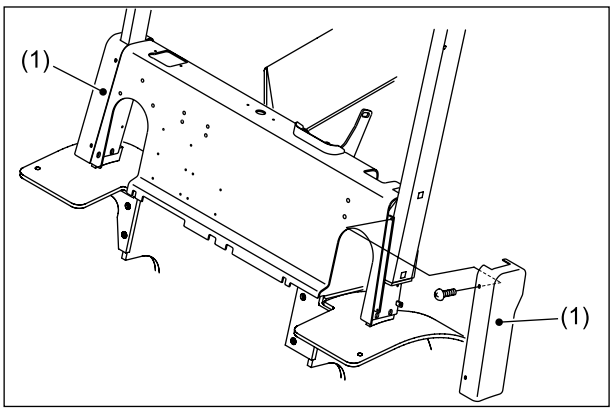


Fig. 2.35

⑥ Remove the connectors of the overhead guard wire harness (front) (1) from the connectors of the front guard wire harness.

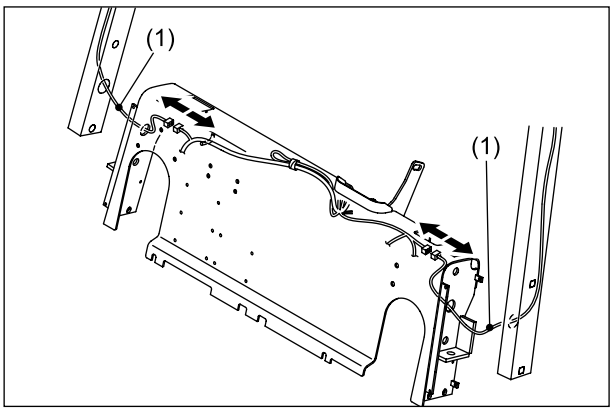


Fig. 2.36

⑦ Remove the connectors of the overhead guard wire harness (rear) (1) from the connectors of the engine wire harness.

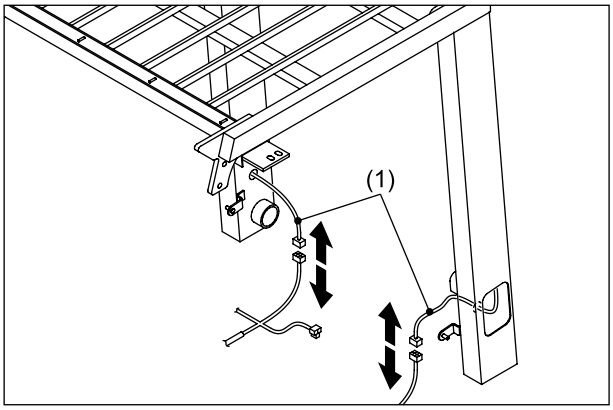


Fig. 2.37

⑧ Remove the hose (3) from between the fuel tank (1) and the overhead guard's left rear leg (2), and then install the cover (4) on the tank-side pipe. Remove the hose (5) and install the cover (6).

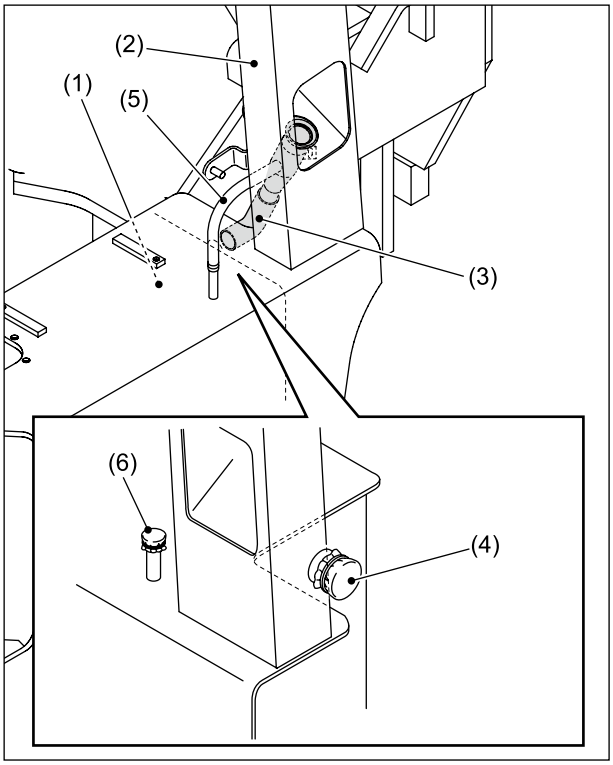


Fig. 2.38

⑨ Remove the bolts (1) securing the overhead guard.

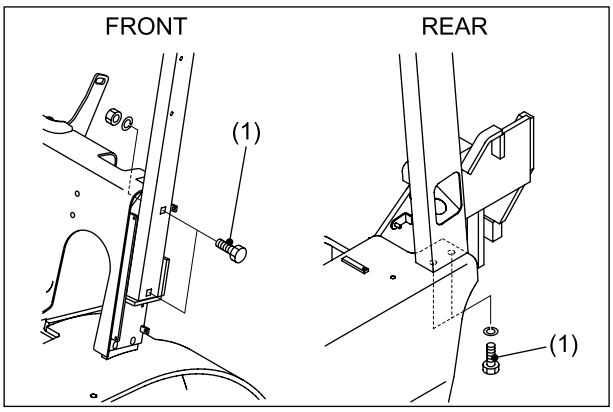


Fig. 2.39

⑨ Hoist the overhead guard (1) off from the frame with the wire ropes attached to sections A.

154 kg [340 lbs]

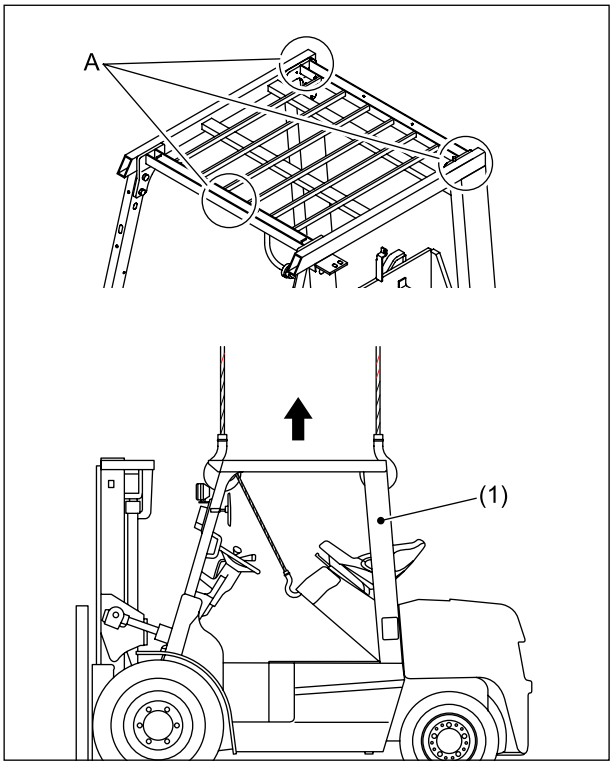


Fig. 2.40

■ REINSTALLATION

① Hoist the overhead guard (1) with the wire ropes attached to sections A. Then install the overhead guard (1) on the frame (2).

154 kg [340 lbs]

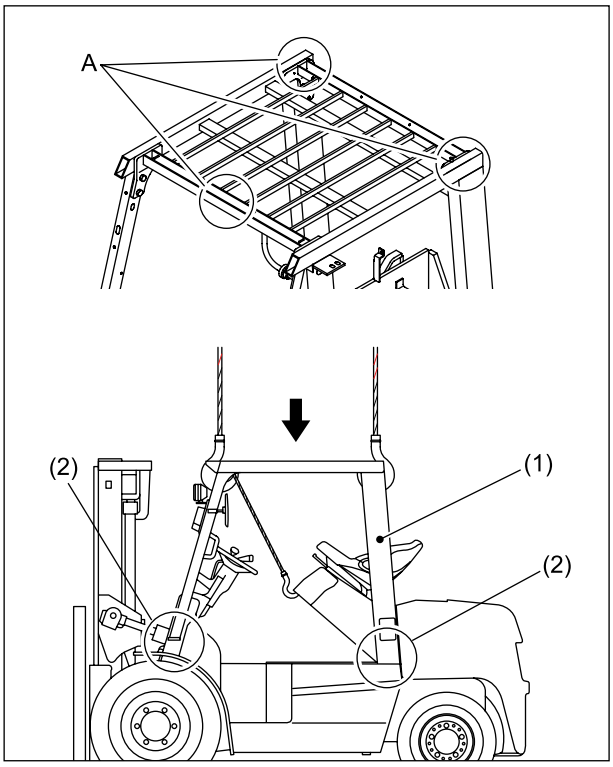


Fig. 2.41

② Secure the overhead guard (2) using the bolts (1).

31.4 - 47.1 N-m {3.2 - 4.8 kgf-m} [23.2 - 34.7 lbf-ft]

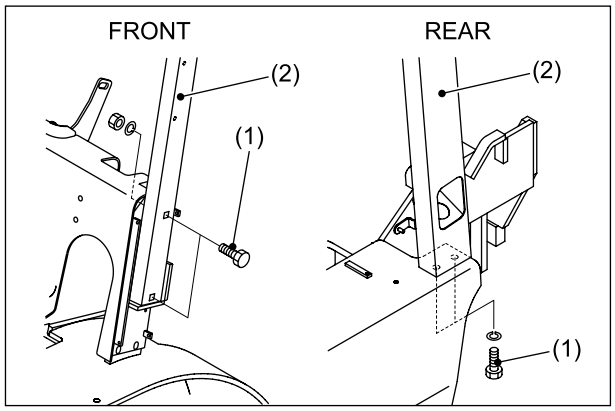


Fig. 2.42

③ Connect the connectors of the overhead guard wire harness (rear) (1) to the connectors of the engine wire harness (2).

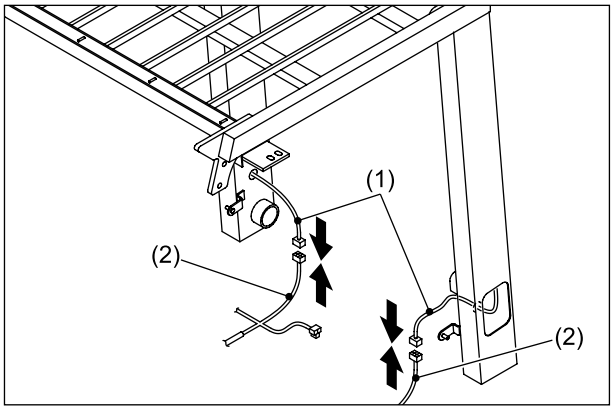


Fig. 2.43

④ Connect the connectors of the overhead guard wire harness (front) (1) to the connectors of the front guard wire harness (2).

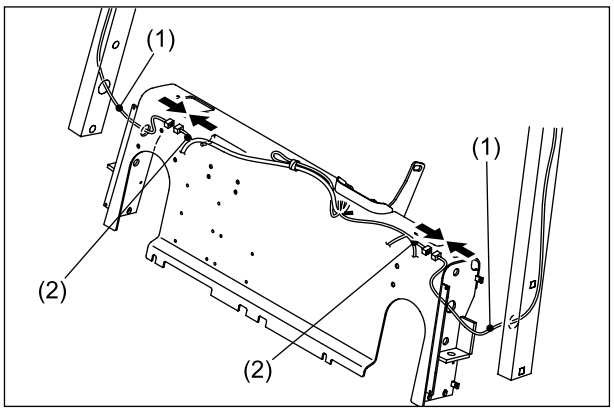


Fig. 2.44

⑤ Install both side covers (1) on the front guard.

5 N-m {0.5 kgf-m} [3.7 lbt-ft]

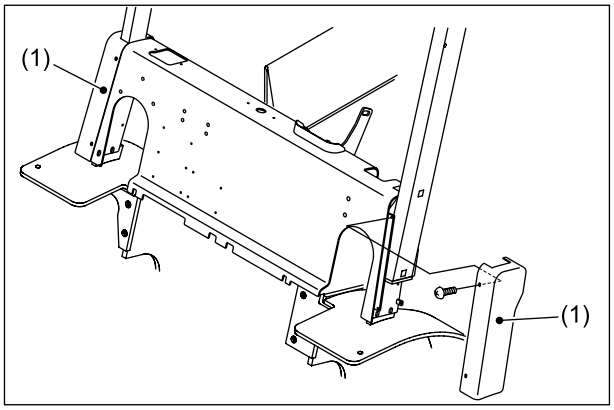


Fig. 2.45

2.3 ENGINE HOOD

■ REMOVAL

① Remove the overhead guard. (See "2.2 HOOD AND OVERHEAD GUARD.")

② Remove the clip (3) and washer (4) securing the gas spring (1) to the overhead guard (2).

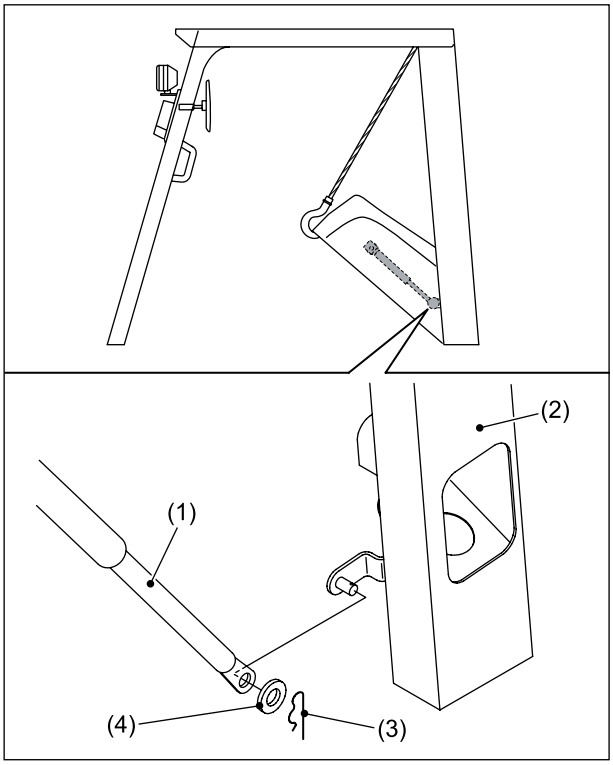


Fig. 2.46

③ Raise the engine hood so that the gas spring (1) is fully stretched. Then, remove the gas spring from the overhead guard.

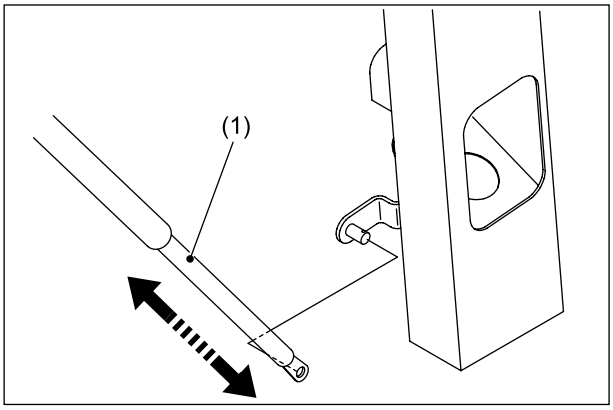


Fig. 2.47

④ Unlock the engine hood (1) and then lower it carefully.

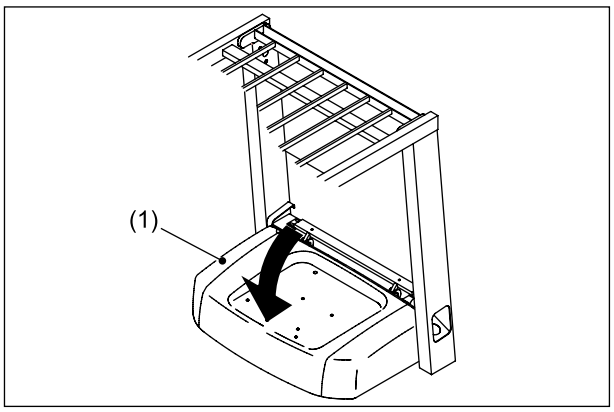


Fig. 2.48

⑤ Remove the bolts (2) securing the bracket (1) in place. Then, remove the bracket (1) and engine hood (3) together.

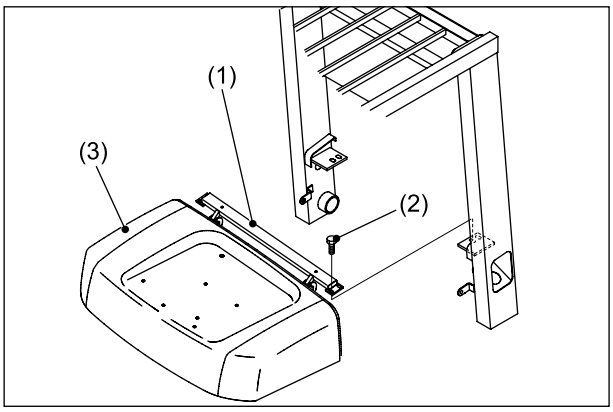


Fig. 2.49

■ REINSTALLATION

① Fit the bracket (1) to the overhead guard's rear legs (2), and then secure them using the bolts (3).

21.2 N-m {2.16 kgf-m} [15.6 lbf-ft]

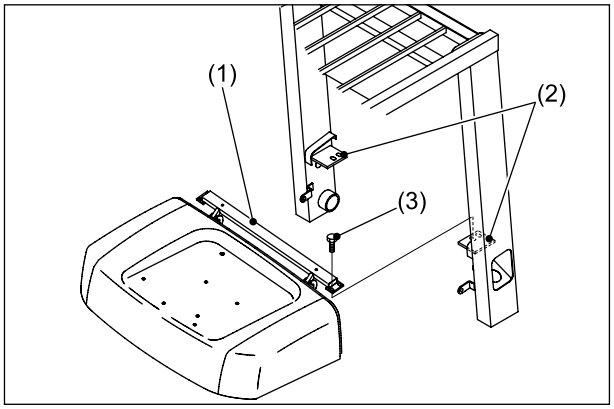


Fig. 2.50

② Raise the engine hood (1). Keep the engine hood raised by fastening it to the overhead guard (2) using a rope.

27 kg [59.5 lbs]

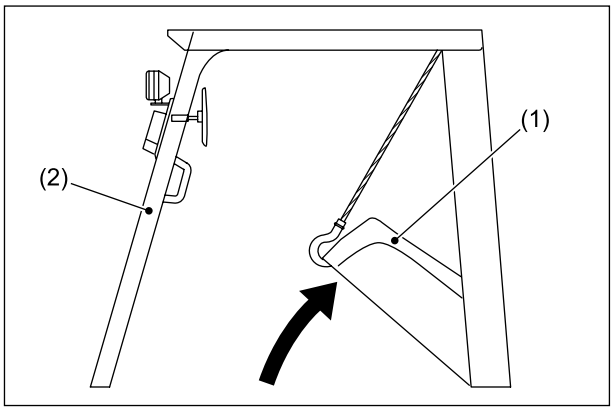


Fig. 2.51

③ Install the gas spring (1) on the overhead guard (2) using the clip (3) and washer (4).

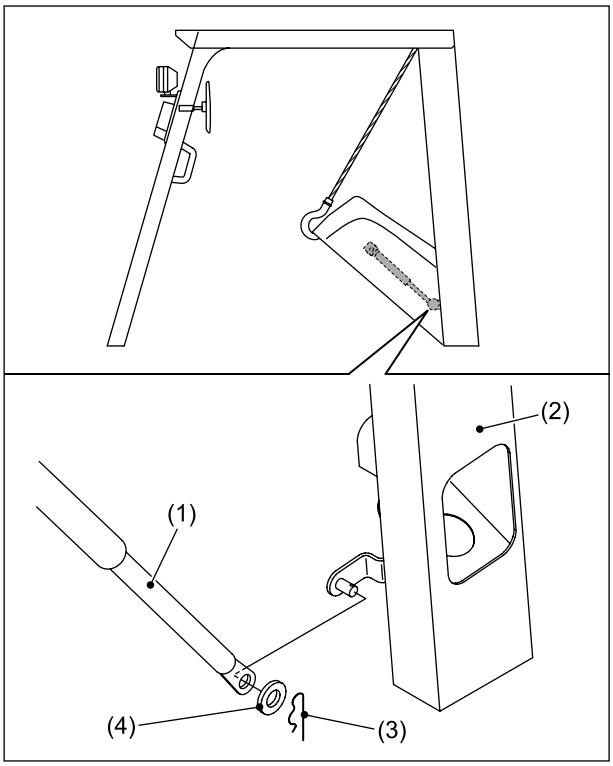


Fig. 2.52

④ Install the overhead guard and engine hood on the frame. (See "2.2 HOOD AND OVERHEAD GUARD.")

2.4 COUNTERWEIGHT

■ REMOVAL

① Pass a wire rope (2) through each hole in the counterweight (1) and then attach a ring to each end of the wire rope.

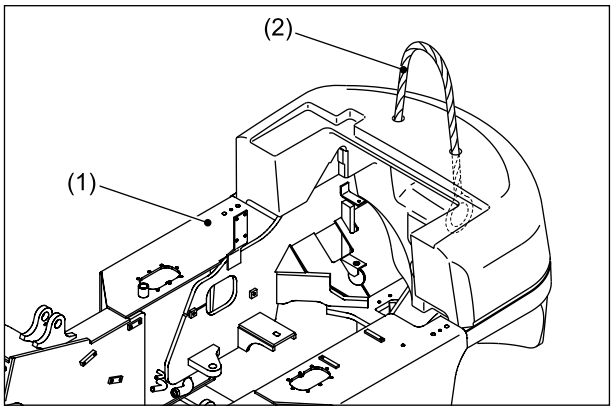


Fig. 2.53

② Remove the bolts (1), spring washers (2), and washers (3) securing the counterweight.

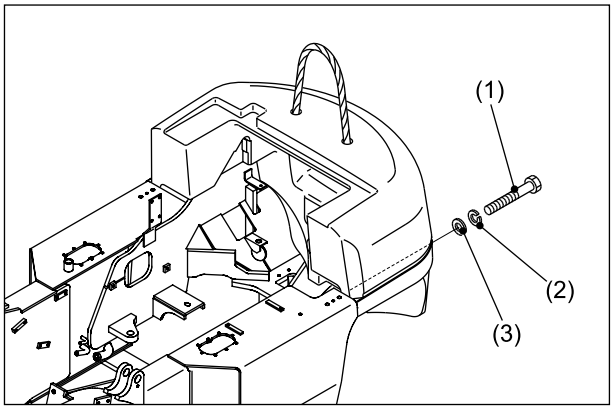


Fig. 2.54

③ Hoist the counterweight (1) off the frame (2).

	(kg [lbs])
3.5 tons	2044 [4506]
4.0 tons	2474 [5454]
4.5 tons	2764 [6094]
5.0 tons	2764 [6094]

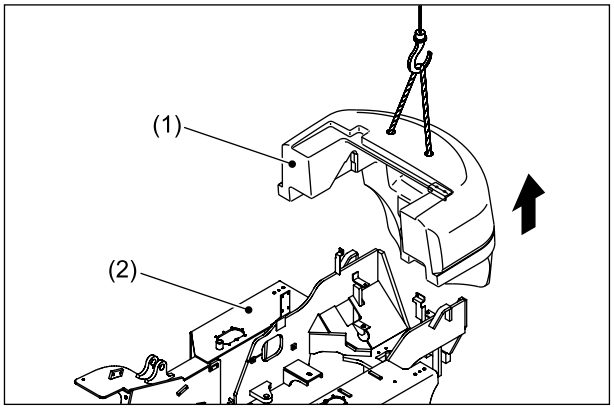


Fig. 2.55

■ REINSTALLATION

① Hoist the counterweight (1) and place it in its mounting position at the rear section of the frame (2).
Align section A of the frame with the recess of the counterweight.

	(kg [lbs])
3.5 tons	2044 [4506]
4.0 tons	2474 [5454]
4.5 tons	2764 [6094]
5.0 tons	2764 [6094]

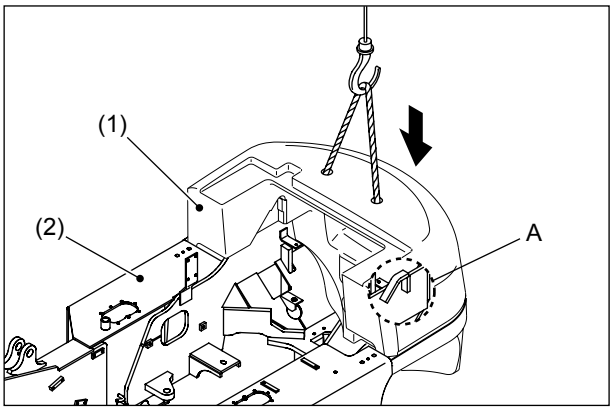


Fig. 2.56

② Secure the counterweight in place using the bolts (1), spring washers (2), and washers (3).

417 - 624 N-m {42.5 - 63.6 kgf-m} [307.6 - 460.2 lbf-ft]

Apply LOCTITE #572.

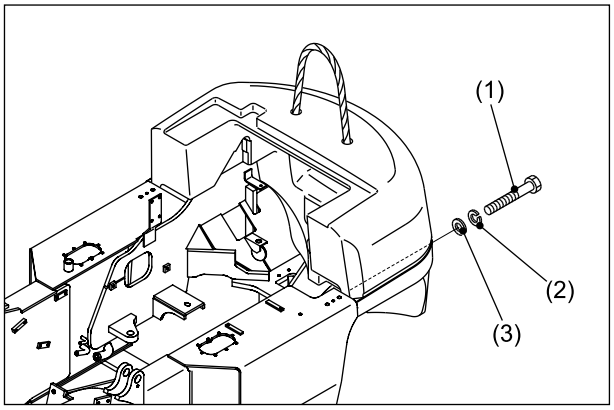


Fig. 2.57

2.5 MUFFLER

■ REMOVAL

① Remove the counterweight. (See “2.4 COUNTERWEIGHT.”)

② Remove the bolt (1) and nut (2) securing the muffler, and remove the washers (3) and cushions (4).

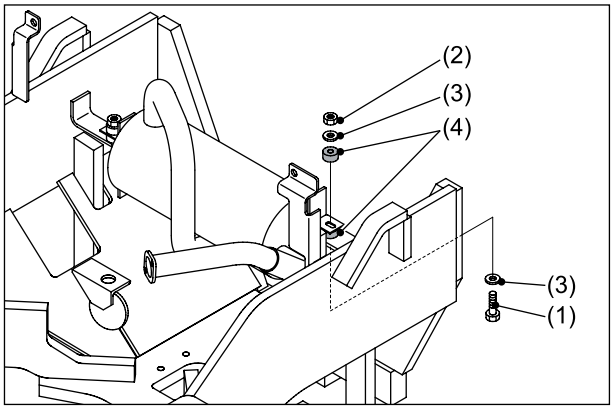


Fig. 2.58

③ Remove the nut (1) on the engine-side flange, and then remove the muffler (2).

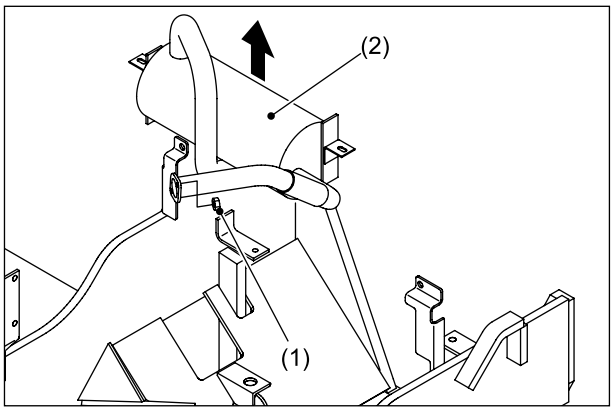


Fig. 2.59

■ REINSTALLATION

① Install the muffler-side flange onto the stud of the exhaust manifold flange.

② Secure the muffler using the cushions (1), bolt (2), washers (3) and nut (4). Install the nut (5) on the engine-side flange.

Nut (4): 11 N-m {1.1 kgf-m} [8.1 lbf-ft]
Nut (5): 21.2 N-m {2.16 kgf-m} [15.6 lbf-ft]

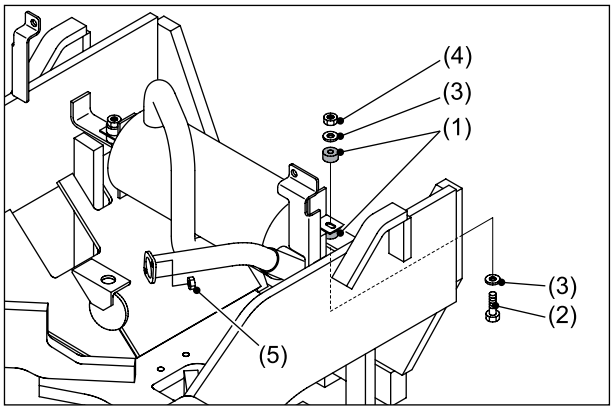


Fig. 2.60

③ Install the counterweight. (See "2.4 COUNTERWEIGHT.")

2.6 RADIATOR

■ REMOVAL

① Remove the radiator cover (1).

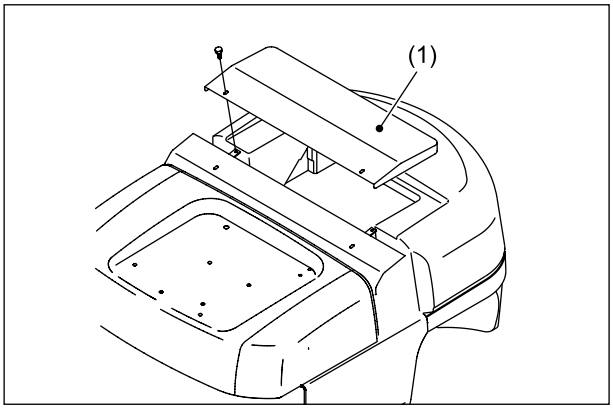


Fig. 2.61

② Remove the counterweight. (See "2.4 COUNTERWEIGHT.")
③ Drain the coolant.
④ Remove the radiator hoses (1).
For an automatic transmission truck, remove the oil cooler hose as well.
Tag all hoses for proper reinstallation.

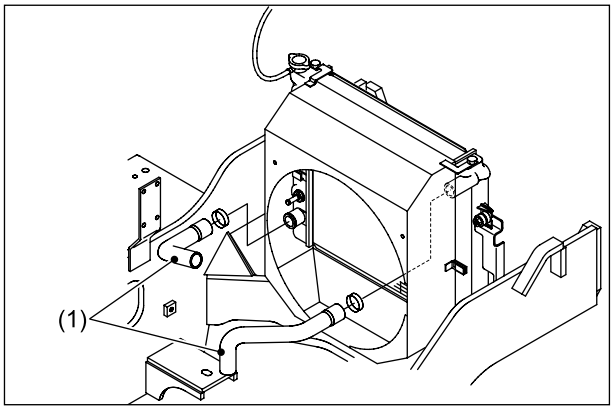


Fig. 2.62

⑤ Remove the hose (1) leading from the radiator cap to the reserve tank.

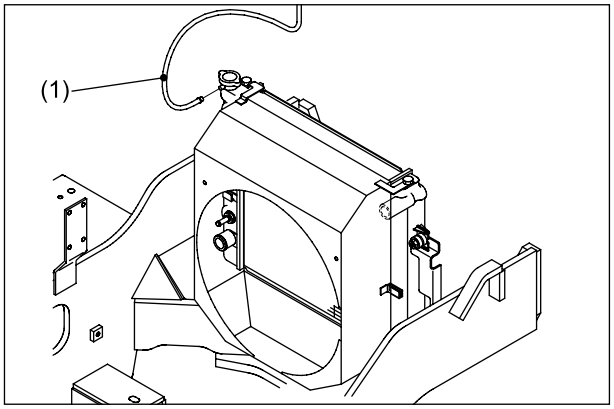


Fig. 2.63

⑥ Remove the fan shroud mounting bolts (1) and then separate the fan shroud (3) from the radiator (2).
Bring the removed fan shroud near the engine.

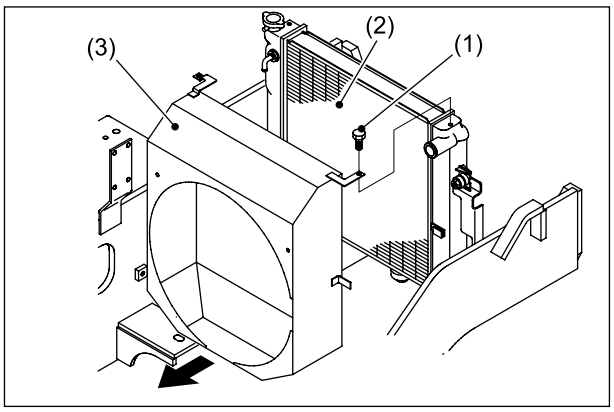


Fig. 2.64

⑦ Remove the bolts (1), washers (2), rubber cushions (3), and nuts (4) that secure the radiator in place, and then remove the radiator (5).

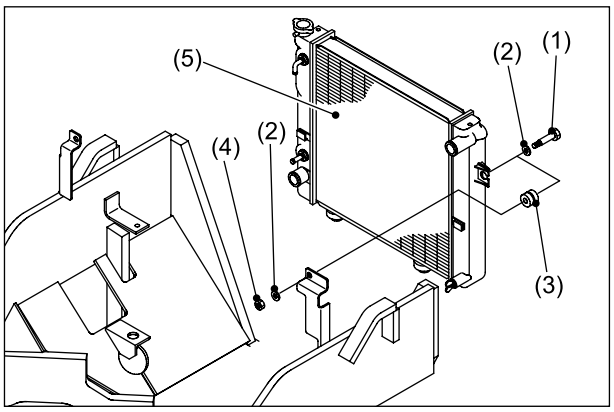


Fig. 2.65

⑧ Remove the fan shroud (1).

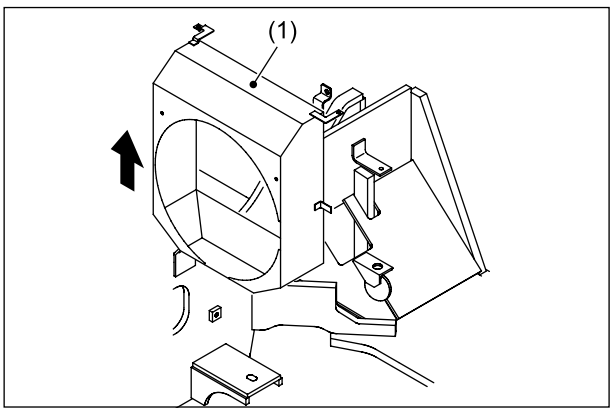


Fig. 2.66

■ REINSTALLATION

① Place the fan shroud on the fan of the engine.
② Align the rubber cushions (1) with the holes in the frame.

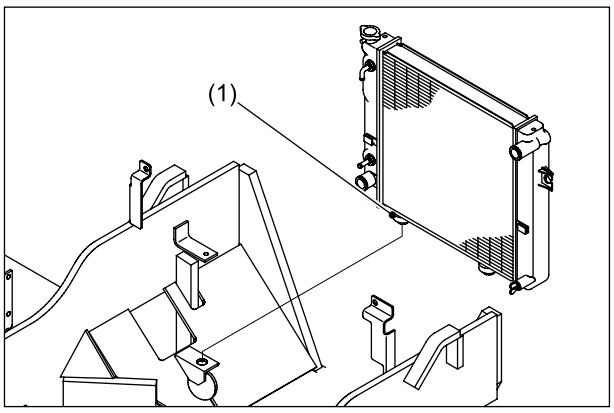


Fig. 2.67

③ Install the radiator (2) with the rubber cushions (1) and then secure it using the bolts (3), washers (4), and nuts (5).

7.8 - 11.7 N-m {0.8 - 1.2 kgf-m} [5.8 - 8.6 lbf-ft]

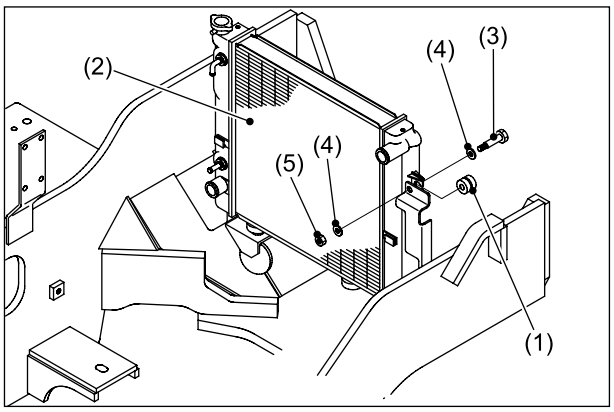


Fig. 2.68

④ Align the hook of the fan shroud (1) with the guide located at the center of the tank of the radiator (2). Secure it using the bolts (3).

7.8 - 11.7 N-m {0.8 - 1.2 kgf-m} [5.8 - 8.6 lbf-ft]

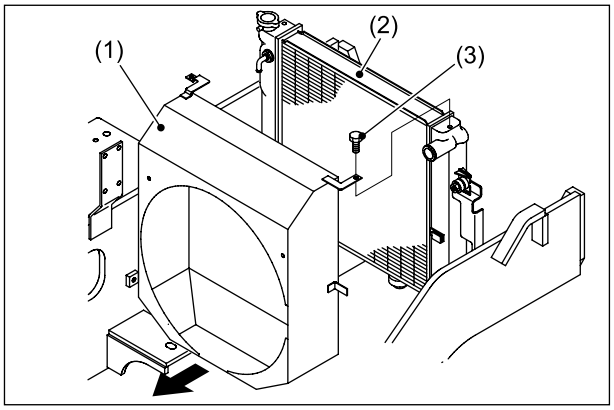


Fig. 2.69

⑤ Connect one end of the hose (1) leading from the reserve tank, to the radiator cap (2).

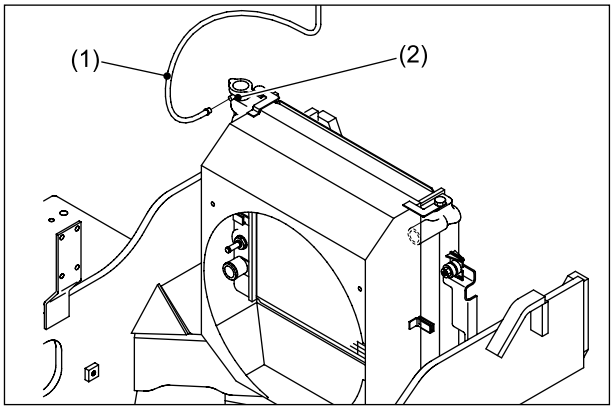


Fig. 2.70

⑥ Connect the radiator hoses (1).
For an automatic transmission truck, connect the oil cooler hose as well.

⑦ Tighten the drain plug securely. Add the same amount of coolant as was drained during removal.

⑧ Install the counterweight. (See "2.4 COUNTERWEIGHT.")

⑨ Install the radiator cover. (See Fig. 2.61.)

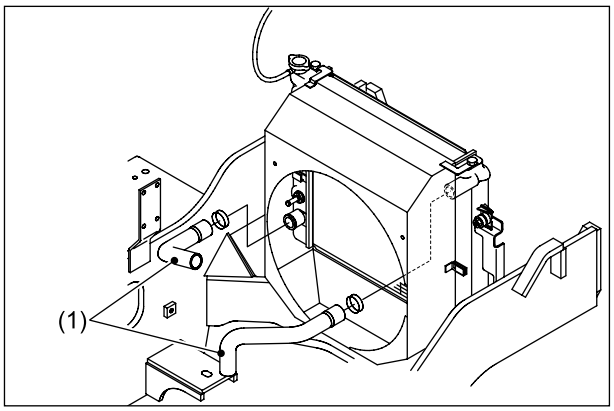


Fig. 2.71

2.7 AIR CLEANER

■ REMOVAL

⚠ **Do not start the engine with the air cleaner removed.**

① Open the engine hood and then lock the gas spring securely.

② Remove one end of the hose (1) leading to the engine, from the air cleaner (2). Cover the opening end of the hose.

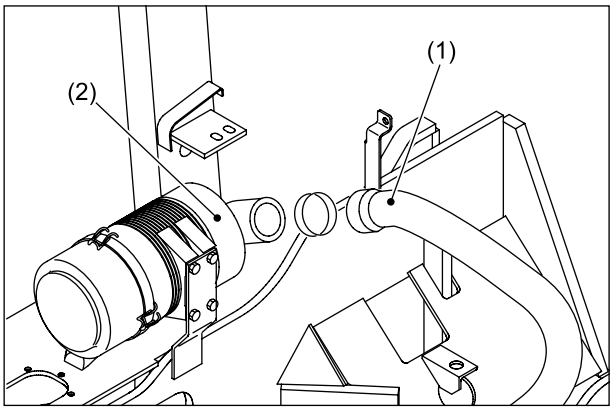


Fig. 2.72

③ Remove one end of the plastic duct (1) leading to the rear pipe, from the air cleaner (2).

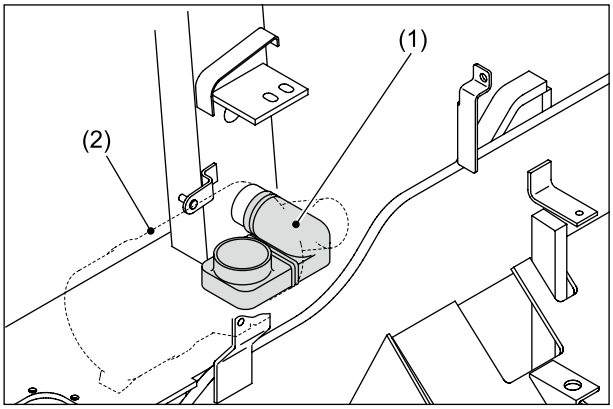


Fig. 2.73

④ Remove the bolts (1) that secure the air cleaner in place and remove the air cleaner (2).

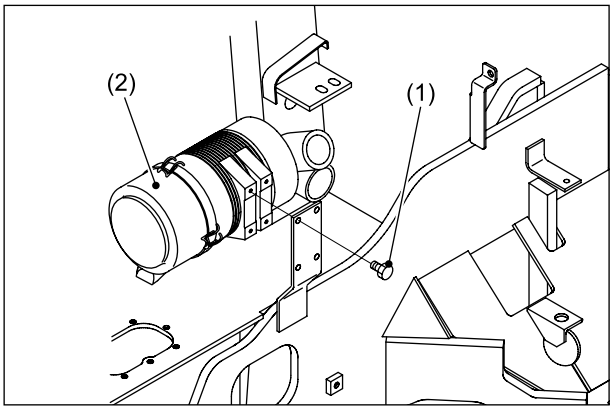


Fig. 2.74

■ REINSTALLATION

① Install the air cleaner (1) on the bracket (2) using the bolts (3).

7.8 to 11.7 N-m {0.8 to 1.2 kgf-m} [5.8 - 8.6 lbf-ft]

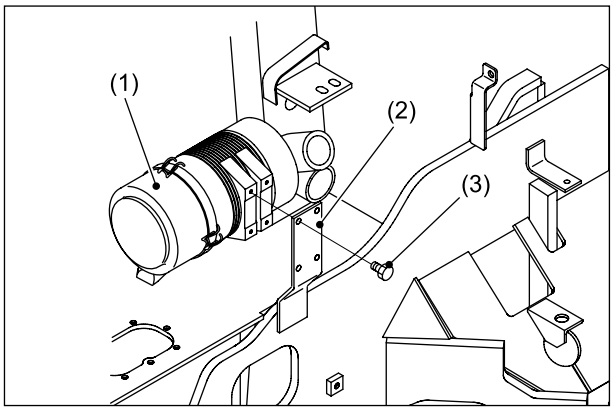


Fig. 2.75

② Connect one end of the plastic duct (1) leading from the rear pipe, to the air cleaner (2).

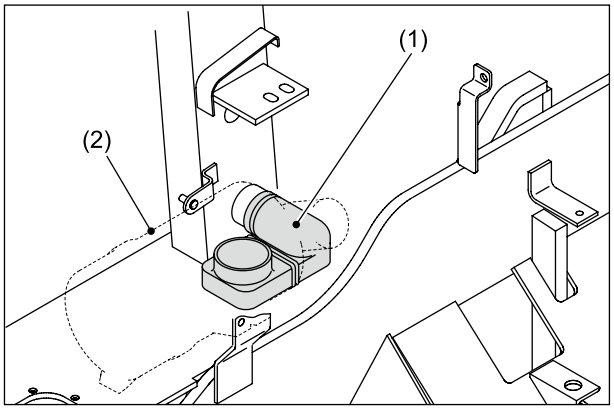


Fig. 2.76

③ Remove the cover from the opening end of the hose (1) that connects between the engine and air cleaner. Connect the hose (1) to the air cleaner (2).

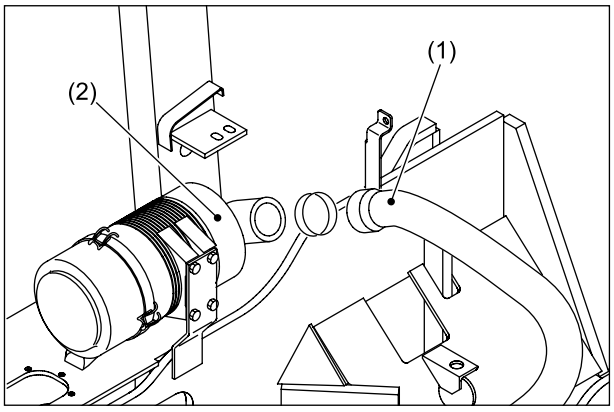


Fig. 2.77

④ Unlock the gas spring of the engine hood and then close the engine hood.

2.8 FRONT GUARD

■ REMOVAL

① Remove the overhead guard. (See “2.2 HOOD AND OVERHEAD GUARD.”)
② Remove the steering wheel. (See “2.13 STEERING WHEEL.”)
③ Disconnect the connectors of the front guard wire harness (1) from the connectors of the engine wire harness (2).
④ Remove all the plastic covers.

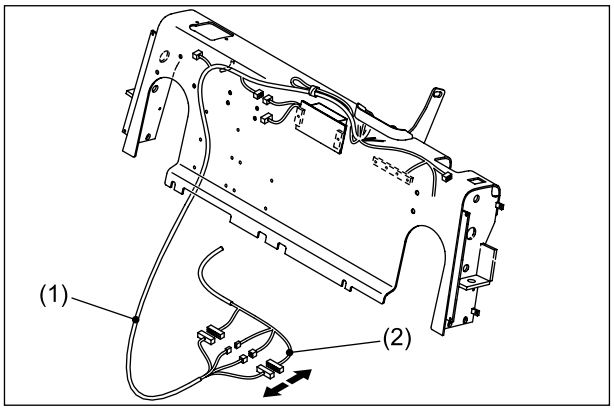


Fig. 2.78

⑤ Remove the floorboard kit (1).

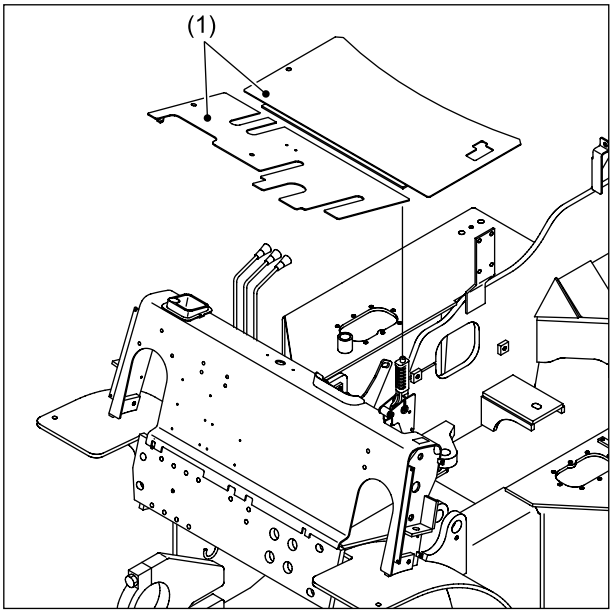


Fig. 2.79

⑥ Remove the bolts (1) and then remove the parking brake lever (2).
⑦ Remove the bolts (3) securing the valve levers (4) and remove the valve levers.

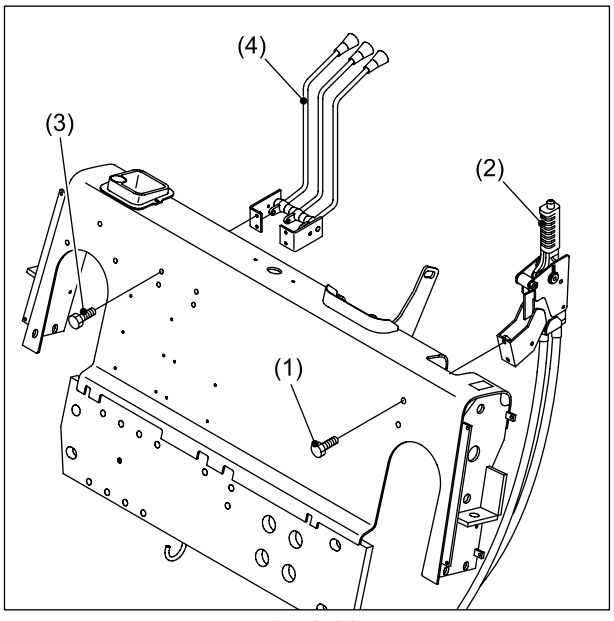


Fig. 2.80

⑧ Remove the wiring to the parking brake switch.

⑨ Remove the brake oil reservoir.

Note: The reservoir should be removed with brake oil in it.

⑩ Remove the bolts (3) that secure the pipes (2) leading to the tilt cylinders (1), to the front guard.

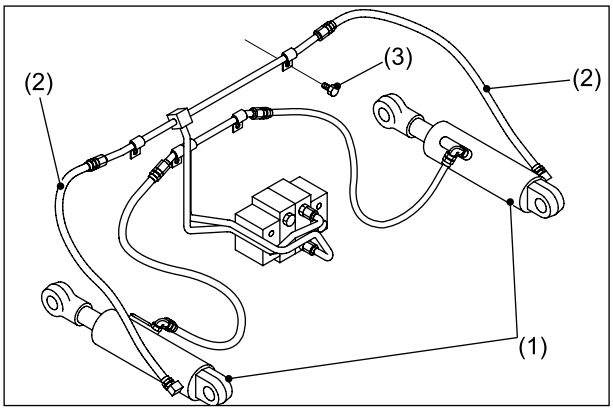


Fig. 2.81

⑪ Remove the four mounting-bolts (2) at the right and left sides of the front guard (1).

⑫ Remove the front guard (1) by hoisting it.

40 kg [88 lbs]

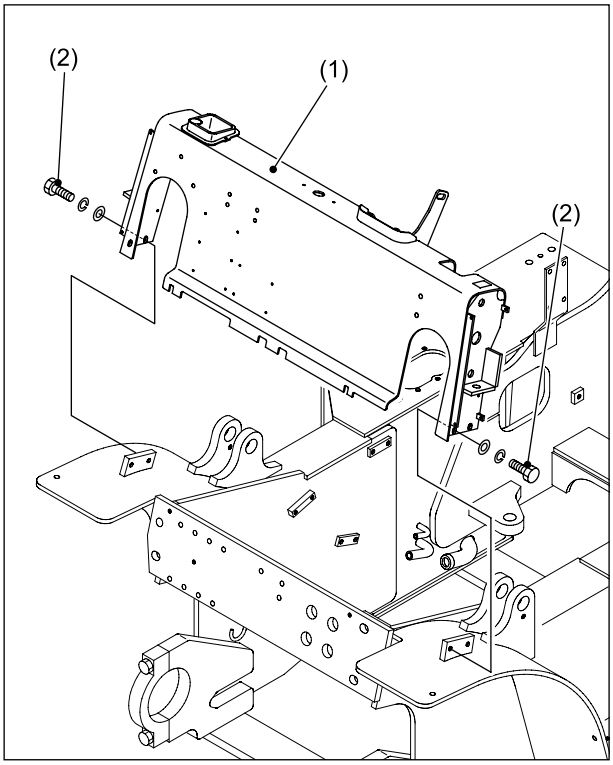


Fig. 2.82

■ REINSTALLATION

① Hoist the front guard (1) and place it in the mounting position in the front of the frame.

40 kg [88 lbs]

② Secure the front guard (1) using the four bolts (2), spring washers (3) and washers (4) at the right and left sides of the front guard.

31.4 - 47.1 N-m {3.2 - 4.8 kgf-m} [23.2 - 34.7 lbf-ft]

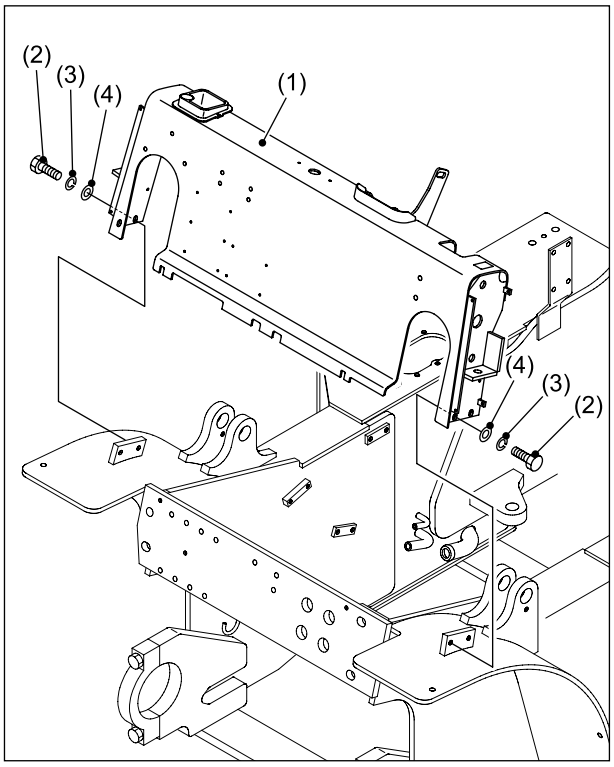


Fig. 2.83

③ Install the tilt cylinder piping (1) on the front guard using the bolts (2).

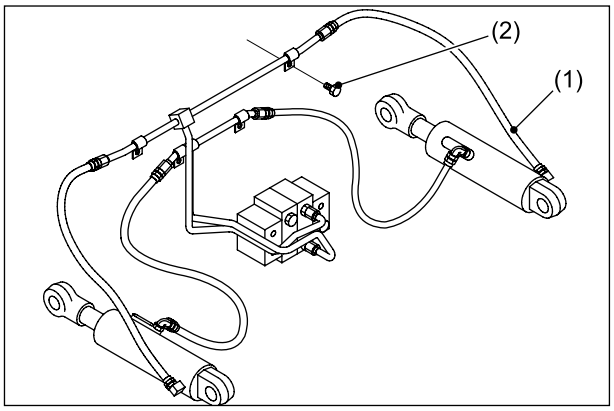


Fig. 2.84

④ Install the parking brake lever (1) on the front guard using the bolts (2).

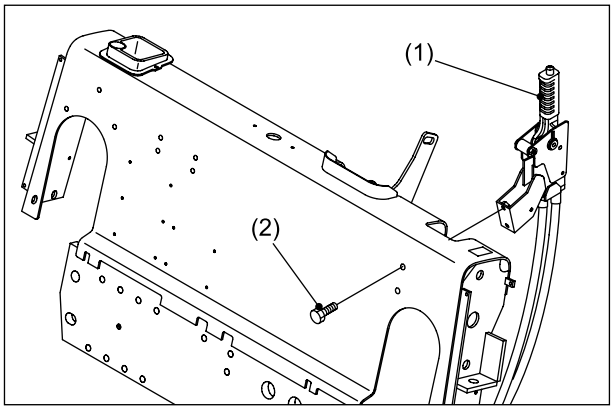


Fig. 2.85

⑤ Connect the wiring to the parking brake switch.

⑥ Install the brake oil reservoir.

⑦ Install the valve levers (1) on the front guard using the bolts (2).

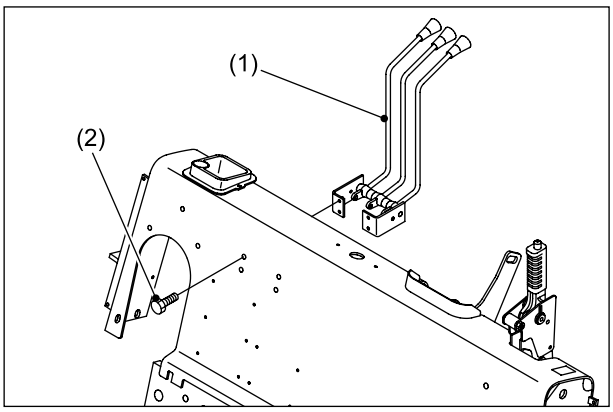


Fig. 2.86

⑧ Connect the connectors of the front guard wire harness (1) to the connectors of the engine wire harness (2).

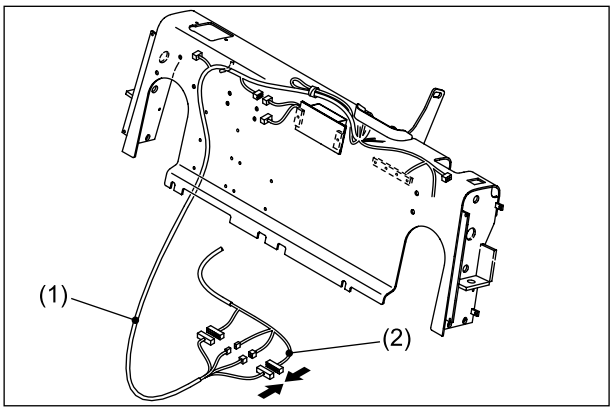


Fig. 2.87

⑨ Install the floorboard kit (1).

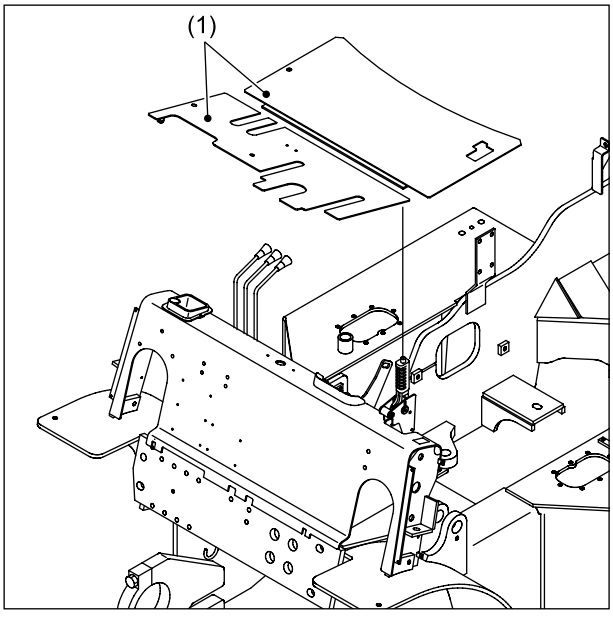


Fig. 2.88

⑩ Install the steering wheel. (See "2.13 STEERING WHEEL.")

⑪ Install the overhead guard. (See "2.2 HOOD AND OVERHEAD GUARD.")

2.9A BRAKE PEDAL (automatic transmission trucks)

■ REMOVAL

① Remove the floorboard kit. (See "2.8 FRONT GUARD.")

② Remove the brake pipes (2) from the brake booster (1).

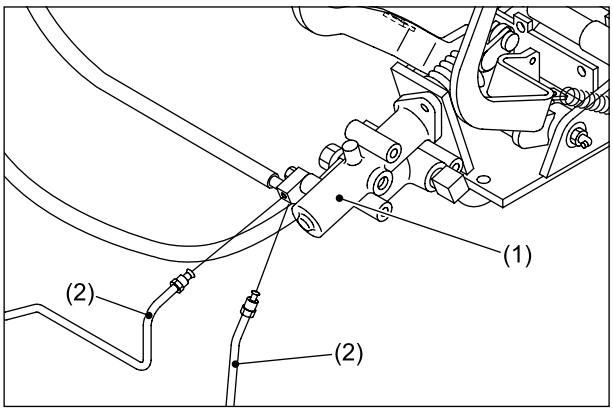


Fig. 2.89

③ Remove the high-pressure hose (2) from the brake booster (1). Remove the two return hoses (3) from the brake booster (1).

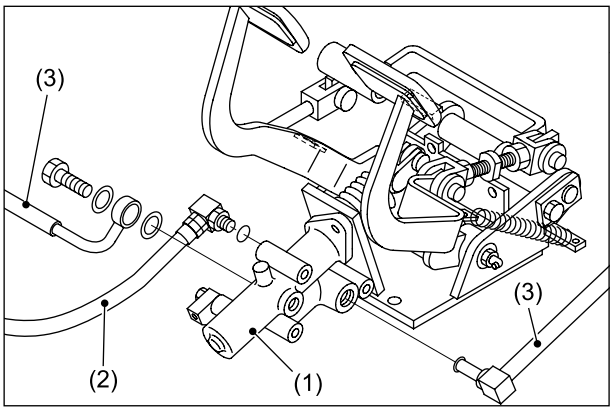


Fig. 2.90

④ Remove the connecting rod (2) from the linkage (1).

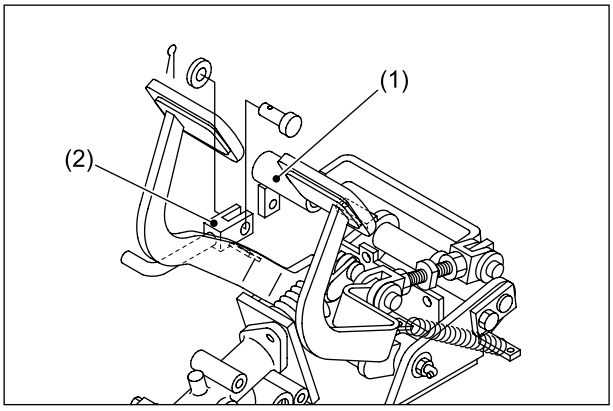


Fig. 2.91

⑤ Remove the pedal assembly (2) from the transmission (1).

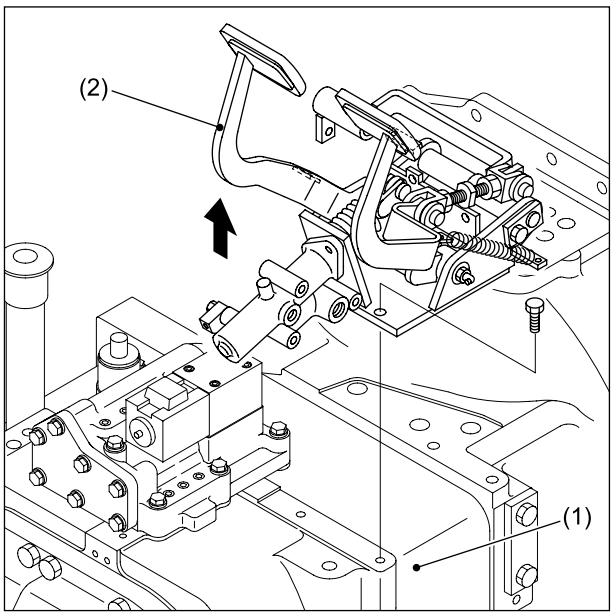


Fig. 2.92

■ REINSTALLATION

① Install the pedal assembly (1) on the transmission (2).

21.2 N-m {2.16 kgf-m} [15.6 lbf-ft]

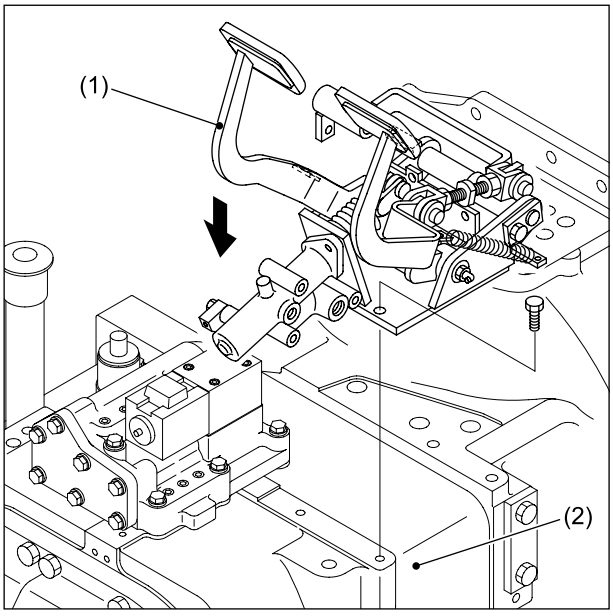


Fig. 2.93

② Install the connecting rod (2) on the linkage (1).

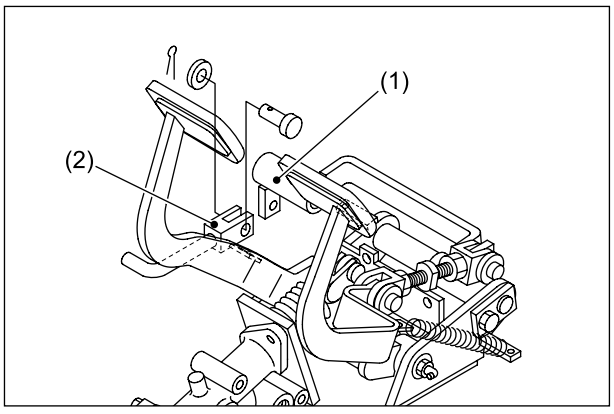


Fig. 2.94

③ Install the brake pipes (2) on the brake booster (1).

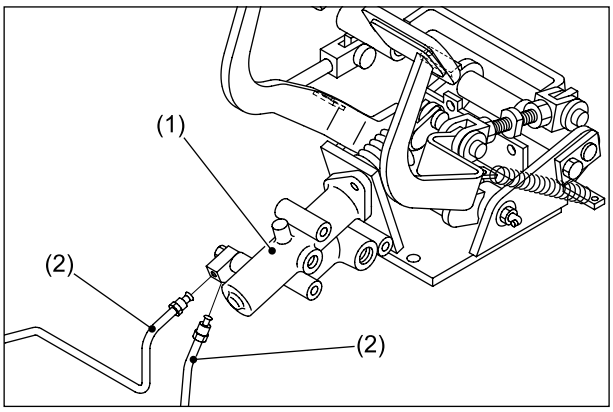


Fig. 2.95

④ Install the high-pressure hose (2) on the brake booster (1).
Install the two return hoses (3) on the brake booster (1).

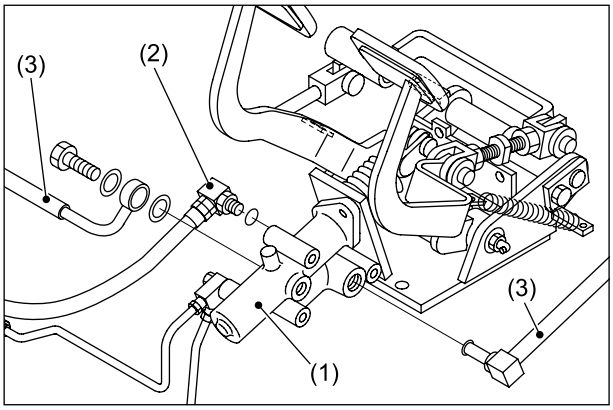


Fig. 2.96

⑤ Install the floorboard kit. (See “2.8 FRONT GUARD.”)

2.9B BRAKE PEDAL AND CLUTCH PEDAL (manual transmission trucks)

■ REMOVAL

① Remove the floorboard kit. (See "2.8 FRONT GUARD.")

② Remove the split pin (1), washer (2) and pin (3), and then remove the clutch release cylinder (5) from the arm (4).

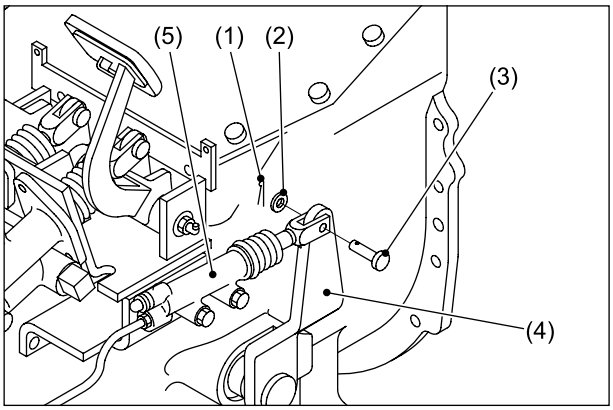


Fig. 2.97

③ Remove the brake pipes (2) from the brake booster (1).

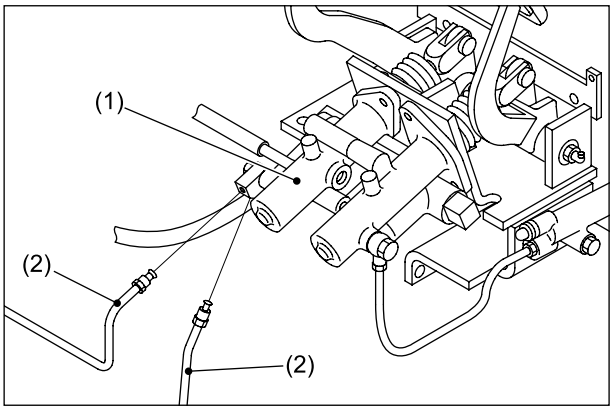


Fig. 2.98

④ Remove the high-pressure hose (2) from the brake booster (1).

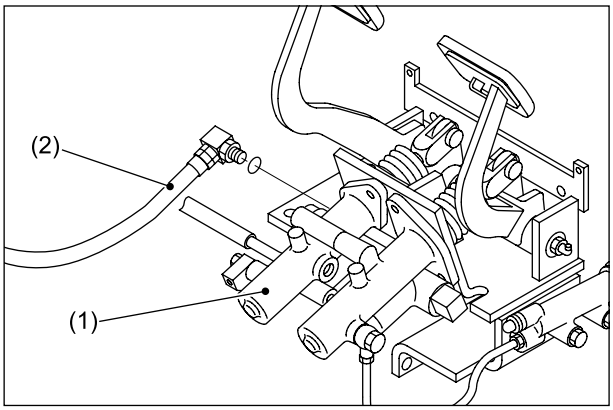


Fig. 2.99

⑤ Remove the return hoses (3) from the brake booster (1) and clutch booster (2).

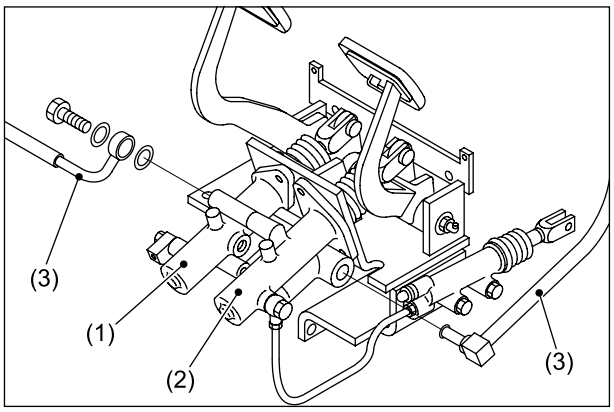


Fig. 2.100

⑥ Remove the pedal assembly (2) from the transmission (1).

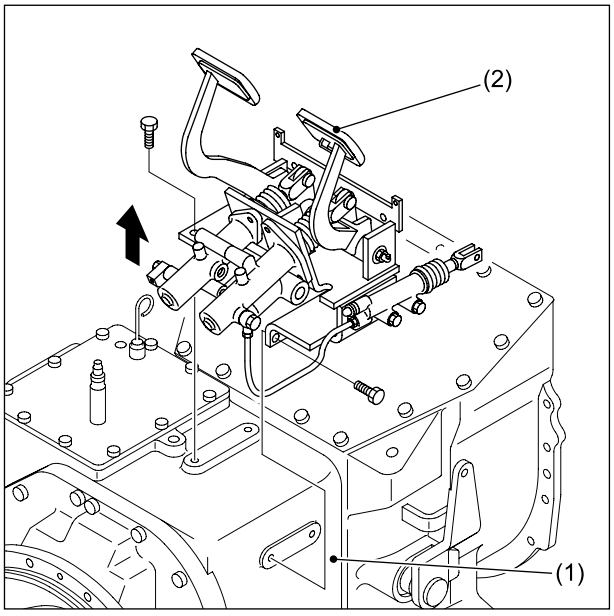


Fig. 2.101

■ REINSTALLATION

① Install the pedal assembly (1) on the transmission (2).

21.2 N-m {2.16 kgf-m}
[15.6 lbf-ft]

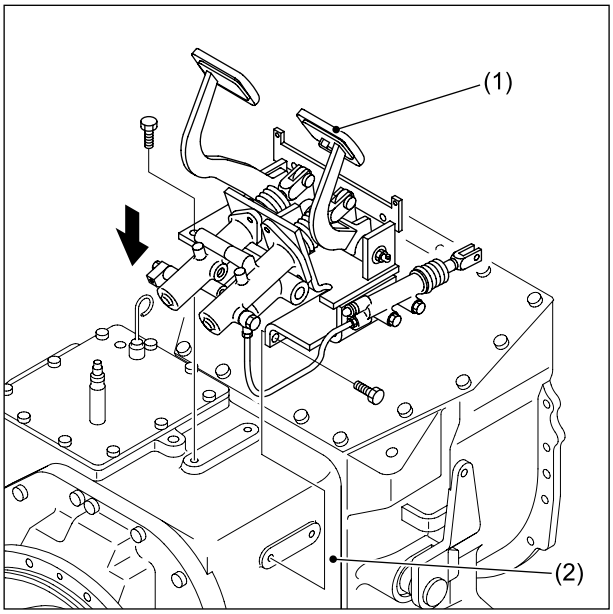


Fig. 2.102

② Connect the clutch release cylinder (1) and the arm (2) using the pin (3), and secure them using the washer (4) and split pin (5).

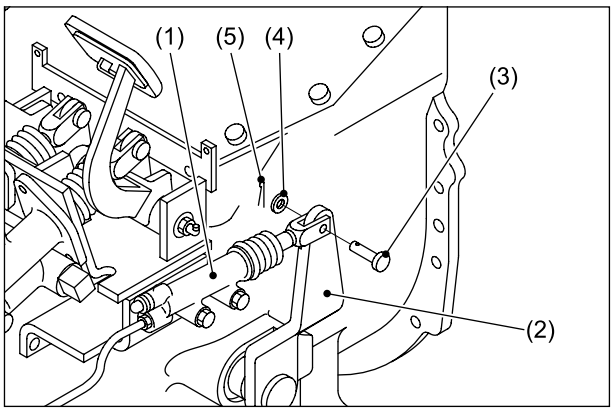


Fig. 2.103

③ Install the brake pipes (2) on the brake booster (1).

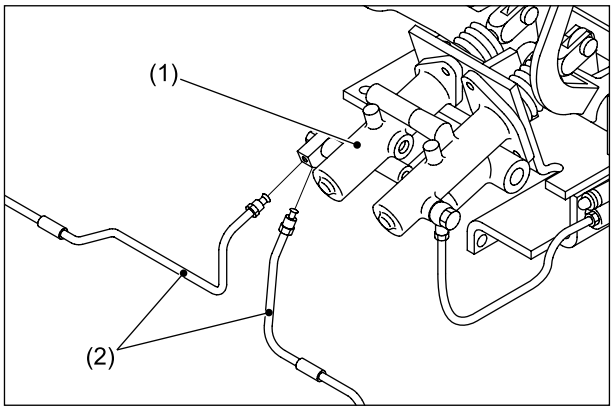


Fig. 2.104

④ Connect the high-pressure hose (2) to the brake booster (1). Connect the return hoses (4) to the brake booster (1) and clutch booster (3).

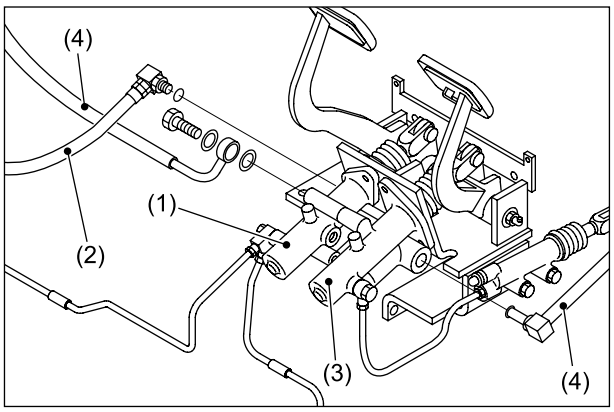


Fig. 2.105

⑤ Install the floorboard kit. (See “2.8 FRONT GUARD.”)

2.10 ENGINE AND DRIVE UNIT

■ REMOVAL

① Park the truck.
② Remove the wheels.
③ Remove the mast assembly. (See “2.17 MAST ASSEMBLY.”)
④ Remove the overhead guard and hood. (See “2.2 HOOD AND OVERHEAD GUARD.”)
⑤ Remove the counterweight. (See “2.4 COUNTERWEIGHT.”)
⑥ Remove the muffler and exhaust pipe. (See “2.5 MUFFLER.”)
⑦ Remove the radiator. (See “2.6 RADIATOR.”)
⑧ Remove the air cleaner. (See “2.7 AIR CLEANER.”)
⑨ Remove the accelerator cable from the front plate.
⑩ Remove the front guard and the floorboard kit. (See “2.8 FRONT GUARD.”)
⑪ Remove the front plate (1) from the frame.

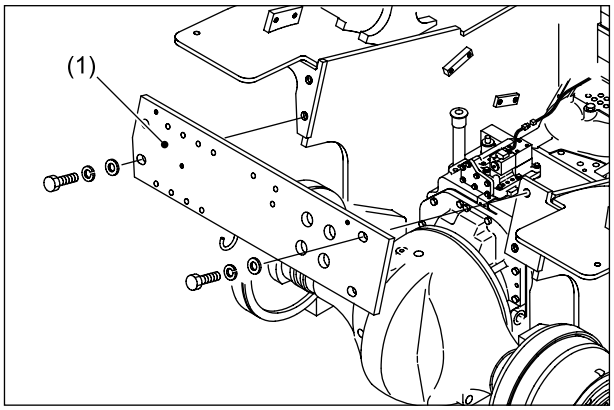


Fig. 2.106

⑫ Remove the suction hose (2) leading to the pump (1).
⑬ Remove the propeller shaft (3).

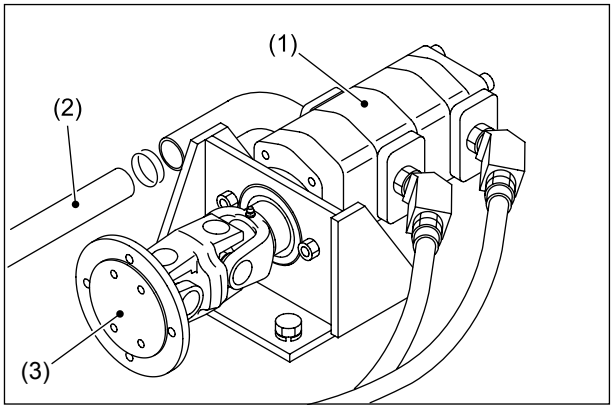
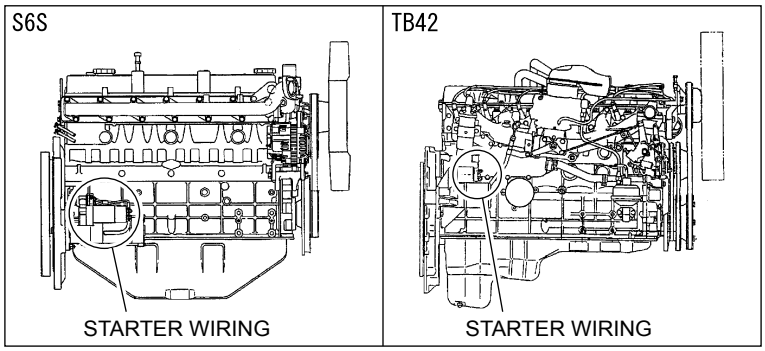


Fig. 2.107

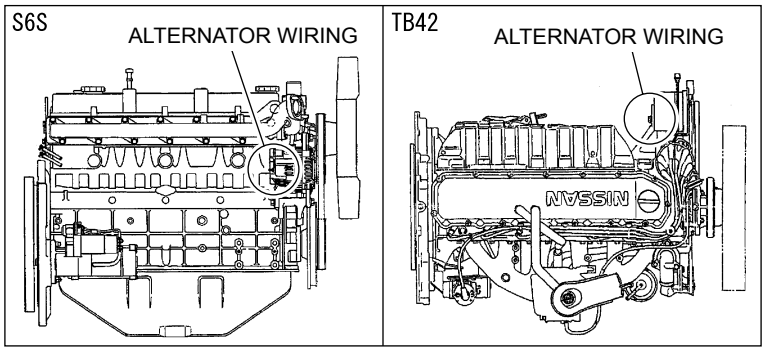
⑭ Disconnect the fuel hose from the engine.

⑮ Remove the battery. (See “2.1.4 BATTERY.”)
⑯ Remove each wiring from the engine.

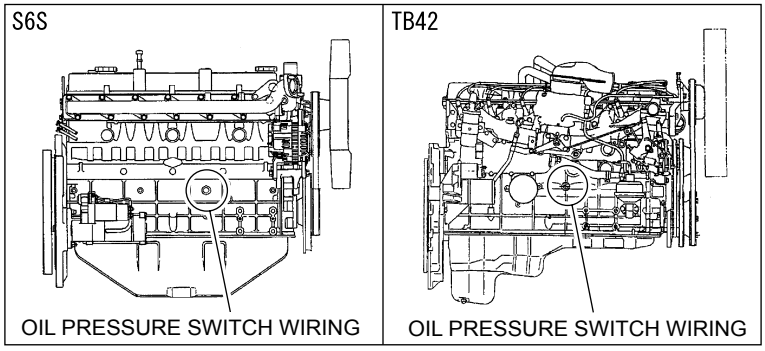
・Starter wiring



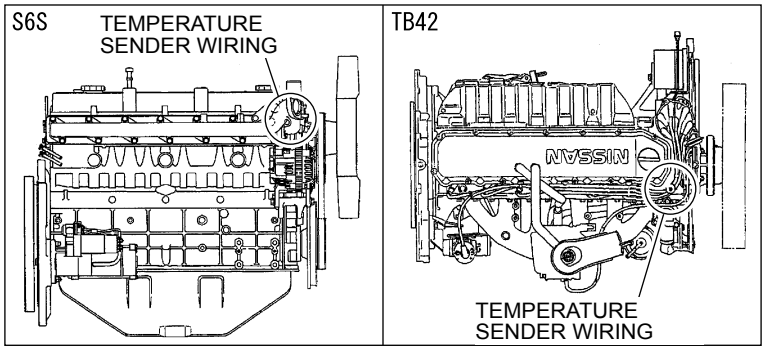
・Alternator wiring



・Oil pressure switch wiring

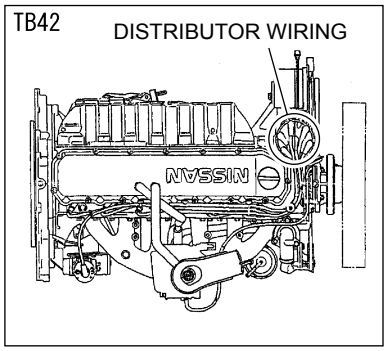


・Temperature sender wiring

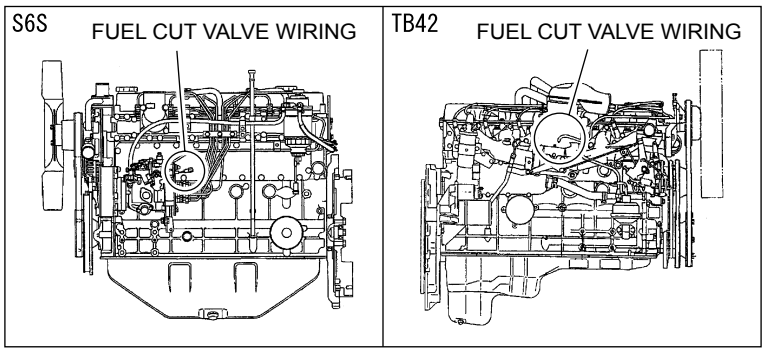


・Grounding

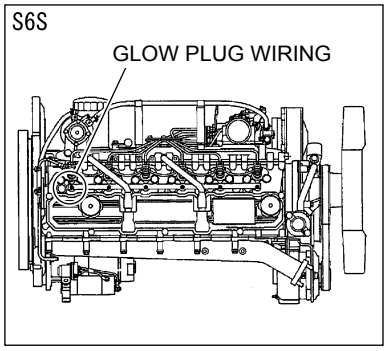
・Distributor wiring (for TB42 only)



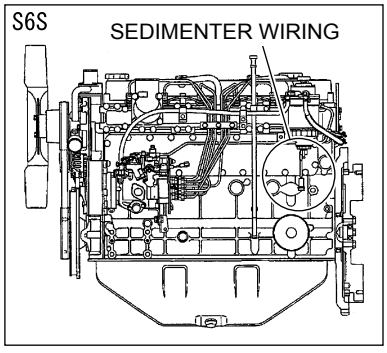
・Fuel cut valve wiring



・Glow plug wiring (for S6S only)



・Sedimenter wiring (for S6S only)



<For an automatic transmission truck>

⑰ Disconnect the wiring from the solenoid valve in the transmission control valve assembly.

⑱ Disconnect the oil cooler hoses (1) from the transmission case (2).

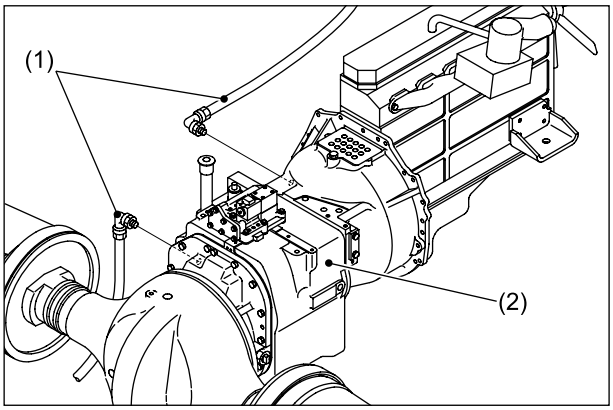


Fig. 2.108

<For a manual transmission truck>

⑲ Disconnect the oil cooler hoses (1) from the transmission case (2).

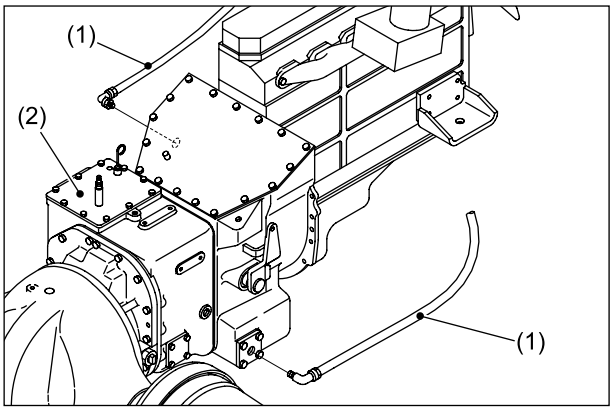


Fig. 2.109

⑳ Disconnect the wiring from the neutral switch (1) and reverse switch (2).

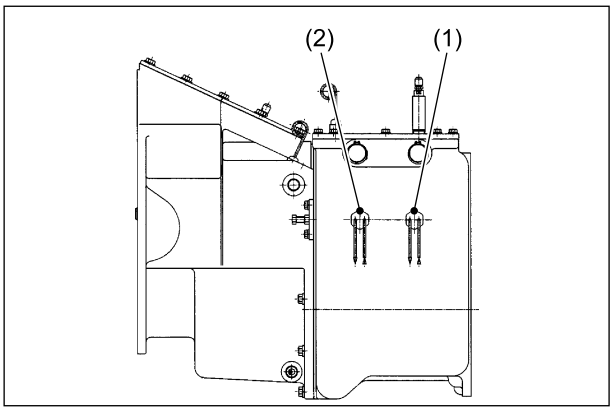


Fig. 2.110

㉑ Remove the mounting bolt (1), washers (2), cushions (3), and nut (4).

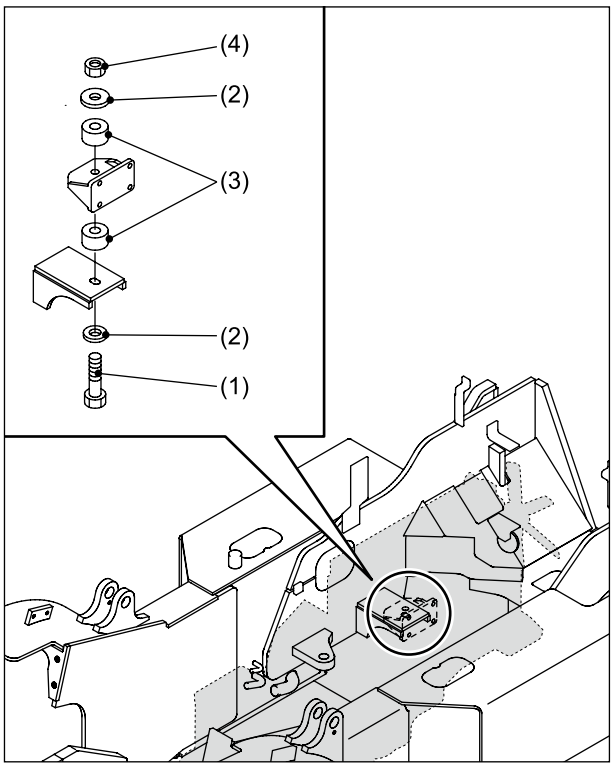


Fig. 2.111

㉒ Remove the bolts (1) and washers (2). Then remove the axle support caps (3).

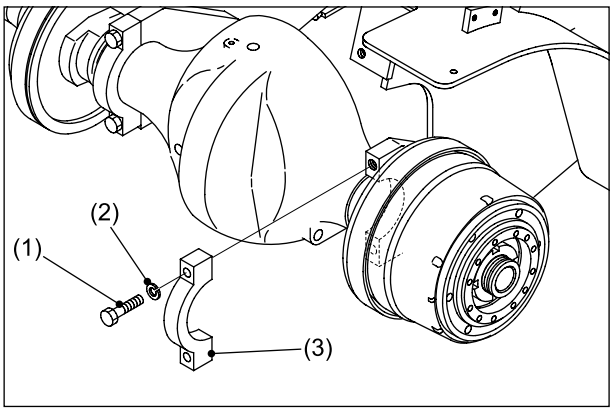


Fig. 2.112

㉓ Slowly hoist the engine and drive unit assembly and remove it. Be careful not to damage other parts.

1100 kg [2425 lbs]

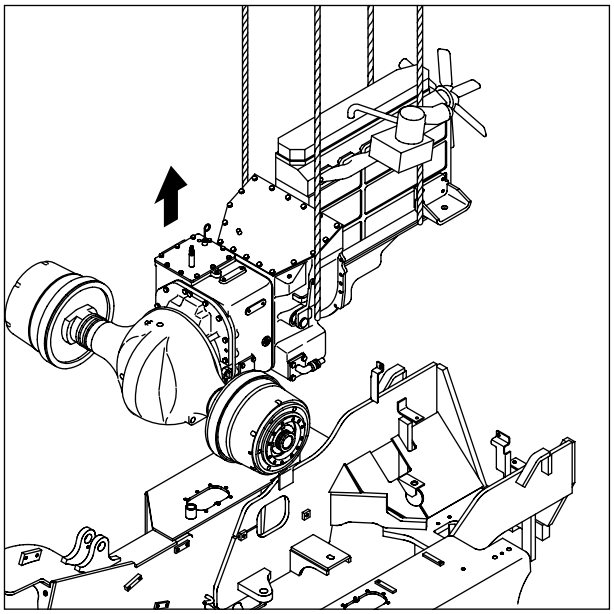


Fig. 2.113

■ REINSTALLATION

① Lift the engine (1) and drive unit (2) over the frame together, and carefully lower them in the mounting position.

1100 kg [2425 lbs]

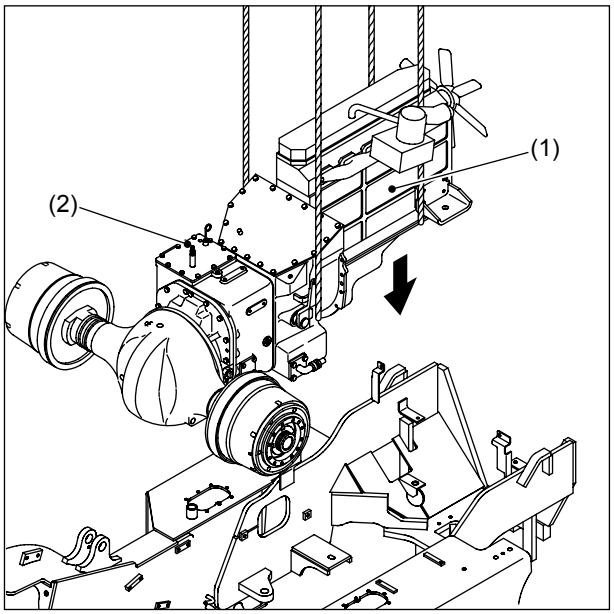


Fig. 2.114

② Secure the engine and drive unit using the cushions (1), mount bolt (2), washers (3), and nut (4).

61.7 N-m {6.39 kgf-m} [45.5 lbf-ft]

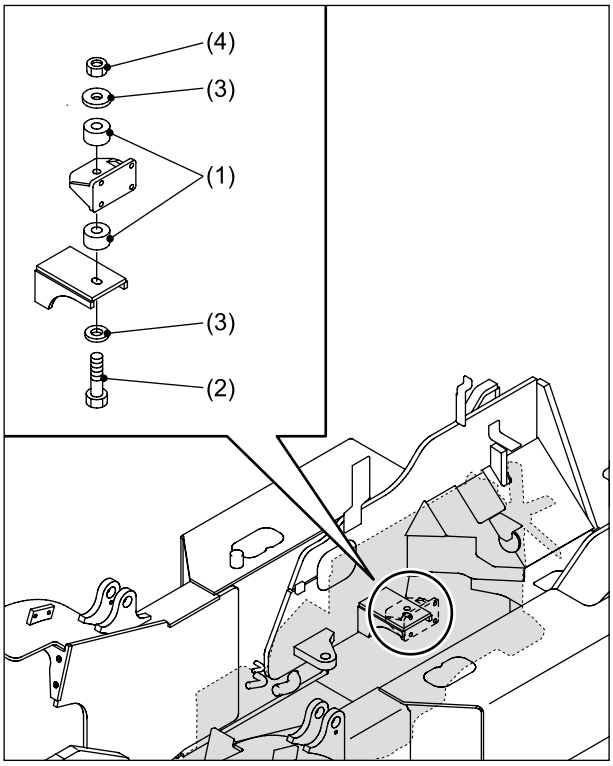


Fig. 2.115

③ Install the axle support caps (1) using the bolts (2) and washers (3).

175 N-m {17.8 kgf-m} [129.1 lbf-ft]
Apply LOCTITE #572.

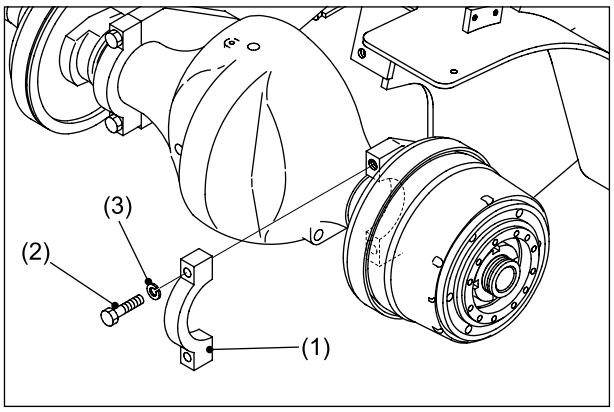


Fig. 2.116

<For an automatic transmission truck>

④ Connect the wire harness (2) to the transmission solenoid valve (1).

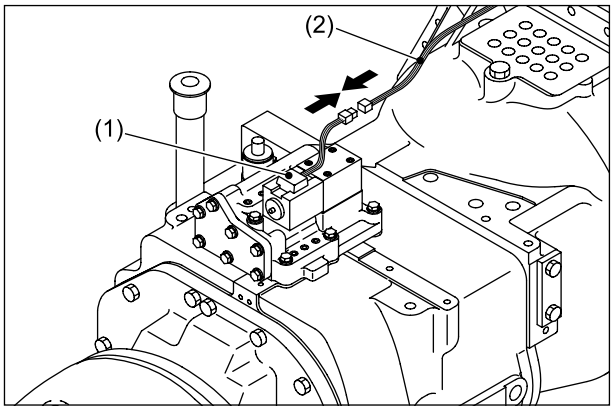


Fig. 2.117

⑤ Connect the oil cooler hoses (1) to the transmission case (2).

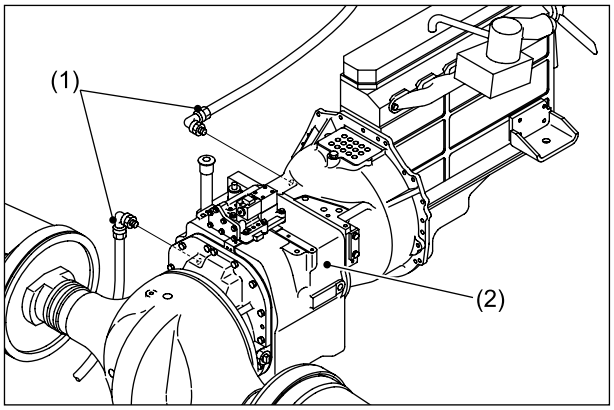


Fig. 2.118

<For a manual transmission truck>

⑥ Connect the oil cooler hoses (1) to the transmission case (2).

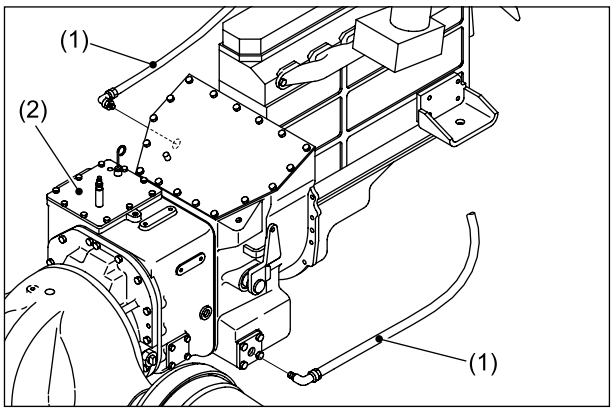


Fig. 2.119

⑦ Connect the wire harness to the neutral switch (1) and the reverse switch (2).

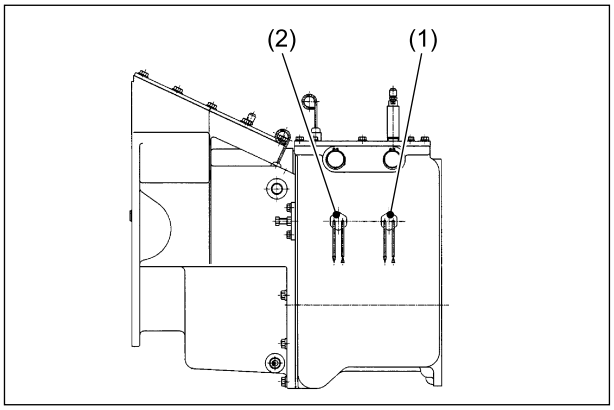
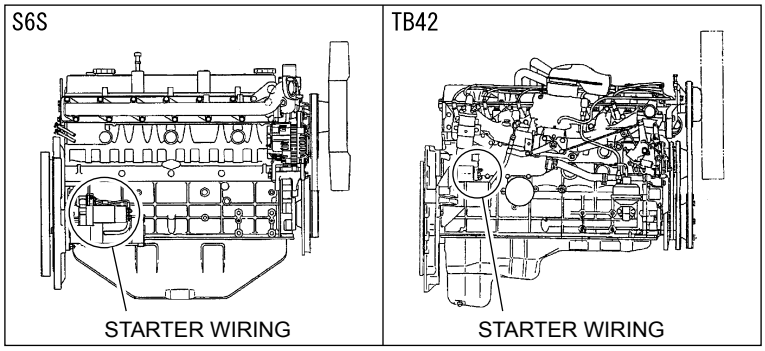


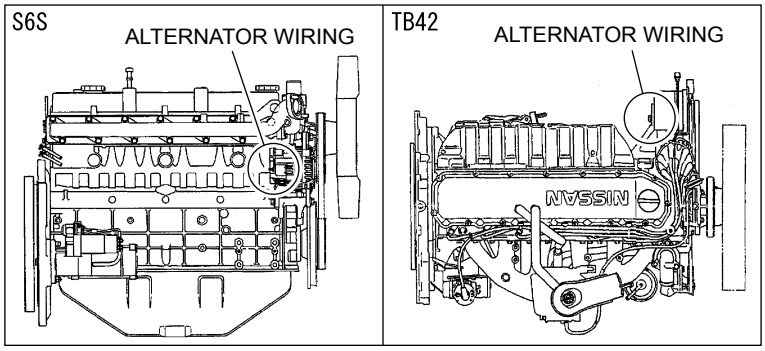
Fig. 2.120

⑧ Connect the wire harness to each part of the engine.

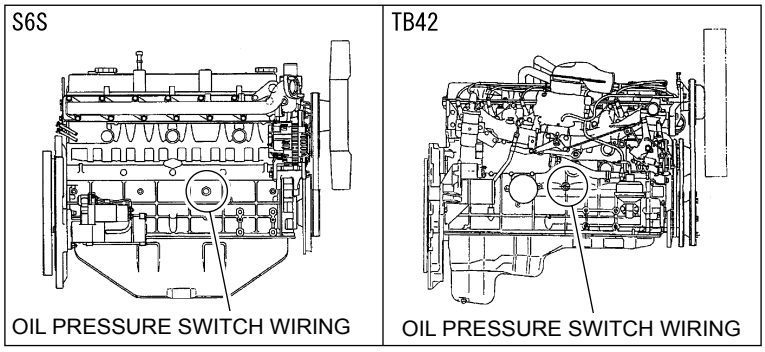
・Starter wiring



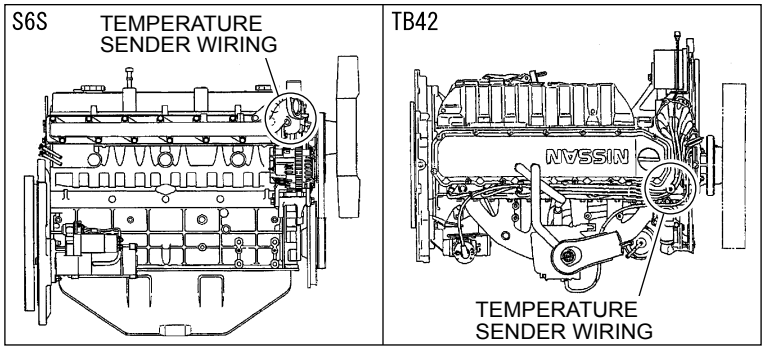
・Alternator wiring



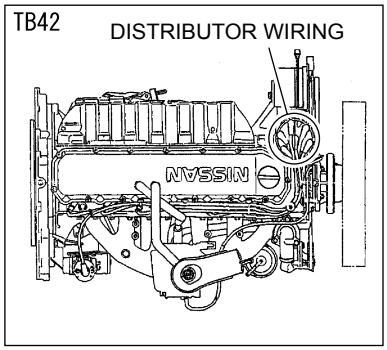
・Oil pressure switch wiring



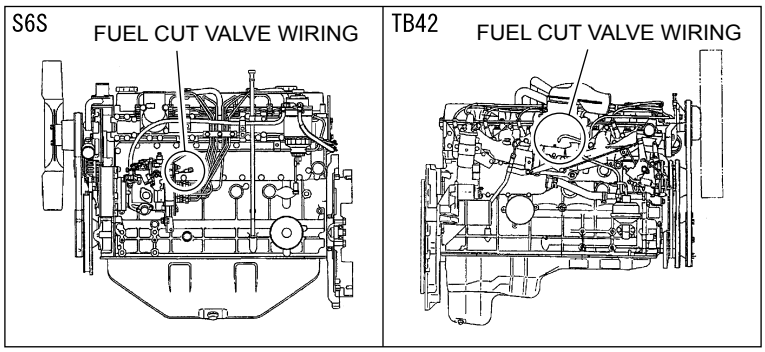
・Temperature sender wiring



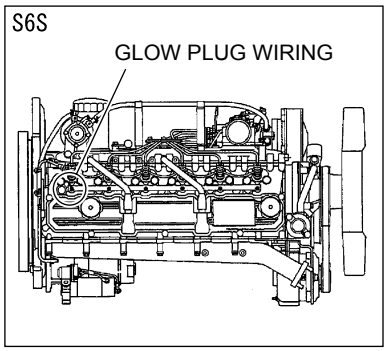
・Grounding
・Distributor wiring (for TB42 only)



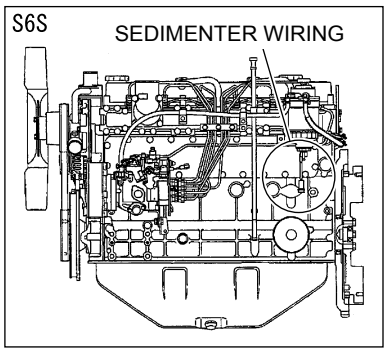
・Fuel cut valve wiring



・Glow plug wiring (for S6S only)



・Sedimenter wiring (for S6S only)



⑨ Connect the suction hose (2) leading to the pump (1).

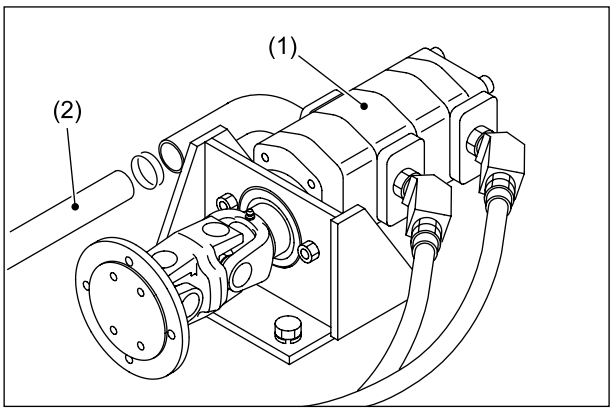


Fig. 2.121

⑩ Install the front plate on the frame.
⑪ Connect the fuel hose to the engine.
⑫ Install the propeller shafts on the engine.
⑬ Install the front guard and the floorboard kit. (See “2.8 FRONT GUARD.”)
⑭ Install the accelerator cable on the front plate.
⑮ Install the radiator. (See “2.6 RADIATOR.”)
⑯ Install the counterweight. (See “2.4 COUNTERWEIGHT.”)
⑰ Install the air cleaner. (See “2.7 AIR CLEANER.”)
⑱ Install the overhead guard and hood. (See “2.2 HOOD AND OVERHEAD GUARD.”)
⑲ Install the mast assembly. (See “2.17 MAST ASSEMBLY.”)
⑳ Install the wheels.

2.11 DRIVE AXLE

■ REMOVAL

① Jack up the front end of the truck and support the truck frame with a support stand (1). Place blocks (2) on each rear wheel.

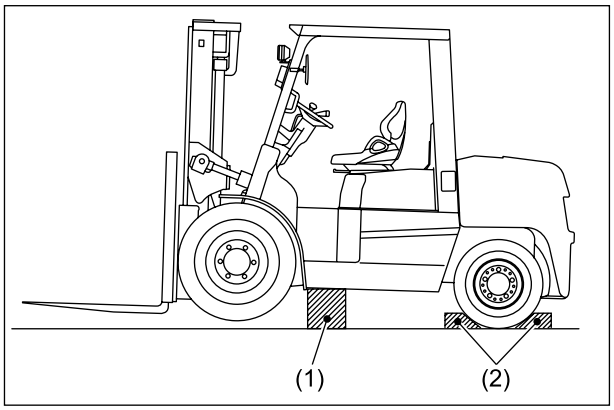


Fig. 2.122

② Remove the wheels.
③ Remove the mast assembly. (See "2.17 MAST ASSEMBLY.")
④ Drain the gear oil.

⑤ Remove the brake pipes (1).

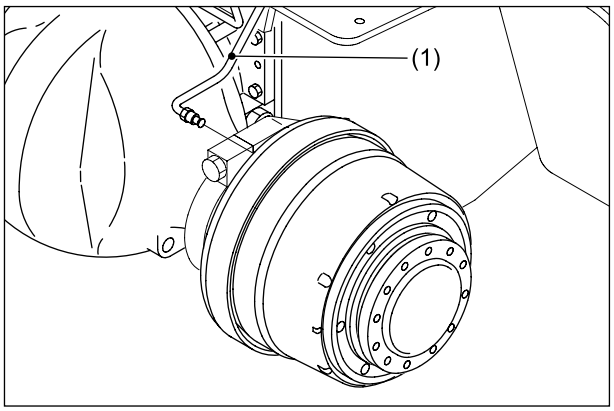


Fig. 2.123

⑥ Remove the parking brake cables (1) from the brake lever (2).

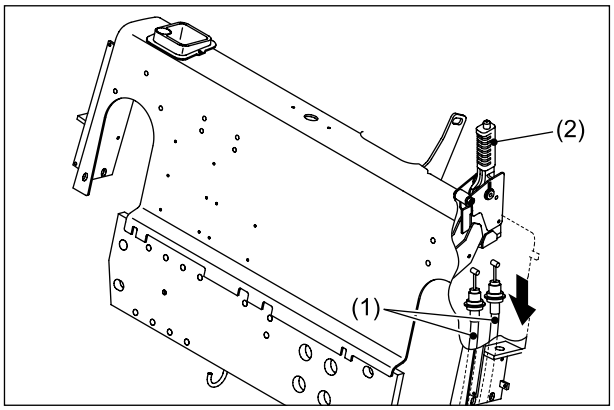


Fig. 2.124

⑦ Remove the axle shafts (1).

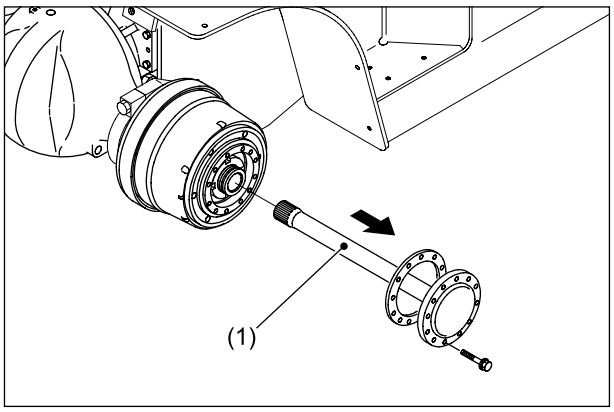


Fig. 2.125

⑧ Support the transmission and then remove the bolts (1) that connect the drive axle to the transmission.

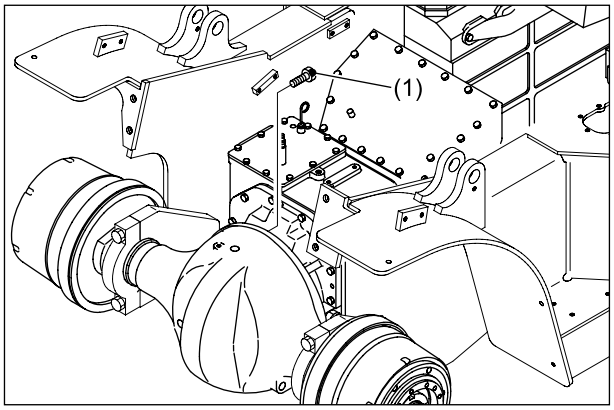


Fig. 2.126

⑨ Support the drive axle with a crane and wire ropes.

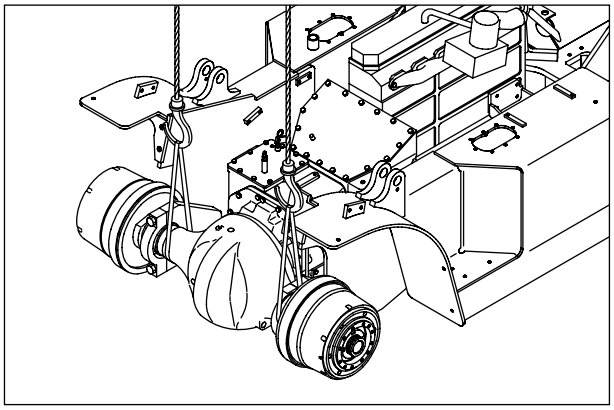


Fig. 2.127

⑩ Remove the support caps (1) from the frame and then remove the drive axle (2).

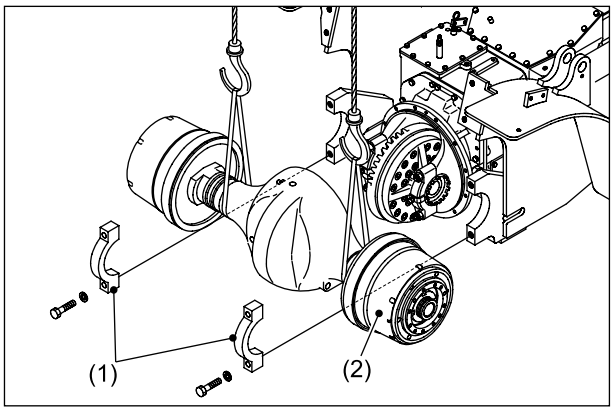


Fig. 2.128

■ REINSTALLATION

① Hold the drive axle (1) near the position of the frame where the drive axle is to be installed.

② Apply liquid gasket to the fitting surface of the drive axle (1), and then install the drive axle (1) on the transmission (2).

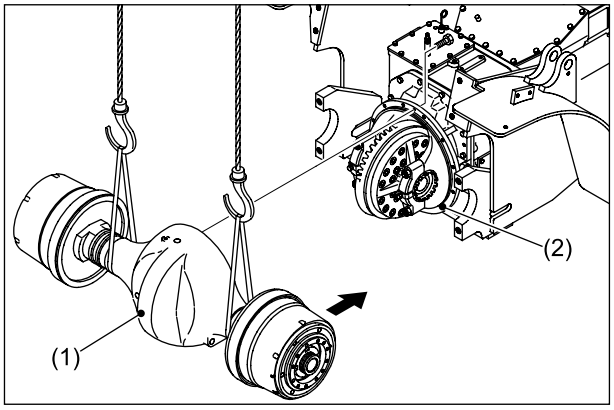


Fig. 2.129

③ Secure the drive axle to the frame using the support caps (1).

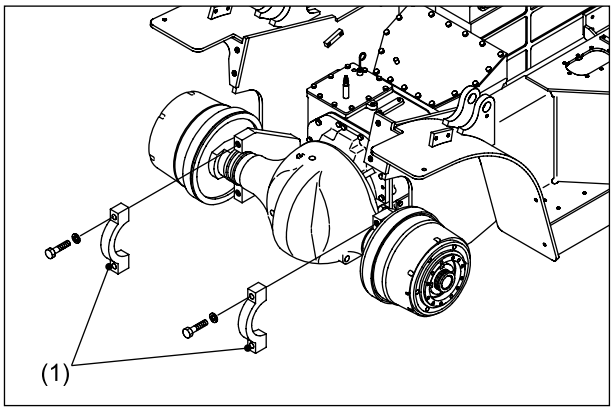


Fig. 2.130

④ Install the axle shafts (2) using a new gaskets (1).

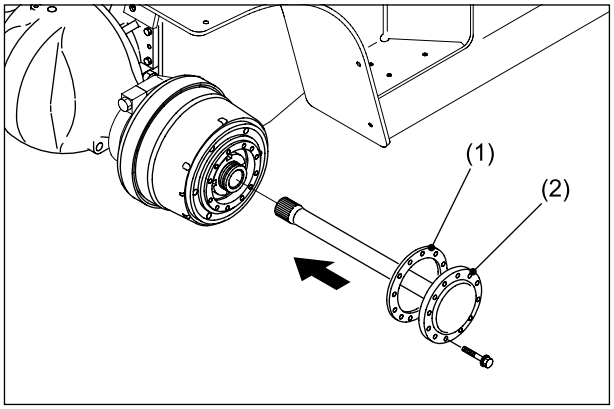


Fig. 2.131

⑤ Install the brake pipes (1).

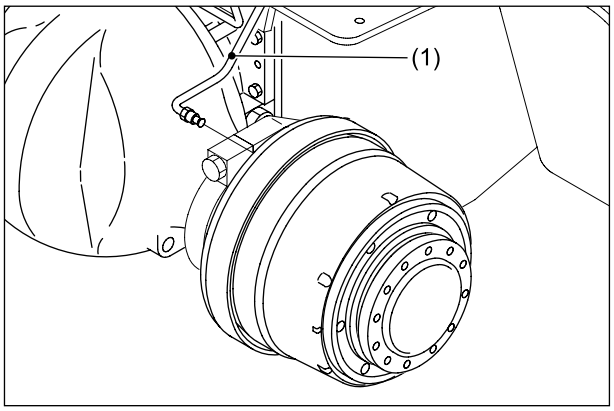


Fig. 2.132

⑥ Connect the parking brake cables (1) to the brake lever (2).

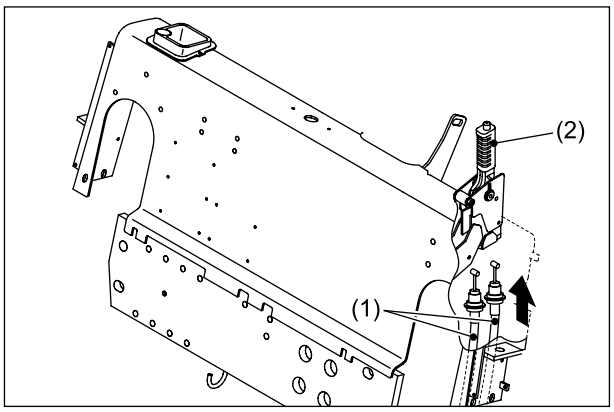


Fig. 2.133

⑦ Add gear oil.
⑧ Install the mast assembly. (See “2.17 MAST ASSEMBLY.”)
⑨ Install the wheels.
⑩ Remove the support stand.

2.12 STEERING AXLE

■ REMOVAL

① Jack up the rear wheels and support the frame of the truck with a stand (1). Place blocks (2) on each front wheel.

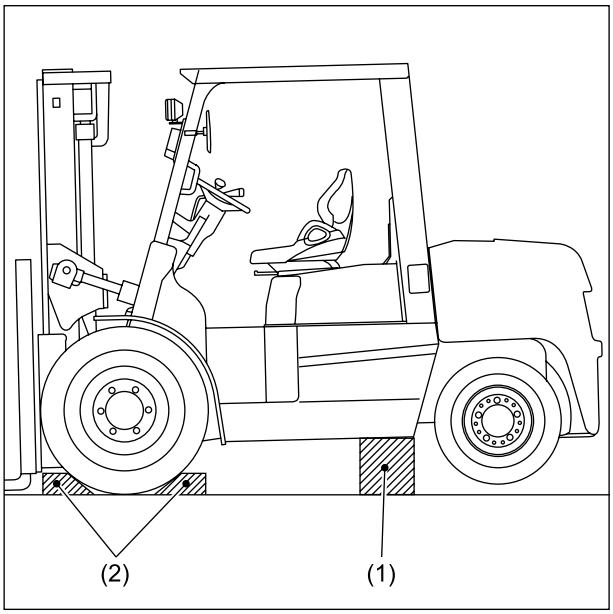


Fig. 2.134

② Remove the counterweight. (See "2.4 COUNTERWEIGHT.")

③ Remove the wheels.

④ Remove the ball joint (3) of the steering cylinder rod (2) from the center arm (1).

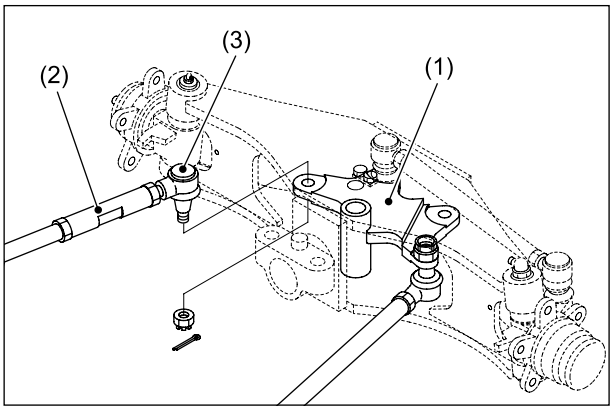


Fig. 2.135

⑤ Remove the ball joint (3) of the drag link (2) from the center arm (1).

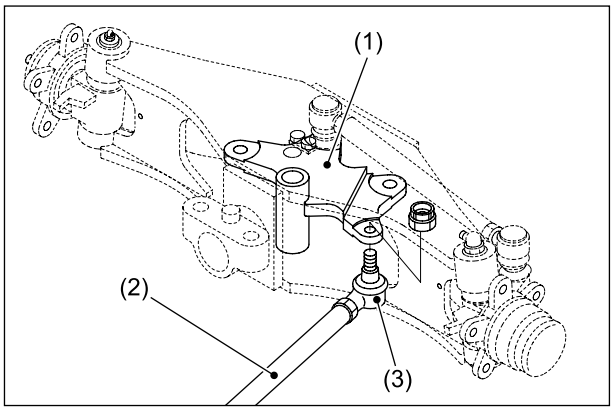


Fig. 2.136

⑥ Support the underside of the steering axle (1) with a garage jack. Then remove the bolts (3) and spring washers (4) that secure the axle supports (2) in place.

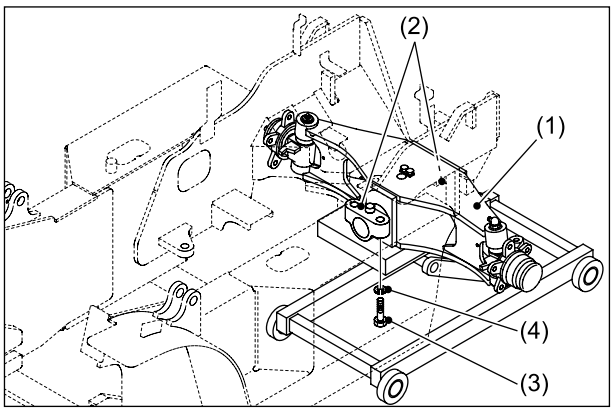


Fig. 2.137

⑦ Gradually lower the garage jack and remove the steering axle (1) from the frame (2).

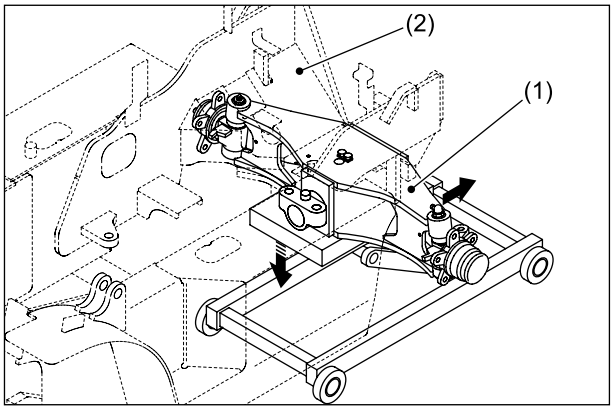


Fig. 2.138

■ REINSTALLATION

① Place the steering axle (1) on the garage jack. Then place the steering axle near its mounting position on the frame (2).

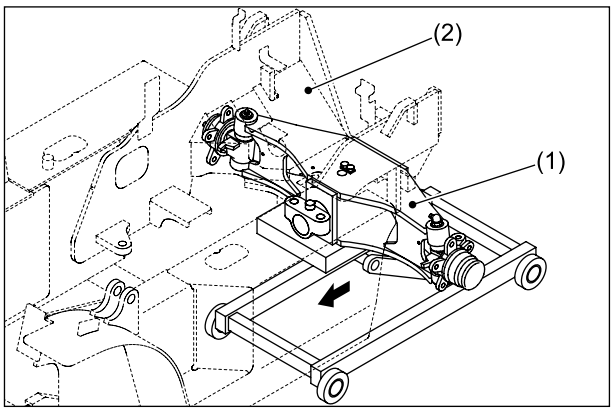
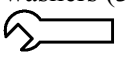


Fig. 2.139

② Jack up the steering axle so that the bolt holes in the steering axle are aligned with the holes in the frame.

③ Secure the steering axle (4) in place by installing the front and back axle supports (1) on the frame using the bolts (2) and spring washers (3).


175 N-m {17.8 kgf-m}
[129.1 lbf-ft]


Apply LOCTITE #578.

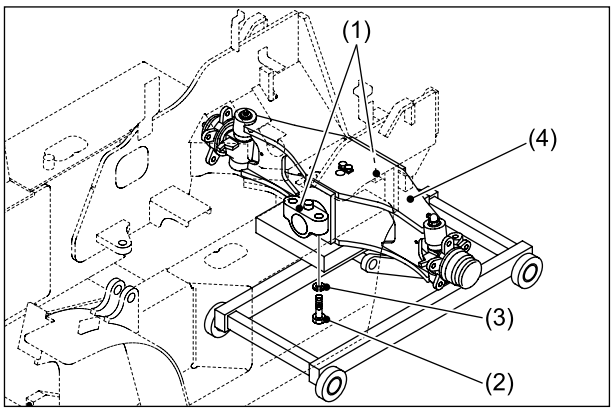


Fig. 2.140

④ Install the ball joint (3) of the drag link (2) on the center arm (1).

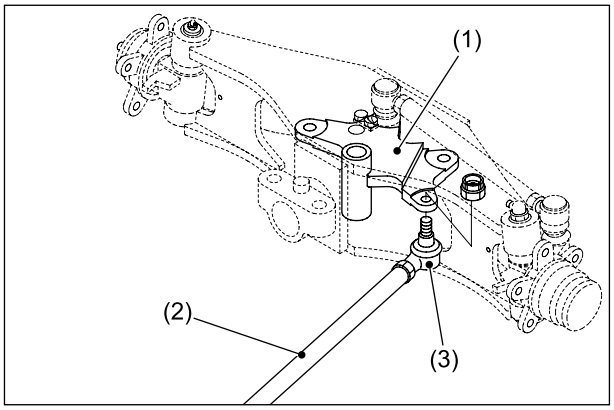


Fig. 2.141

⑤ Install the ball joint (3) of the steering cylinder rod (2) on the center arm (1).

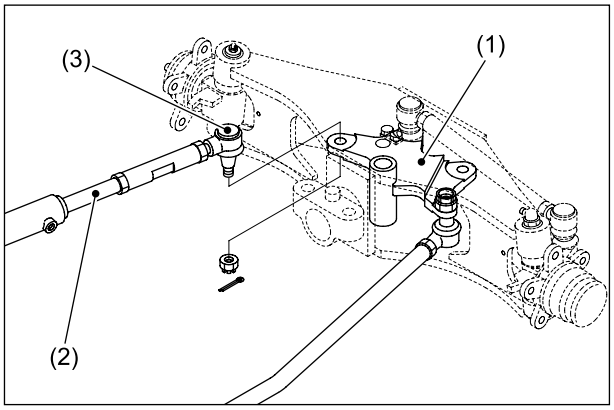


Fig. 2.142

⑥ Install the counterweight. (See "2.4 COUNTERWEIGHT.")

⑦ Install the wheels.

2.13 STEERING WHEEL

■ REMOVAL

① Remove the bolts (1), and then remove the covers A (2) and B (3).

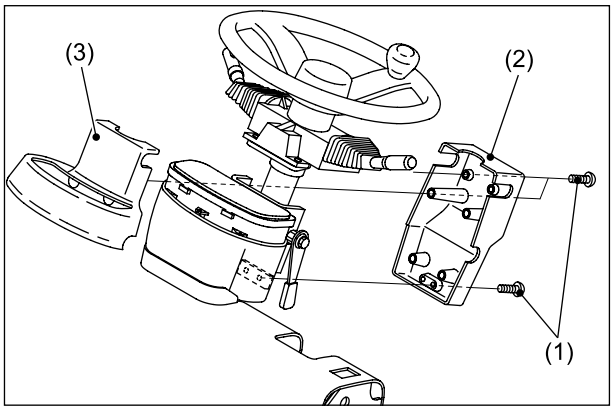


Fig. 2.143

② Remove the bolts (1) and move the combination meter assembly (2) toward the front guard side.
(At this point, the wire harness must remain connected.)
Remove the cover C (3).

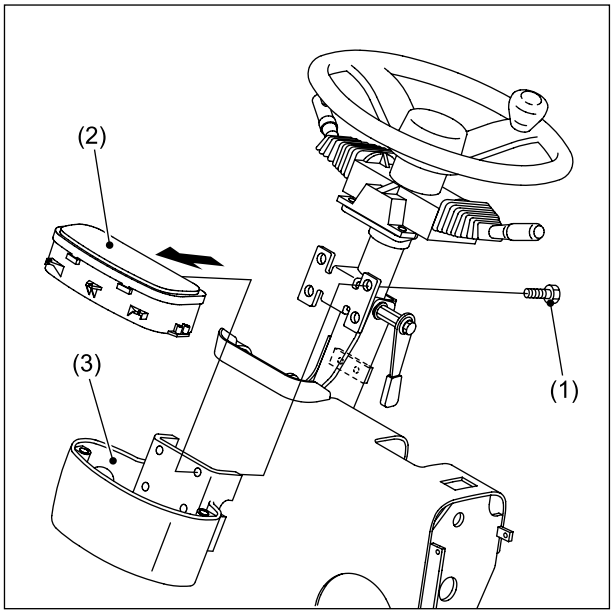


Fig. 2.144

③ Remove the wire harness (2) from the combination switch (1).

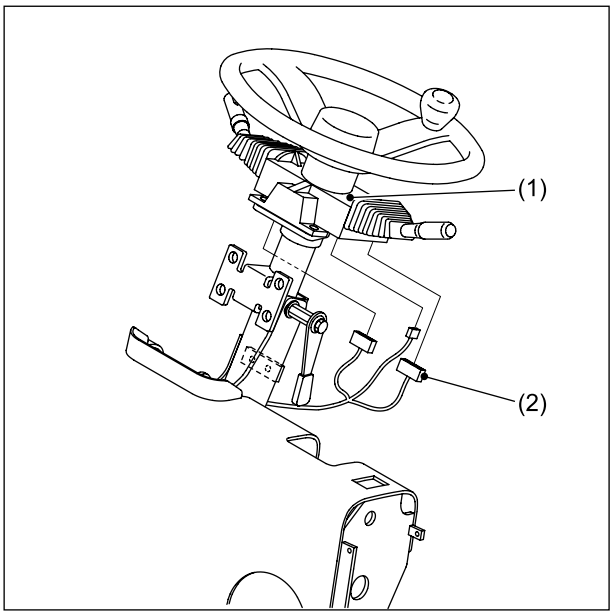


Fig. 2.145

④ Remove the bolt (1) and washer (2). Then remove the steering wheel lock lever (3).

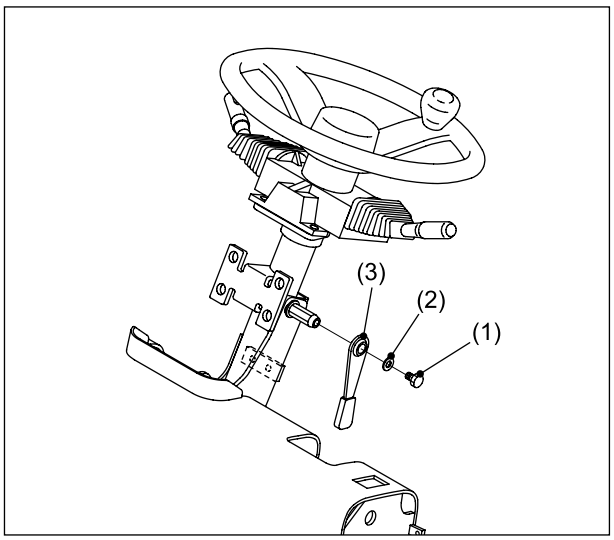


Fig. 2.146

⑤ Remove the lock bolt (1) and washer (2).

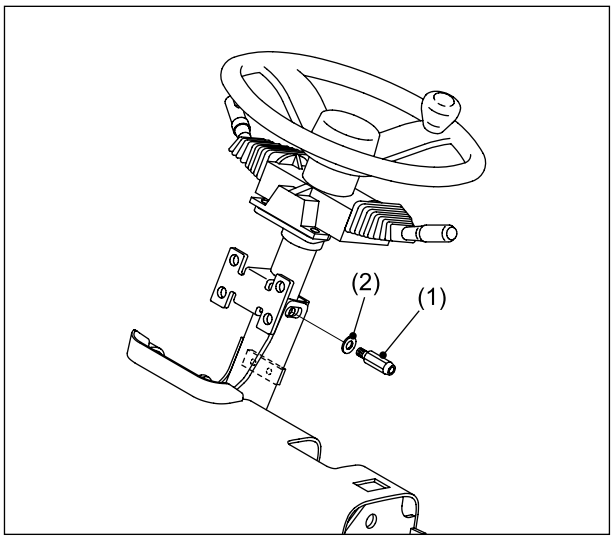


Fig. 2.147

⑥ Remove the bolts (1) and bushings (2). Then remove the steering wheel assembly (3).

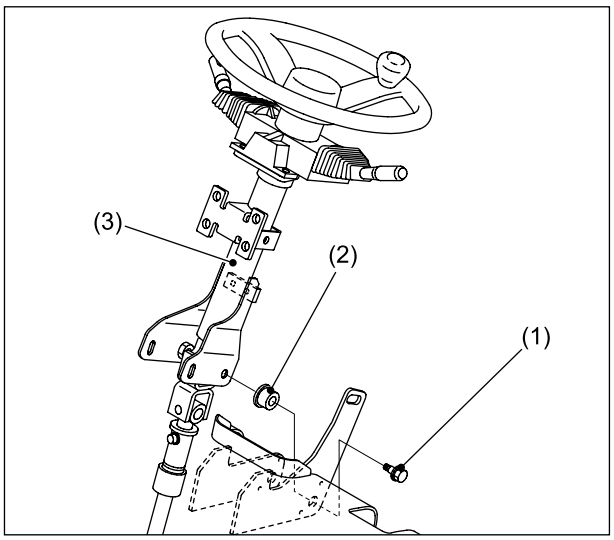


Fig. 2.148

■ REINSTALLATION

① Install the universal joint (1) on the spline shaft (2) in the steering gear box. Then, install the steering wheel assembly (5) on the front guard (6) and secure it using the bushings (3) and bolts (4).

21.2 N-m {2.16 kgf-m}
[15.6 lbf-ft]

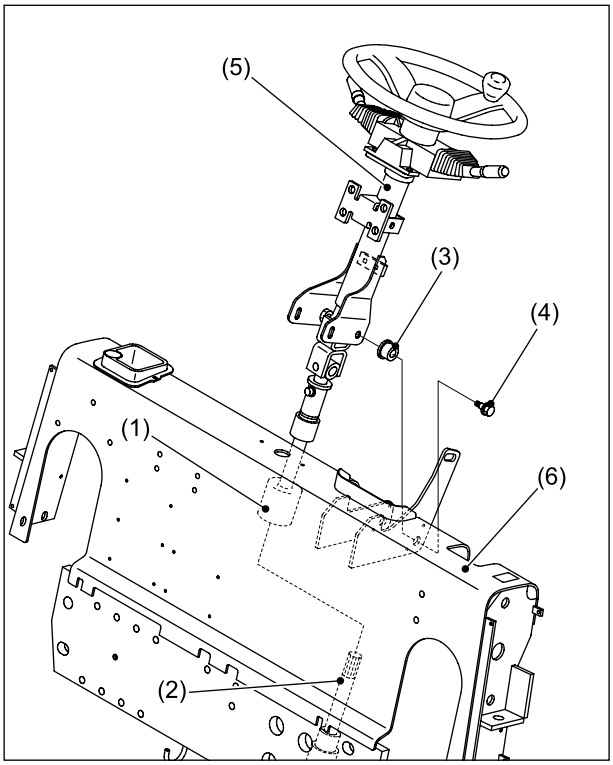


Fig. 2.149

② Install the lock bolt (1) and washer (2).

39.1 N-m {4.0 kgf-m}
[28.8 lbf-ft]

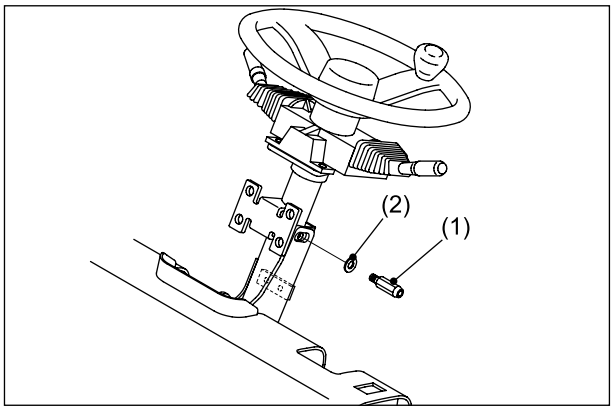


Fig. 2.150

③ Install the steering wheel lock lever (2) on the lock bolt (1). Then secure it using the washer (3) and bolt (4).

15.6 - 23.4 N-m {1.6 - 2.4 kgf-m}
[11.5 - 17.3 lbf-ft]

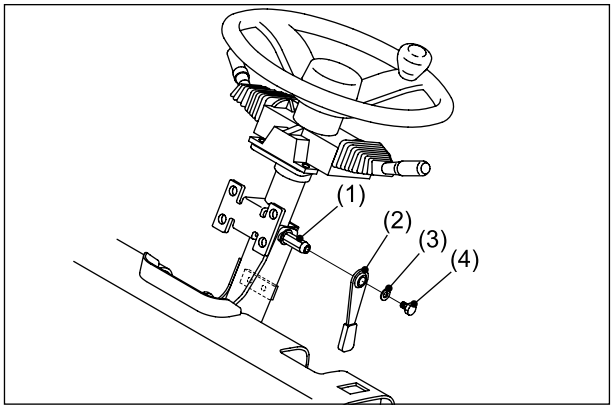


Fig. 2.151

④ Connect the wire harness (2) to the combination switch (1).

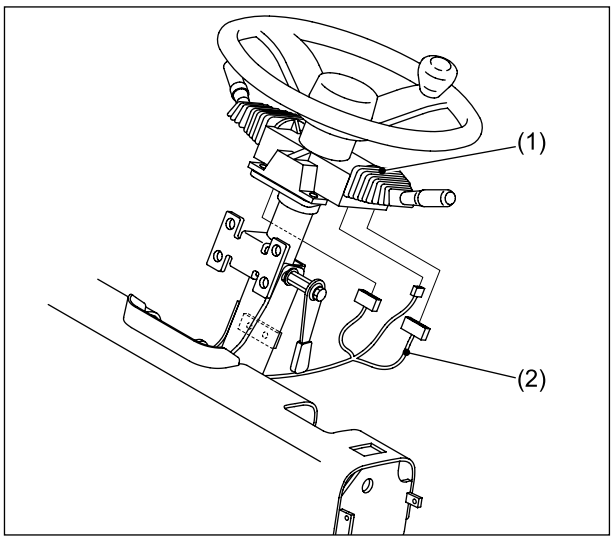


Fig. 2.152

⑤ Install the combination meter (1) and cover C (2) on the steering wheel column (3) using the bolts (4).

3.2 - 4.8 N-m {0.3 - 0.5 kgf-m} [2.4 - 3.5 lbf-ft]

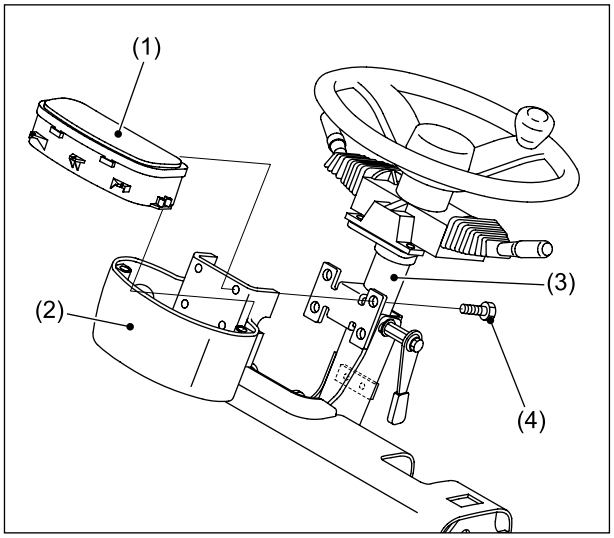


Fig. 2.153

⑥ Install the covers A (1) and B (2) using the bolts (3).

M4: 1.2 N-m {0.12 kgf-m} [0.89 lbf-ft]
M5: 2.4 N-m {0.24 kgf-m} [1.77 lbf-ft]
M6: 5.0 N-m {0.4 kgf-m} [3.69 lbf-ft]

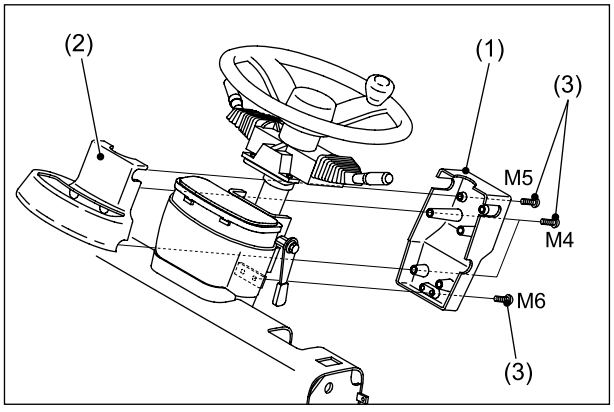


Fig. 2.154

2.14 TILT CYLINDER

⚠ **When disassembling or reassembling the tilt cylinder, make sure to support the outer channel of the mast using a crane and wire ropes.**

■ REMOVAL

① Remove the plastic covers (1) and then remove the tilt cylinder covers (2).

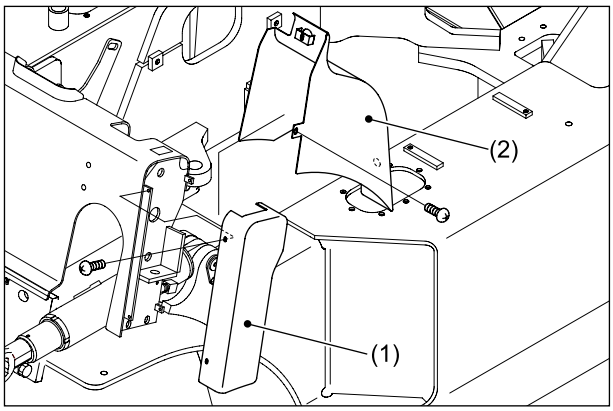


Fig. 2.155

② Disconnect the hoses (2) from the tilt cylinder (1).
Before disconnecting these hoses, release any residual pressure in the system by operating the tilt lever.

⚠ **Caution must be taken when removing the hoses. The oil may spurt.**

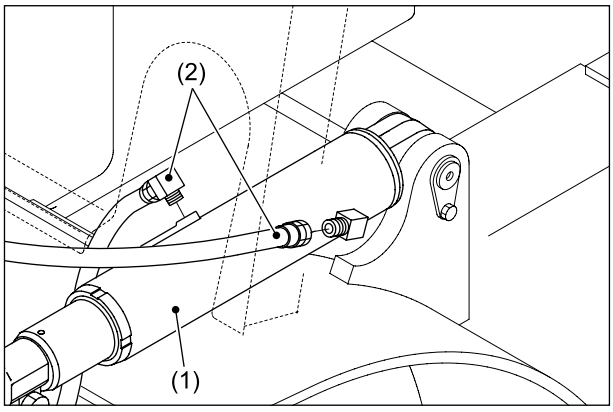


Fig. 2.156

③ Remove the bolts (1) and plates (2). Then remove the connecting pins (3) from the mast.

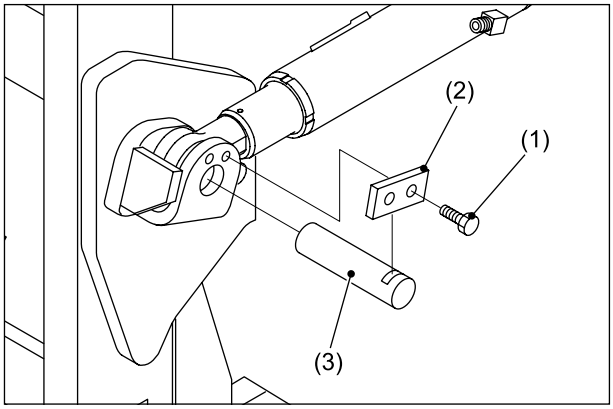


Fig. 2.157

④ Remove the bolts (1) and remove the connecting pins (2) from the frame. Then remove the tilt cylinders (3).

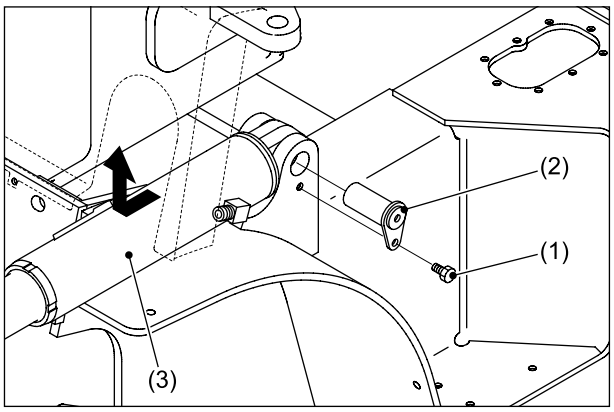


Fig. 2.158

■ REINSTALLATION

① Place each tilt cylinder (2) in the mounting position on the frame. Pay attention to the positions of the right and left hydraulic ports (1).

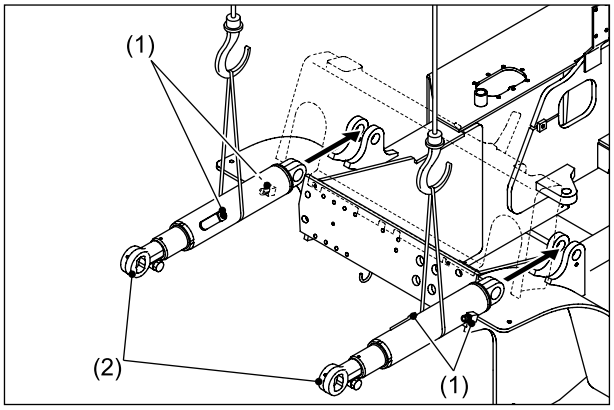


Fig. 2.159

② Install the connecting pin (1) at the frame side and then secure it using the bolts (2).

17.1 - 25.4 N-m {1.74 - 2.59 kgf-m} [12.6 - 18.7 lbf-ft]

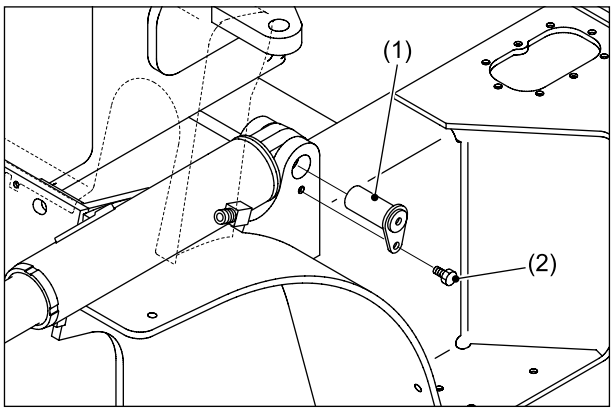


Fig. 2.160

③ Install the connecting pin (1) at the mast side and secure it using the plate (2) and bolts (3).

17.1 - 25.4 N-m {1.74 - 2.59 kgf-m} [12.6 - 18.7 lbf-ft]

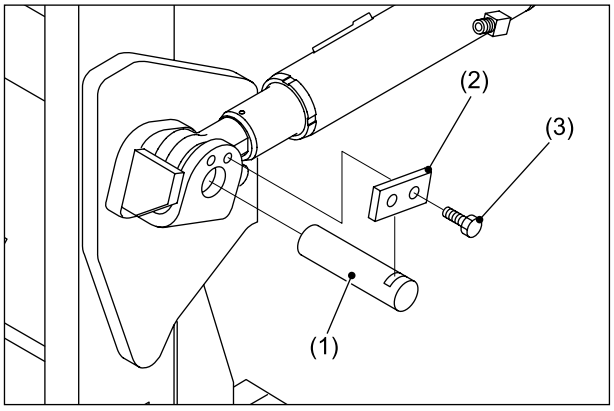


Fig. 2.161

④ Connect the hydraulic hoses (2) to each tilt cylinder (1).

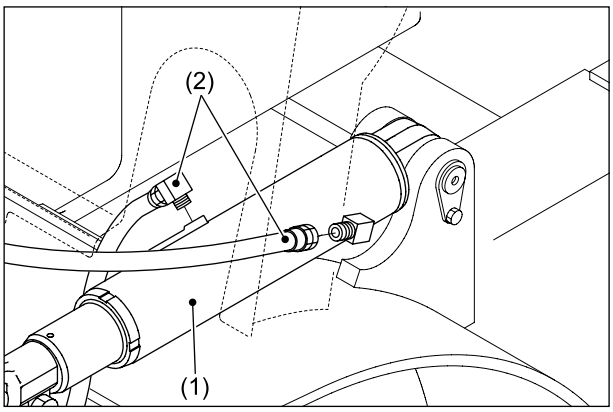


Fig. 2.162

⑤ Install the tilt cylinder covers (1) and plastic covers (2).

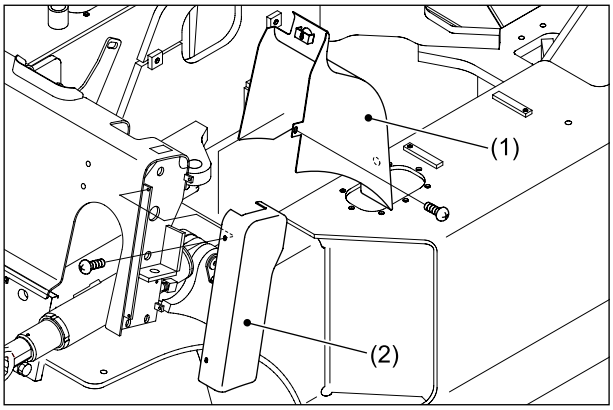


Fig. 2.163

2.15 MAIN PUMP

■ REMOVAL

① Drain the oil from the oil tank.
② Remove the counterweight. (See "2.4 COUNTERWEIGHT.")
③ Disconnect the hose (1) from the main pump (2) that leads to the oil tank.

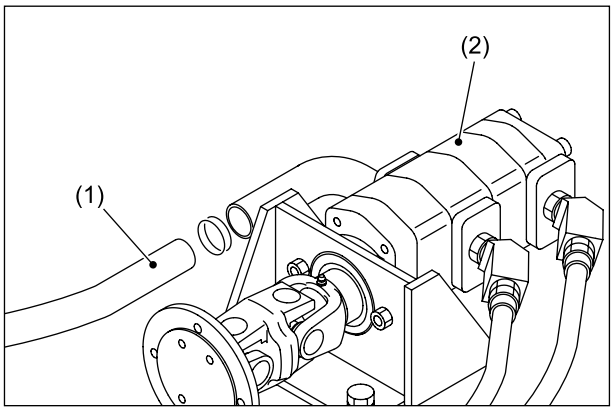


Fig. 2.164

④ Disconnect the hoses (1) from the main pump (2), one leading to the control valve and the other to the priority valve.

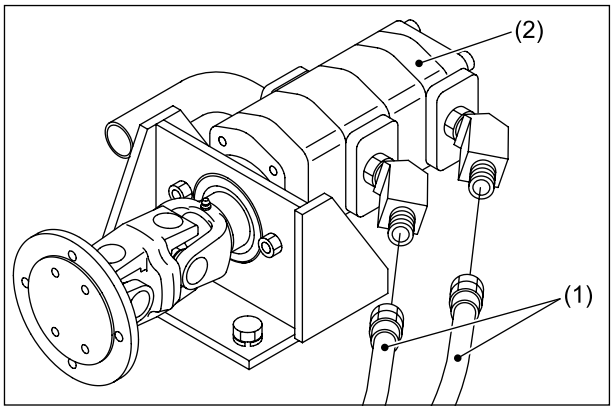


Fig. 2.165

⑤ Remove the bolts (1) securing the pump in place, and then remove the main pump (2) from the bracket (3).

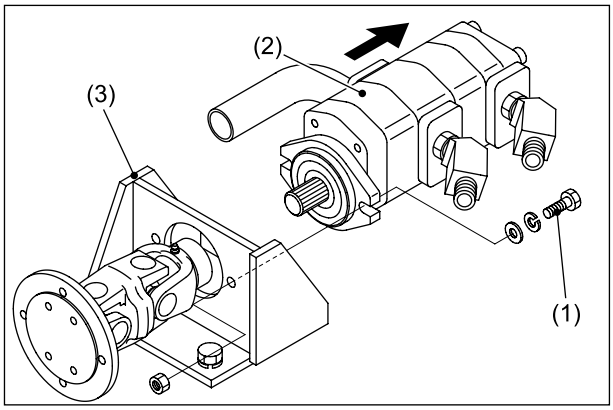


Fig. 2.166

■ REINSTALLATION

① Install the main pump (1) on the mounting bracket (2) section and then secure it using the bolts (3), spring washers (4), washers (5) and nuts (6).

33.8 – 50.9 N-m {3.5 – 5.2 kgf-m} [24.9 – 37.5 lbf-ft]

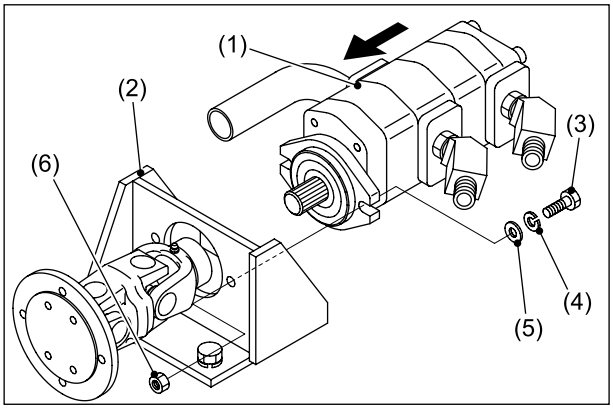


Fig. 2.167

② Connect one end of the hose (1) leading from the oil tank, to the main pump (2).

⚠ **Caution must be used when connecting the hose. Oil may leak from the hose.**

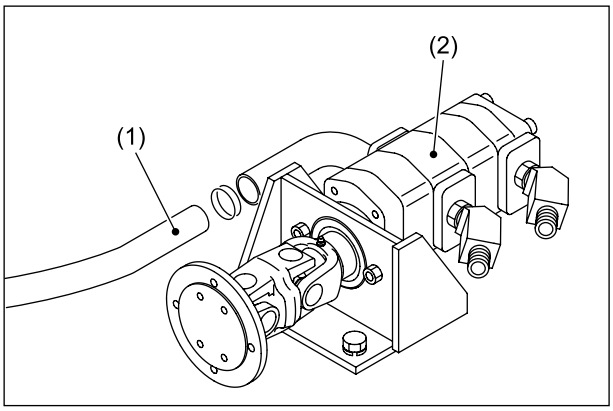


Fig. 2.168

③ Connect the hoses (1) to the main pump (2), one leading from the control valve and the other from the priority valve.

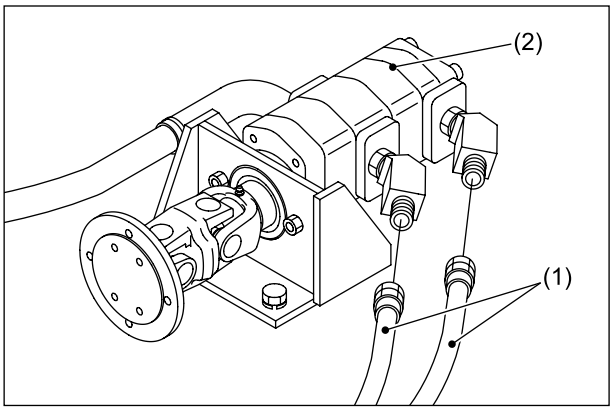


Fig. 2.169

④ Install the counterweight. (See "2.4 COUNTERWEIGHT.")

⑤ Fill the oil tank with the specified amount of oil.

2.16 CONTROL VALVE

■ REMOVAL

① Remove the pin (1), washer (2), and cotter pin (3). Then remove the rod (4) from each spool.

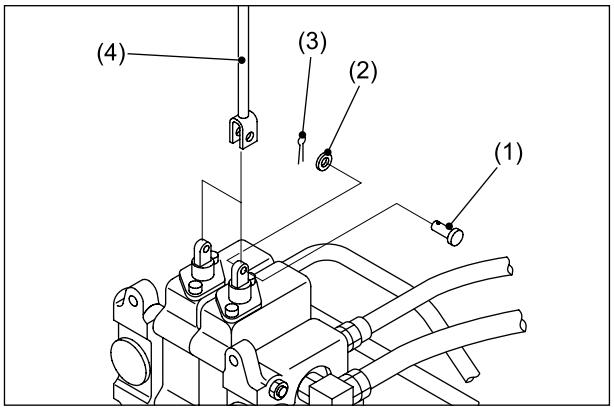


Fig. 2.170

② Disconnect the hoses (2) from the control valve (1).
Temporarily secure each return hose with its end at a level that is higher than the oil level in the tank.

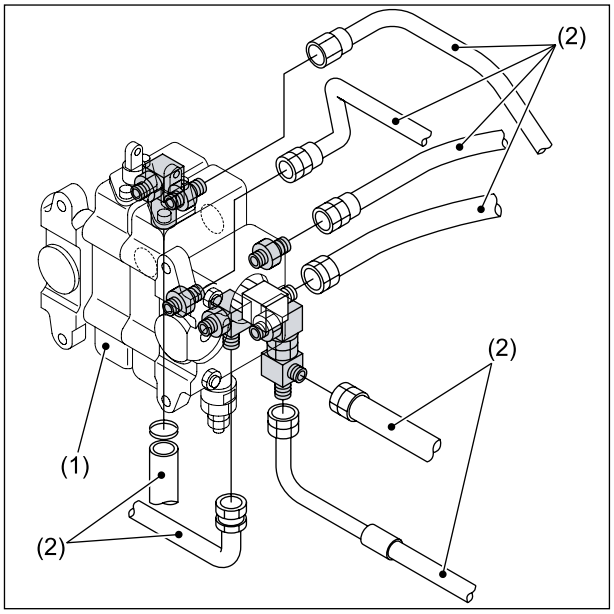


Fig. 2.171

③ Remove the bolts (1) and nuts (2). Then remove the control valve (4) from the front plate (3).

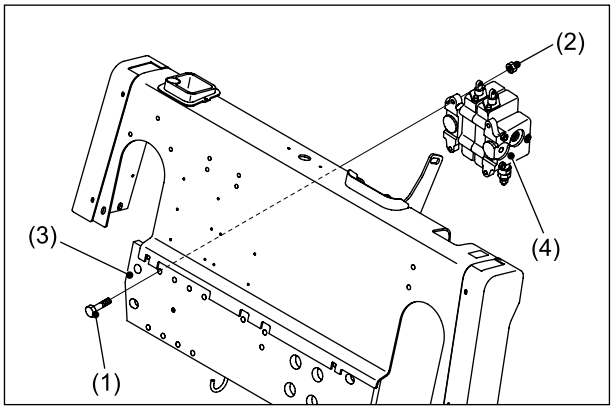


Fig. 2.172

■ REINSTALLATION

① Install the control valve (1) on the front plate (2). Then secure it using the bolts (3) and nuts (4).

27.7 - 41.5 N-m {2.8 - 4.2 kgf-m} [20.4 - 30.6 lbf-ft]

⚠ **Apply LOCTITE #262 or SCOTCH GRIP 2352 to the threads of the bolts (3).**

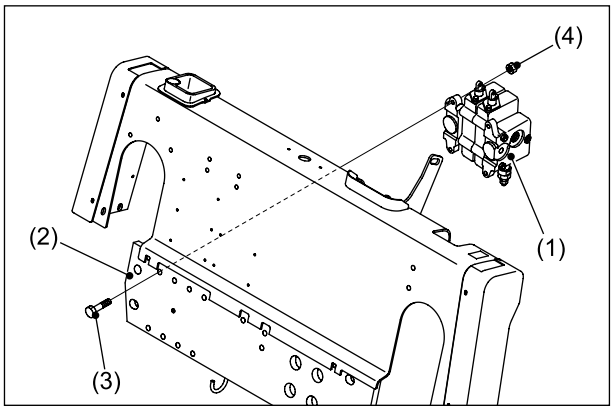


Fig. 2.173

② Connect the hose (2) to each port of the control valve (1).

Port P1: From the main pump.
Port P2: To the priority valve.
Port PF: To the steering gear box.
Port T: To the oil tank.
Port A1: To the lift cylinder.
Port A: To the tilt cylinder.
Port B2: To the tilt cylinder.

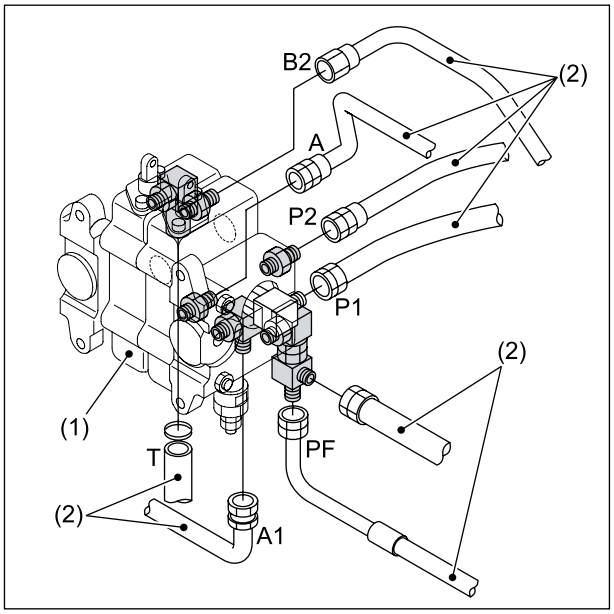


Fig. 2.174

③ Connect the rod (1) to each spool and then secure it using the pin (2), washer (3), and cotter pin (4).

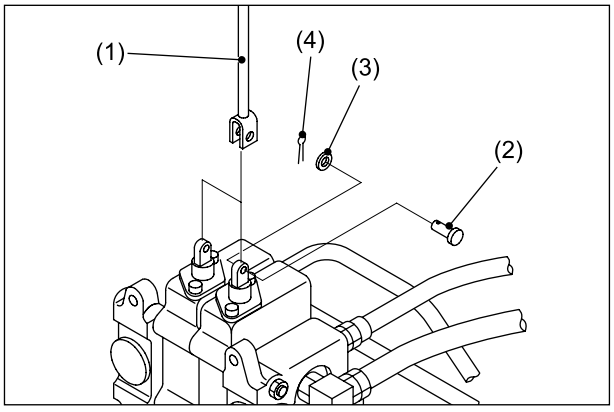


Fig. 2.175

2.17 MAST ASSEMBLY

■ REMOVAL

① Slightly support the top cross-member of the outer channel of the mast assembly using a crane.

② Remove the bolts (1) and plate (2). Then remove the mast-side connecting pin (4) of the tilt cylinder (3).

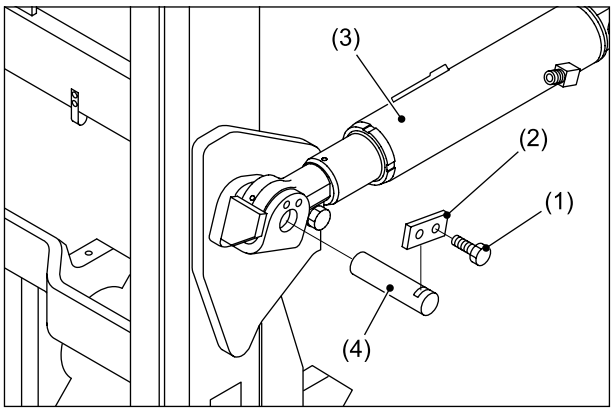


Fig. 2.176

③ Disconnect the hoses (2) from the lift cylinders (1).

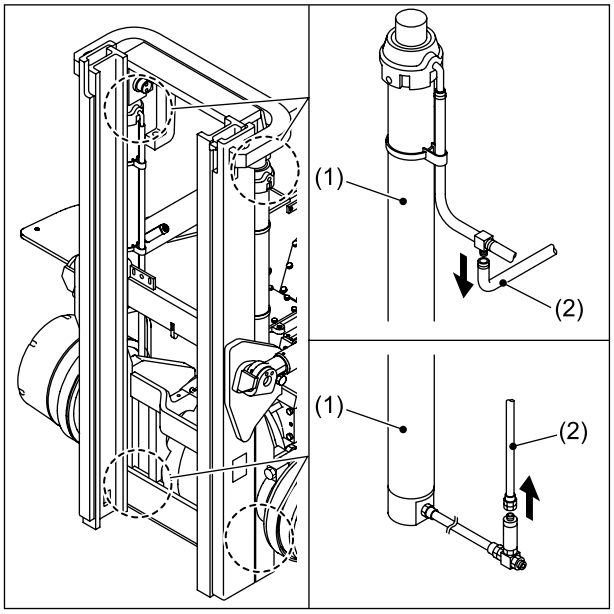


Fig. 2.177

④ Remove the bolts (1) and spring washers (2) that secure the mast support located at the bottom of the mast assembly. Then remove the mast support caps (3).

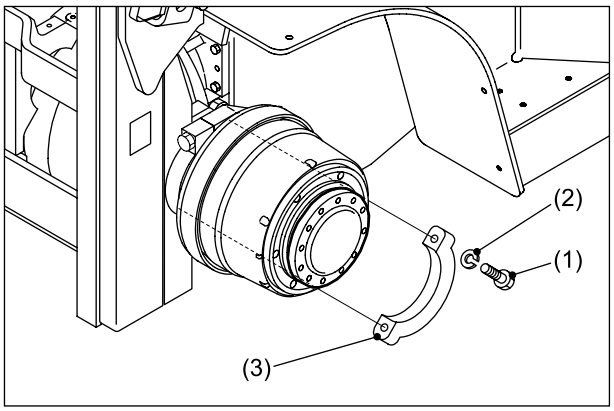


Fig. 2.178

⑤ Remove the mast assembly by lifting it with a crane.

3.5 tons, 4.0 tons	980 kg [2161 lbs]
4.5 tons	1120 kg [2469 lbs]
5.0 tons	1250 kg [2756 lbs]

(For a standard mast assembly with a lifting height of 3 m)

■ REINSTALLATION

① Hoist the mast assembly using a crane. Install the mast support section (1) located at the bottom of the mast assembly in the groove in the drive axle (2) using the bushings (3).

3.5 tons, 4.0 tons	980 kg [2161 lbs]
4.5 tons	1120 kg [2469 lbs]
5.0 tons	1250 kg [2756 lbs]

(For a standard mast assembly with a lifting height of 3 m)

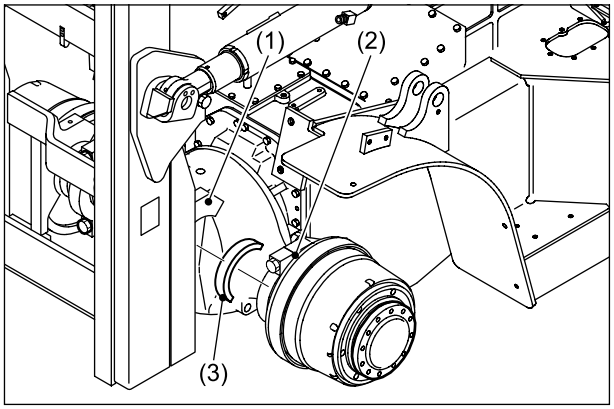


Fig. 2.179

② Install the mast support cap (1) and then secure it using the bolts (2) and spring washers (3).

139 - 208 N-m {14.2 - 21.2 kgf-m} [102.5 - 153.4 lbf-ft]

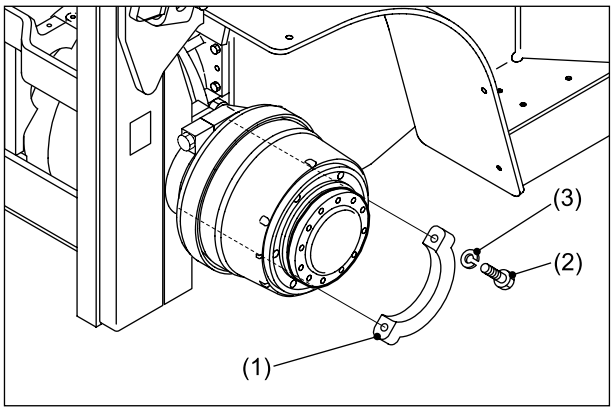


Fig. 2.180

③ Install the tilt cylinder (1) on the mast assembly using the connecting pin (2), and then secure it using the bolts (3) and plate (4).

17.1 - 25.4 N-m {1.74 - 2.59 kgf-m} [12.6 - 18.7 lbf-ft]

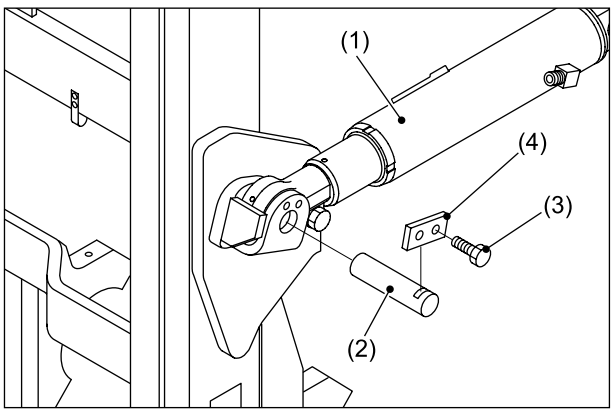


Fig. 2.181

④ Remove the crane from the mast assembly.

⑤ Connect the hoses (2) to the lift cylinders (1).

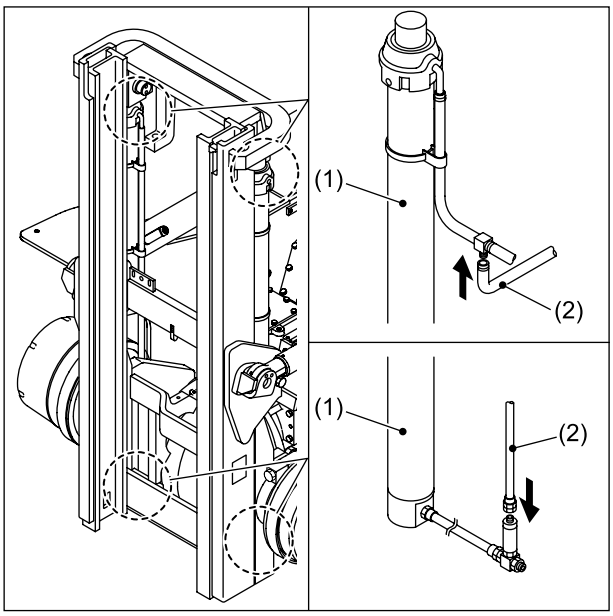


Fig. 2.182

3. DISASSEMBLY AND REASSEMBLY

3.1 CLUTCH PEDAL AND BRAKE PEDAL

3.1.1 BRAKE PEDAL (automatic transmission trucks)

■ DISASSEMBLY

① Remove the springs (3) from the brake pedal (1) and inching pedal (2).

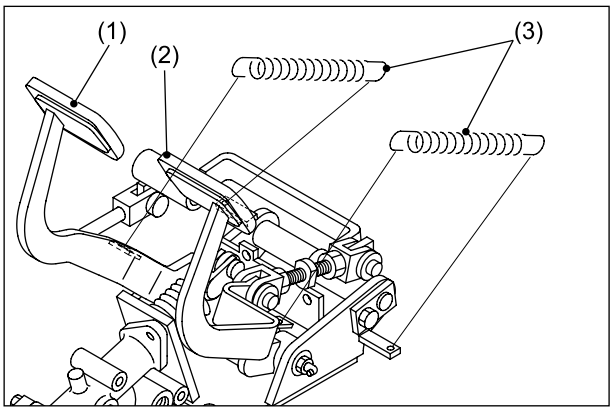


Fig. 3.1

② Remove the split pins (1), washers (2), and pins (3). Then remove the joint (5) and inching rod (6) from the linkage (4).

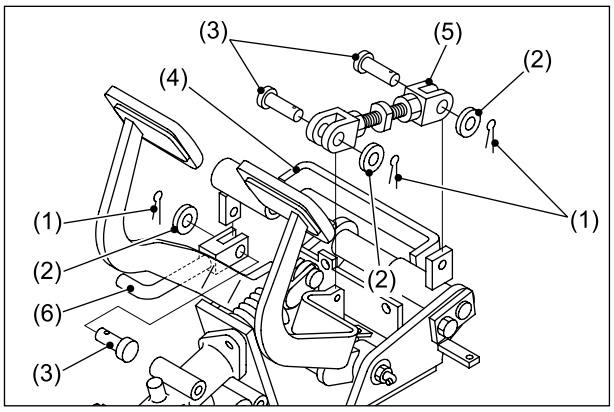


Fig. 3.2

③ Remove the bolts (1) and remove the shafts (2) and spacers (3).

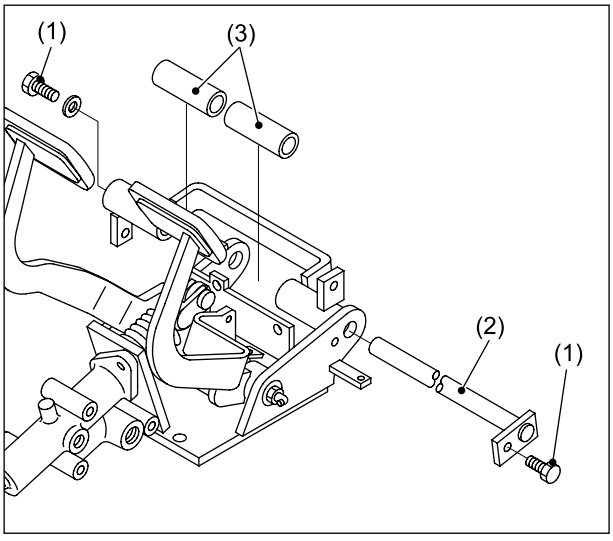


Fig. 3.3

④ Remove the linkage (2) from the pedal bracket (1).

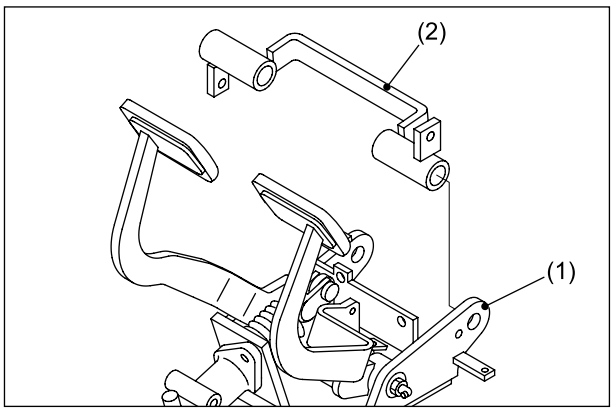


Fig. 3.4

⑤ Remove the split pin (1), washer (2), and pin (3) from the brake booster (4).

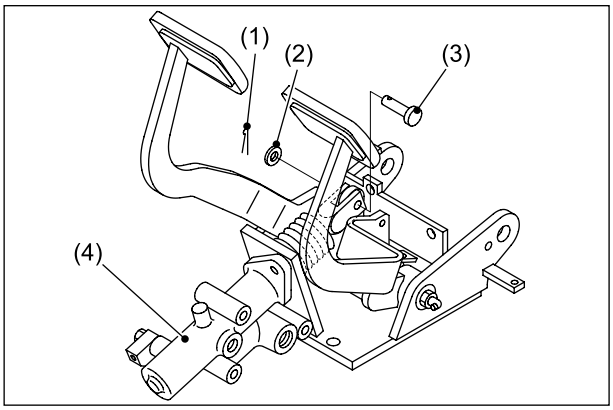


Fig. 3.5

⑥ Remove the bolt (1) and remove the shaft (2). Then remove the brake pedal (4) and inching pedal (5) from the pedal bracket (3).

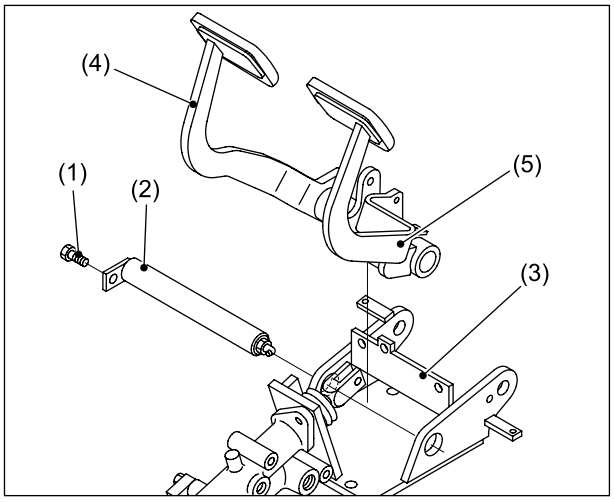


Fig. 3.6

⑦ Remove the bolts (1) and then remove the brake booster (3) from the brake bracket (2).

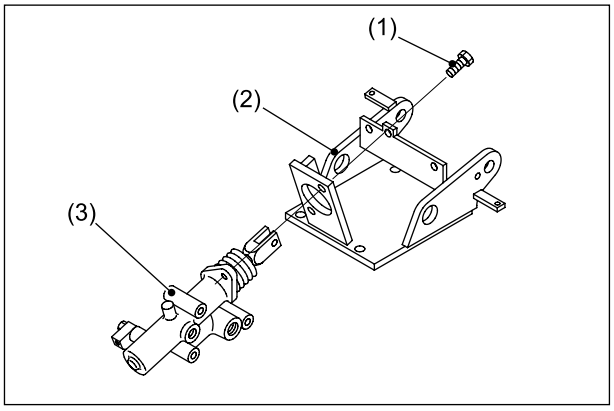


Fig. 3.7

■ REASSEMBLY

① Install the brake booster (2) on the pedal bracket (1) using the bolts (3).

21.2 N-m {2.2 kgf-m} [15.6 lbf-ft]

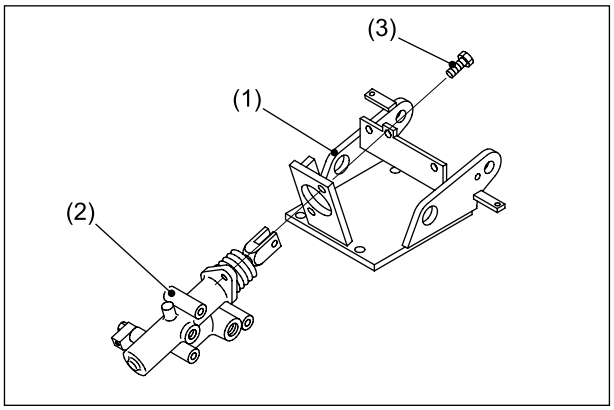


Fig. 3.8

② Place the brake pedal (1) and inching pedal (2) in the pedal bracket (3) and then secure them using the shaft (4).

9.8 N-m {1.0 kgf-m} [7.2 lbf-ft]

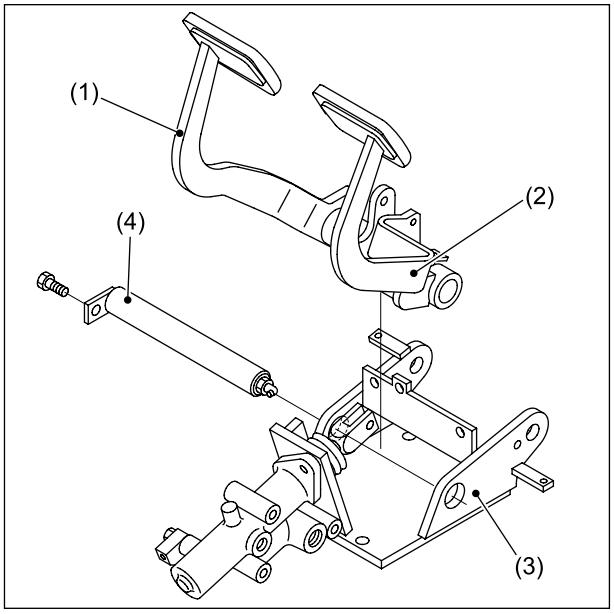


Fig. 3.9

③ Install the brake pedal (2) on the brake booster (1) using the pin (3), washer (4), and split pin (5).

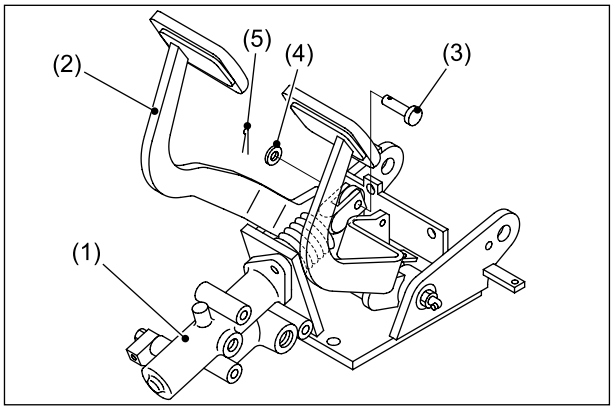


Fig. 3.10

④ Place the linkage (1) and spacers (2) in the pedal bracket (3). Then secure them using the shaft (4).

M8: 9.8 N-m {1.0 kgf-m} [7.2 lbf-ft]
M6: 4.0 N-m {0.4 kgf-m} [3.0 lbf-ft]

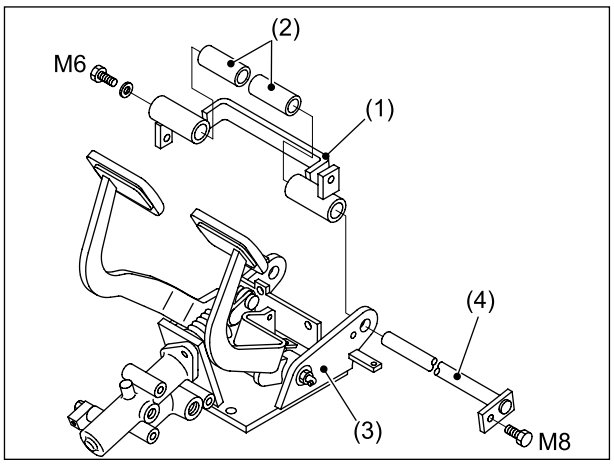


Fig. 3.11

⑤ Install the joint (2) and inching rod (3) on the linkage (1) using the pins (4), washers (5), and split pins (6).

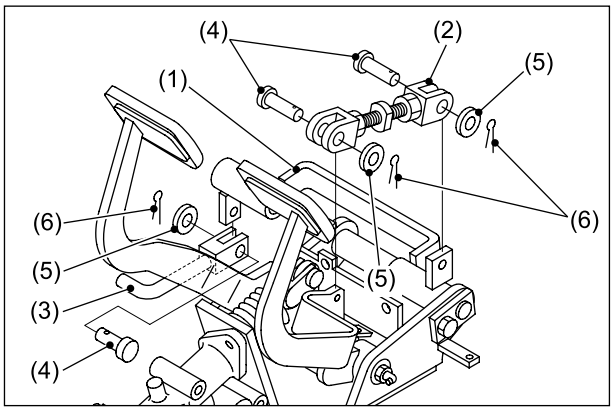


Fig. 3.12

⑥ Install the springs (3) on the brake pedal (1) and inching pedal (2).

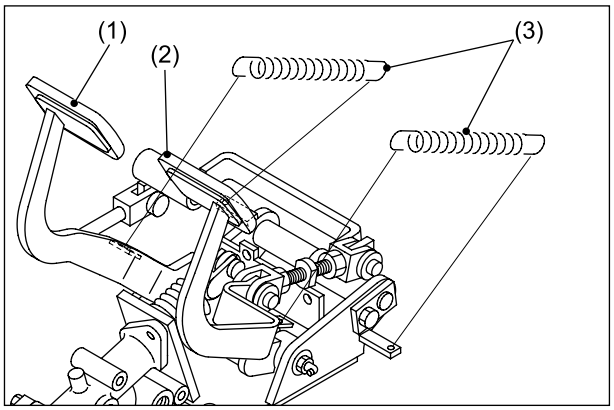


Fig. 3.13

3.1.2 CLUTCH PEDAL AND BRAKE PEDAL (manual transmission trucks)

■ DISASSEMBLY

① Remove the pipe (3) connecting the clutch release cylinder (1) and the clutch booster (2).

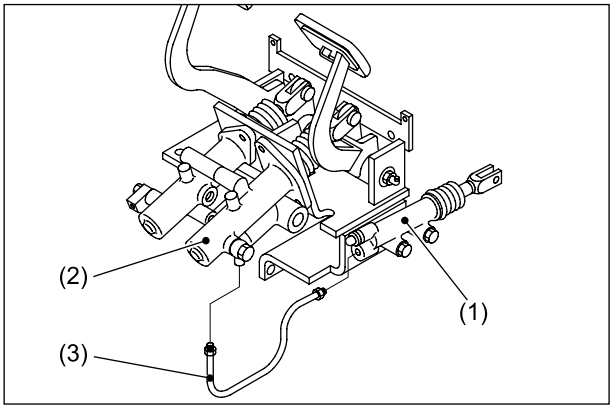


Fig. 3.14

② Remove the bolts (1) and remove the clutch release cylinder (2).

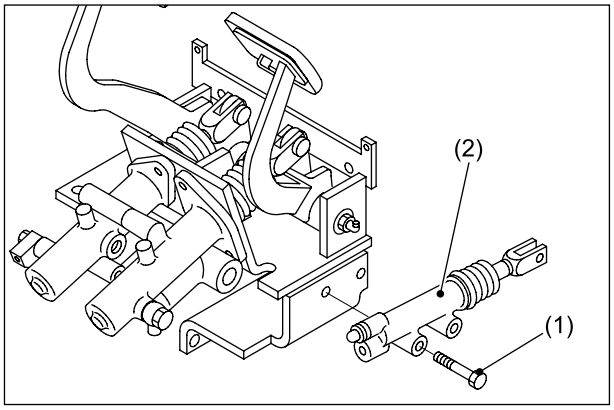


Fig. 3.15

③ Remove the springs (3) from the brake pedal (1) and clutch pedal (2).

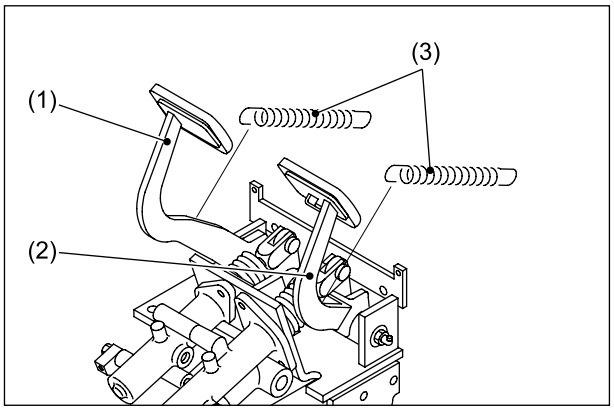


Fig. 3.16

④ Remove the split pins (3) from the clutch booster (1) and brake booster (2), and then remove the pins (4) and washers (5).

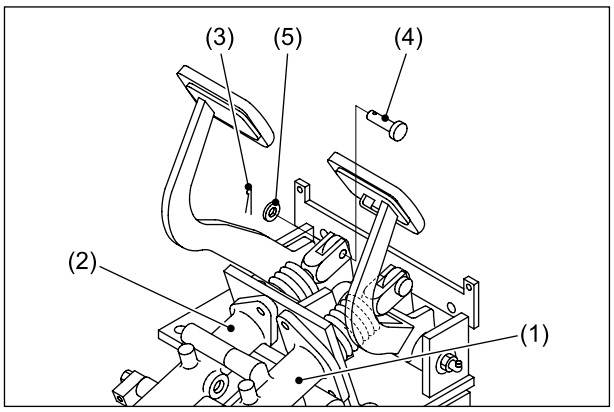


Fig. 3.17

⑤ Remove the bolts (1) and then remove the clutch booster (2) and brake booster (3).

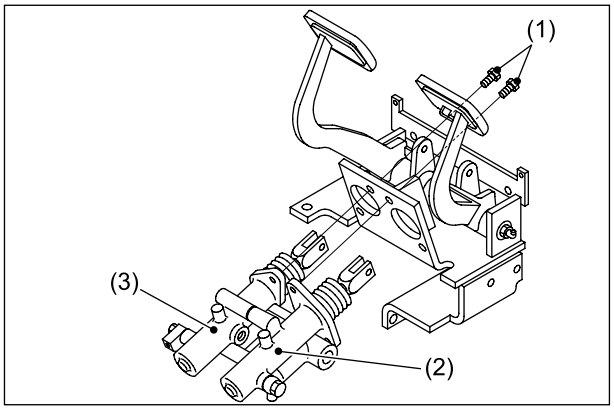


Fig. 3.18

⑥ Remove the bolt (1) and remove the shaft (2). Then remove the clutch pedal (4) and brake pedal (5) from the pedal bracket (3).

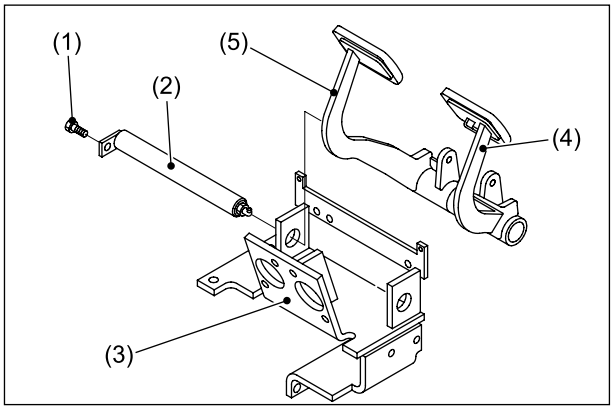


Fig. 3.19

■ REASSEMBLY

① Place the brake pedal (1) and clutch pedal (2) in the pedal bracket (3). Then secure them to the bracket using the shaft (4).

9.8 N-m {1.0 kgf-m} [7.2 lbf-ft]

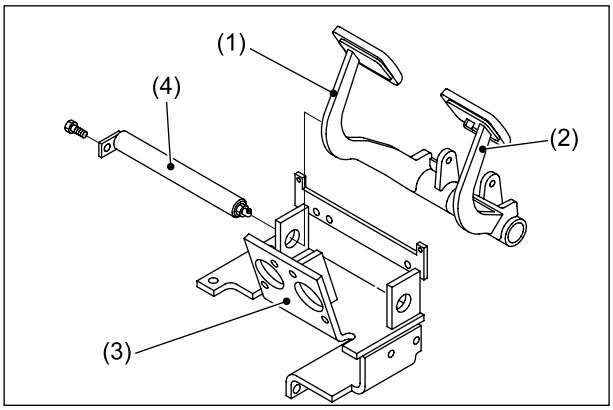


Fig. 3.20

② Install the clutch booster (1) and brake booster (2) on the pedal bracket (4) using the bolts (3).

21.2 N-m {2.2 kgf-m} [15.6 lbf-ft]

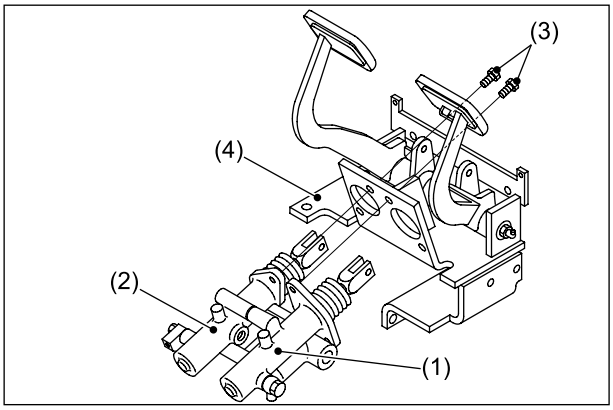


Fig. 3.21

③ Secure the brake booster (1) to the brake pedal (2) using the pin (3), washer (4), and split pin (5).

Secure the clutch booster (6) to the clutch pedal (7) in the same manner.

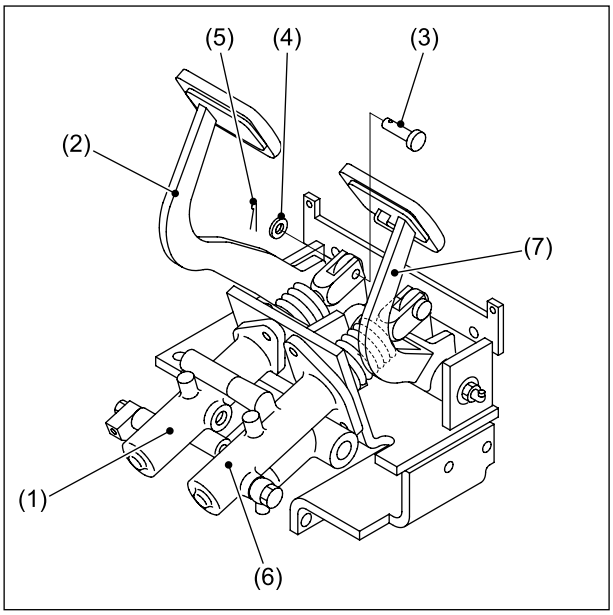


Fig. 3.22

④ Install the springs (3) on the brake pedal (1) and clutch pedal (2).

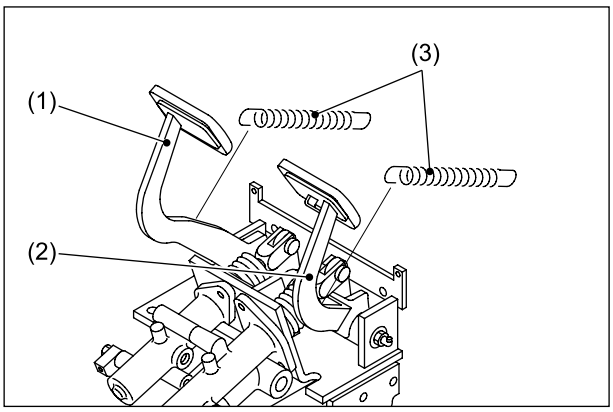


Fig. 3.23

⑤ Install the clutch release cylinder (2) on the pedal bracket (1) using the bolts (3).

21.2 N-m {2.2 kgf-m} [15.6 lbf-ft]

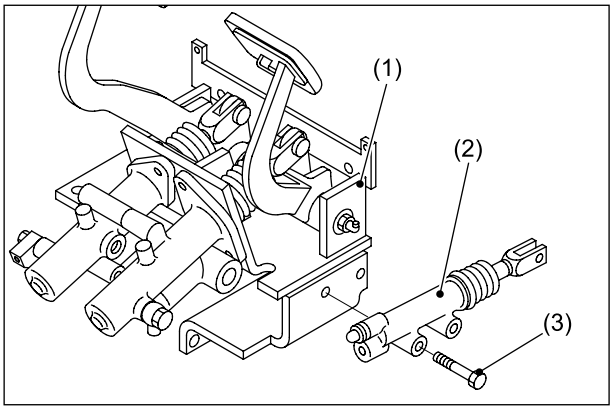


Fig. 3.24

⑥ Install the pipe (3) connecting the clutch release cylinder (1) and clutch booster (2).

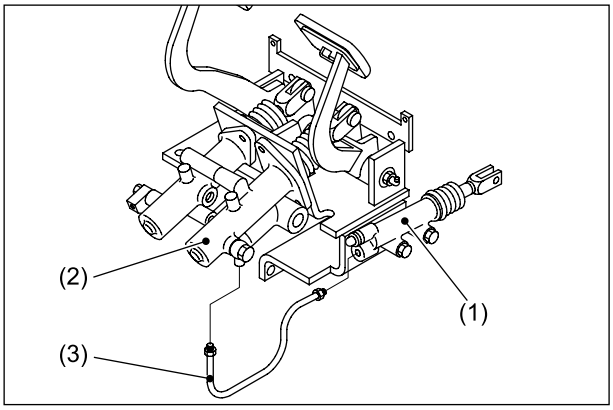


Fig. 3.25

3.1.3 CLUTCH BOOSTER

⚠ **Have a repair kit handy before starting the disassembly. Use the new parts from the kit during reassembly.**

■ DISASSEMBLY

① Remove the push rod assembly (2) along with the boot (1).

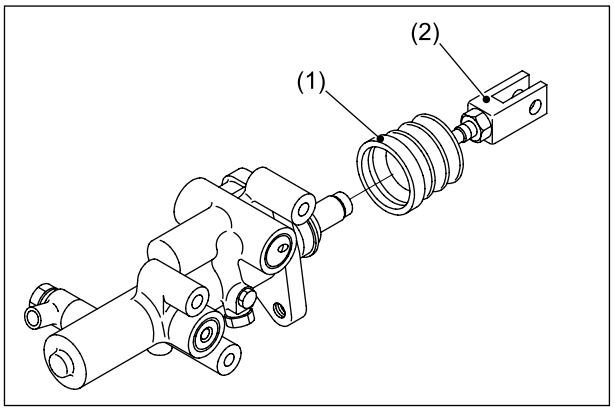


Fig. 3.26

② Slightly push in the guide assembly (1) and remove the stopper ring (2).

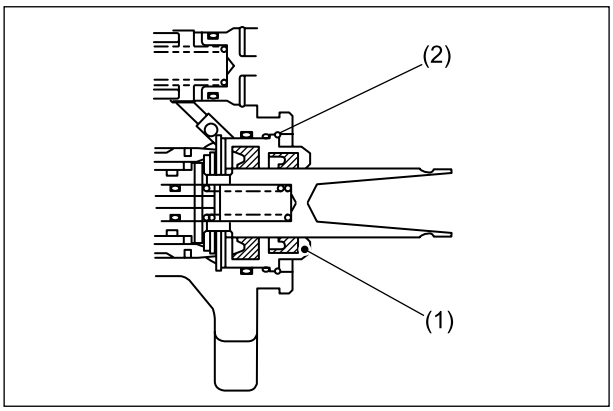


Fig. 3.27

③ Remove the reaction piston assembly (1).

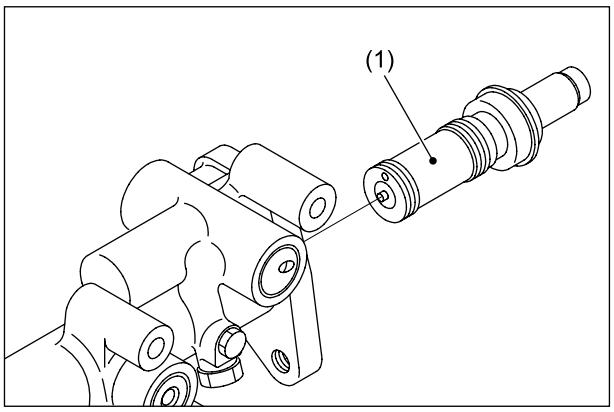


Fig. 3.28

④ Remove the bolt (1) and gasket (2).

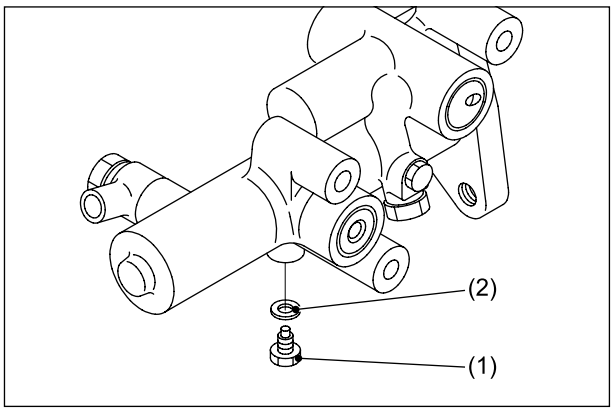


Fig. 3.29

⑤ Slightly push in the master cylinder piston (1) and remove the pin (2). Then remove the master cylinder piston (1) and spring (3).

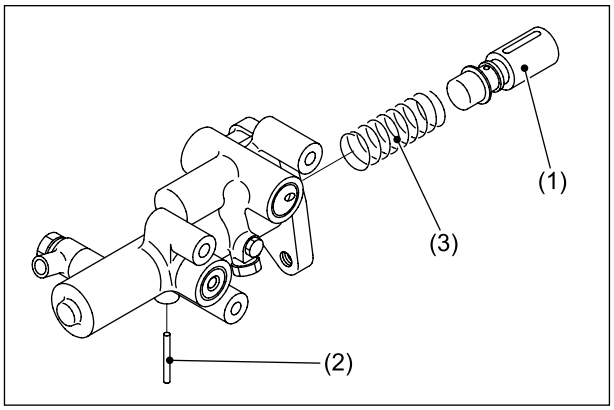


Fig. 3.30

⑥ Remove the snap ring (1) and remove the plug (2), spring (3), and spool (4).

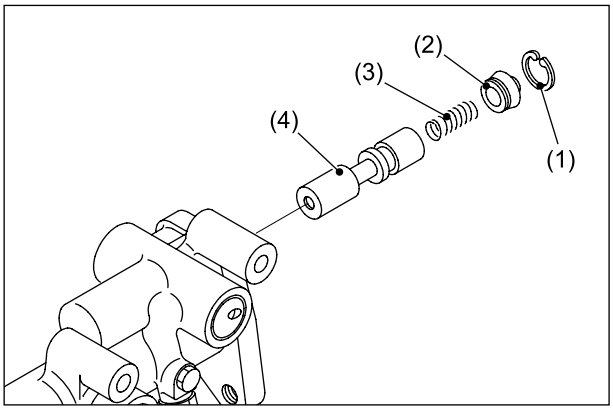


Fig. 3.31

⑦ Disassembling the reaction piston

1) Remove the snap ring (2) from the reaction piston 1 (1) and then remove the guide assembly (3).

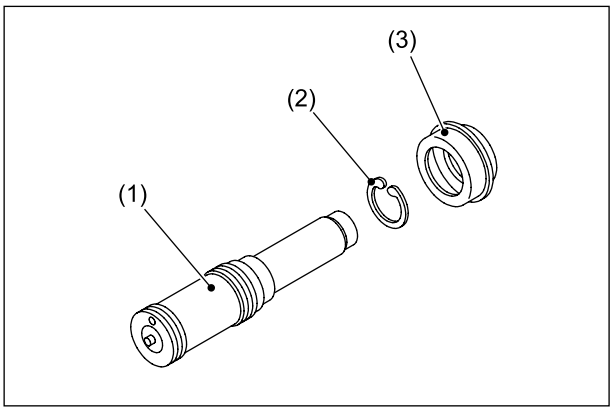


Fig. 3.32

2) Remove the reaction piston 1 (2) from the power piston (1).

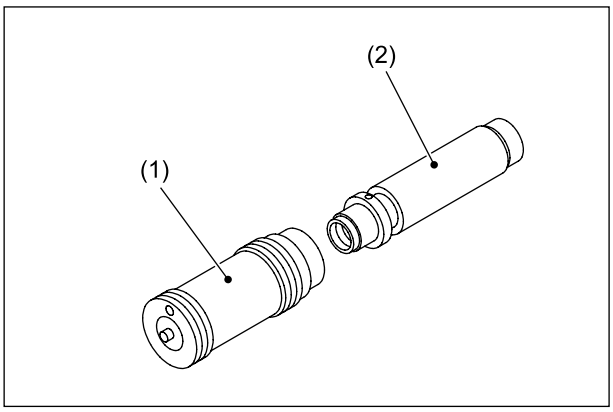


Fig. 3.33

3) Remove the reaction piston 2 (1) and spring (2) from the power piston (3).

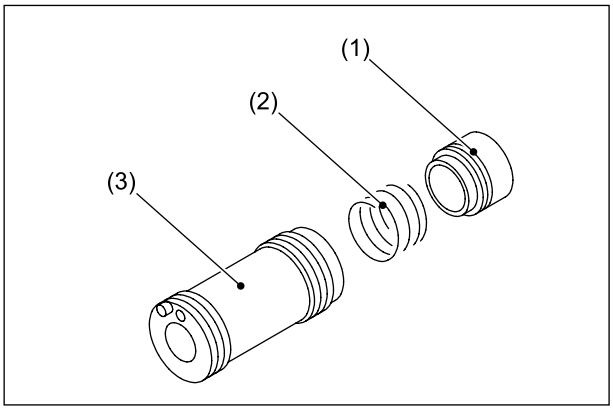


Fig. 3.34

4) Remove the snap ring (1) and remove the plug (3), spring (4), and control valve (5) from the power piston (2).

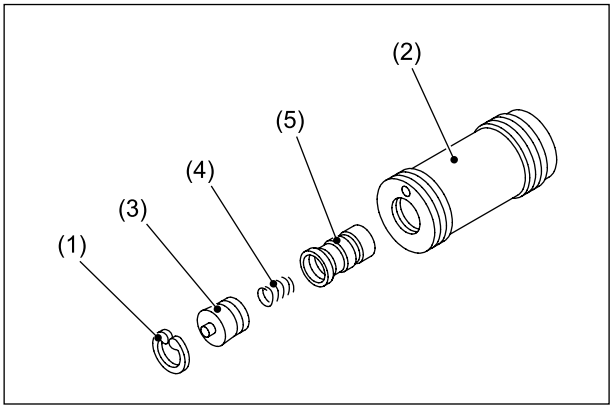


Fig. 3.35

5) Push in the control valve seat (1) and remove the pin (2). Then remove the control valve seat (1) and spring (3) from the reaction piston (4).

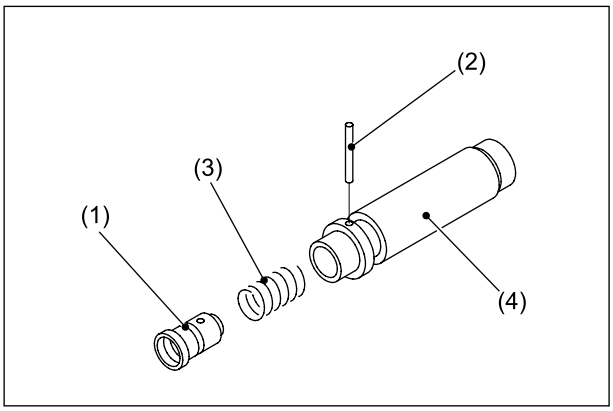


Fig. 3.36

■ REASSEMBLY

① Reassembling the reaction piston

1) Insert the control valve (1), spring (2), and plug (3) into the power piston (4). Then install the snap ring (5).

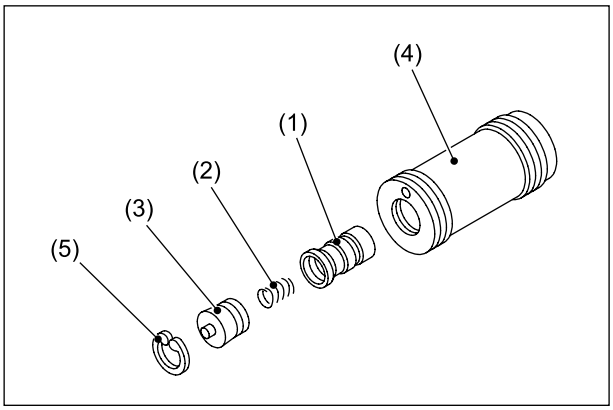


Fig. 3.37

2) Install the spring (2) onto the reaction piston 1 (1). Pushing in the control valve seat (3), install the pin (4).

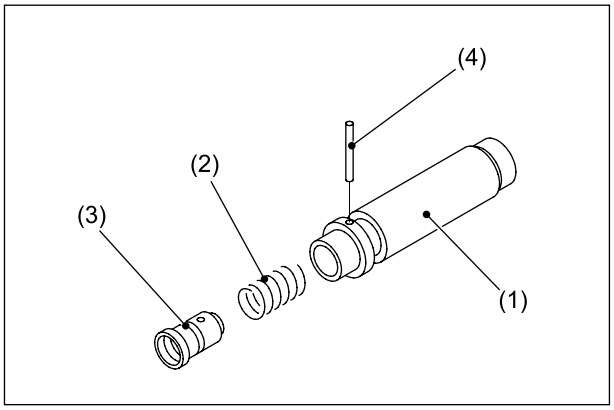


Fig. 3.38

3) Install the reaction piston 2 (2) and spring (3) onto the power piston (1).

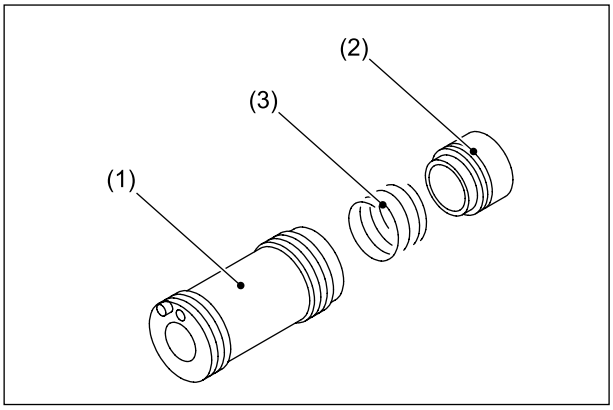


Fig. 3.39

4) Install the reaction piston 1 (2) on the power piston (1) using the snap ring (3) and washer plates (4).

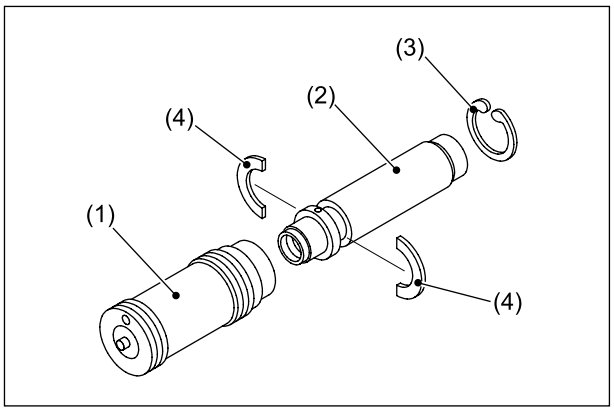


Fig. 3.40

5) Install the guide assembly (2) on the reaction piston 1 (1).

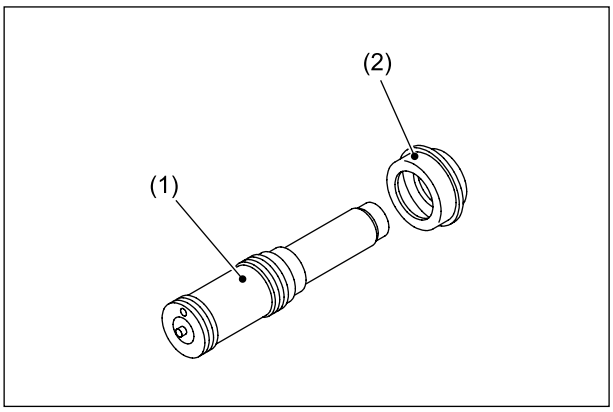


Fig. 3.41

② Install the spring (1) and master cylinder piston (2) on the cylinder section. Pushing in the master cylinder piston (2), install the pin (3).

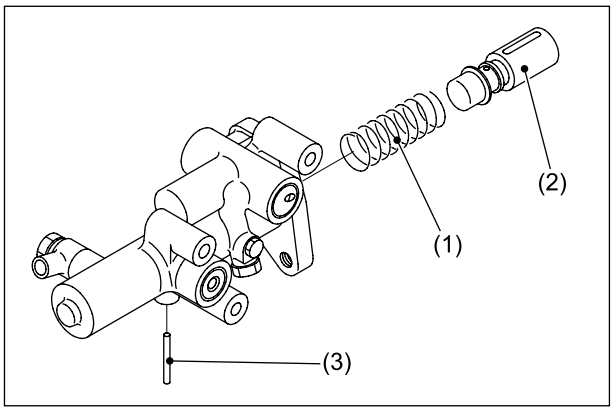


Fig. 3.42

③ Install the bolt (2) using a new gasket (1).

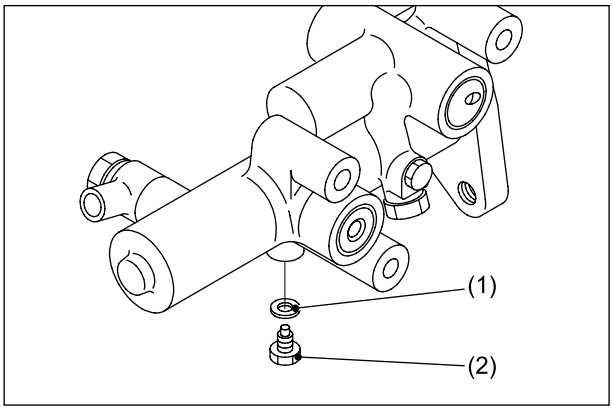


Fig. 3.43

④ Install the reaction piston assembly (1) on the cylinder. Pushing in the guide (2), install the stopper ring (3).

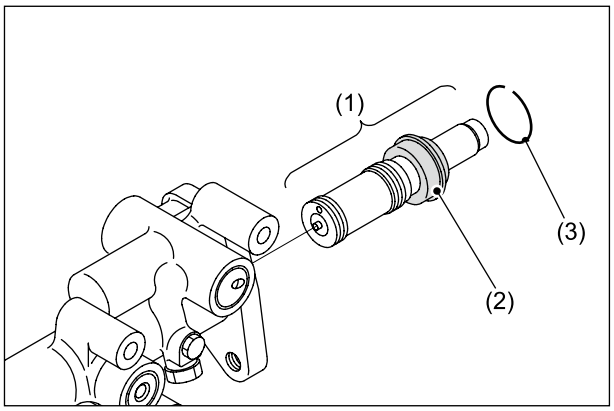


Fig. 3.44

⑤ Install the spool (1), spring (2), and plug (3). Then install the snap ring (4).

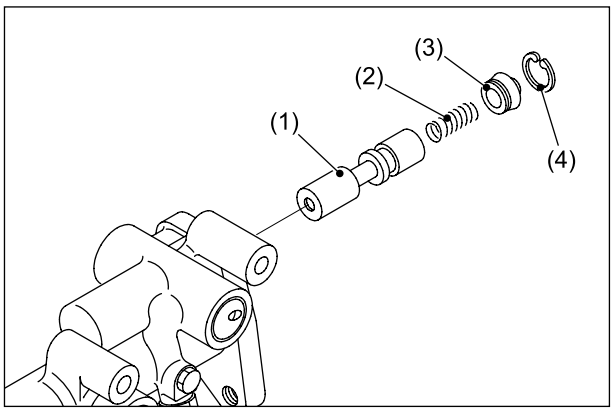


Fig. 3.45

⑥ Install the push rod (1) along with the boot (2).

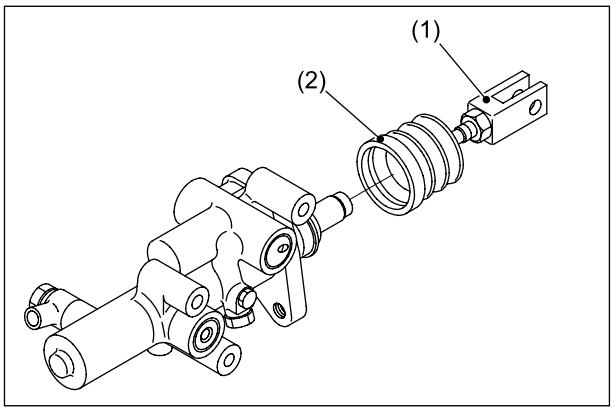


Fig. 3.46

3.1.4 BRAKE BOOSTER

⚠ **Have a repair kit handy before starting the disassembly. Use the new parts from the kit during reassembly.**

■ DISASSEMBLY

① Remove the push rod assembly (2) along with the boot (1).

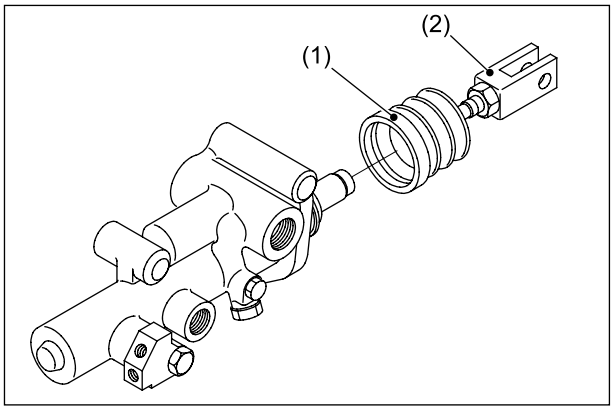


Fig. 3.47

② Slightly push in the guide assembly (1) and remove the stopper ring (2).

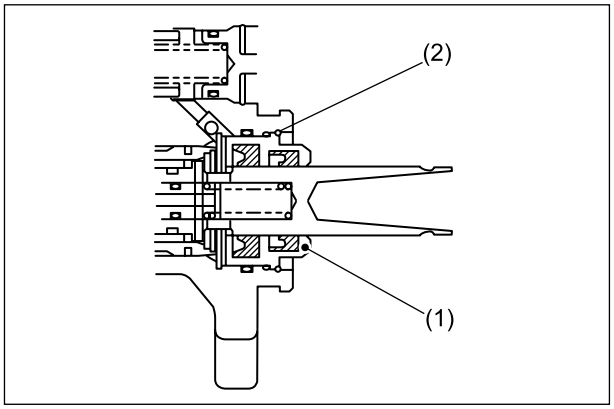


Fig. 3.48

③ Remove the reaction piston assembly (1).

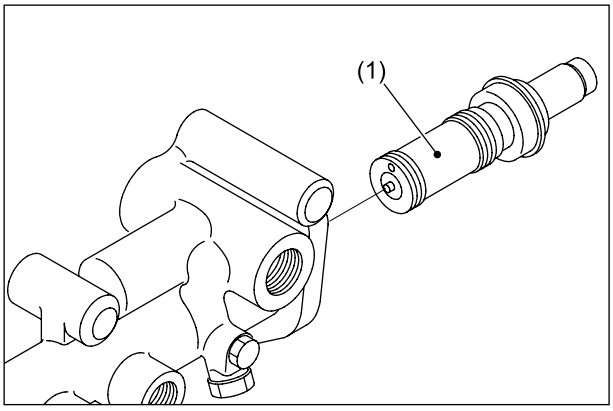


Fig. 3.49

④ Remove the bolt (1) and gasket (2).

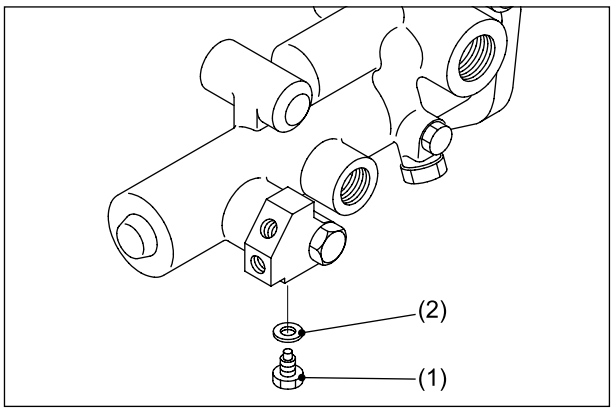


Fig. 3.50

⑤ Slightly push in the master cylinder piston (1) and remove the pin (2). Then remove the master cylinder piston (1) and spring (3).

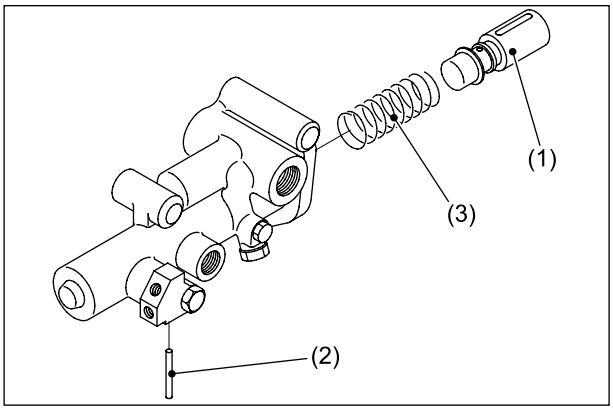


Fig. 3.51

⑥ Remove the snap ring (1) and remove the plug (2), spring (3), and spool (4).

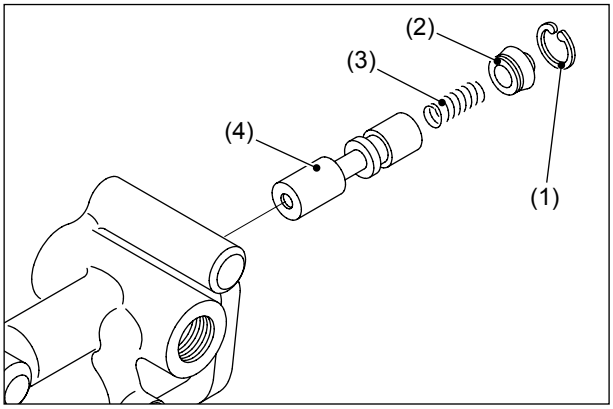


Fig. 3.52

⑦ Disassembling the reaction piston

1) Remove the snap ring (2) from the reaction piston 1(1), and then remove the guide assembly (3).

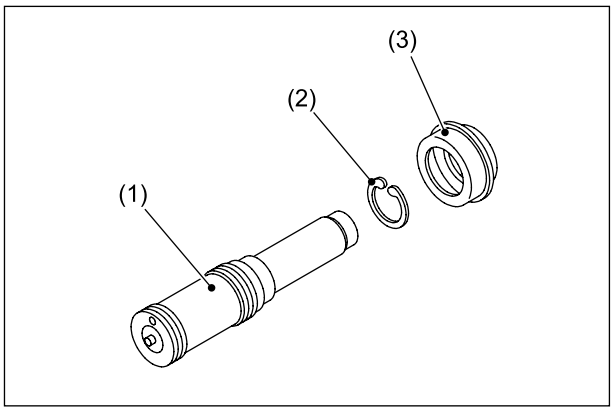


Fig. 3.53

2) Remove the reaction piston 1 (2) from the power piston (1).

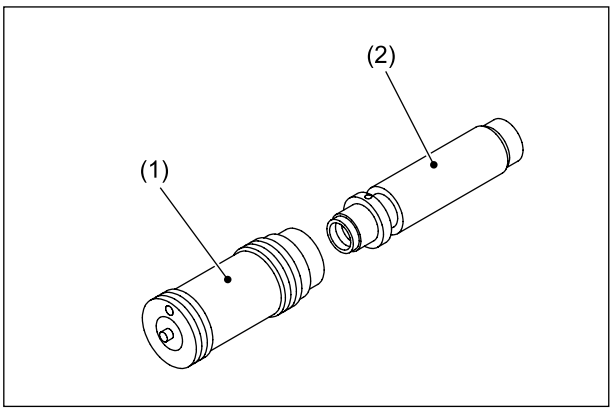


Fig. 3.54

3) Remove the reaction piston 2 (1) and spring (2) from the power piston (3).

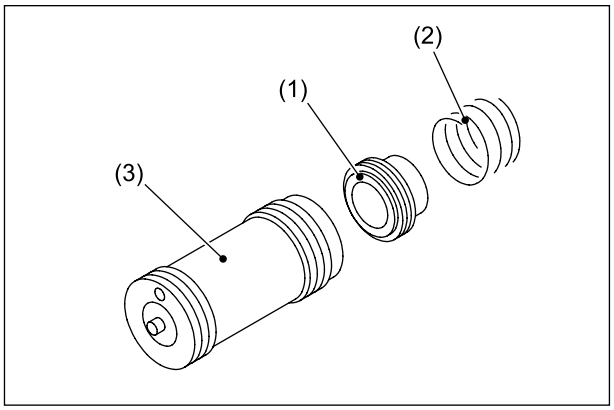


Fig. 3.55

4) Remove the snap ring (1) and remove the plug (3), spring (4), and control valve (5) from the power piston (2).

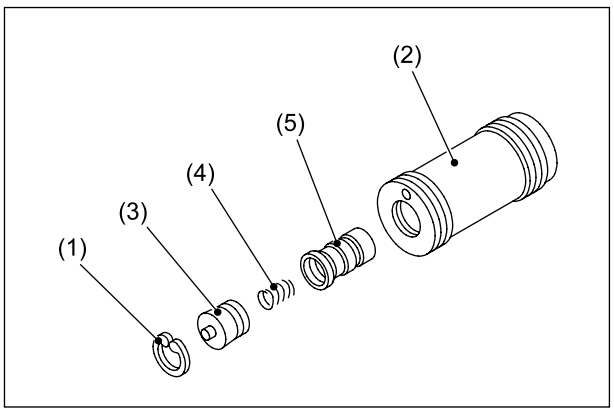


Fig. 3.56

5) Push in the control valve seat (1) and remove the pin (2). Then remove the control valve seat (1) and spring (3) from the reaction piston 1 (4).

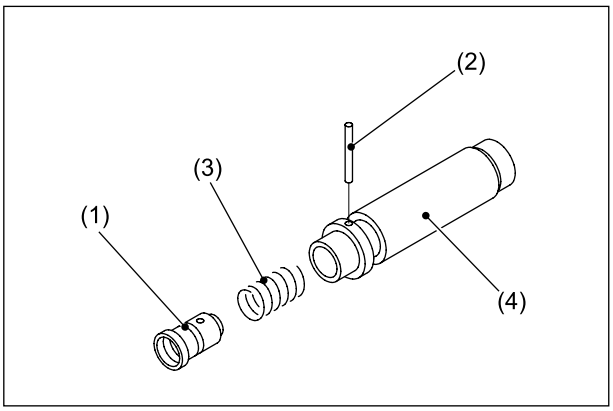


Fig. 3.57

■ REASSEMBLY

① Reassembling the reaction piston

1) Insert the control valve (1), spring (2), and plug (3) into the power piston (4). Then install the snap ring (5).

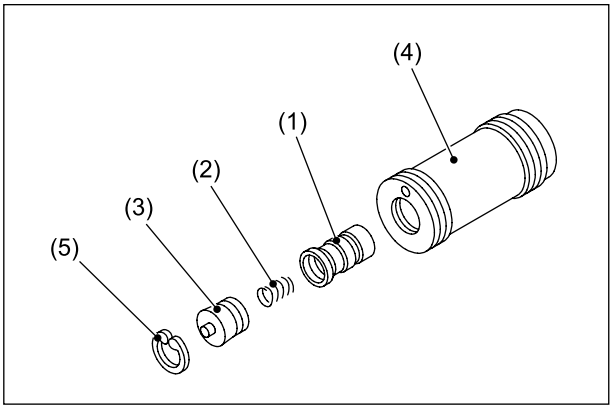


Fig. 3.58

2) Install the spring (2) onto the reaction piston 1 (1). Pushing in the control valve seat (3), install the pin (4).

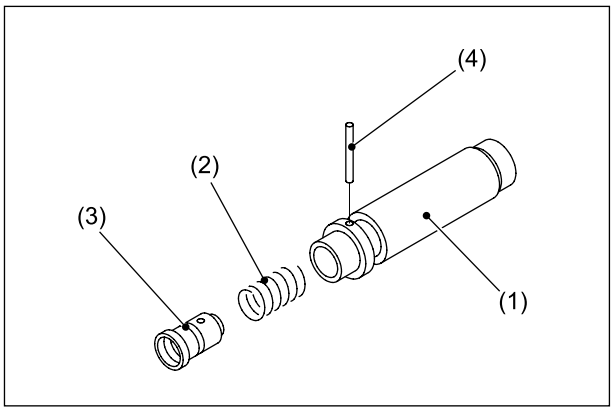


Fig. 3.59

3) Install the reaction piston 2 (2) and spring (3) onto the power piston (1).

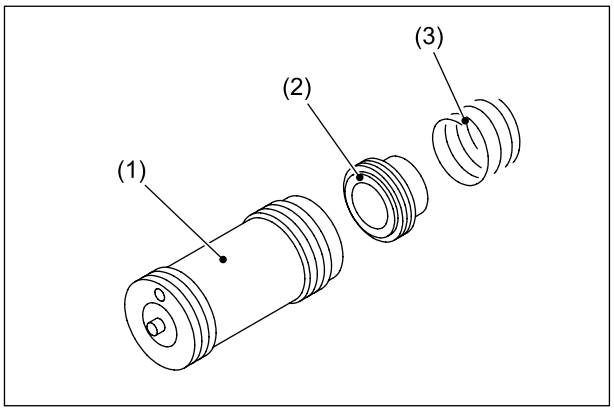


Fig. 3.60

4) Install the reaction piston 1 (2) on the power piston (1) using the snap ring (3) and washer plates (4).

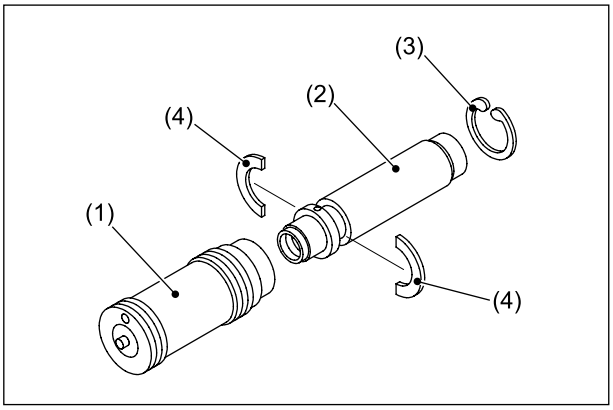


Fig. 3.61

5) Install the guide assembly (2) on the reaction piston 1 (1).

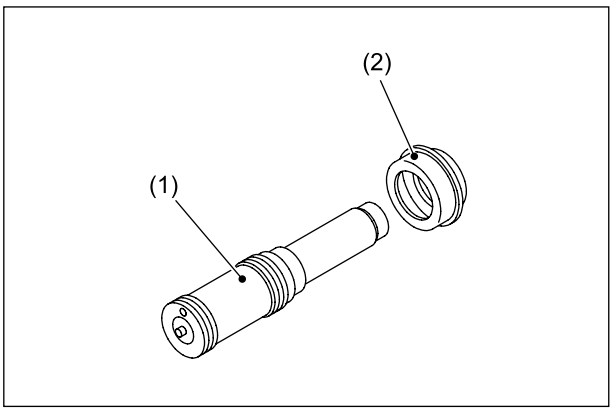


Fig. 3.62

② Install the spring (1) and master cylinder piston (2) on the cylinder section. Pushing in the master cylinder piston (2), install the pin (3).

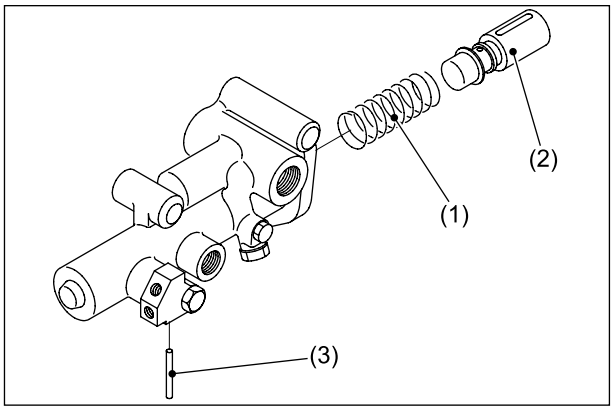


Fig. 3.63

③ Install the bolt (2) using a new gasket (1).

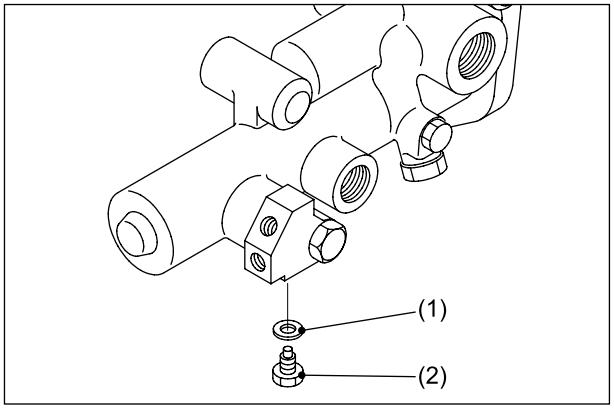


Fig. 3.64

④ Install the reaction piston assembly (1) on the cylinder. Pushing in the guide (2), install the stopper ring (3).

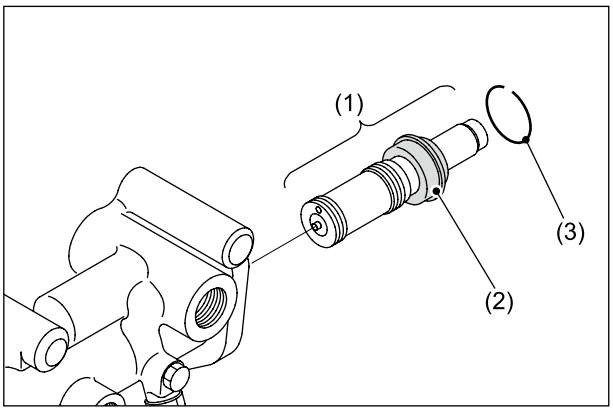


Fig. 3.65

⑤ Install the spool (1), spring (2), and plug (3). Then install the snap ring (4).

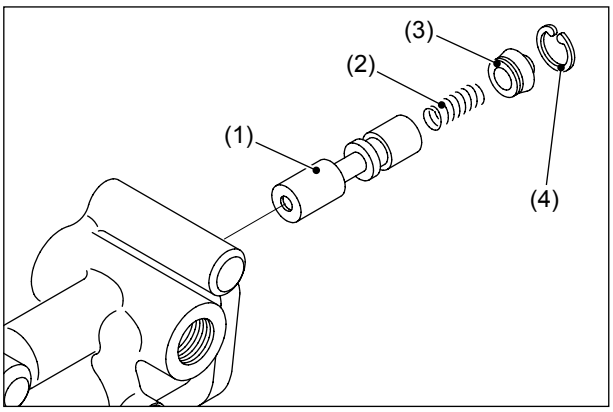


Fig. 3.66

⑥ Install the push rod (1) along with the boot (2).

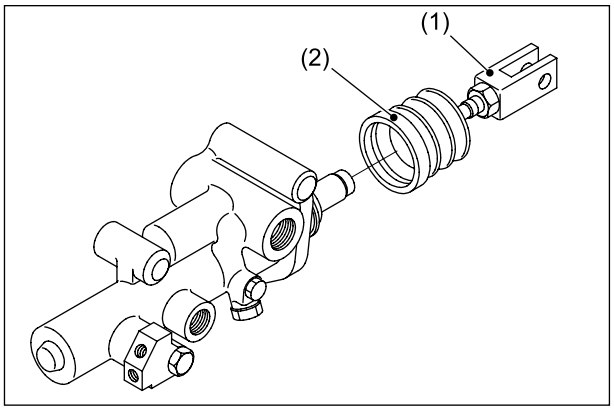


Fig. 3.67

3.2 DRIVE UNIT

3.2.1 TORQUE CONVERTER TYPE TRANSMISSION

■ DISASSEMBLING THE UNIT

① Remove the torque converter assembly (1).

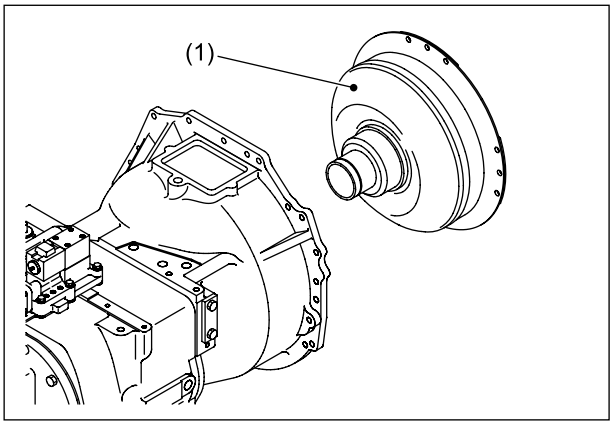


Fig. 3.68

② Remove the transmission control valve (1).

Note: Remove the old gaskets from the mating surfaces. Use caution to prevent gasket scraps from entering the oil or screw holes.

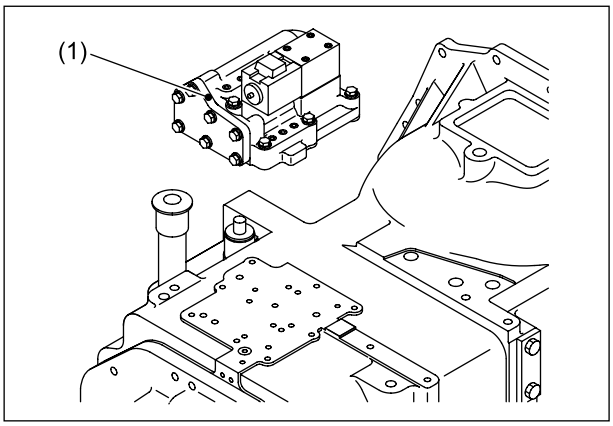


Fig. 3.69

③ Remove the differential assembly (1).

Note: Remove the old gaskets from the mating surfaces. Use caution to prevent gasket scraps from entering the oil or screw holes.

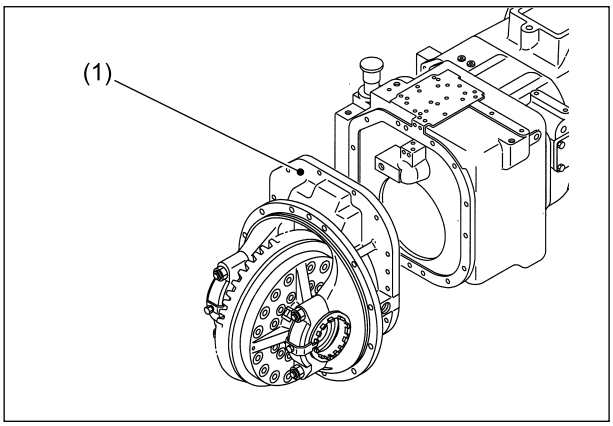


Fig. 3.70

④ Separate the transmission from the converter housing. Remove the output gear.

Note: Remove the old gaskets from the mating surfaces. Use caution to prevent gasket scraps from entering the oil or screw holes.

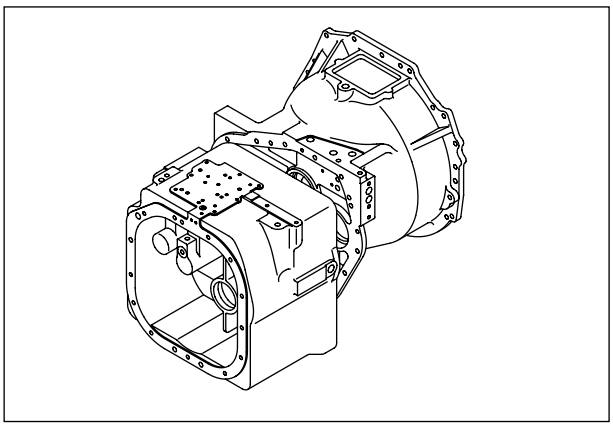


Fig. 3.71

■ DISASSEMBLING CONVERTER HOUSING

① Remove the charging pump (1) from the converter housing.

Note: Remove the old gaskets from the mating surfaces. Use caution to prevent gasket scraps from entering the oil or screw holes.

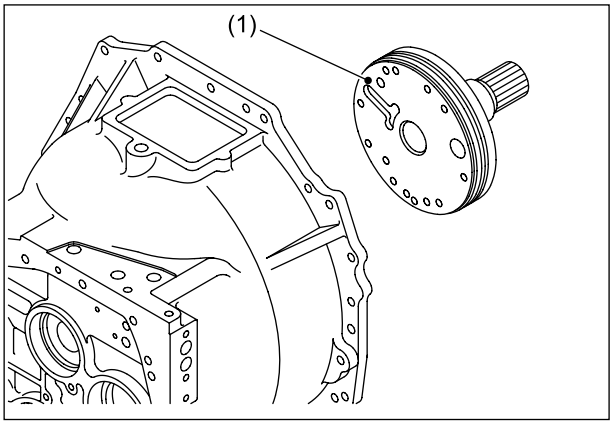


Fig. 3.72

② Remove the strainer (1) from the converter housing.

Note: Remove the old gaskets from the mating surfaces. Use caution to prevent gasket scraps from entering the oil or screw holes.

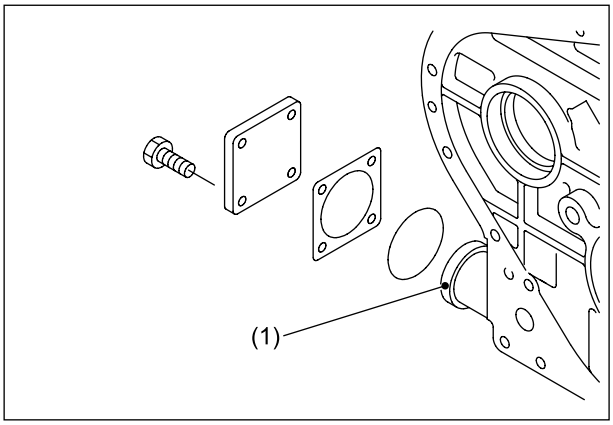


Fig. 3.73

③ Remove the converter relief valve (1) and regulator valve (2) from the converter housing.

Note: Remove the old gaskets from the mating surfaces. Use caution to prevent gasket scraps from entering the oil or screw holes.

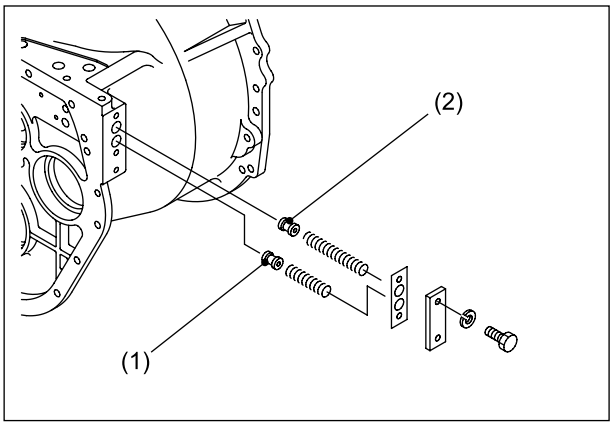


Fig. 3.74

■ REASSEMBLING TORQUE CONVERTER HOUSING

① With a gasket, install the charging pump (1) on the torque converter housing.

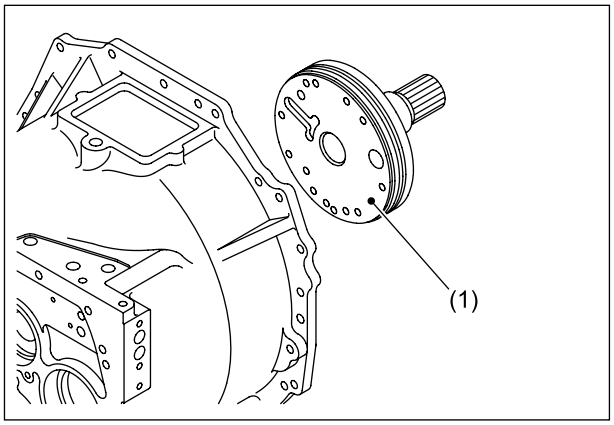


Fig. 3.75

② Install the strainer (1) on the converter housing. With an "O"-ring (2) and gasket (3), install the cover (4).

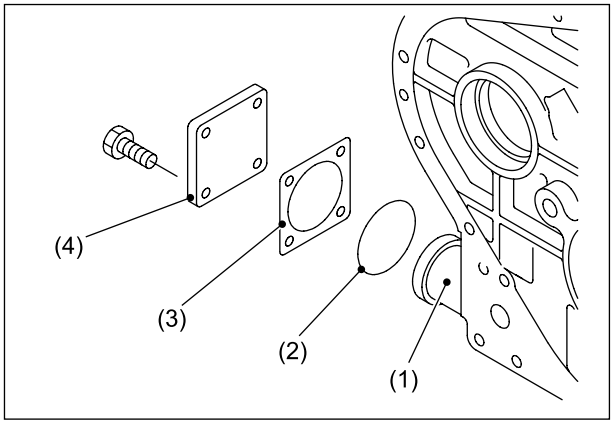


Fig. 3.76

③ Install the converter relief valve (1) and regulator valve (2) on the converter housing. With a gasket (3), install the cover (4).

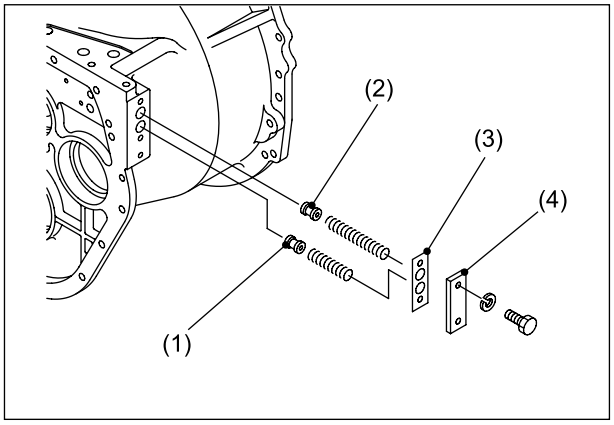


Fig. 3.77

■ DISASSEMBLING TRANSMISSION

① Remove the forward/reverse clutch pack (1) and 2nd clutch pack (2) from the transmission case.

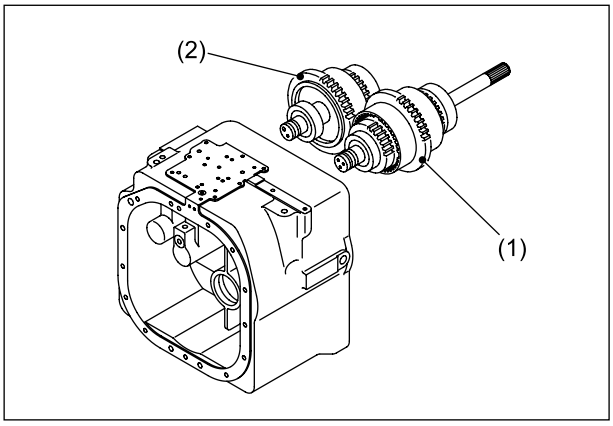


Fig. 3.78

② Remove the counter gear (1) from the transmission case.

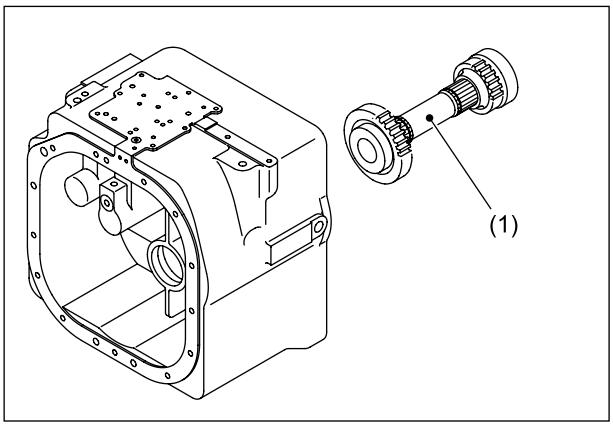


Fig. 3.79

③ Remove the suction pipe (1) from the transmission case. (for 43E-25 only)

Note: The suction pipe (1) is not used with the 44E-25.

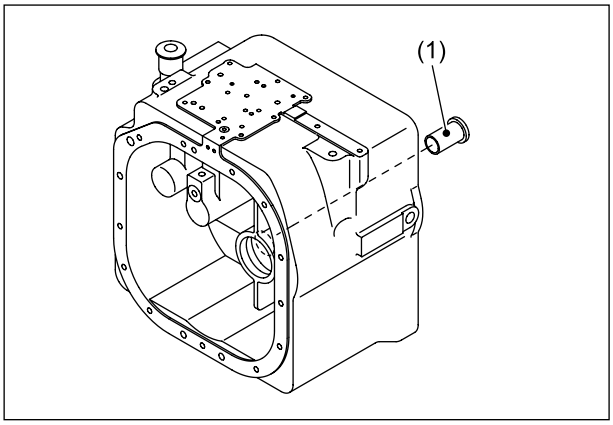


Fig. 3.80

■ REASSEMBLING TRANSMISSION

① Install the suction pipe (1) on the transmission case. (for 43E-25 only)

Note: The suction pipe (1) is not used with the 44E-25.

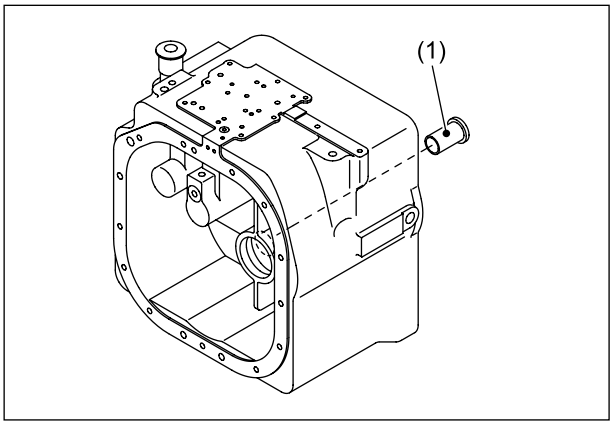


Fig. 3.81

② Install the counter gear (1) in the transmission case.

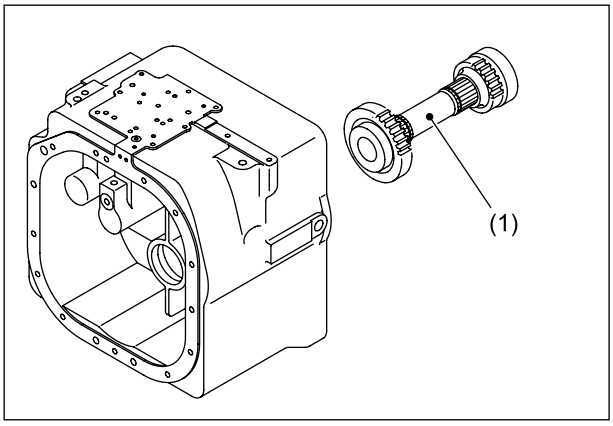


Fig. 3.82

③ Install the clutch packs (2, 3) and output gear (1) in the transmission case.

Note: Make sure that each clutch pack has a seal ring on their shaft end.

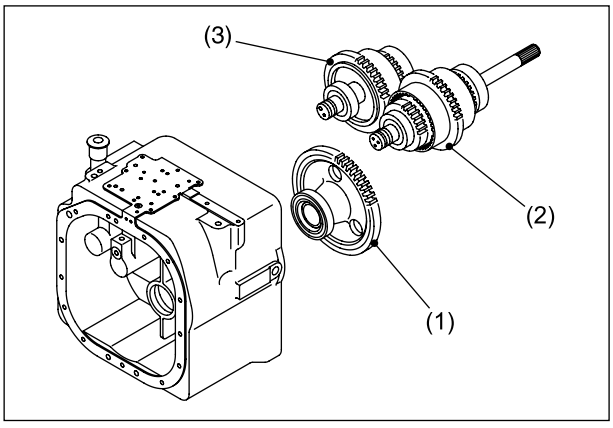


Fig. 3.83

④ With a gasket (1), install the control valve (2) on the transmission case.

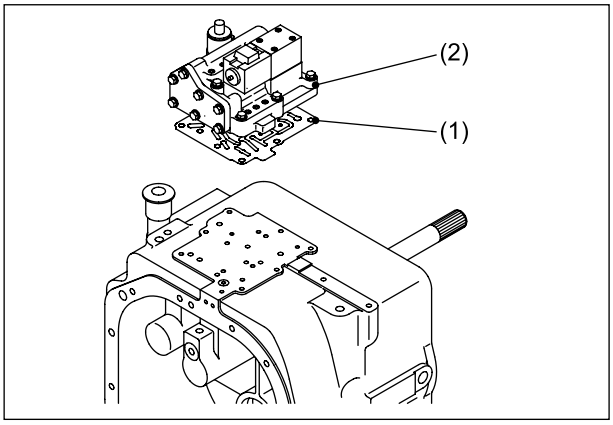


Fig. 3.84

⑤ With a gasket, install the torque converter housing on the transmission case.

Note: Pay attention to the engagement of the gears. There are three types of bolts with different lengths. For their respective locations, see Fig. 3.86.

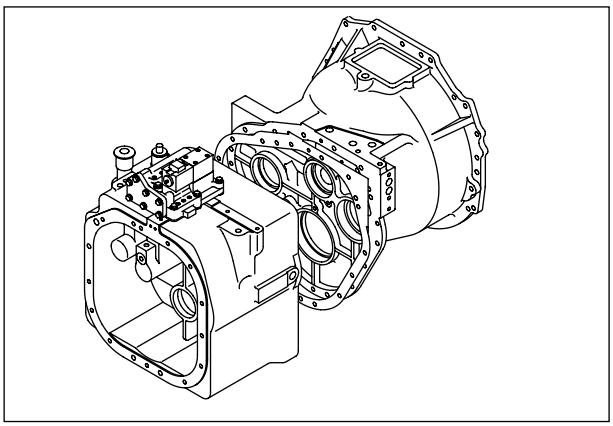
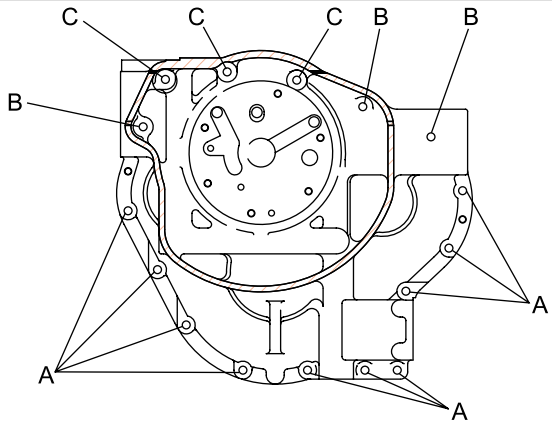


Fig. 3.85



A : 30 mm [1.18 in] long, 10 pcs.
B : 70 mm [2.76 in] long, 3 pcs.
C : 90 mm [3.54 in] long, 3 pcs.

Fig. 3.86

⑥ With a gasket, install the differential on the transmission case. (for 43E-25 only)

Note: For the 44E-25, apply liquid packing (THREEBOND 1216E or equivalent) to the mating surfaces.

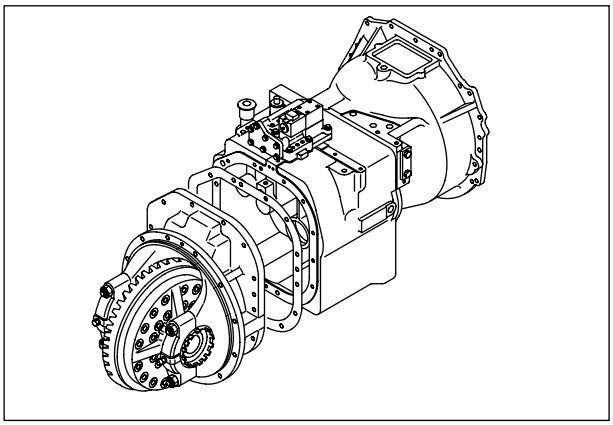


Fig. 3.87

⑦ Install the torque converter on the torque converter housing.

Note: Make sure that the torque converter has a seal ring (1) on its boss.

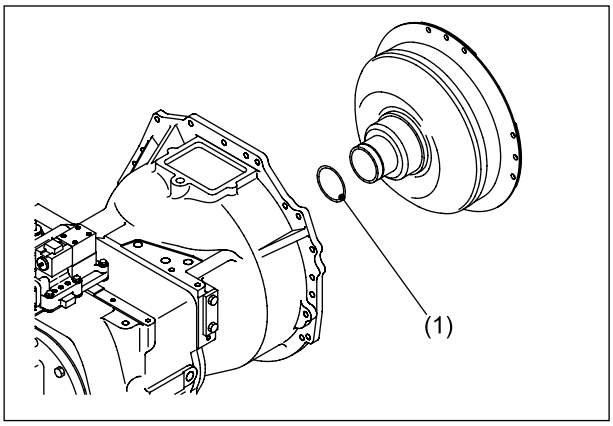


Fig. 3.88

■ DISASSEMBLING CLUTCH PACK

The explanation given below is made using the forward/reverse clutch pack. The explanation about other clutch packs is omitted because they are similar in construction to the forward/reverse clutch pack.

① Remove the three seal rings (1) from the shaft.

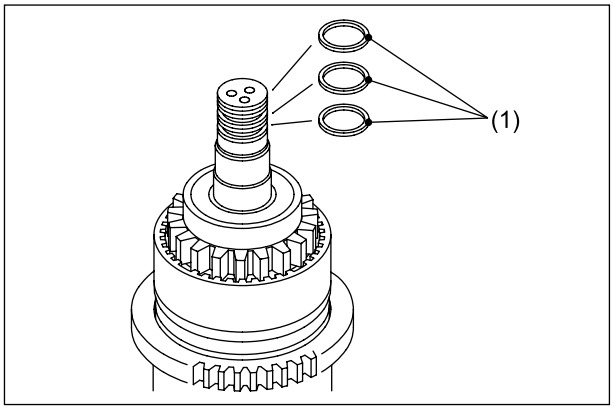


Fig. 3.89

② Using a puller (1), remove the forward gear along with the bearing and thrust washer. Remove the thrust washer from inside.

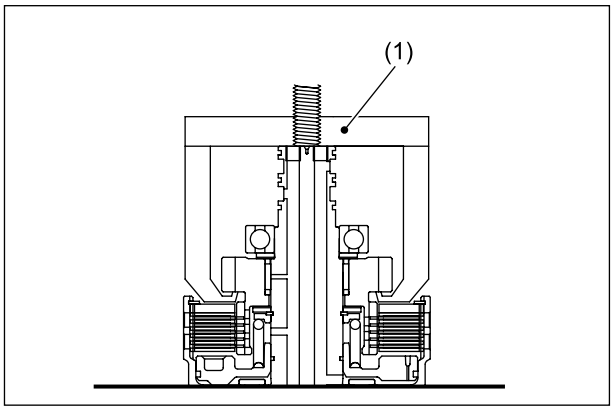


Fig. 3.90

③ Remove the snap ring (1) from the clutch drum.

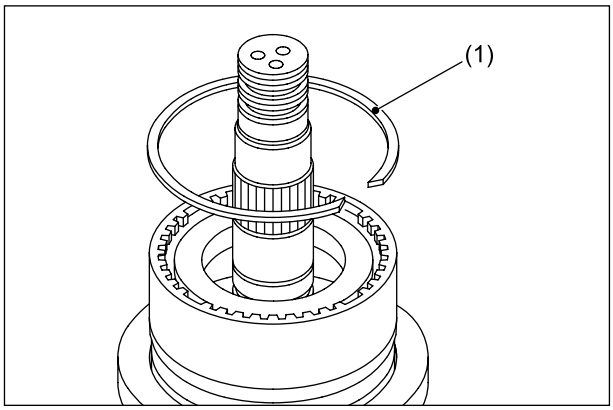


Fig. 3.91

④ Remove the end plate (1).

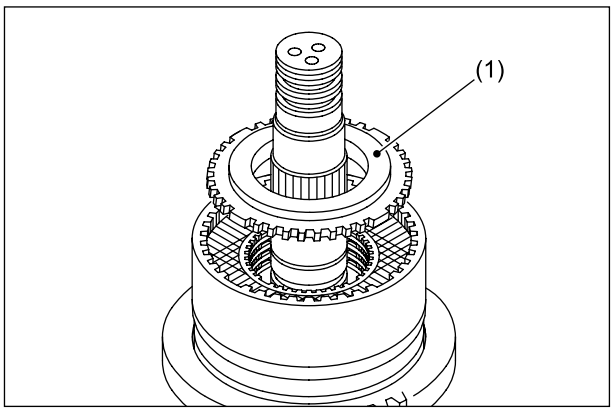


Fig. 3.92

⑤ Remove the clutch discs (friction plates (1) and separator plates (2)).

	Friction plates	Separator plates
Fwd	5	6
Rev	5	6
2nd	5	6

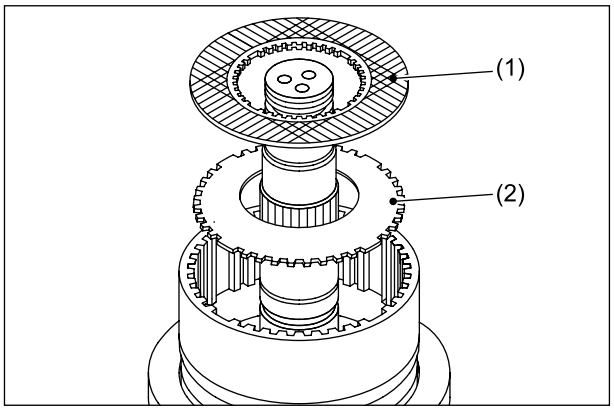


Fig. 3.93

⑥ Using a jig (1), compress the return spring and remove the snap ring from the groove. Release the compression slowly and remove the snap ring (2), retainer (3), and return spring (4).

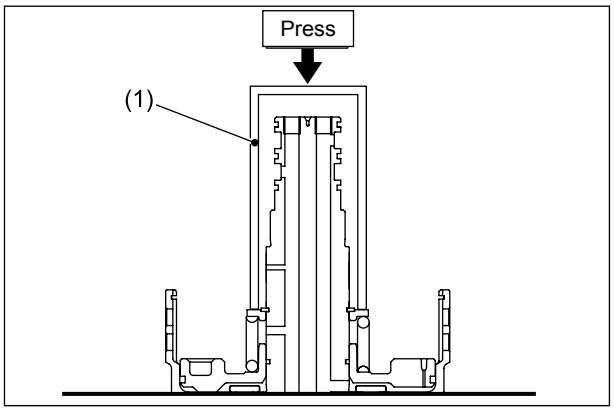


Fig. 3.94

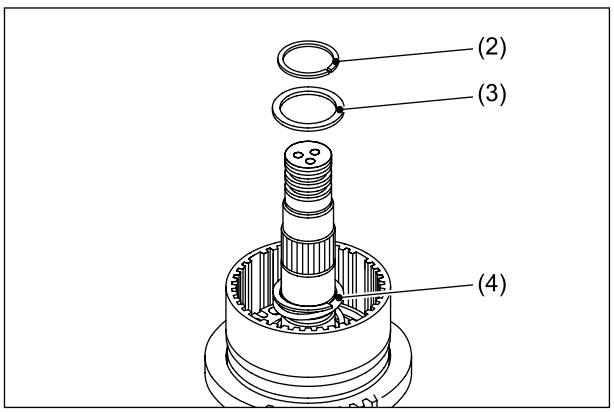


Fig. 3.95

⑦ Remove the piston (1) from the clutch drum.

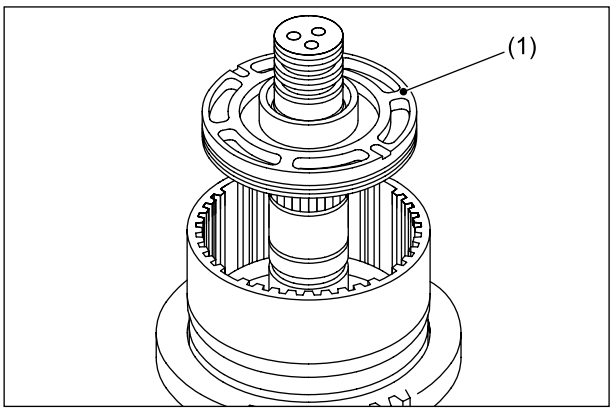


Fig. 3.96

⑧ Remove the seal ring (1) from the piston.

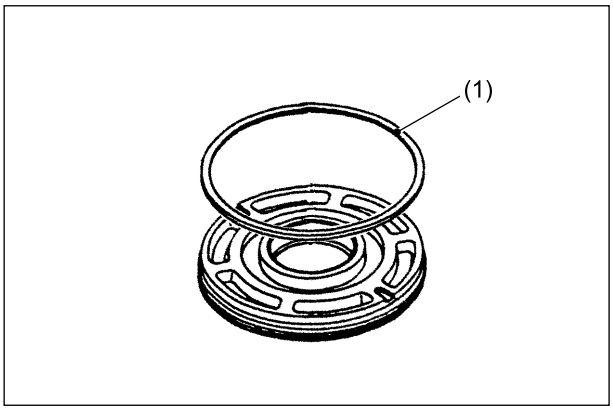


Fig. 3.97

⑨ Remove the seal ring (1) from the shaft.

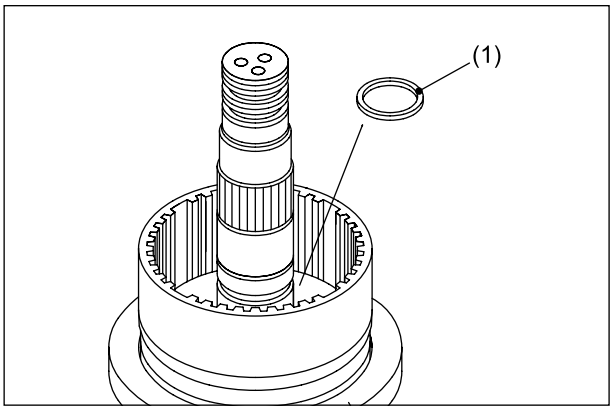


Fig. 3.98

⑩ Follow the same steps for disassembling the reverse clutch pack and the 2nd clutch pack.

■ REASSEMBLING CLUTCH PACK

The explanation given below is made using the forward/reverse clutch pack. The explanation about other clutch packs is omitted because they are similar in construction to the forward/reverse clutch pack.

① Install the seal ring (1) on the outer diameter of the piston.

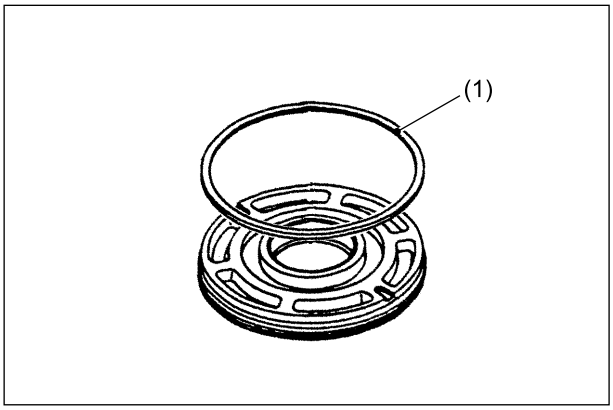


Fig. 3.99

② Install the seal ring (1) on the clutch shaft.

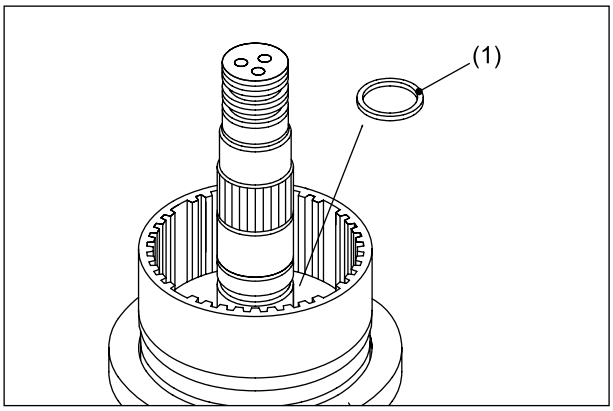


Fig. 3.100

③ Install the piston assembly (1).

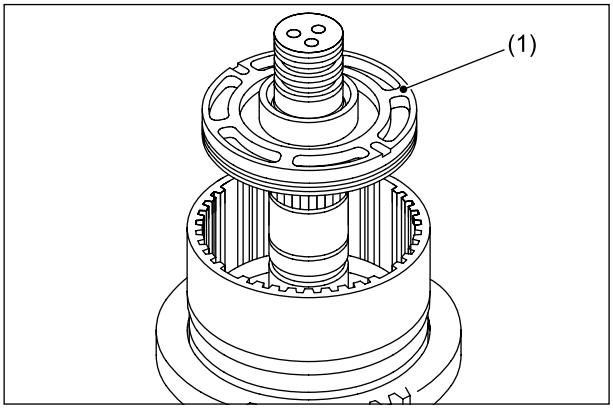


Fig. 3.101

④ Install the return spring (1). Using a jig (4), compress the return spring (1) along with the retainer (2) and snap ring (3) till the snap ring groove and secure it with the snap ring (3). (For the jig (4), see Fig. 3.103.)

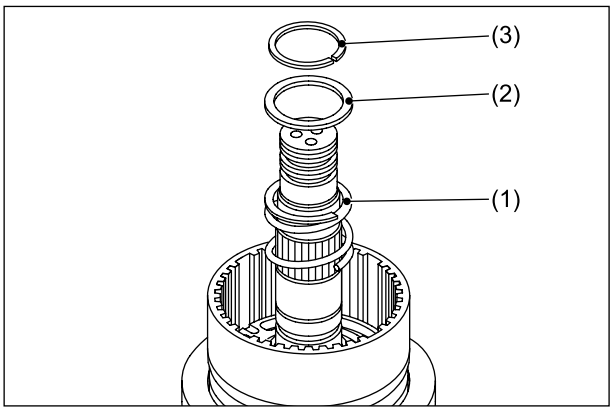


Fig. 3.102

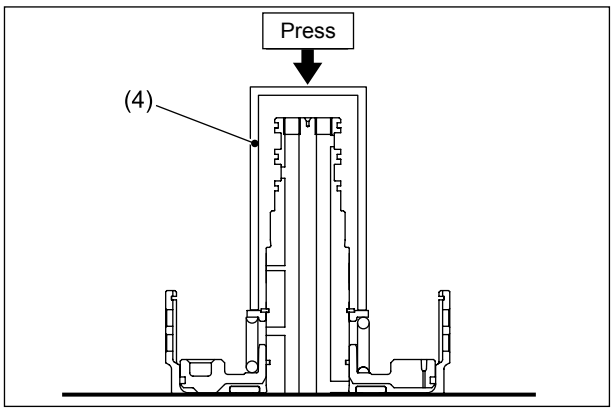


Fig. 3.103

⑤ Install the clutch discs (five separator plates (1) and five friction plates (2)) as follows: Install one separator plate first and then one friction plate. Keep installing pairs of plates in that order, ending with a separator plate.

	Friction plates	Separator plates
Fwd	5	6
Rev	5	6
2nd	5	6

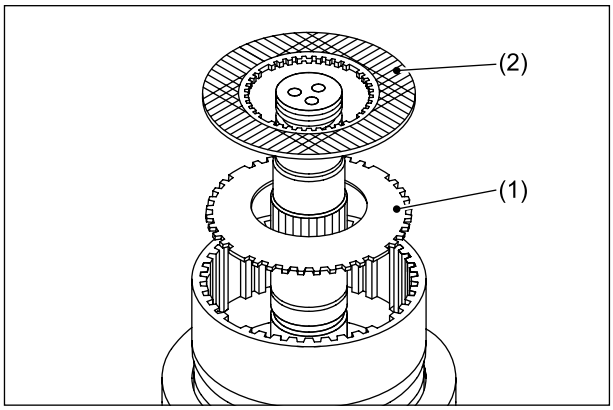


Fig. 3.104

⑥ Install the end plate (1) and secure with the snap ring (2).

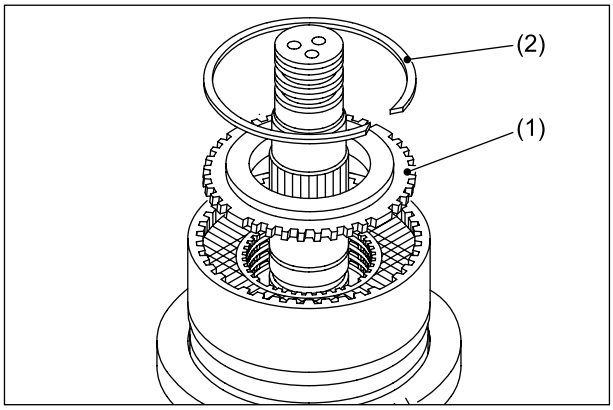


Fig. 3.105

⑦ Install the thrust washer (1), needle bearing (2), and gear (3).

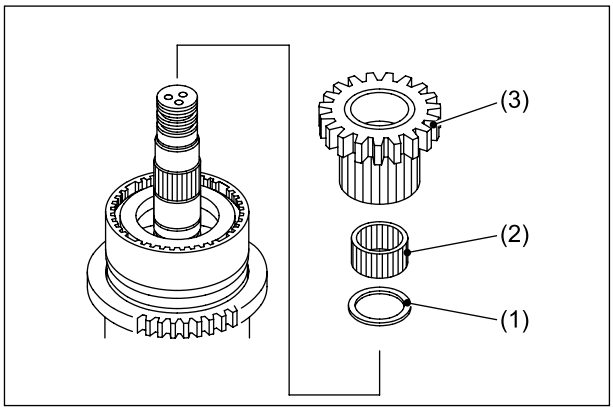


Fig. 3.106

⑧ Install the thrust washer (1) and bearing (2).

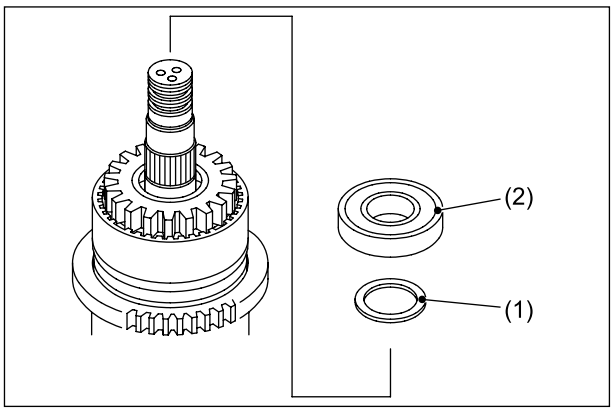


Fig. 3.107

⑨ Install the seal rings (1).

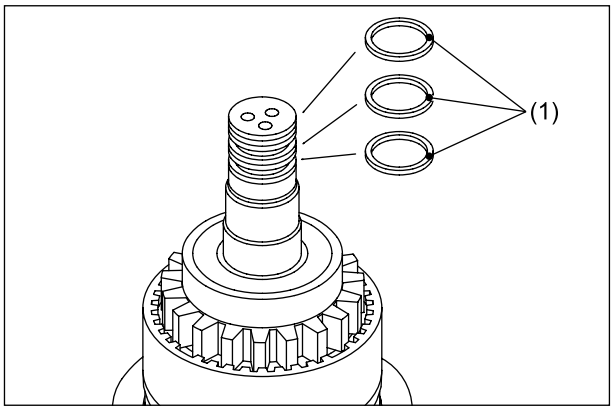


Fig. 3.108

⑩ Follow the same steps for reassembling the reverse clutch pack and 2nd clutch pack.

■ DISASSEMBLING CHARGING PUMP

① Remove the bolts assembling the charging pump.

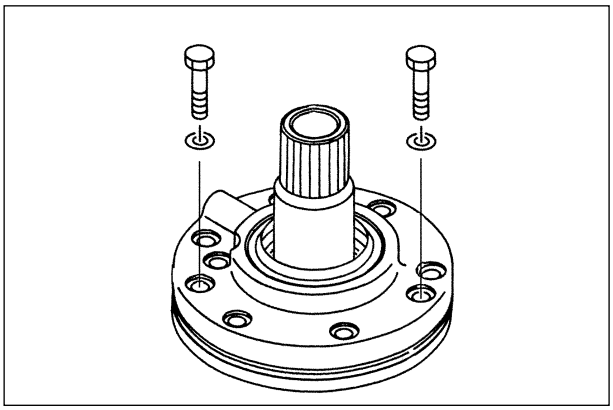


Fig. 3.109

② Separate the case (1) from the stator support (2).

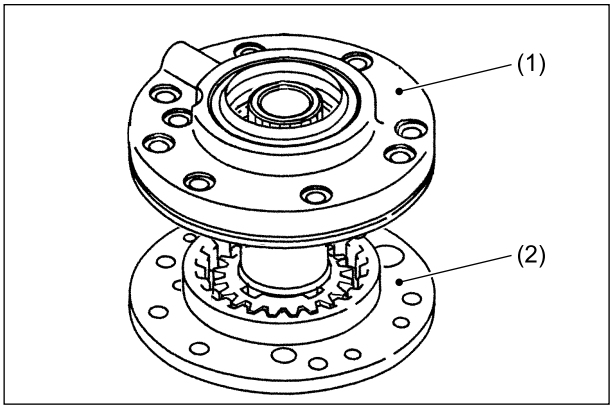


Fig. 3.110

③ Remove the drive gear (1) and driven gear (2) from the case.

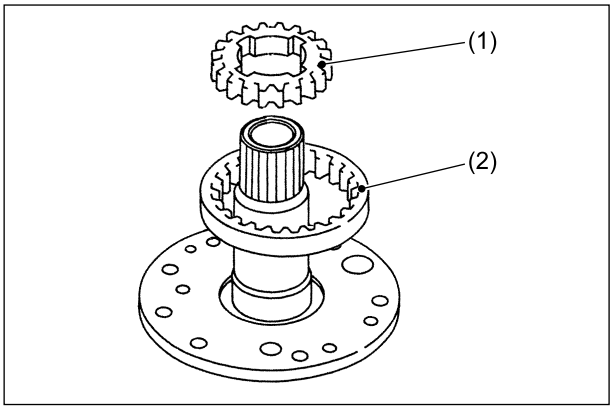


Fig. 3.111

④ Remove the oil seal (1) from the case.

Note: Do not reuse the removed oil seal.

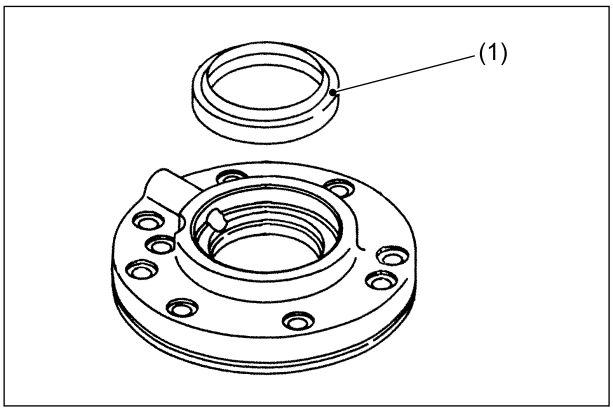


Fig. 3.112

■ REASSEMBLING CHARGING PUMP

① Install the seal ring (1) on the case.

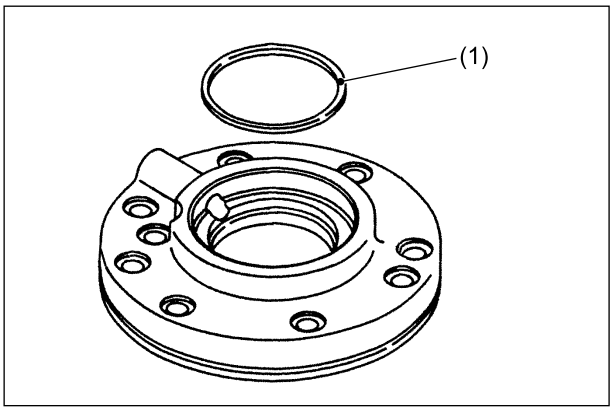


Fig. 3.113

② Install the oil seal (2) on the case (1).

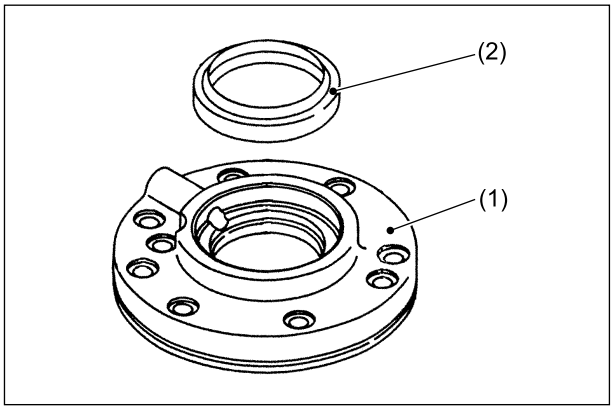


Fig. 3.114

③ Install the drive gear (1) and driven gear (2) on the case.

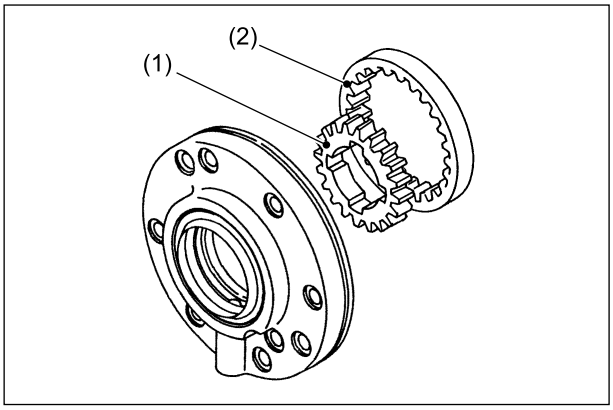


Fig. 3.115

④ Install the stator support (1) on the case.

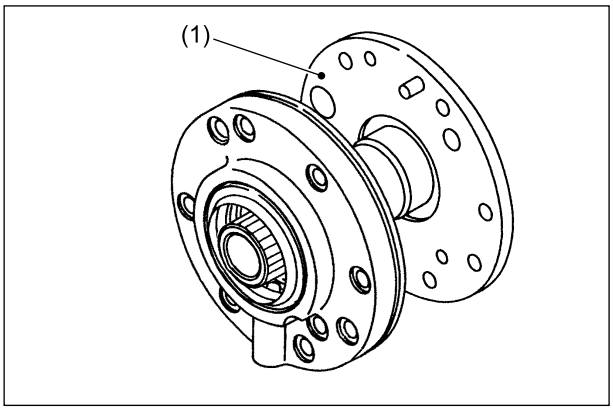


Fig. 3.116

■ DISASSEMBLING CONTROL VALVE

① Remove the forward/reverse solenoid valve (1) and 2nd solenoid valve (2) from the valve body.

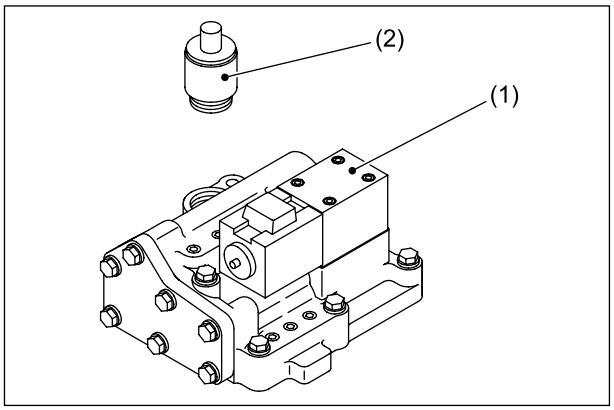


Fig. 3.117

② Remove the front cover (1).

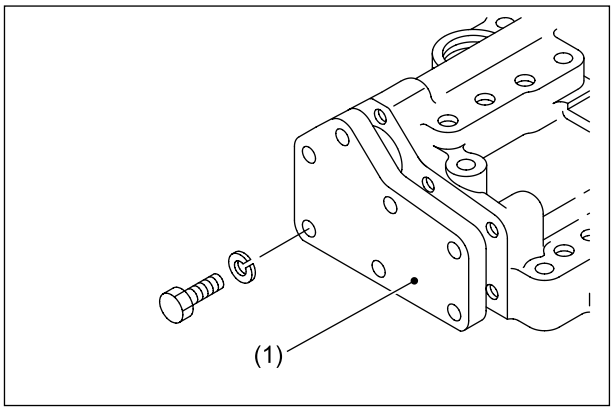


Fig. 3.118

③ Remove the accumulator piston (1), three springs (2) and stopper (3).

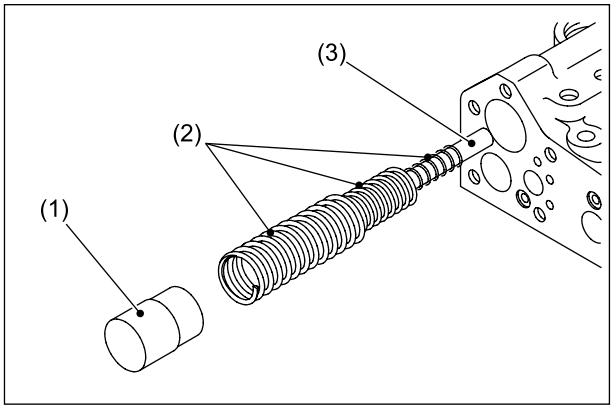


Fig. 3.119

④ Remove the modulator valve (1).

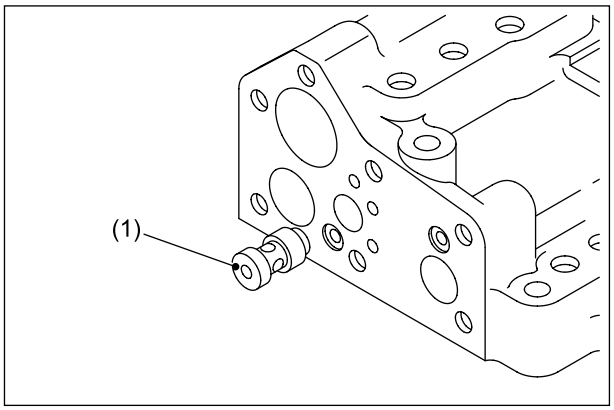


Fig. 3.120

⑤ Remove the inching valve piston (1) and spring (2).

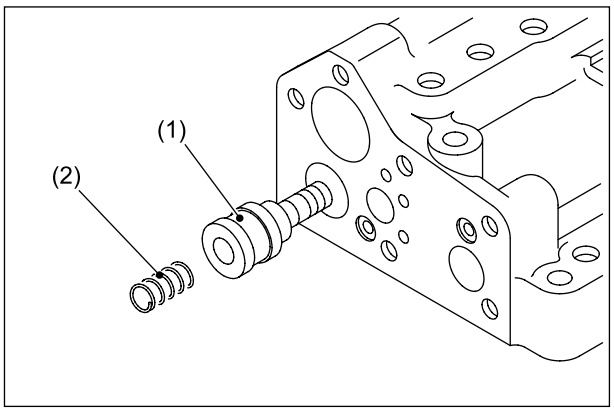


Fig. 3.121

⑥ Remove the inching spool (1) along with the spring (2).

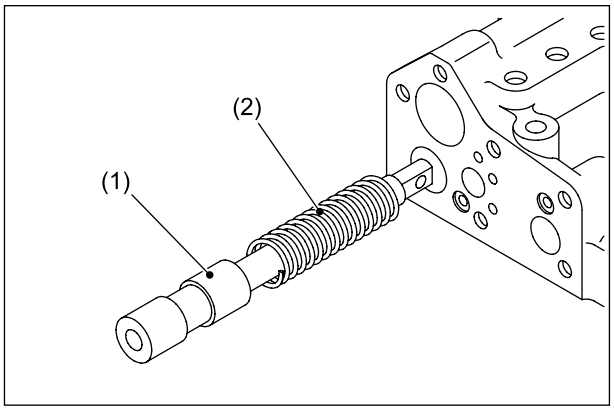


Fig. 3.122

⑦ Remove the speed range selector spool (2nd) (1) and spring (2) from the valve body.

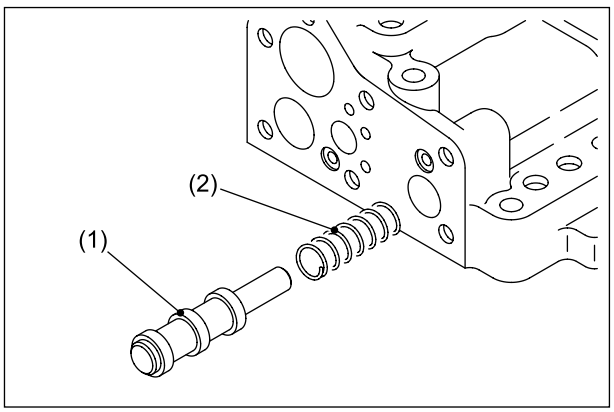


Fig. 3.123

■ REASSEMBLING CONTROL VALVE

① Install the selector spool (1) and the spring (2) in the valve body.

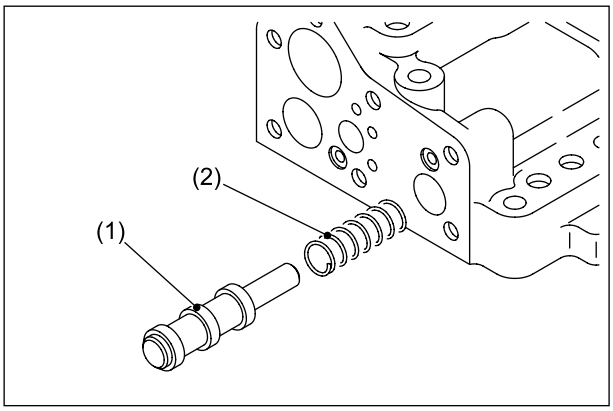


Fig. 3.124

② Install the accumulator springs (outer (1), middle (2), inner (3)) in that order, and then install the pin (4) and piston (5).

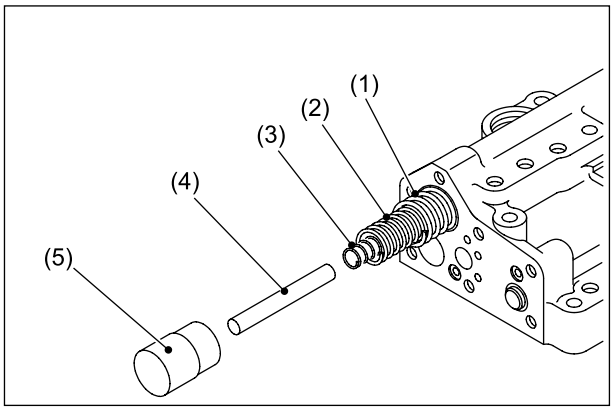


Fig. 3.125

③ Install the modulation piston (1) into the valve body.

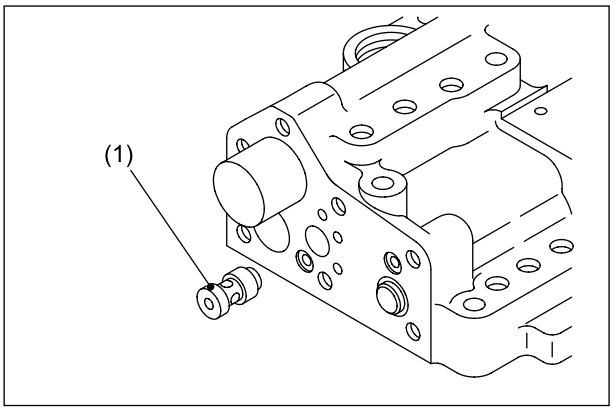


Fig. 3.126

④ Install the inching spool (1) and spring (2) into the valve body.

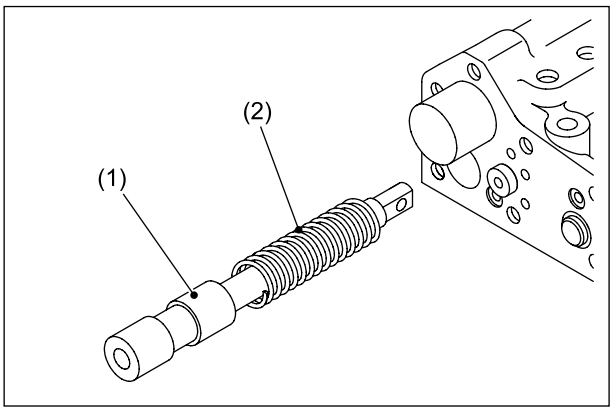


Fig. 3.127

⑤ Install the piston (1) and spring (2) to the back of the inching spool.

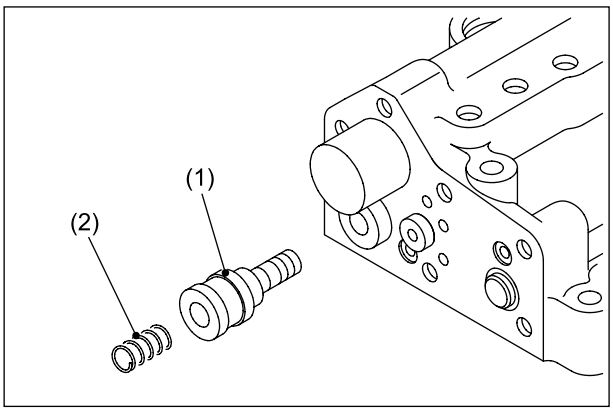


Fig. 3.128

⑥ Install the front cover (2) with a gasket (1) into the valve body.

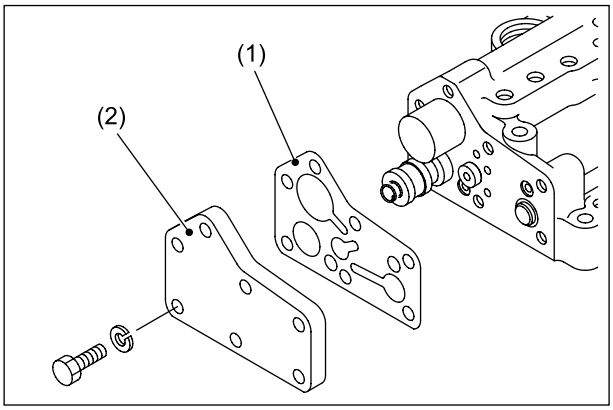


Fig. 3.129

⑦ Install the directional solenoid valve (1) onto the valve body.

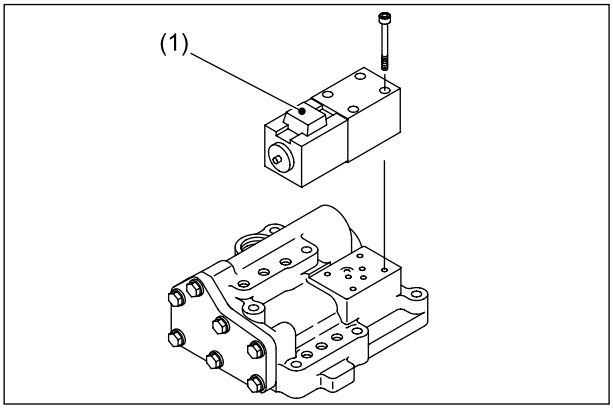


Fig. 3.130

⑧ Install the speed range solenoid valve (1) onto the valve body.

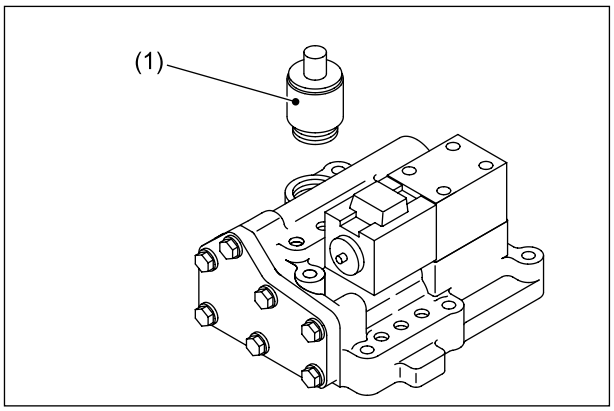


Fig. 3.131

■ DISASSEMBLING DIFFERENTIAL

① Remove the bearing cap stopper (1).

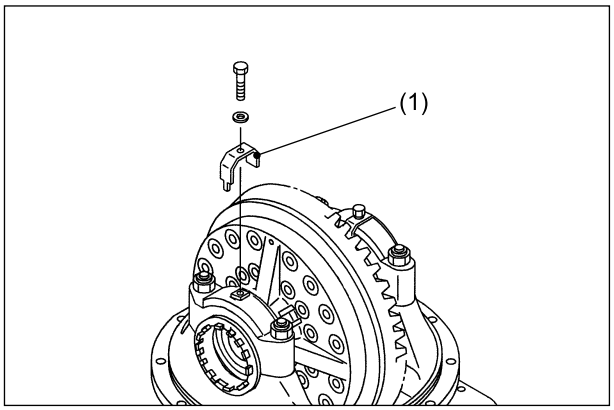


Fig. 3.132

② Remove the split pin (1) and nuts (2) and remove the bearing cap (3).

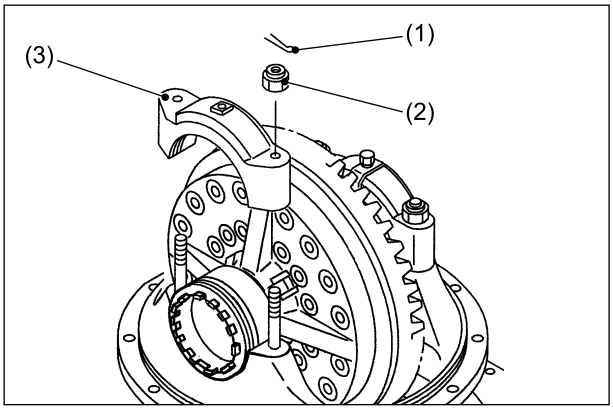


Fig. 3.133

③ Remove the cross case assembly.

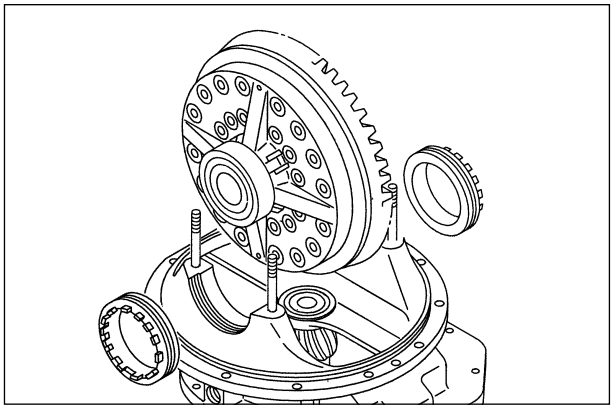


Fig. 3.134

④ Remove the drive pinion assembly (1).

Note: Record the type and number of shims.

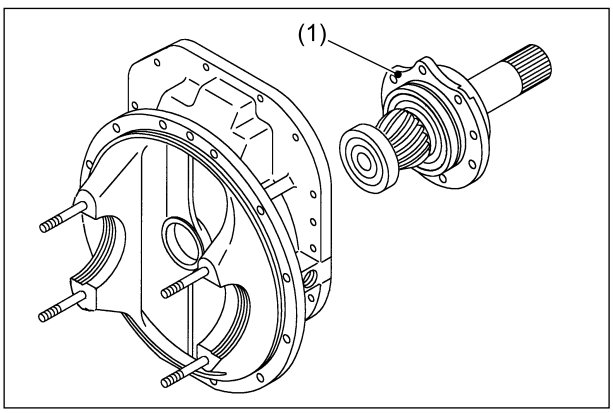


Fig. 3.135

⑤ Disassembling cross case

1) Remove the ring gear (1) from the cross case assembly.

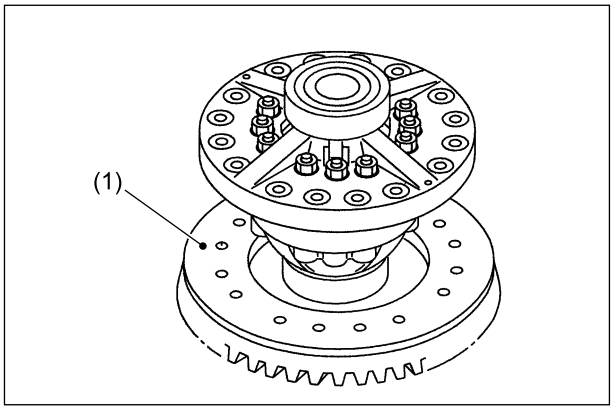


Fig. 3.136

2) Put the cross case upright with the flange half upward and remove the assembling bolts and nuts.

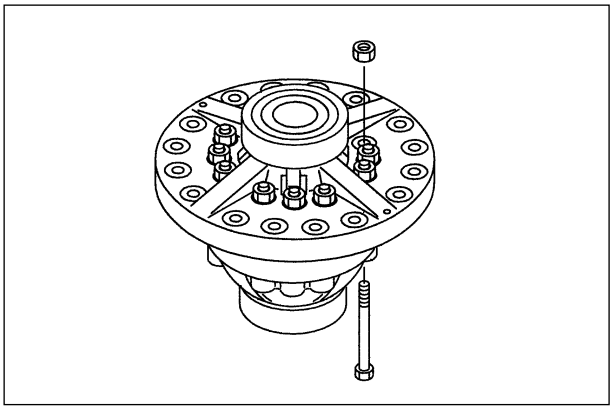


Fig. 3.137

3) Separate the cross case into the flange half and the plain half. Remove the side gears (1) and pinion gears (2).

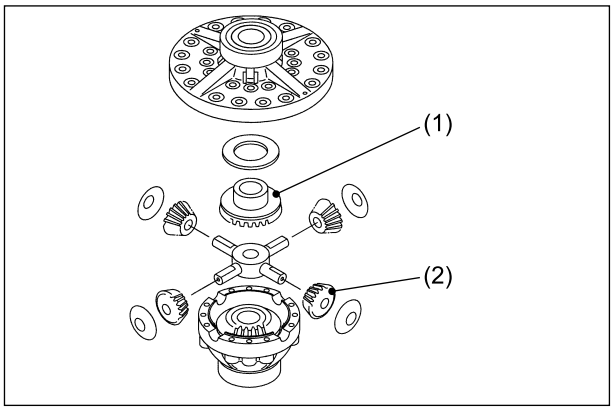


Fig. 3.138

⑥ Disassembling drive pinion assembly

1) Extend the caulked part (1) of the lock nut outward.

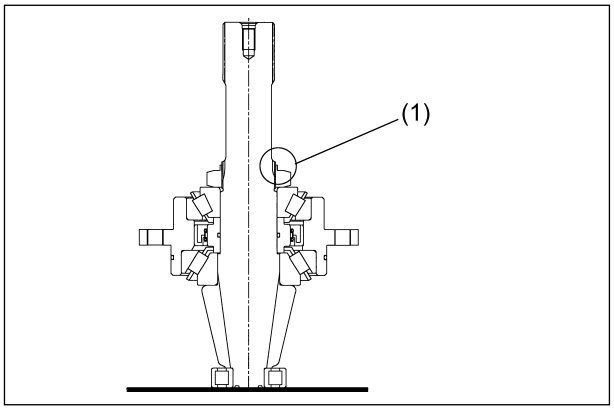


Fig. 3.139

2) Remove the lock nut.

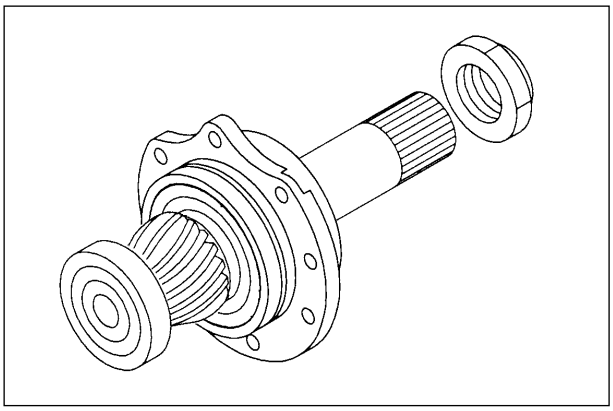


Fig. 3.140

3) Remove the drive pinion from the bearing cage.

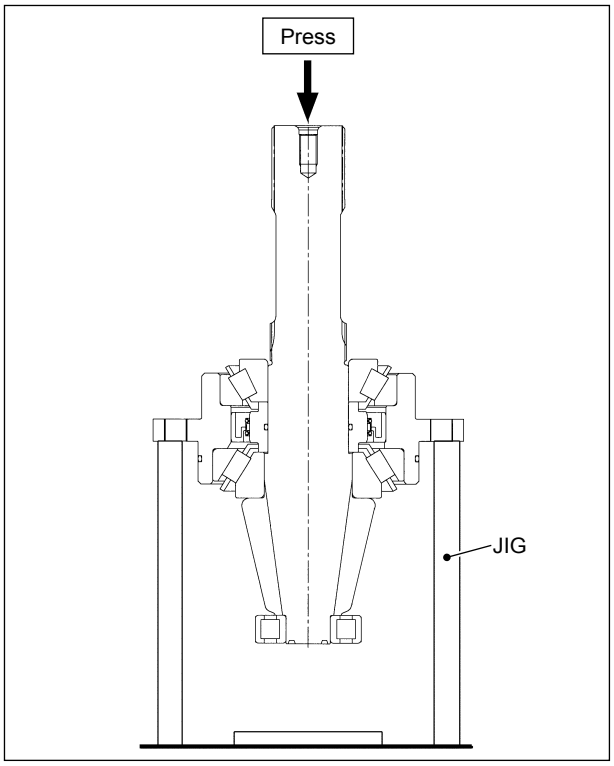


Fig. 3.141

4) Remove the shims (1) and spacer (2) from the drive pinion.

Note: Record the type and number of shims.

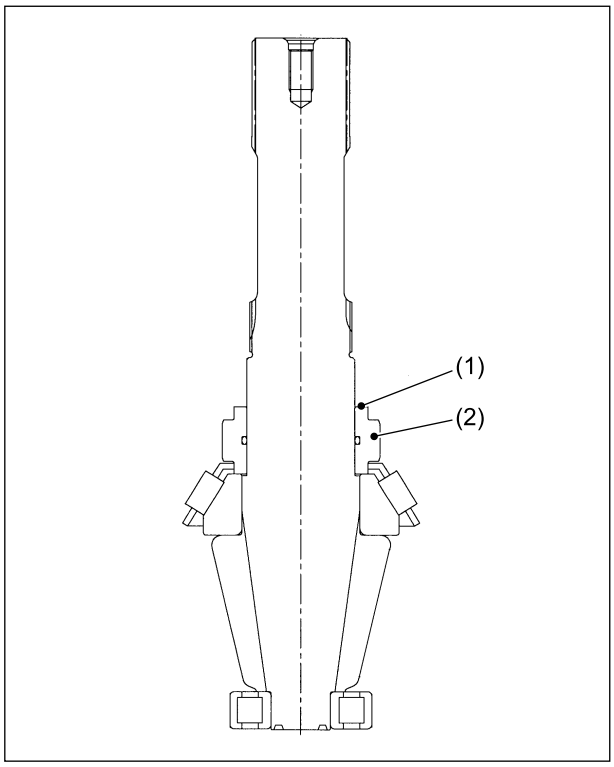


Fig. 3.142

5) Remove the outside bearing cup (1) and oil seal (2) from the bearing cage.

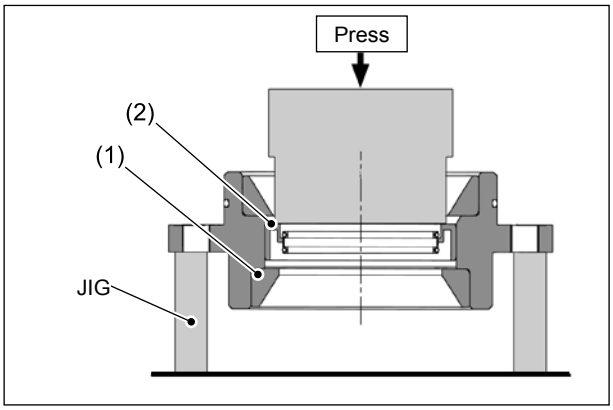


Fig. 3.143

6) Remove the bearing cup (1) from inside the bearing cage.

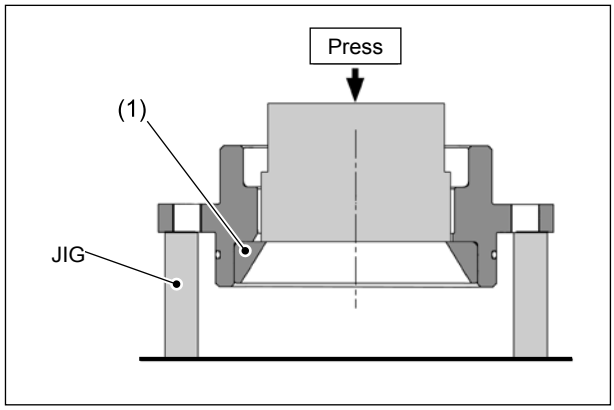


Fig. 3.144

■ REASSEMBLING DIFFERENTIAL

① Reassembling drive pinion

1) Install the oil seal (2) on the bearing cage (1).

Note: Pay attention to the direction of the oil seal when installing it.

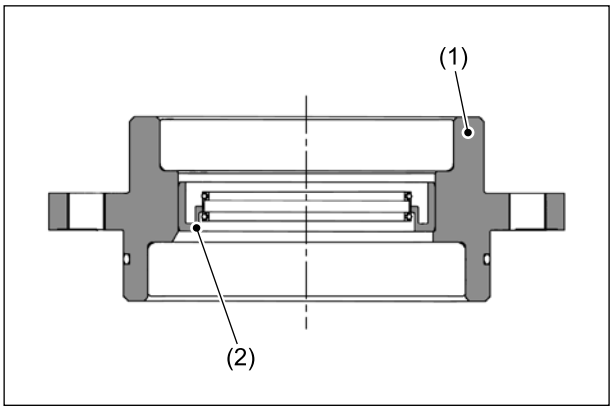


Fig. 3.145

2) Install the inside and outside bearing cups (1) on the bearing cage.

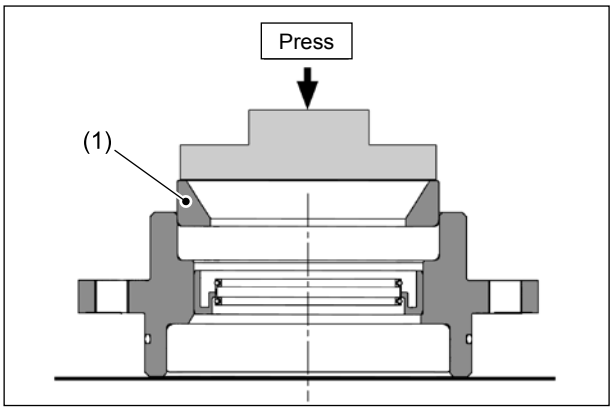


Fig. 3.146

3) Install the inside bearing cone (1) on the drive pinion.

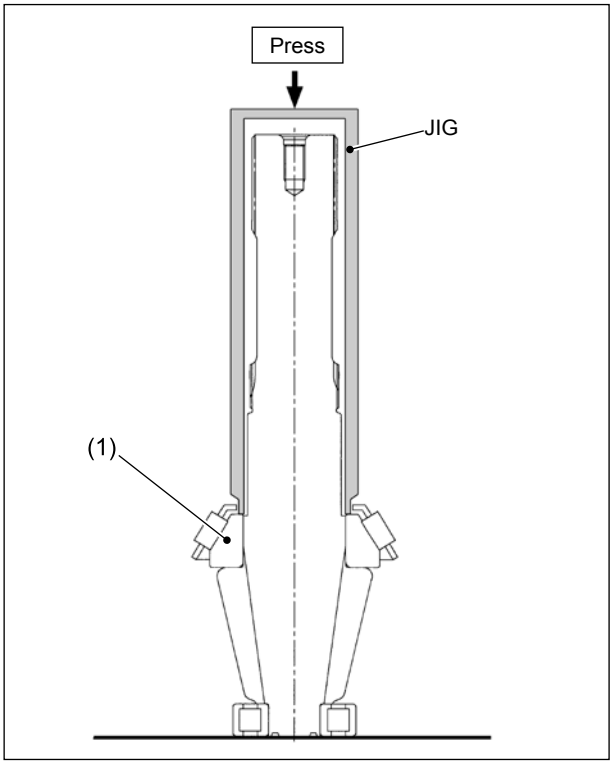


Fig. 3.147

4) Install the “O”-ring (2) on the inner diameter of the spacer (1).

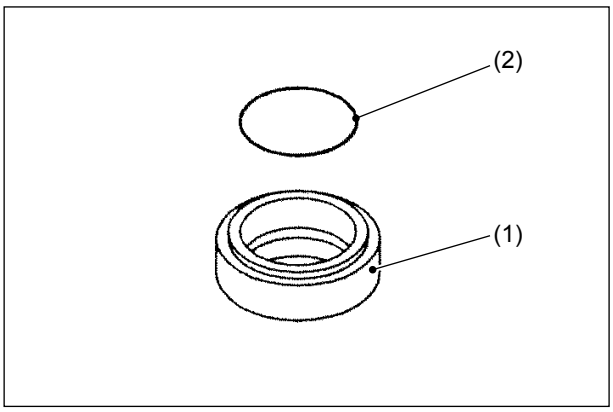


Fig. 3.148

5) Install the spacer (1) and shims (2) on the drive pinion.

Note: Install the same number and type of shims as removed.

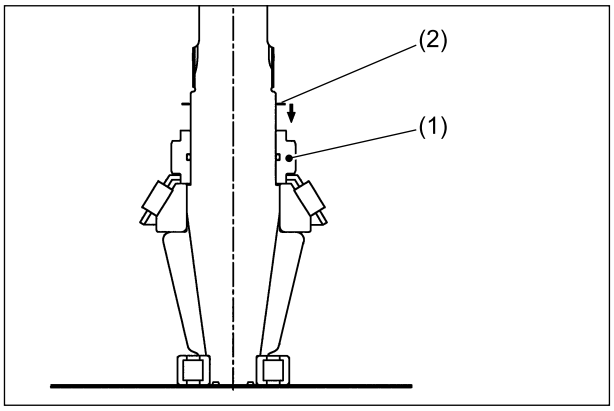


Fig. 3.149

6) Install the bearing cage on the drive pinion and install the outside bearing cone (1).

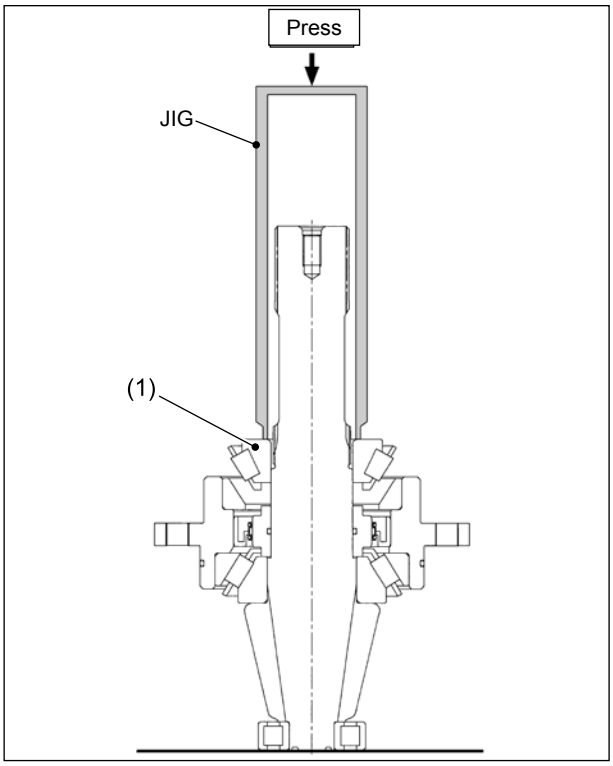


Fig. 3.150

7) Install the lock nut on the drive pinion and tighten to 392.3 to 441.3 N-m {40 to 45 kgf-m} [289 to 326 ft-lbs]. Measure the starting torque of the drive pinion. If the measurement is out of the standard value, adjust it by increasing or reducing the number of shims described in step 5).

Starting torque: 2.9 to 3.9 N-m {30 to 40 kgf-cm} [0.22 to 0.29 ft-lbs]

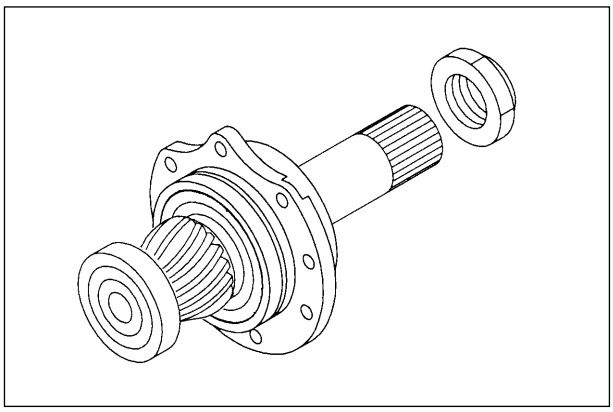


Fig. 3.151

② Reassembling cross case

1) Install the side gear (2) on the plain half with 2-mm thrust washer (1).

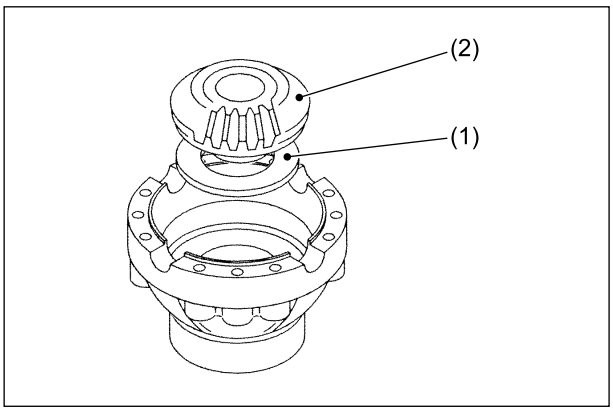


Fig. 3.152

2) Install the pinion gears and thrust washers on the spider.

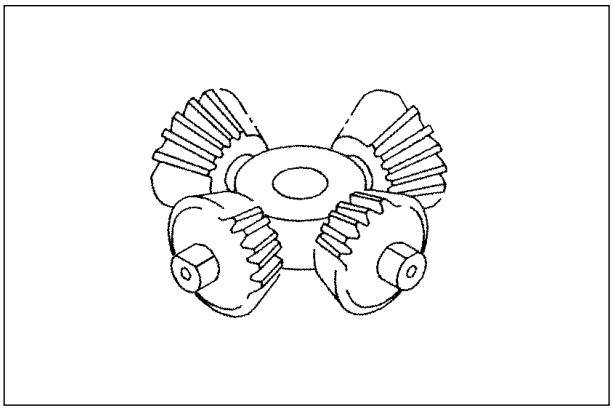


Fig. 3.153

3) Install the pinion gear assembly on the plain half.

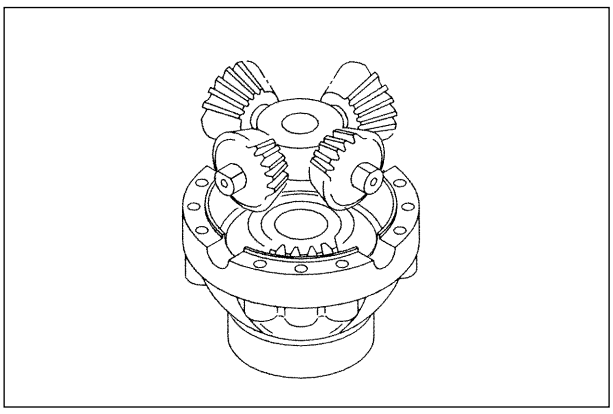


Fig. 3.154

4) Measure the backlash between each of the side gears and each of the pinion gears. If the measurement is out of the standard value, adjust it by increasing or reducing the thickness of washer for the side gear.

Backlash: 0.23 to 0.33 mm
[0.009 to 0.013 in.]
Washer thickness: 1.8, 1.9, 2.0, 2.2, 2.3, 2.6 mm
[0.07, 0.075, 0.078, 0.087, 0.091, 0.102 in.]

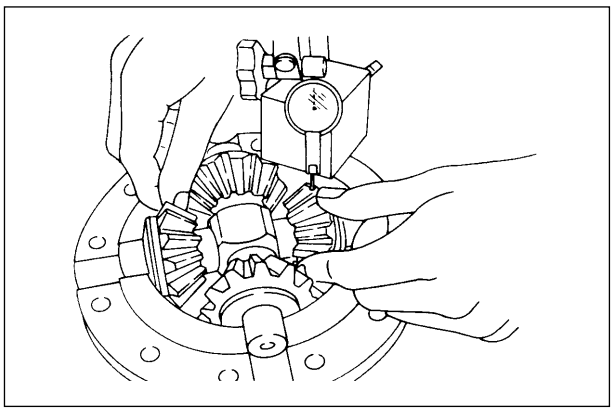


Fig. 3.155

5) Install the same types of thrust washers and side gear as for the plain half, on the flange half.

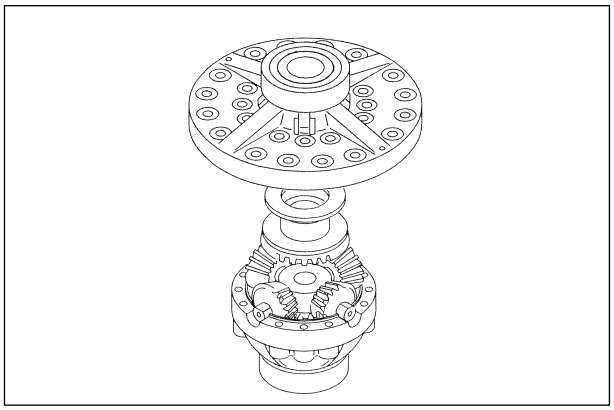


Fig. 3.156

6) Holding the side gear of the flange half case by your hand, install the flange half on the plain half and then tighten the assembling bolts and nuts.

127.5 to 190.3 N-m
{1300 to 1940 kgf-cm}
[94 to 140 ft-lbs]

Note: Apply LOCTITE #270 on the threaded part.

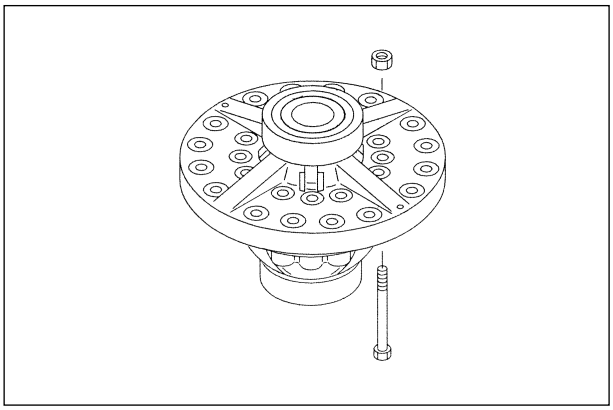


Fig. 3.157

7) Install the ring gear on the flange half.

127.5 to 190.3 N-m
{1300 to 1940 kgf-cm}
[94 to 140 ft-lbs]

Note: Apply LOCTITE #270 on the threaded part.

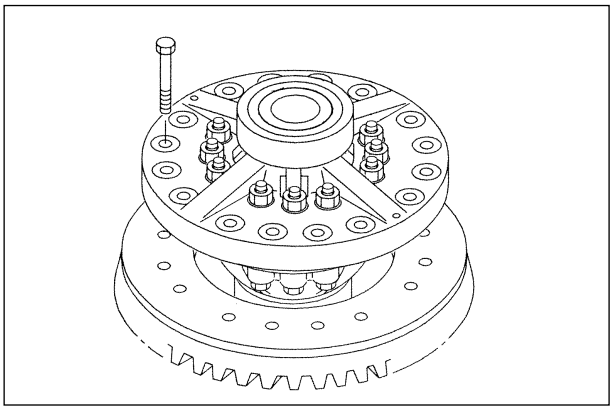


Fig. 3.158

③ Install the drive pinion assembly (1) on the housing along with two 0.5-mm [0.02 in.] shims (2). Tighten only two bolts which are located diagonally.

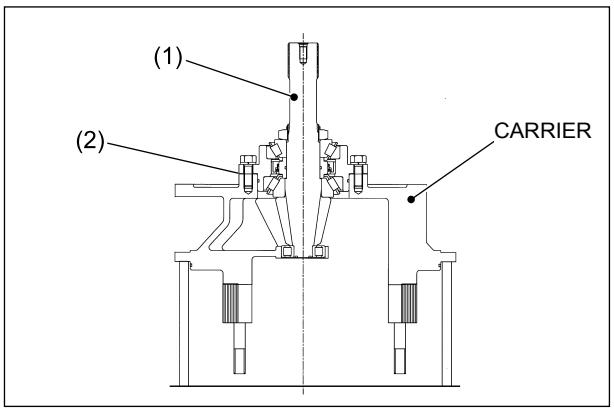


Fig. 3.159

④ Install the cross case assembly on the housing and lightly tighten the cap fitting nuts. Install the two adjustment nuts.

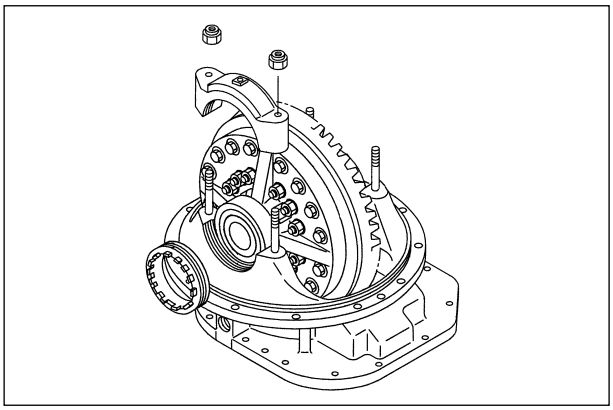


Fig. 3.160

⑤ Adjusting backlash and engagement
When the ring gear requires moving, loosen the adjustment nuts (1) and move the ring gear. For the drive pinion, increase or reduce the number of bearing cage shims (2).
For the adjustment procedure, see Table 3.1.

Backlash: 0.23 to 0.33 mm [0.009 to 0.013 in.]

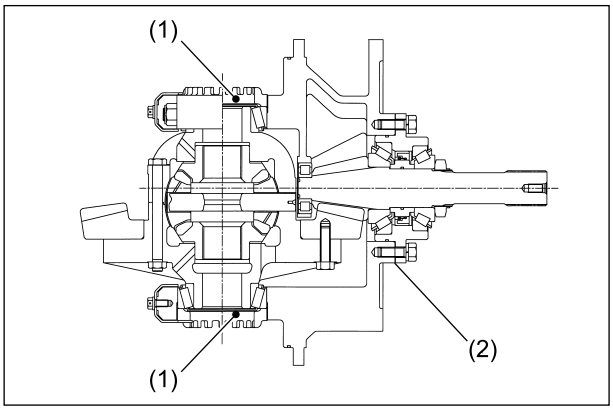
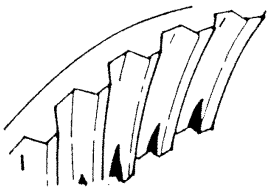
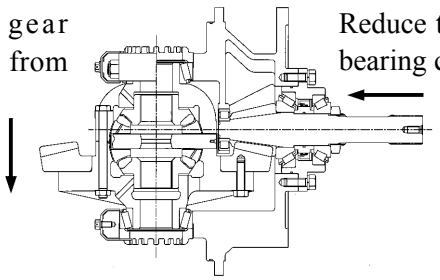
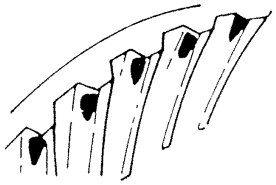
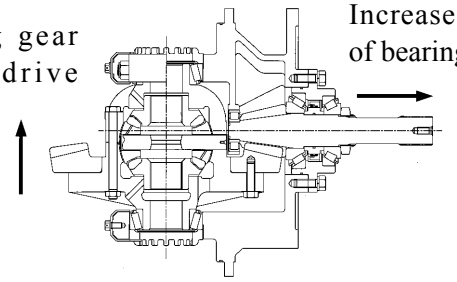
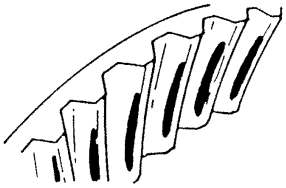
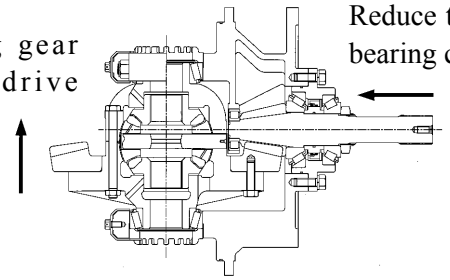
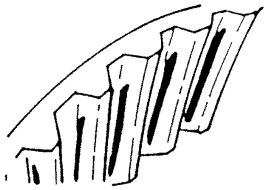
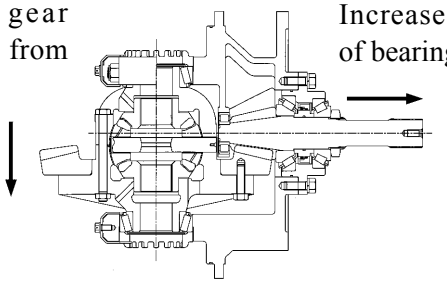


Fig. 3.161

Table 3.1

Contact	Adjustment
 Drive pinion far away from the rotational center of ring gear	Move ring gear further away from drive pinion  Reduce the number of bearing cage shims
 Drive pinion too close to the rotational center of ring gear	Move ring gear closer to drive pinion  Increase the number of bearing cage shims
 Ring gear far away from drive pinion	Move ring gear closer to drive pinion  Reduce the number of bearing cage shims
 Ring gear too close to drive pinion	Move ring gear further away from drive pinion  Increase the number of bearing cage shims

⑥ After adjusting the engagement of the gears, tighten the bolts securing the cap nut and bearing cage.

Cap nut tightening torque:
217.7 to 325.6 N-m
{2220 to 3320 kgf-cm}
[161 to 240 ft-lbs]

Note: Apply LOCTITE #270 on the threaded part.

Install the adjustment nut stopper and split pin and then pass the wire.

Note: Apply LOCTITE #270 on the threaded part.

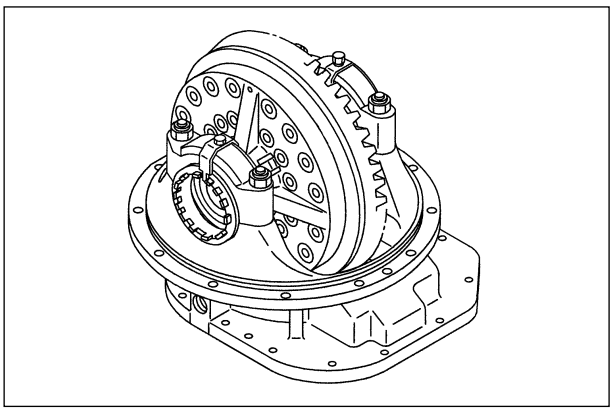


Fig. 3.162

3.2.2 SYNCHROMESH TYPE TRANSMISSION

■ DISASSEMBLING CLUTCH HOUSING

① Remove the differential from the transmission.

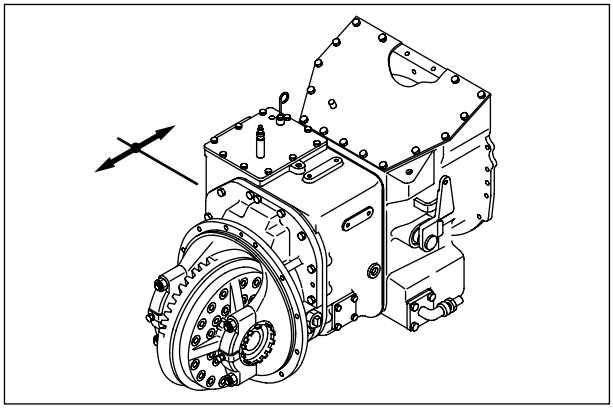


Fig. 3.163

② Remove the snap ring (1) from the shaft of the clutch release arm.

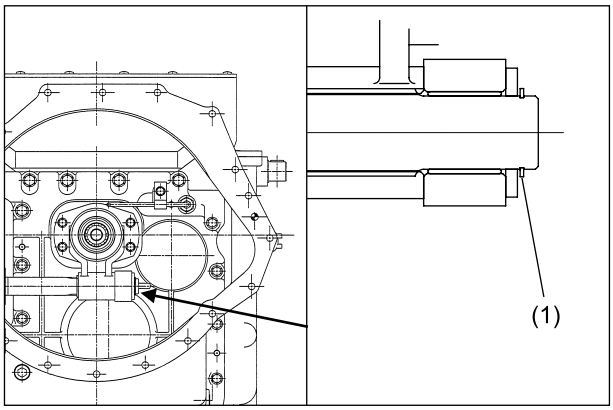


Fig. 3.164

③ Holding the yoke by hand, pull out the clutch release arm (1) from the yoke, and then remove the yoke (2) and retainer (3).
Remove the snap ring (4) from the shaft and then remove the clutch release arm from the clutch housing.

Note: You can remove the retainer at the first stage of disassembly because it is not secured to anywhere.

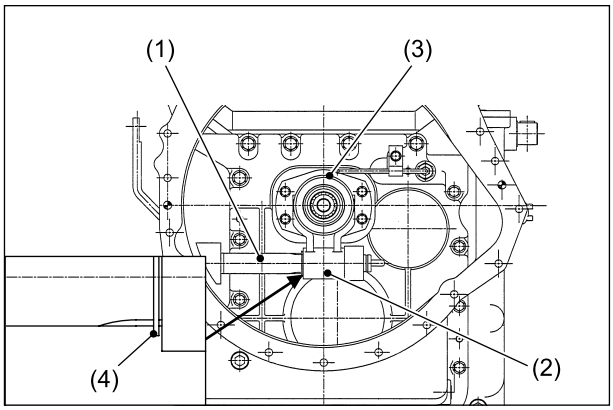


Fig. 3.165

④ Remove the nozzle (1) and support (2).

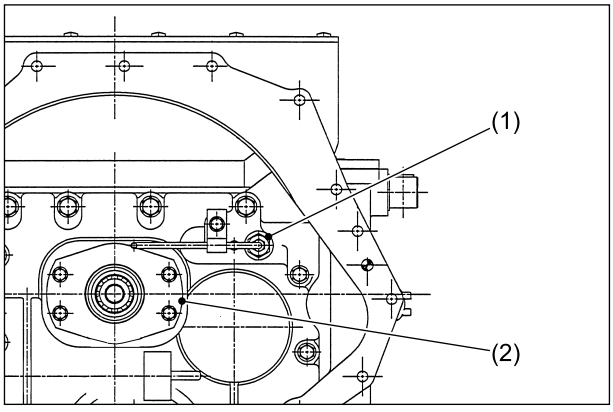


Fig. 3.166

⑤ Make sure the drive unit is placed on the workbench with the differential pointed upward, and then remove the clutch housing.

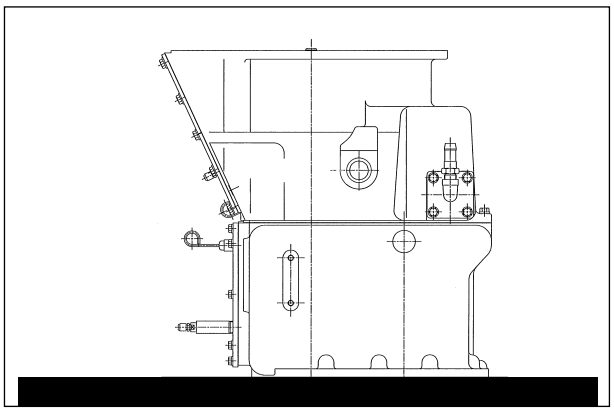


Fig. 3.167

⑥ Remove the cover (1) and remove the strainer.

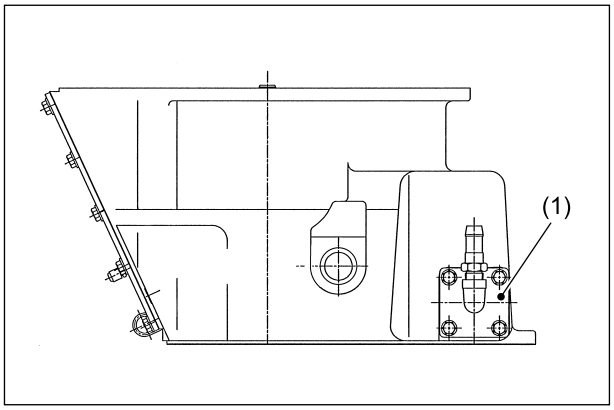


Fig. 3.168

■ REASSEMBLING CLUTCH HOUSING

① Insert the arm assembly through the hole in the clutch housing and then install the snap ring (1) on the arm assembly.

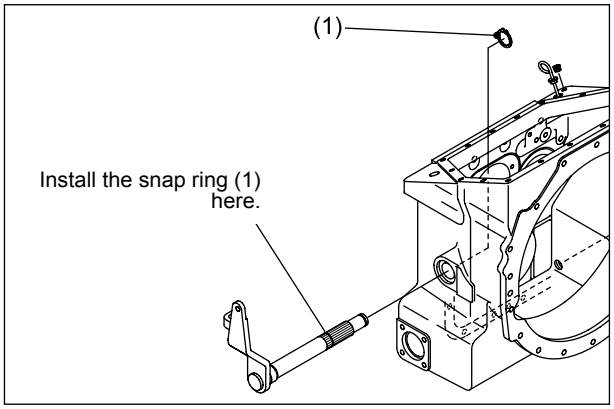


Fig. 3.169

② Install the arm assembly on the boss of the clutch housing, aligning the splines of the arm assembly with the splines of the shift arm.

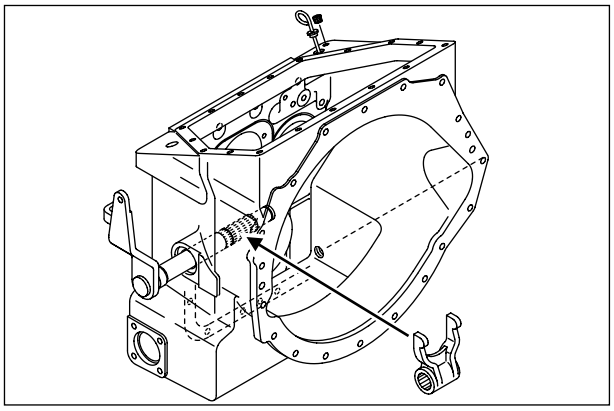


Fig. 3.170

③ Install the snap ring (1) using the spacer.

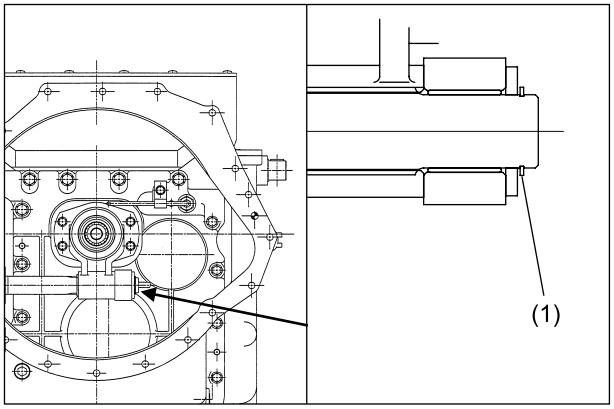


Fig. 3.171

④ Install the thrust bearing (2) on the retainer (1), and then install the support.

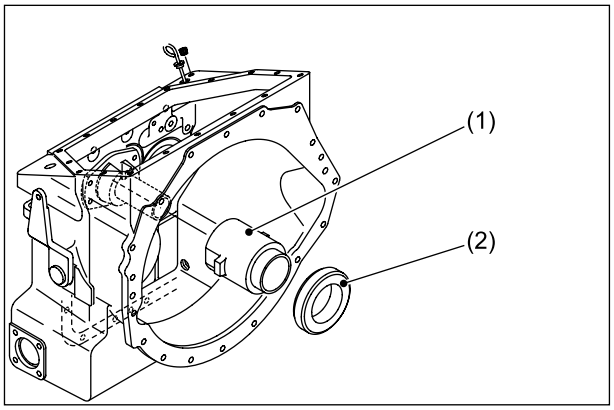


Fig. 3.172

⑤ Install the nozzle (1).

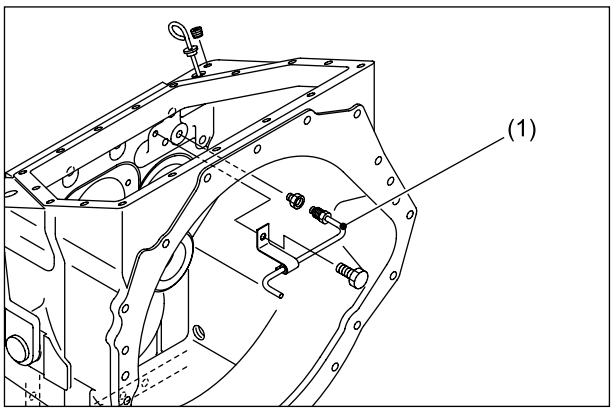


Fig. 3.173

⑥ Install the strainer assembly (3) using the "O"-ring (1) and gasket (2).

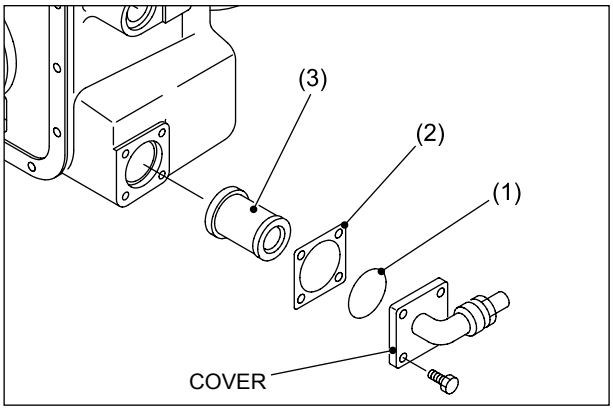


Fig. 3.174

⑦ Install the differential assembly on the transmission using a new gasket.

Note: Always install the differential assembly parallel to the transmission, aligning the splines of the output gear with the splines of the output shaft.

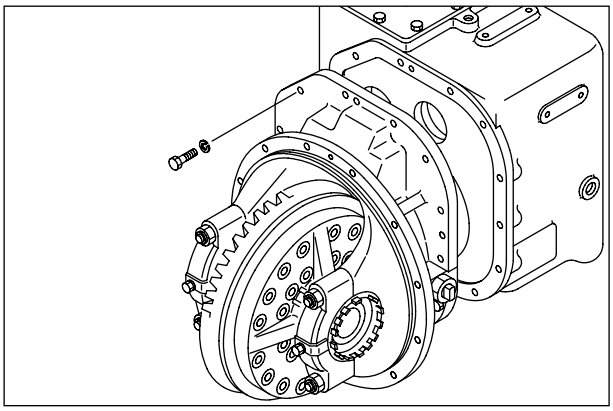


Fig. 3.175

■ DISASSEMBLING TRANSMISSION

① Remove the transmission case cover (1).

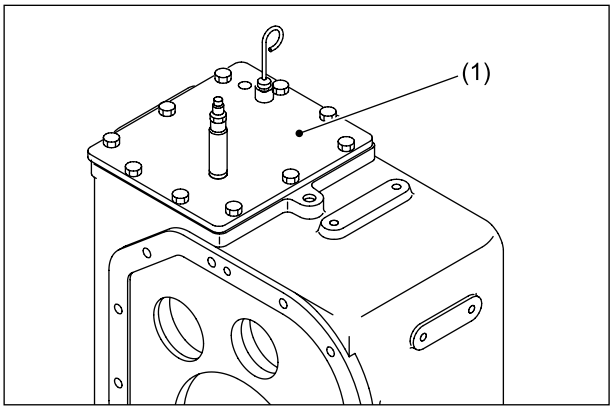


Fig. 3.176

② Remove the fwd/rev shift lever and 1st/2nd speed shift lever.

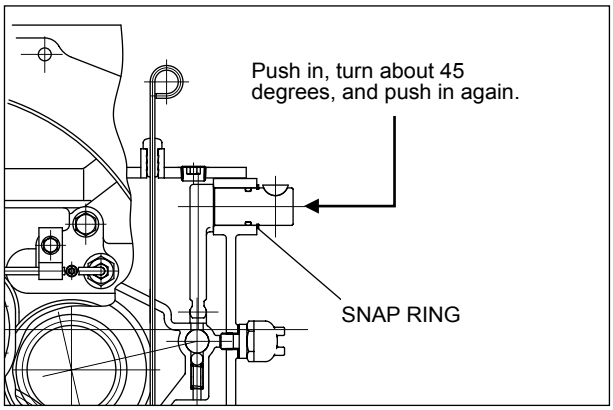


Fig. 3.177

③ Remove the neutral switch (1) and reverse switch (2).

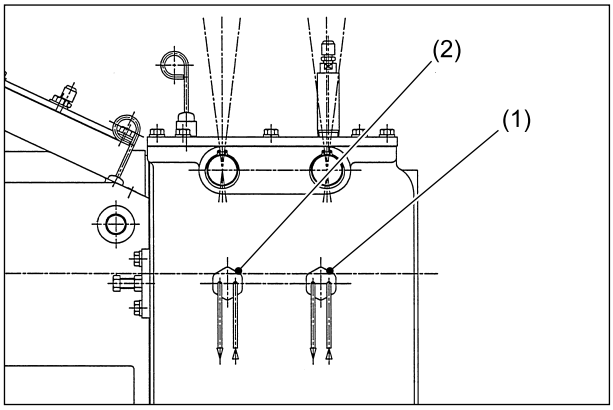


Fig. 3.178

④ Remove the shift rod support (1) and remove the shift fork assembly (2).

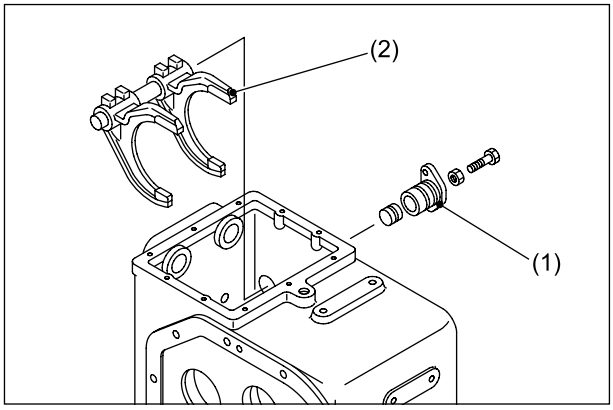


Fig. 3.179

⑤ Remove the input shaft assembly (1).

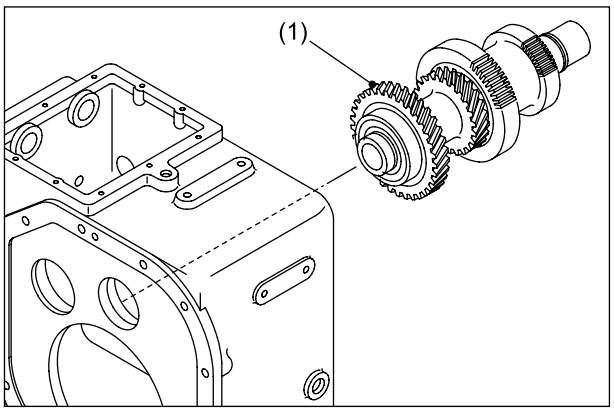


Fig. 3.180

⑥ Remove the main shaft assembly (1).

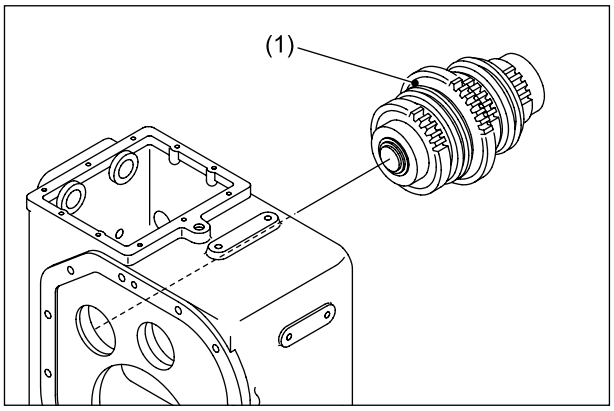


Fig. 3.181

⑦ Remove the main shaft cover (1) and snap ring (2) from the clutch housing.

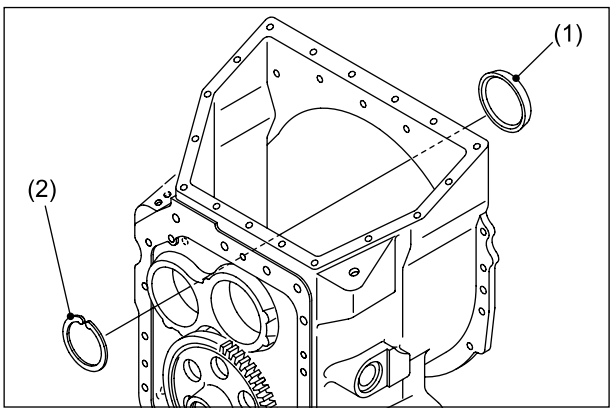


Fig. 3.182

⑧ Remove the output gear (1) from the clutch housing.

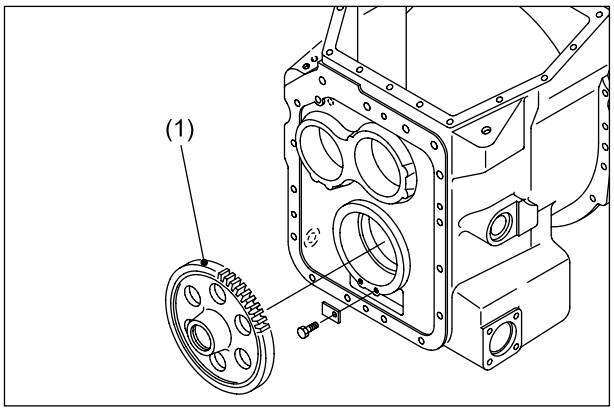


Fig. 3.183

■ REASSEMBLING TRANSMISSION

① Install the input shaft (1) and main shaft (2) into the transmission case, engaging the gears on both shafts properly.

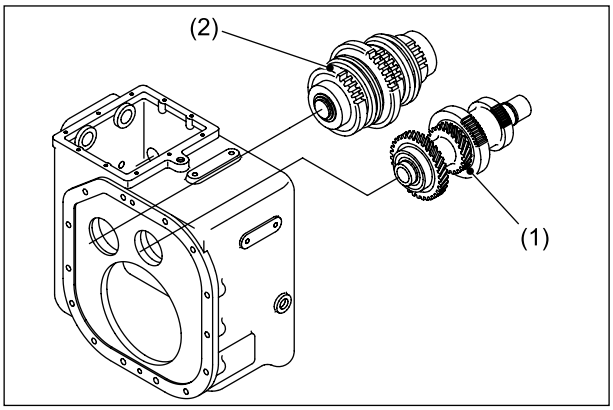


Fig. 3.184

② Install the output gear (1) on the clutch housing. Apply LOCTITE#270 to the threads of the bolts securing the stopper.

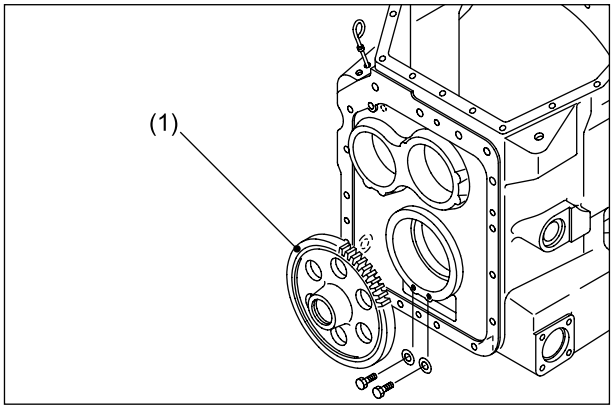


Fig. 3.185

③ Install the clutch housing (1) on the transmission using a new gasket.

M12: 78.4 N-m {8.0 kgf-m} [57.8 lbf-ft]

M10: 42.3 N-m {4.3 kgf-m} [31.2 lbf-ft]

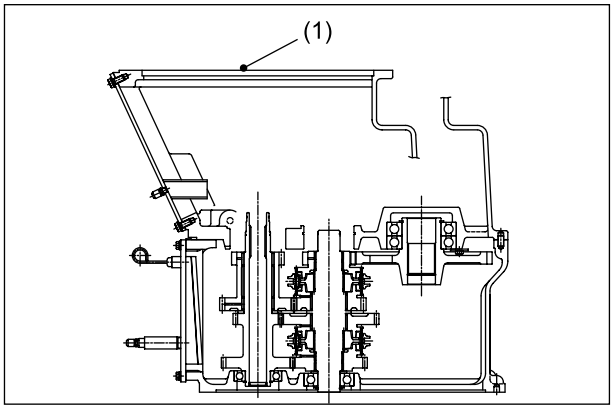


Fig. 3.186

④ Install the thrust washer (1) and bearing (2) on the input shaft, and secure with the snap ring (3).

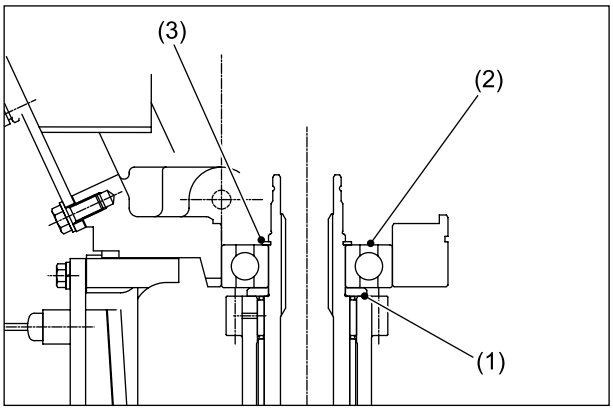


Fig. 3.187

⑤ Install the thrust washer (1) and bearing (2) on the main shaft. Secure with the washer (3) and snap ring (4).

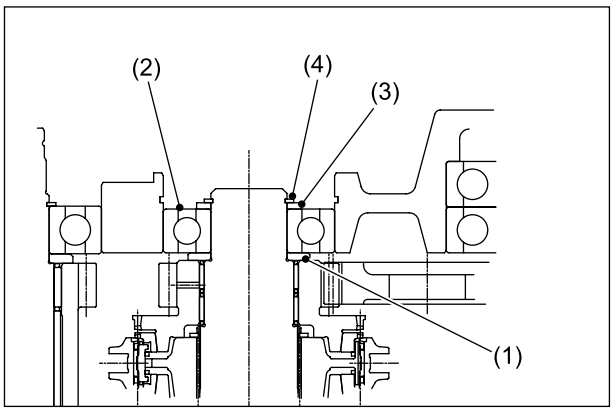


Fig. 3.188

⑥ Install the same number and thickness of shims (1) and spacers (2) that you recorded during removal, and secure with the snap ring (3).

Shim thickness:
0.1, 0.2, 0.5 mm [0.004, 0.008, 0.020 in.]
Axial movement of shaft:
less than 0.2 mm [0.008 in.]

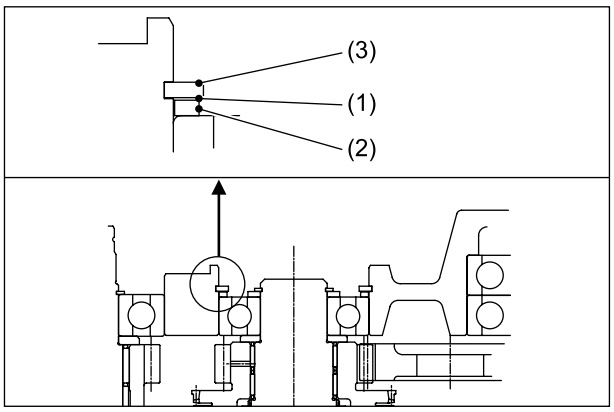


Fig. 3.189

⑦ Apply LOCTITE#575 to the outer edge of the cap and install the cap.

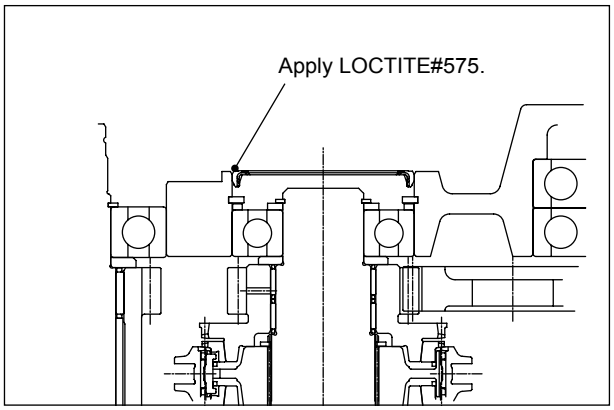


Fig. 3.190

⑧ Install the support assembly using the spacer and shims. Make sure that the oil seal (2) and "O"-ring (3) are installed on the support (1).

Shim thickness: 0.1, 0.2, 0.5 mm
[0.004, 0.008, 0.020 in.]
19.6 N-m {2.0 kgf-m} [14.5 ft-lbs]

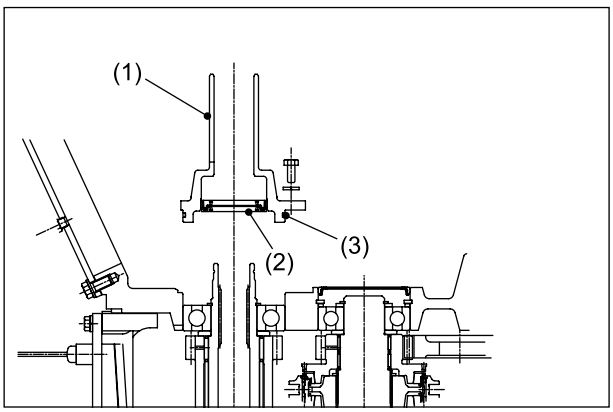


Fig. 3.191

■ DISASSEMBLING MAIN SHAFT

The disassembly procedure for the fwd/rev side of the main shaft will be explained in this section. The fwd/rev and 1st/2nd speed sides of the main shaft are similar and therefore this disassembly procedure pertains to both.
For the purpose of easy reassembly, the component parts of the main shaft are shown in Fig. 3.192.

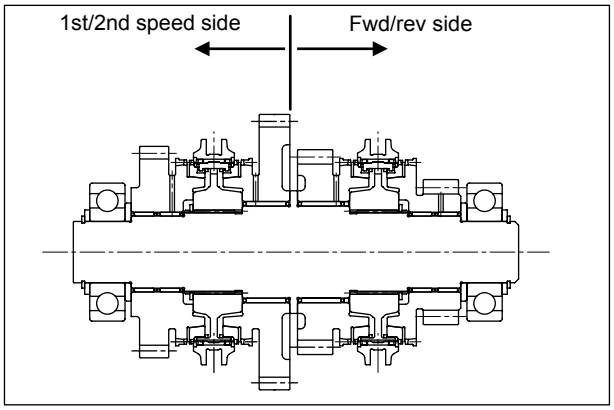


Fig. 3.192

① Remove the snap ring from the end of the main shaft. Using a puller (1), remove the bearing.

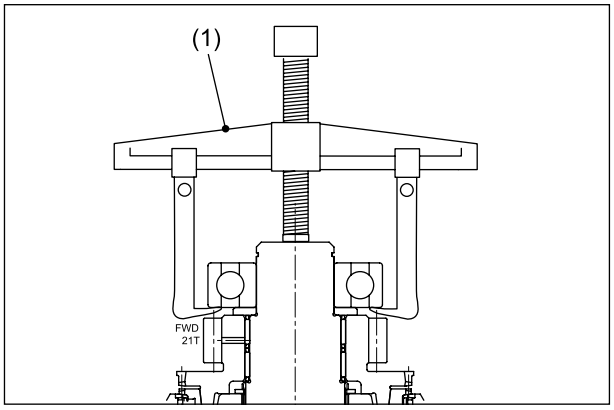


Fig. 3.193

② Remove the thrust washer (1), gear (2), and block ring (3).

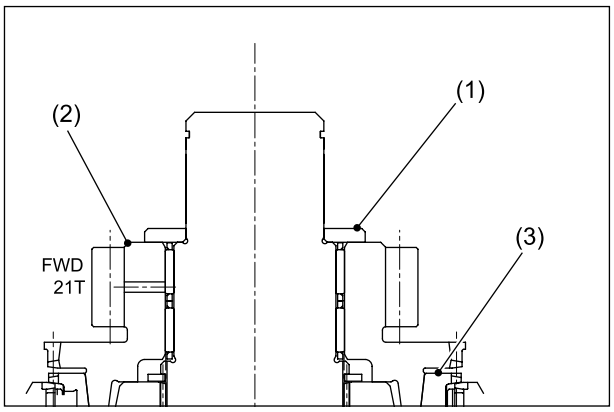


Fig. 3.194

③ Remove the snap ring securing the hub and then remove the synchronizer assembly (1).

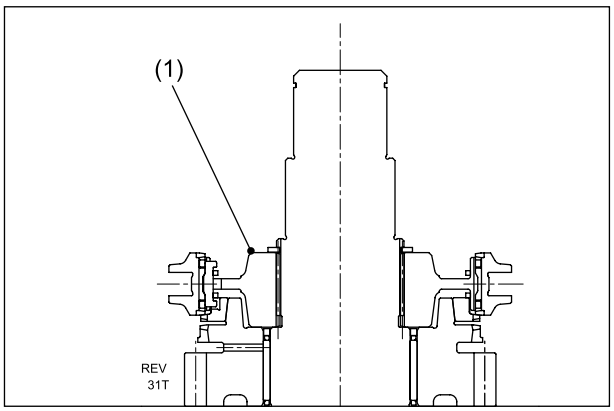


Fig. 3.195

④ Remove the block ring (1), collar (fwd/rev side only)(2), and gear (3).

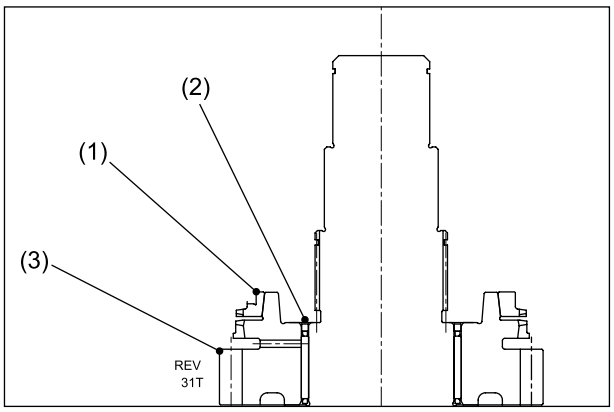


Fig. 3.196

⑤ Disassembling synchronizer

1) Remove the synchronizer support springs (2). Remove the inserts (1) and sleeve (3) from the hub (4).
2) Disassemble the 1st/2nd speed side of the main shaft in the same manner.

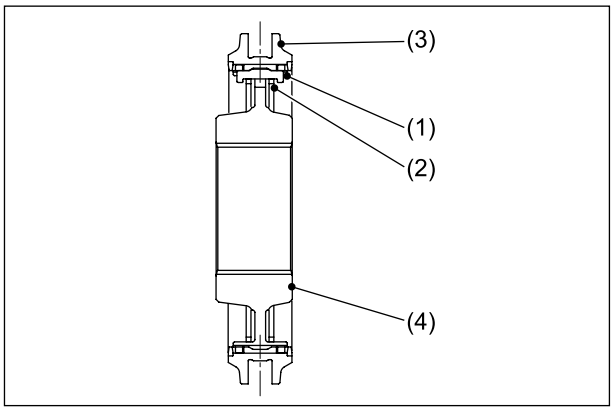


Fig. 3.197

■ REASSEMBLING MAIN SHAFT

The reassembly procedure for the 1st/2nd speed side of the main shaft will be explained in this section. The fwd/rev and 1st/2nd speed sides of the main shaft are similar and therefore this reassembly procedure pertains to both.

Understand the direction and position of the component parts on the main shaft by referring to Figure 3.198.

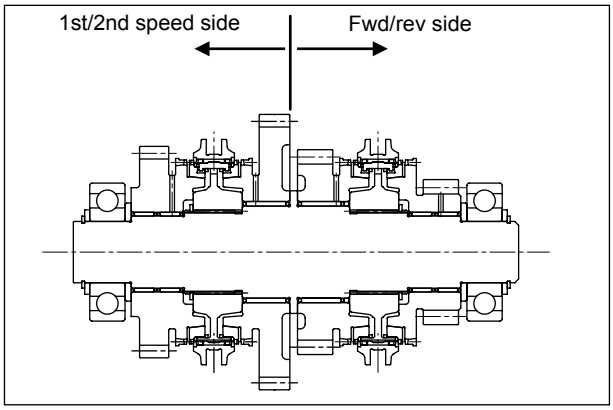


Fig. 3.198

① Install the low gear (1) and needle bearing (2) onto the end of the main shaft that has the smaller chamfer.

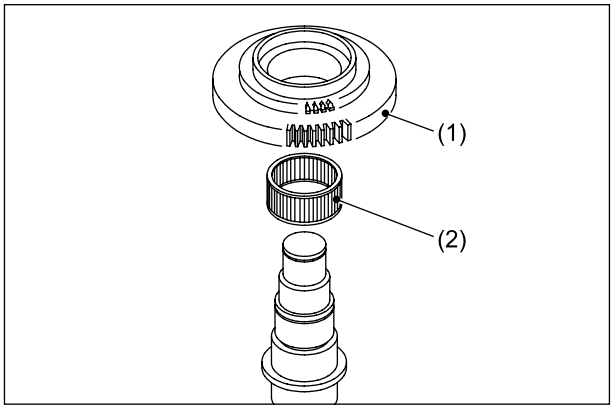


Fig. 3.199

② Install the block ring (1). Install the synchronizer (2) on the splines of the main shaft, and secure with the snap ring (3).

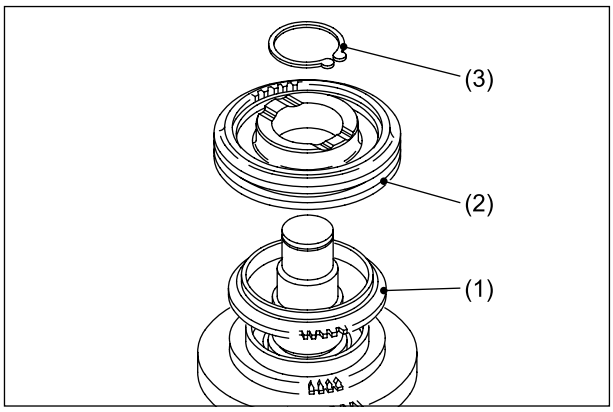


Fig. 3.200

③ Install the block ring (1) and high gear (2) (with needle spring).

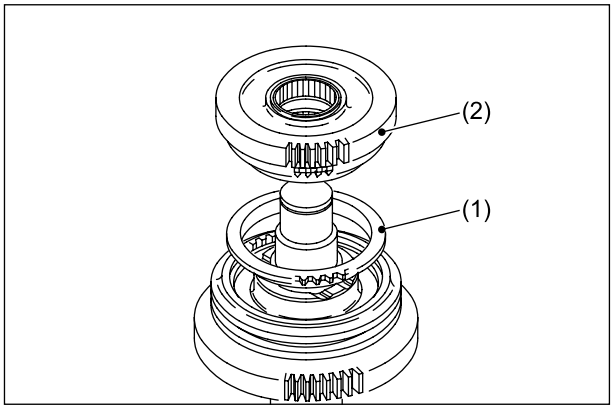


Fig. 3.201

④ Install the thrust washers (1) and press-fit the bearing (2). Then install the snap ring (3) using a spacer.

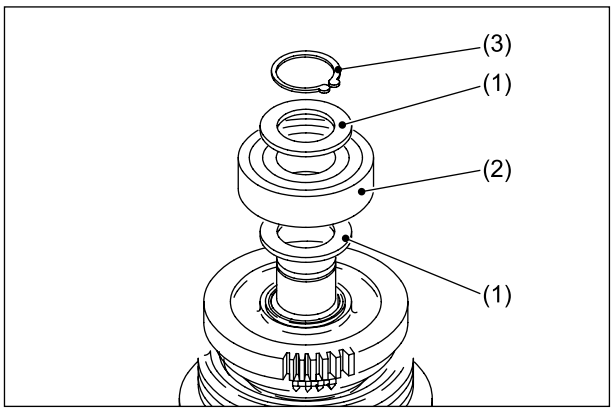


Fig. 3.202

⑤ Reassemble the fwd/rev side using the same steps, except that you don't install the shaft-end bearing immediately after installing the forward gear. The shaft-end bearing will only be installed when reassembling the whole assembly.

■ DISASSEMBLING INPUT SHAFT

① Remove the snap ring (1).

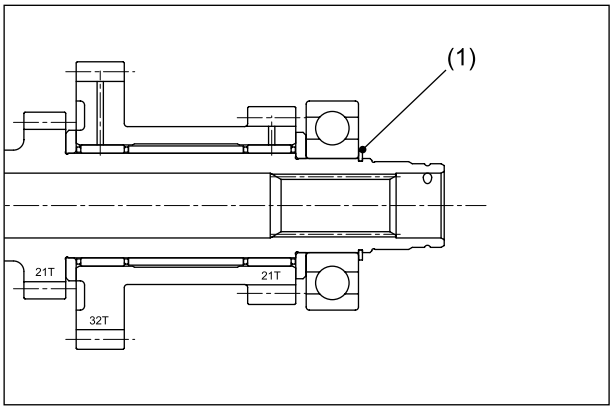


Fig. 3.203

② Using a suitable jig, remove the thrust washer, bearing and counter gear.

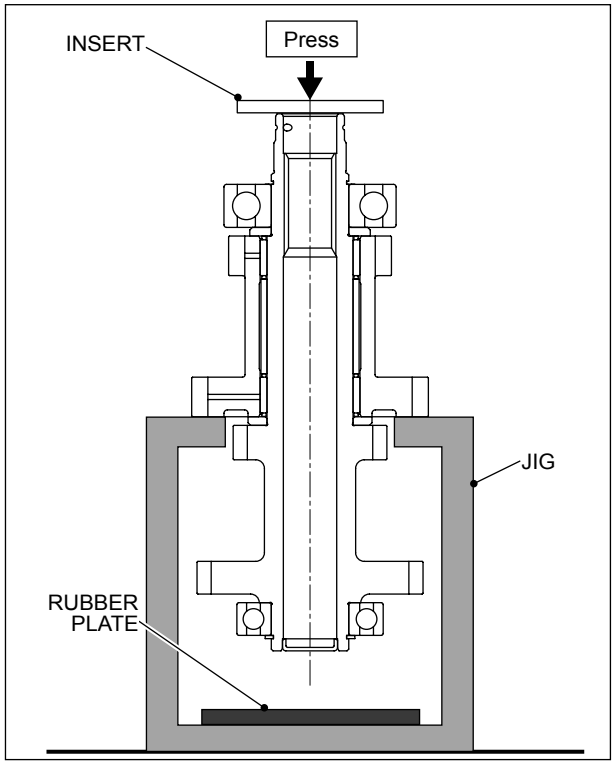


Fig. 3.204

■ REASSEMBLING INPUT SHAFT

① Install the needle bearings (2) and spacer (3) into the counter gear (1).

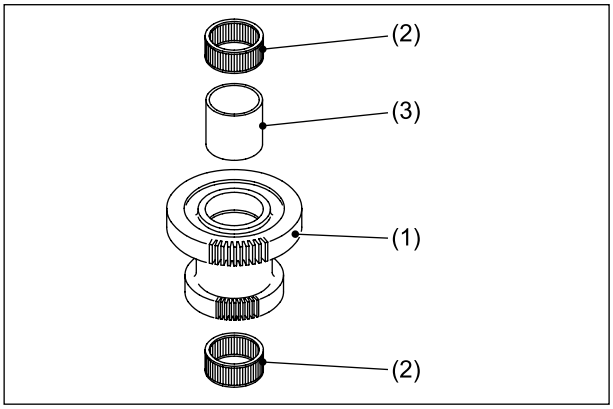


Fig. 3.205

② Install the thrust washer (1) and counter gear assembly (2) onto the input shaft.

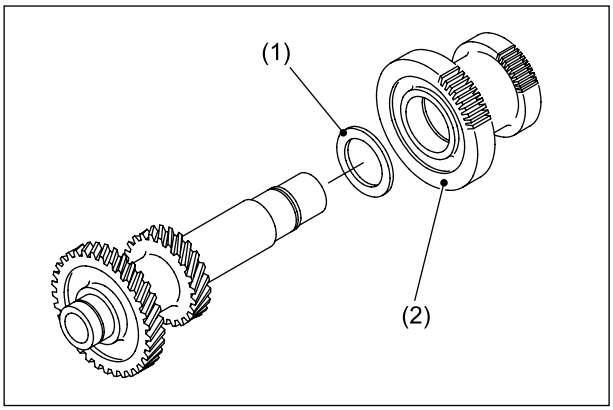


Fig. 3.206

③ Install the thrust washer and press-fit the bearing (1) onto the input shaft. Then install the snap ring (2).

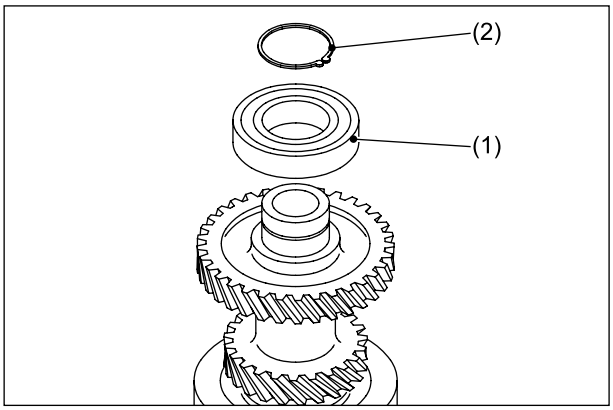


Fig. 3.207

④ Note that the bearing at the counter gear side will be installed when reassembling the clutch housing.

■ DISASSEMBLING OUTPUT GEAR

① Remove the snap ring (1).

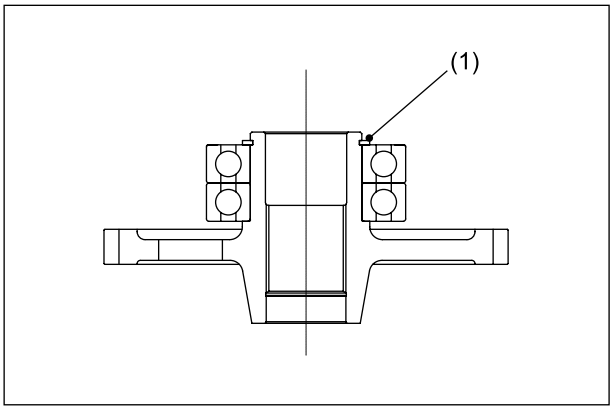


Fig. 3.208

② Using a puller (1) and insert (2), remove the bearings.

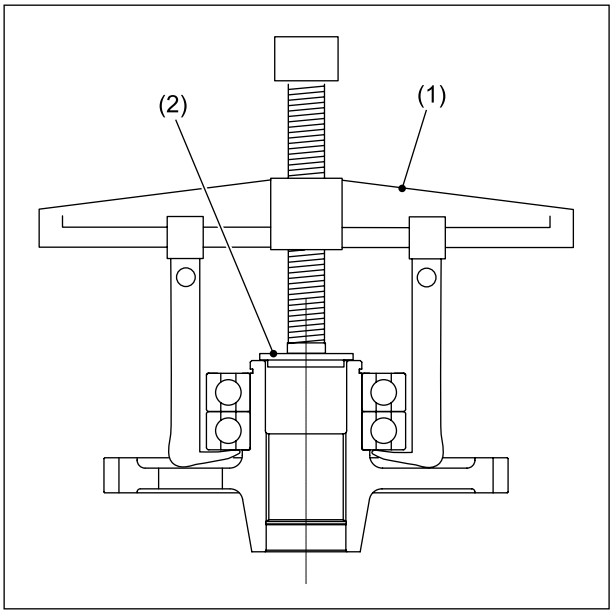


Fig. 3.209

■ REASSEMBLING OUTPUT GEAR

① Using a jig (1) and press, install the bearings (2).

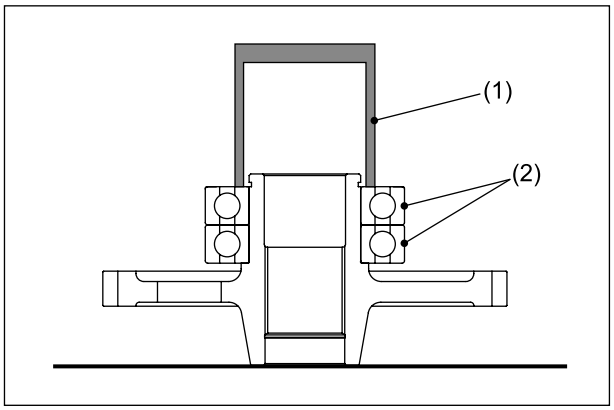


Fig. 3.210

② Install the snap ring (1).

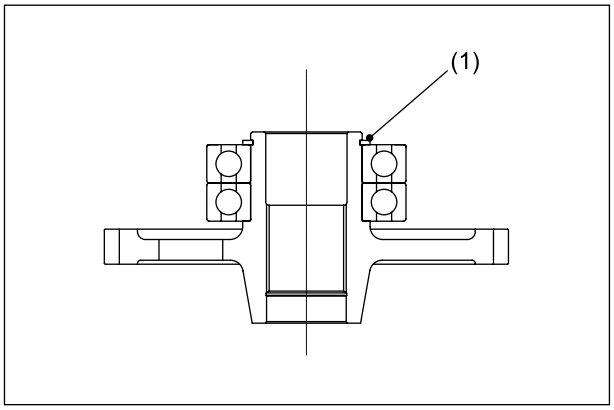


Fig. 3.211

■ REASSEMBLING SHIFT FORK

① Using a jig (1), install the spring (2) and ball (3) into the shift fork (4) and insert the shaft (5) into it.

Note: Use caution not to have the wrong direction of the shaft.
See the Figure 3.213.

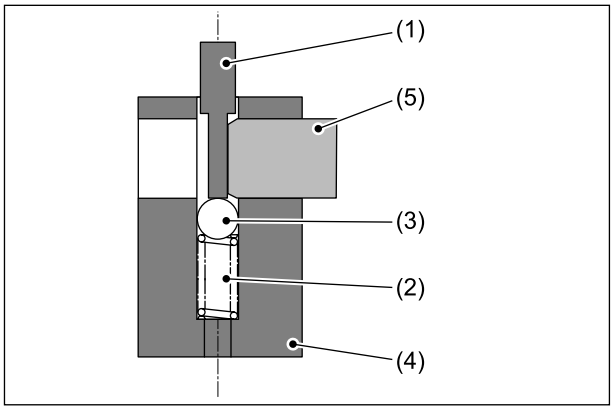


Fig. 3.212

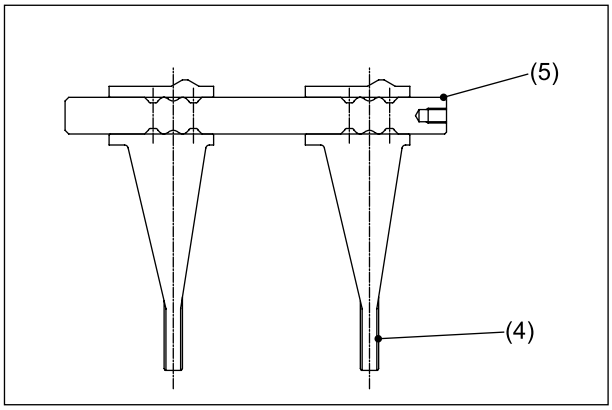


Fig. 3.213

3.3 DRIVE AXLE

■ DISASSEMBLY

① Straighten the lock washer (1) tabs and remove the lock nut (2) and lock washer (1).

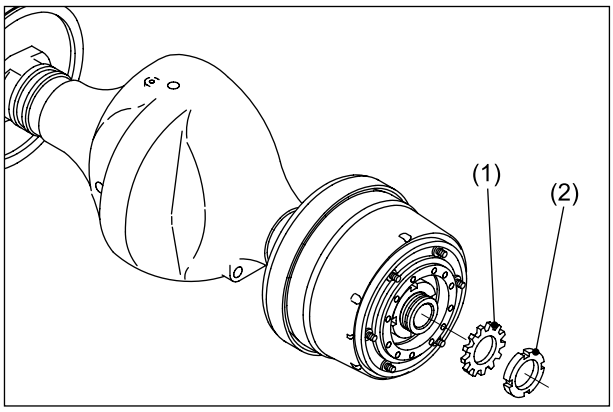


Fig. 3.214

② Remove the adjustment nut (1).

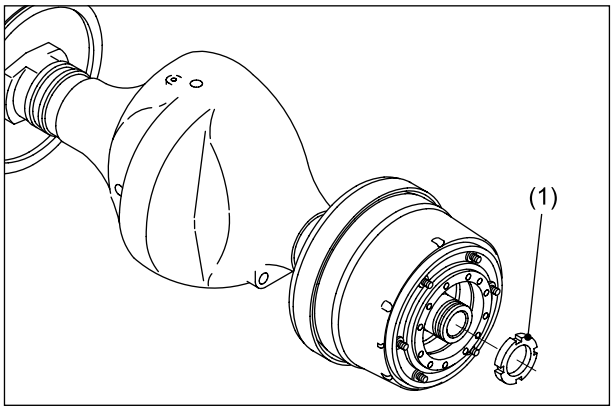


Fig. 3.215

③ Using a puller, remove the hub (3) together with the drum (1) and outer tapered roller bearing (2).

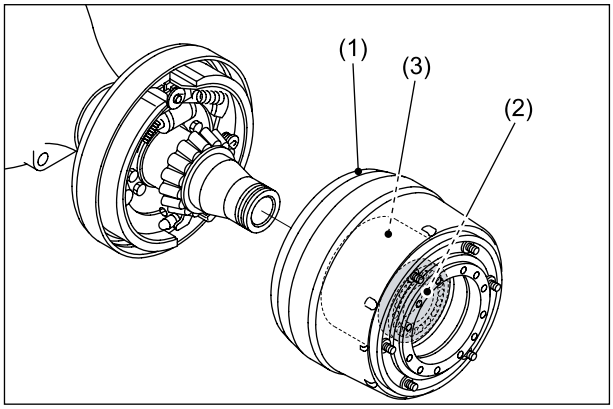


Fig. 3.216

④ Remove the cone (1), oil seal (2) and retainer (3) from the inner tapered roller bearing.

Note: Put an identifying mark (or number) on each set of tapered roller bearings, so that you can distinguish one set from another.

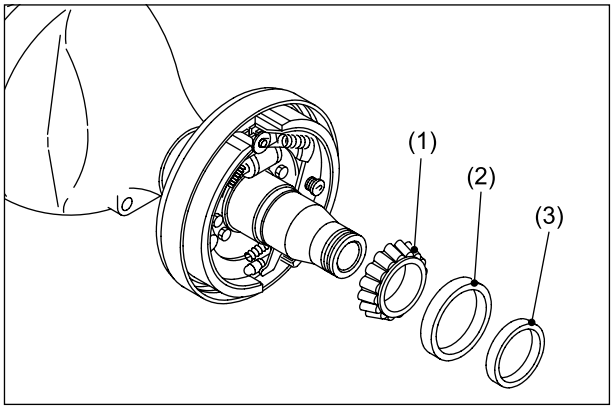


Fig. 3.217

⑤ Remove the bolts (1) and remove the wheel brake assembly (2).

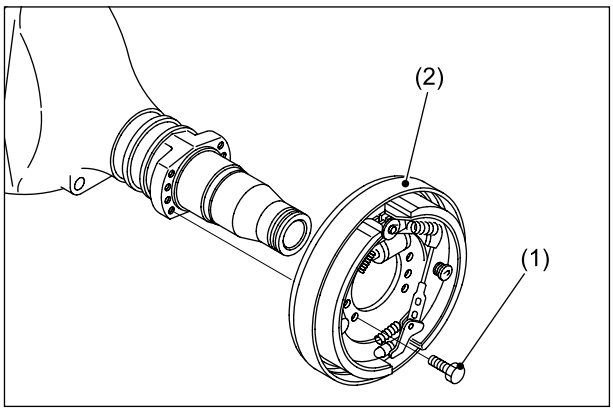


Fig. 3.218

⑥ Disassembling hub

1) Remove the bolts (1) and nuts (2), and remove the drum (3).

2) Remove the outer retainer (4) and oil seal (5).

3) Remove the outer tapered roller bearing (6).

Note: Put an identifying mark (or number) on each set of tapered roller bearings, so that you can distinguish one set from another.

4) Remove the cup (7) from the inner tapered roller bearing.

Note: Put an identifying mark (or number) on each set of tapered roller bearings, so that you can distinguish one set from another.

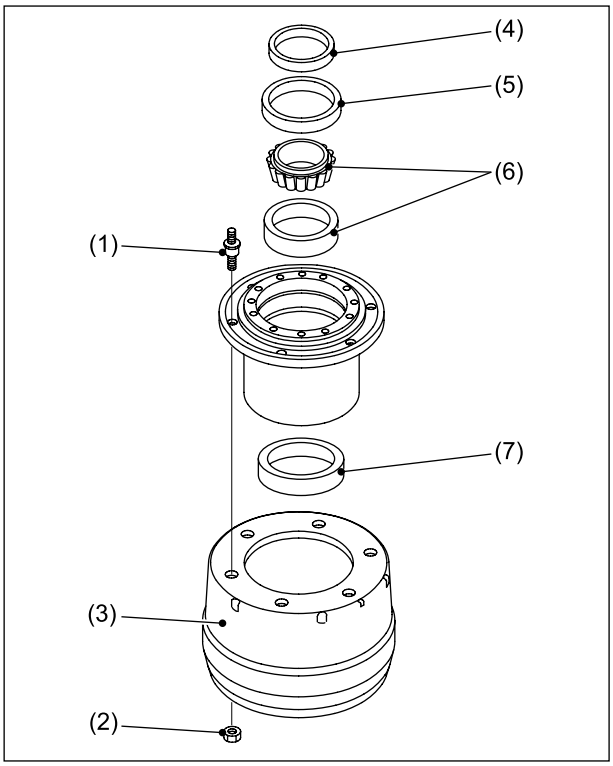


Fig. 3.219

■ REASSEMBLY

① Reassembling hub

1) Install the cup (1) on the inner tapered roller bearing.

Note: Check the identification marks made during disassembly.

2) Install the outer tapered roller bearing (2).

Note: Check the identification marks made during disassembly.

3) Install the outer oil seal (3) and retainer (4).

4) Install the drum (5) using the bolts (6) and nuts (7).

500 N-m {50.0 kgf-m} [368.8 lbf-ft]

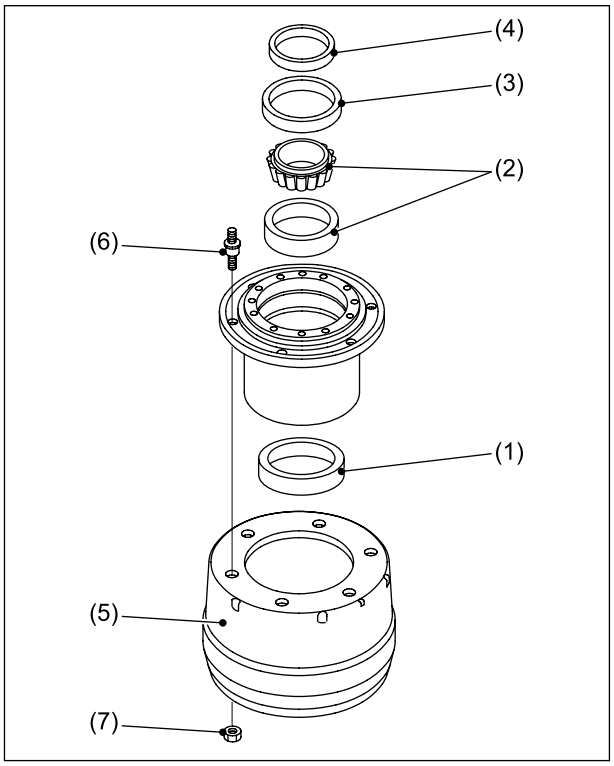


Fig. 3.220

② Install the wheel brake assembly (1) using the bolts (2). Apply LOCTITE#270 to the threads of the bolts before installing.

275 - 324 N-m {28 - 33 kgf-m} [202.8 - 239.0 lbf-ft]

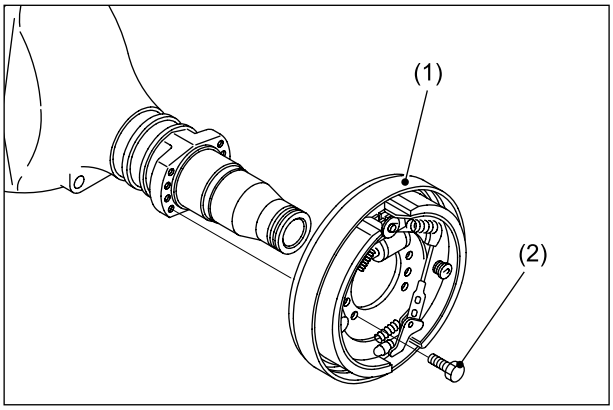


Fig. 3.221

③ Install the retainer (1), oil seal (2), and inner tapered roller bearing cone (3).

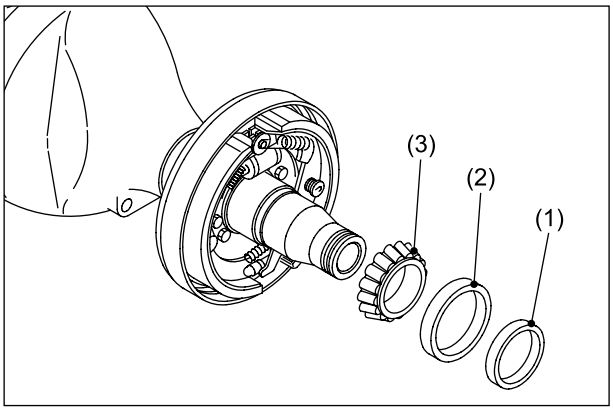


Fig. 3.222

④ Install the hub assembly (1) on the drive axle, making sure that the identification mark (or number) on the inner tapered roller bearing cup in the hub assembly is the same as that on the inner tapered roller bearing cone at the drive axle side.

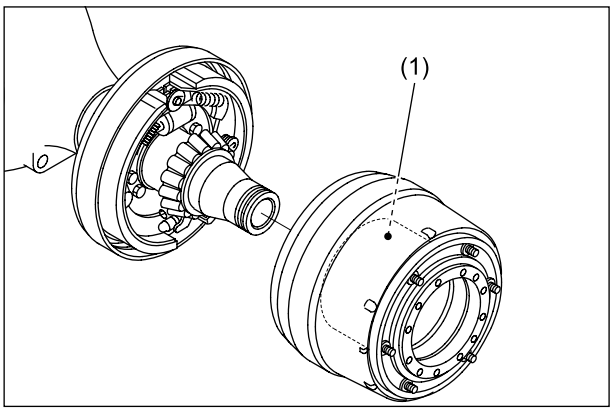


Fig. 3.223

⑤ Install the adjustment nut (1) and then adjust the hub starting torque.

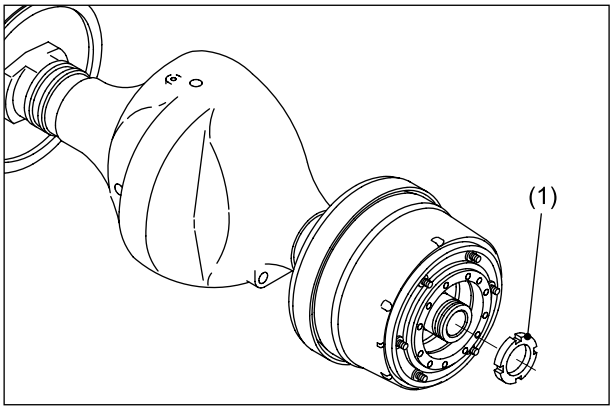


Fig. 3.224

⑥ Install the lock washer (1) and lock nut (2). Secure the lock nut (2) using the lock washer (1) tabs.

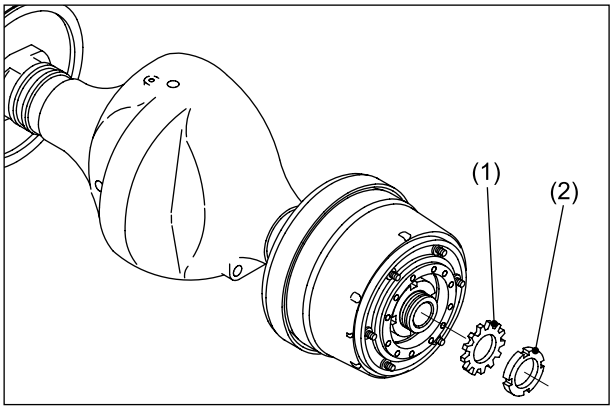


Fig. 3.225

3.4 WHEEL BRAKE

3.4.1 (3.5- to 4.0-ton trucks)

■ DISASSEMBLY

① Remove the hold pins (3) and spring retainers (4) from each of the primary shoe (1) and secondary shoe (2).

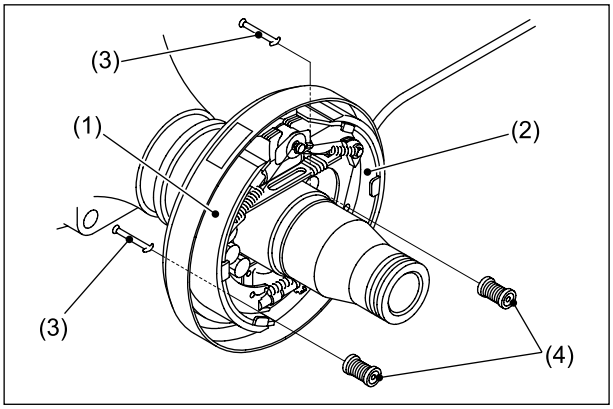


Fig. 3.226

② Remove the two return springs (1).

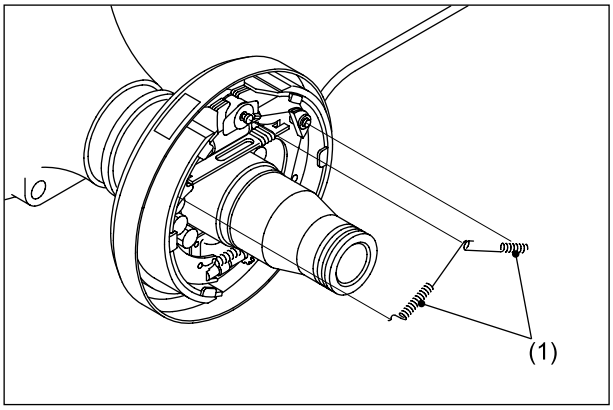


Fig. 3.227

③ Remove the strut (1).

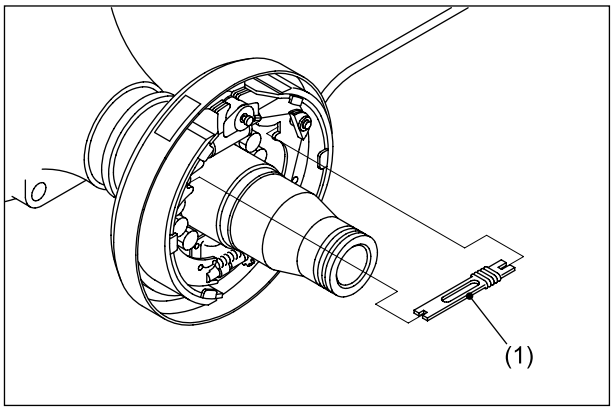


Fig. 3.228

④ Remove the adjuster lever (1) and spring (2).

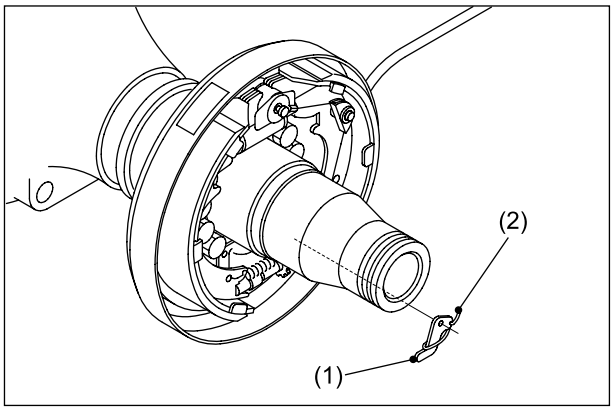


Fig. 3.229

⑤ Remove the washer (1), guide cable (2) and shoe guide plate (3).

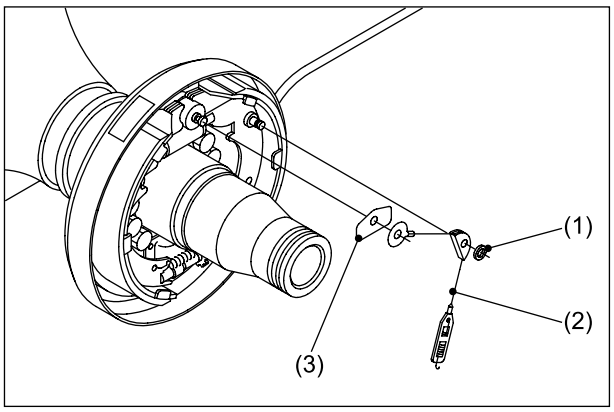


Fig. 3.230

⑥ Remove the primary shoe (1) and secondary shoe (2), together with the adjuster (3) and adjuster spring (4).

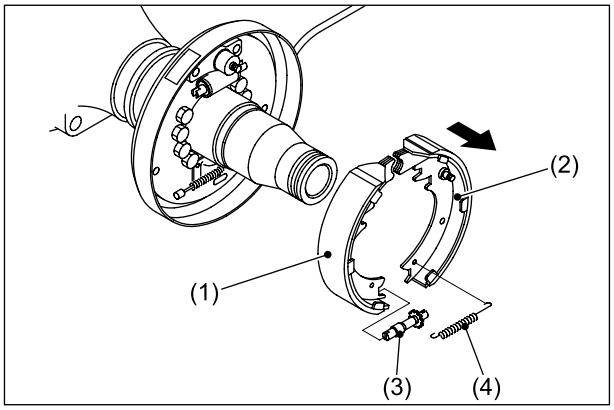


Fig. 3.231

⑦ Remove the brake pipe from the wheel cylinder (1).
Remove the two wheel cylinder mounting bolts (2) and then remove the wheel cylinder (1) from the backing plate (3).

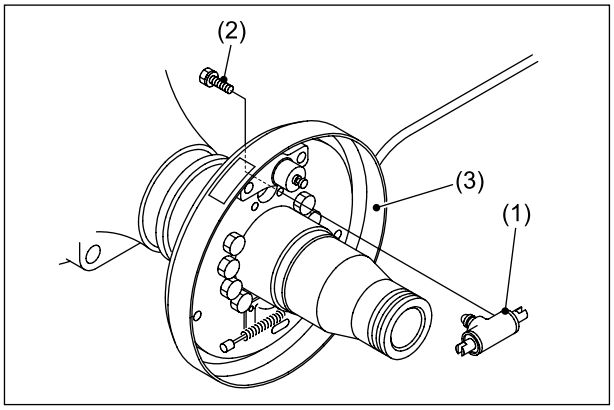


Fig. 3.232

⑧ Remove the retainer (3) securing the parking brake cable (1) to the backing plate (2), and then remove the parking brake cable (1).

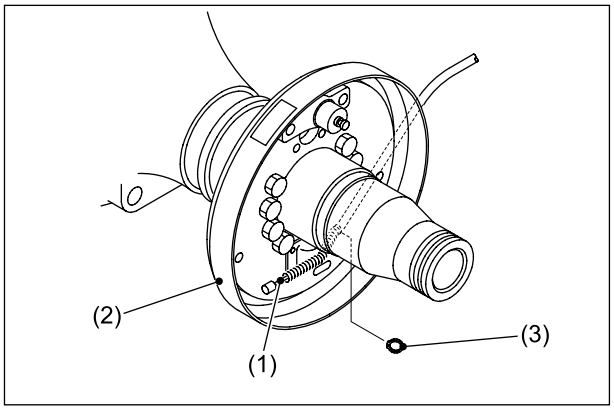


Fig. 3.233

⑨ Remove the eight backing plate mounting bolts (1) and then remove the backing plate (3) from the drive axle (2).

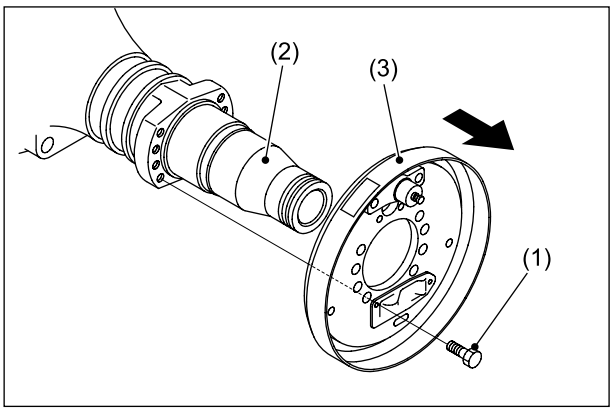


Fig. 3.234

⑩ Remove the retainer (3) and washer (4) securing the brake lever (1) to the primary shoe (2). Remove the brake lever (1).

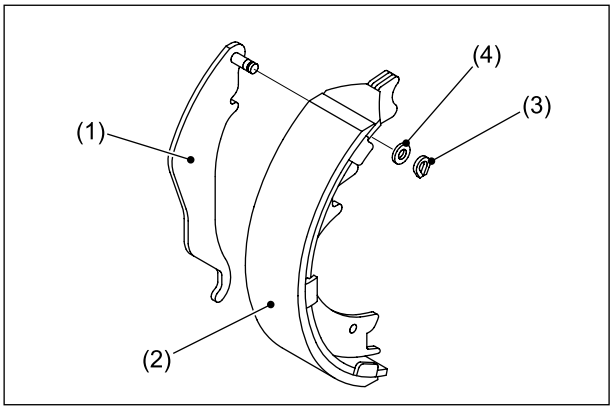


Fig. 3.235

⑪ Disassemble the wheel cylinder as follows:

- Remove the push rod (1) and dust cover (2) from each side of the wheel cylinder.
- Press one piston (3) into one end of the cylinder to remove the piston cup (4) and piston (5) from the other end of the cylinder.
- Press the piston (3) with the fingers to remove from the cylinder.

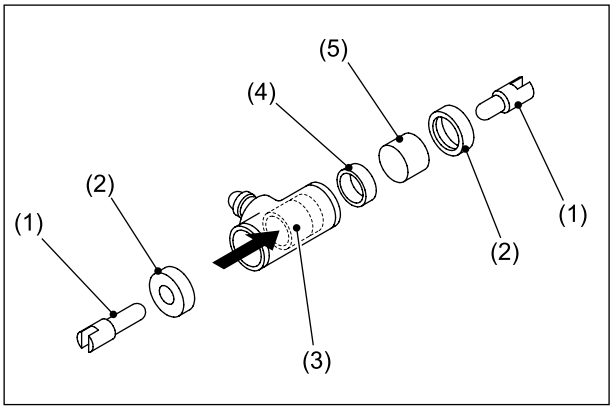


Fig. 3.236

■ INSPECTION

Inspect all the parts for wear or damage. Repair or replace any defective parts with new ones.

① Inspect the wheel cylinder's inner surface and piston's outer surface for sign of corrosion. Measure the clearance between the piston and cylinder.
Standard value: 0.03 - 0.10 mm [0.0012 - 0.0039 in.]
Limit: 0.15 mm [0.006 in.]

② Visually check the piston cup for damage or deformation, replacing any defective piston cup with a new one.

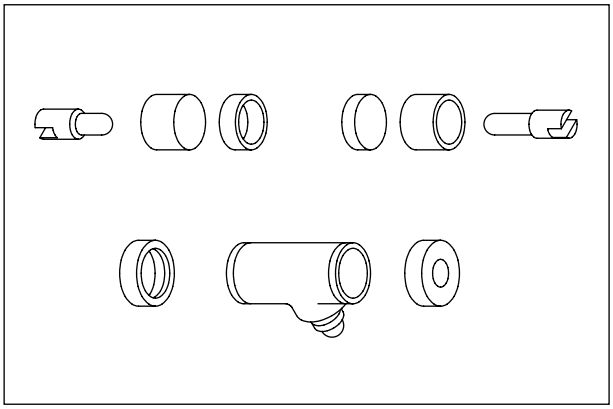


Fig. 3.237

③ Measure the brake lining thickness, and if worn beyond the limit, replace with a new one.

Unit: mm [in.]

	3.5- to 4.0-ton
Standard size	7.67 [0.301]
Limit	1 [0.039]

(Wear allowance: 6.67 [0.263])

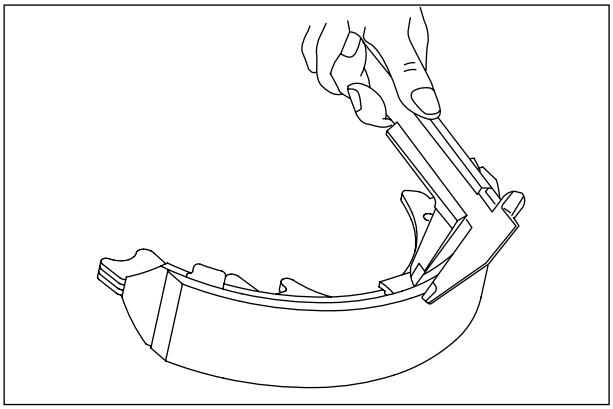


Fig. 3.238

④ Visually check the brake drum inner surface for scratches, nicks or uneven wear, and if any defect is found, repair by grinding. If the surface is badly scratched or worn beyond repair, replace.

Unit: mm [in.]

	3.5- to 4.0-ton
Standard size	314 [12.362]
Limit	316 [12.441]

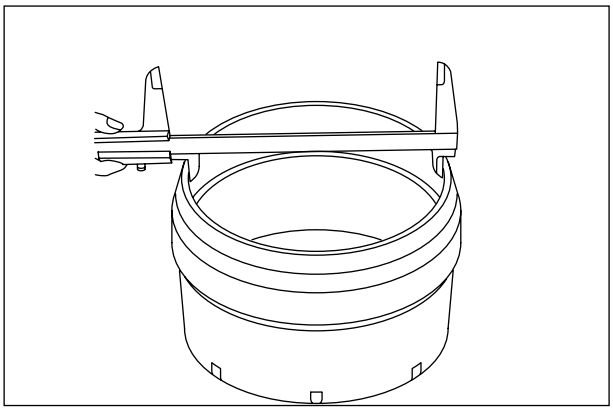


Fig. 3.239

■ REASSEMBLY

① Reassemble the wheel cylinder as follows:
- Apply brake fluid on the piston cup (1) and piston (2).
- Insert the piston cup (1) and piston (2) into the cylinder in that order.
- Install the dust cover (3) and push rod (4) to each side of the cylinder.

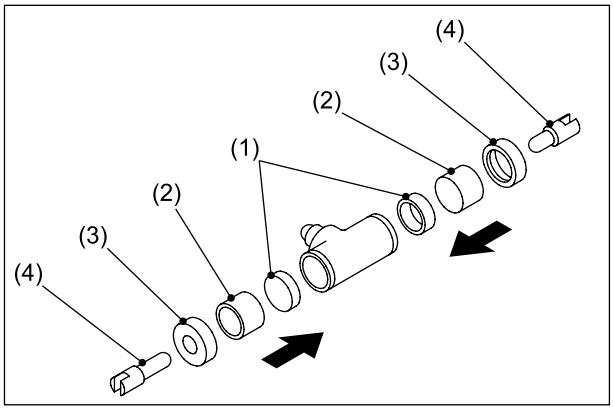


Fig. 3.240

② Install the wheel cylinder (1) to the backing plate (3) with two bolts (2).

27.3 - 49 N-m {2.8 - 5.0 kgf-m} [20.1 - 36.1 lbf-ft]

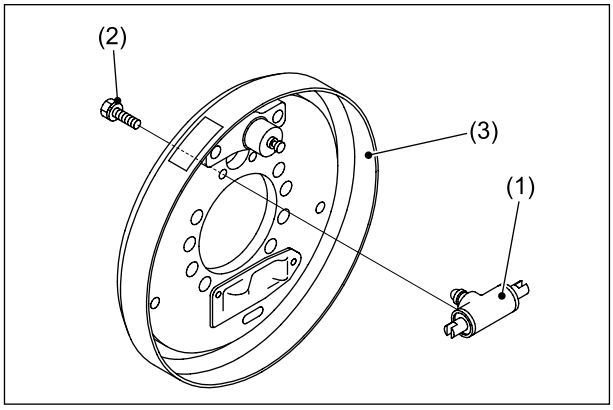


Fig. 3.241

③ Install the backing plate (1) to the drive axle (3) with eight bolts (2).

274 - 323 N-m {30.0 - 33.0 kgf-m} [202.1 - 238.2 lbf-ft]

Apply LOCTITE#270.

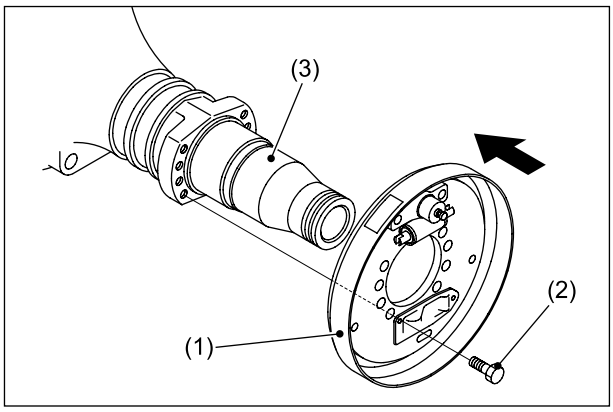


Fig. 3.242

④ Apply heat-resisting grease to the following areas (shown in Figure 3.243):

Note: Use caution not to contaminate the lining with grease.

(a) Backing plate in shoe contact area
(b) Anchor pin
(c) Cable guide in areas which come in contact with adjuster cable
(d) Parking brake lever pin
(e) Adjuster threads and other rotating parts

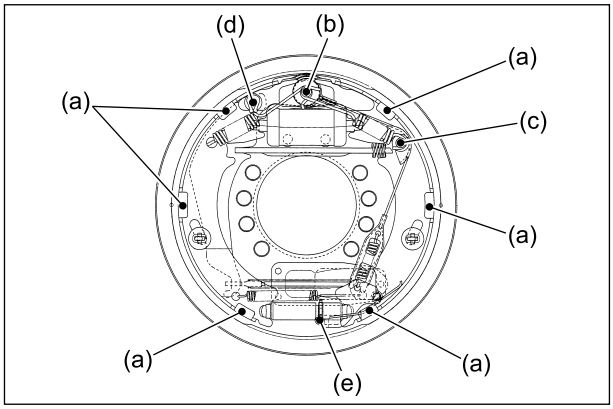


Fig. 3.243

⑤ Install the parking brake cable (1) onto the backing plate (2) and secure with the retainer (3).

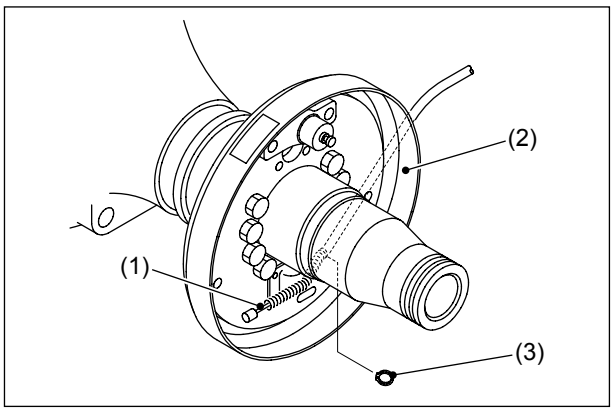


Fig. 3.244

⑥ Install the parking brake lever (1) to the primary shoe (2), and secure with the retainer (3) and washer (4).

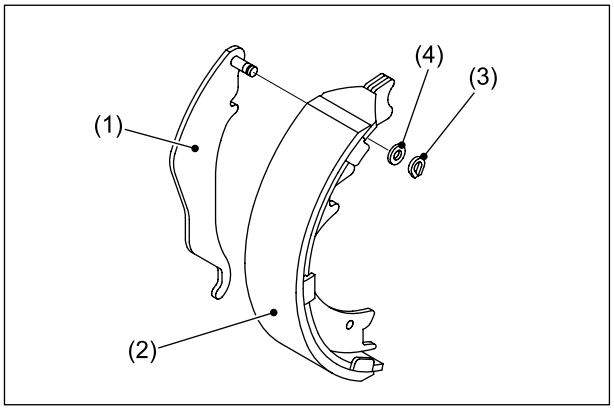


Fig. 3.245

⑦ Install the primary shoe (1) and secondary shoe (2) to the backing plate (3). Install the adjuster (4) and adjuster spring (5) between the two shoes.

- The adjuster thread direction should be left for the left-side brake and right for the right-side brake.
- Use caution not to allow the adjuster teeth to come in contact with the spring.

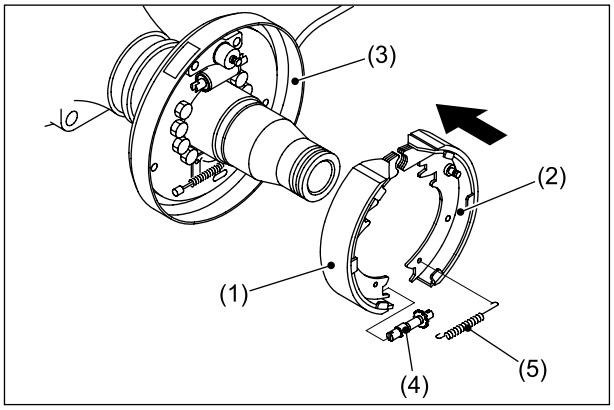


Fig. 3.246

⑧ Install the shoe guide plate (2) to the anchor pin (1) of the backing plate, and then install the guide cable (3) and washer (4).

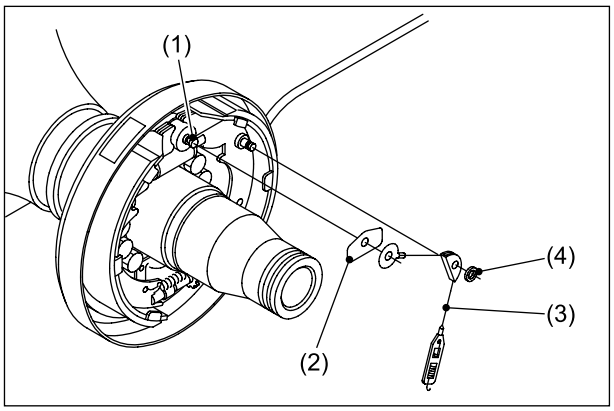


Fig. 3.247

⑨ Install the adjuster lever (1) and spring (2) to the backing plate.
Make sure the adjuster lever end comes in contact with the adjuster teeth.

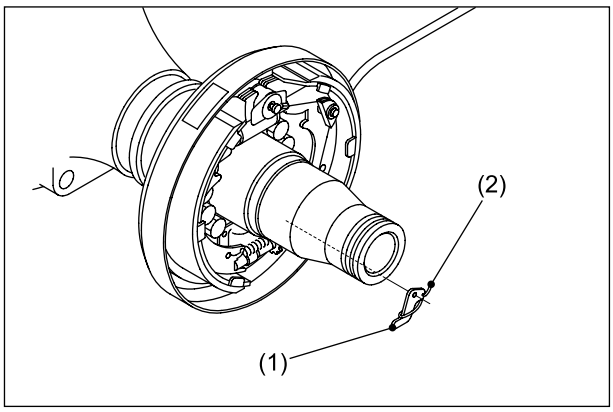


Fig. 3.248

⑩ Install the spring (2) onto the strut (1) and install the strut between the shoes.

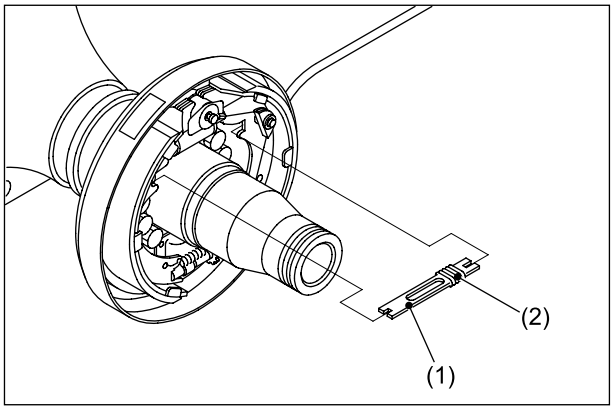


Fig. 3.249

⑪ Install two return springs (1) observing the following conditions:
- The return springs should be installed first to the secondary shoe side, and then to the primary shoe side.
- The longer hook should be installed to the anchor pin (2).

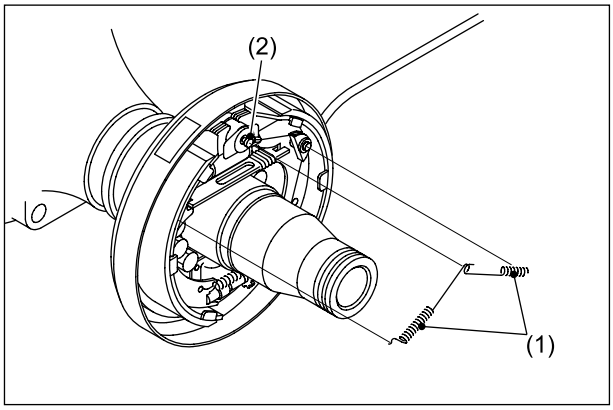


Fig. 3.250

⑫ Install the brake pipe to the wheel cylinder.

⑬ Secure the primary shoe (1) and the secondary shoe (2) in place with the hold pins (3) and the spring retainers (4).

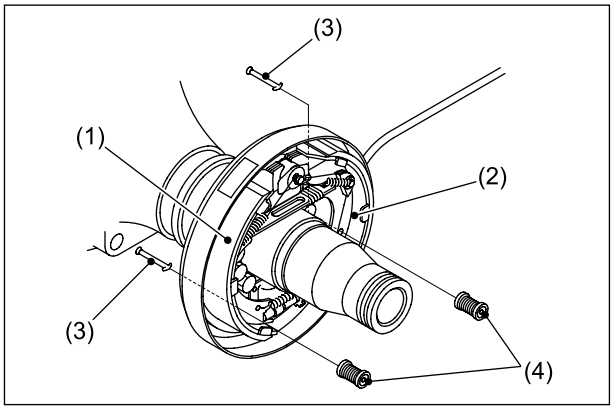


Fig. 3.251

⑭ Measure the inner diameter (a) of the brake drum and the outer diameter (b) of the shoe assembly. Adjust the adjuster (1) so that (a) - (b) equals 1.0 mm [0.04 in.].

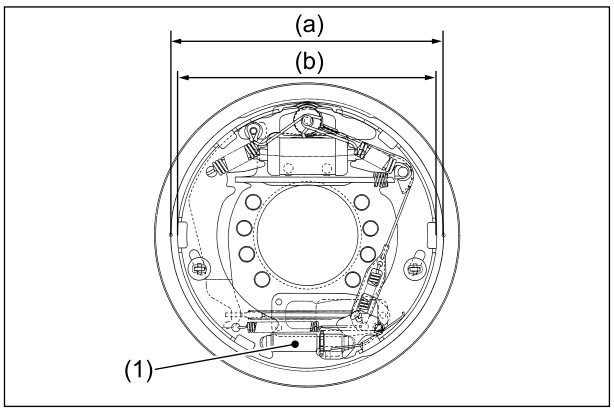


Fig. 3.252

■ OPERATION TEST OF AUTOMATIC CLEARANCE ADJUSTER (3.5- to 4.0-ton trucks)

① Adjust the brake shoe outer diameter nearly to the specified setting size. Push up the adjuster lever with the fingers to turn the adjuster teeth.
When the adjuster lever is released, it returns to the original position.

Note: The adjuster teeth may turn back slightly along with the adjuster lever when your fingers are removed, but the adjuster will operate normally when it is mounted back on the truck.

② If the adjuster won't operate as mentioned above when the adjuster lever is pushed up or released, take the following steps:

- Check the adjuster lever, adjuster, adjuster spring, adjuster cable and shoe return springs for proper installation.
- Check the shoe return springs and adjuster spring for deterioration and the adjuster for rotation, damaged tooth, or improper engagement with the adjuster lever teeth. If any defect is found, replace.

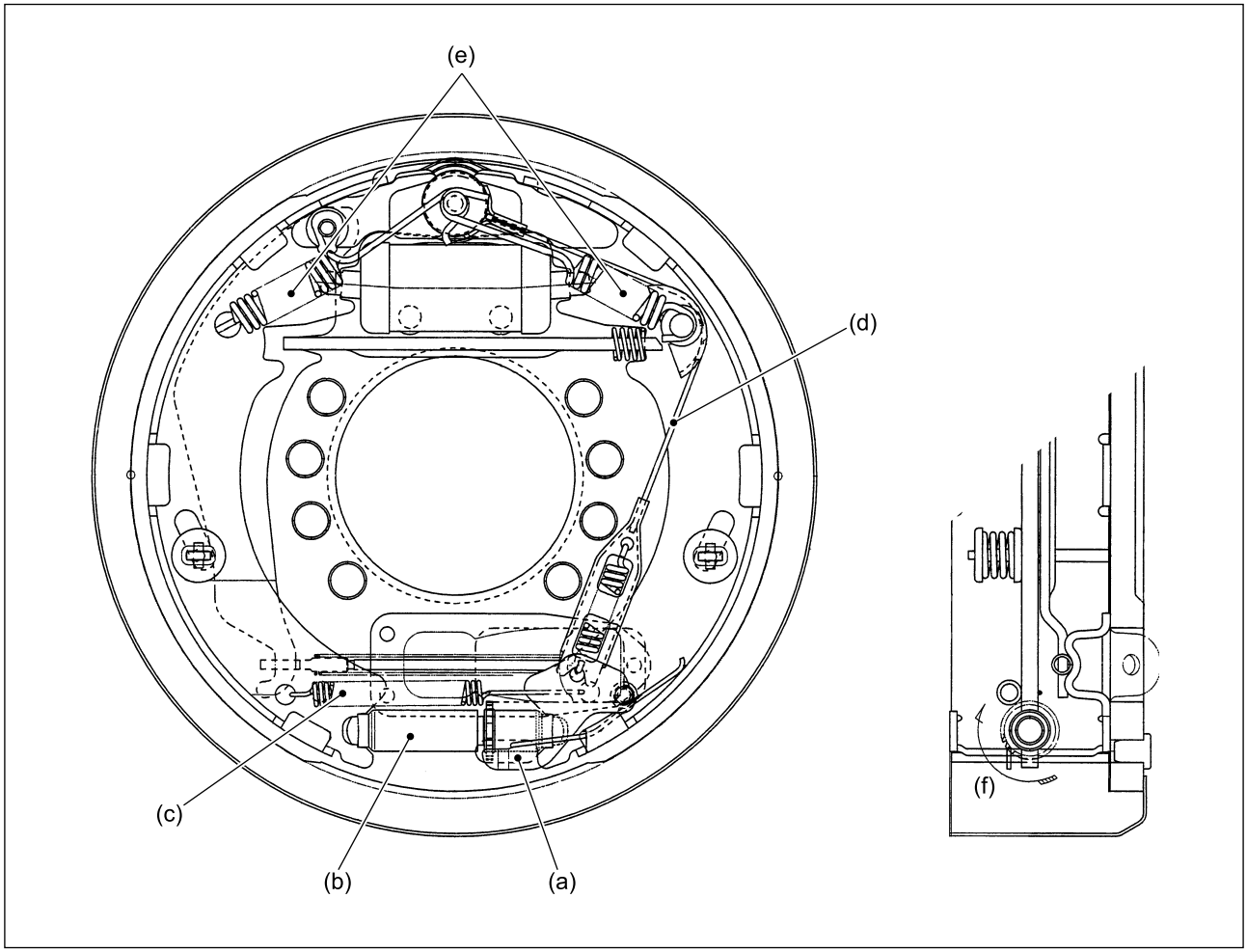


Fig. 3.253

(a) ADJUSTER LEVER
(b) ADJUSTER
(c) ADJUSTER SPRING
(d) ADJUSTER CABLE
(e) SHOE RETURN SPRINGS
(f) Shoes expand in this direction

■ ADJUSITNG BRAKE PEDAL

① Shorten the pushrod of the master cylinder properly.
② Adjust the pedal height as shown in Figure 3.254, using the adjust bolt.
③ Press the brake pedal by the play, extend the pushrod so that its end comes in contact with the master cylinder piston.
Brake pedal play: 25 mm [0.984 in.]
Inching pedal play: 30 mm [1.181 in.]
④ Tighten the pushrod lock nut.

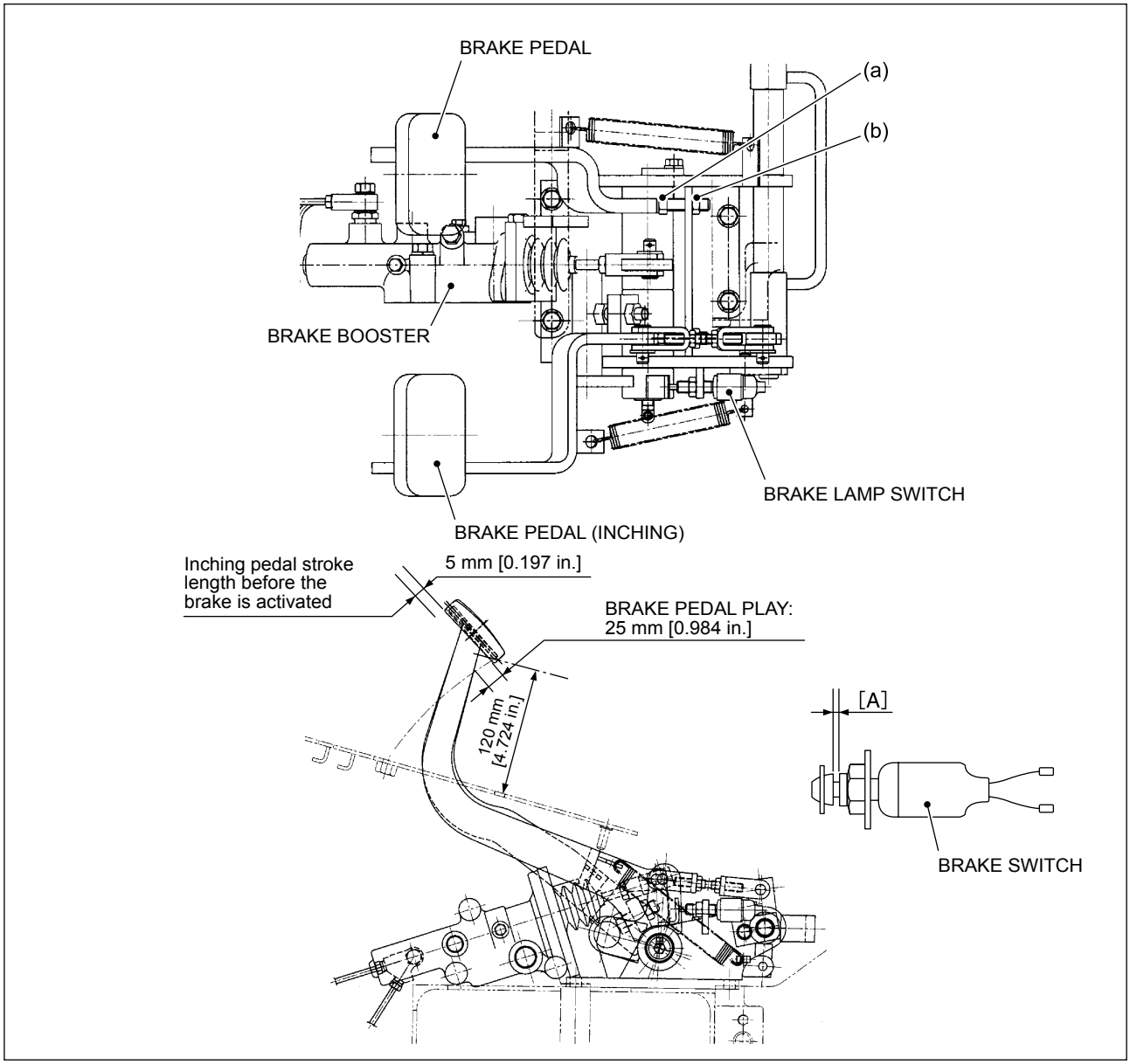


Fig. 3.254

(a) ADJUST BOLT
(b) LOCK NUT

ADJUSTING BRAKE SWITCH

① Make sure the brake pedal height is as indicated in Figure 3.254, and then loosen the brake switch lock nut.
② Remove the brake switch lead wire connector.
③ Turn the switch so that the size “A” is 1 mm [0.04 in.].
④ Make sure the brake lamps turn on when the brake pedal is pressed by the play.

3.4.2 (4.5- to 5.0-ton trucks)

■ DISASSEMBLY

① Remove the hold pins (3) and spring retainers (4) from each of the primary shoe (1) and secondary shoe (2).

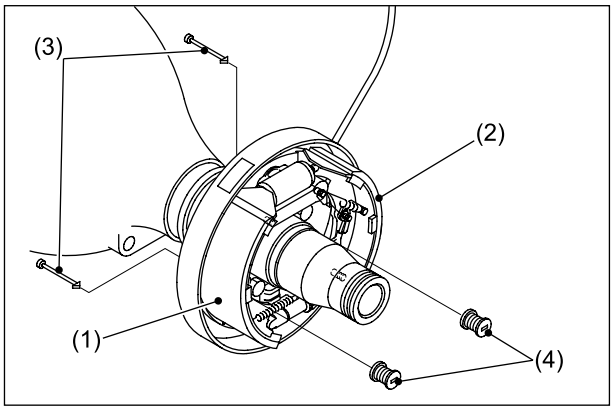


Fig. 3.255

② Remove the return spring (2) from the secondary shoe (1).

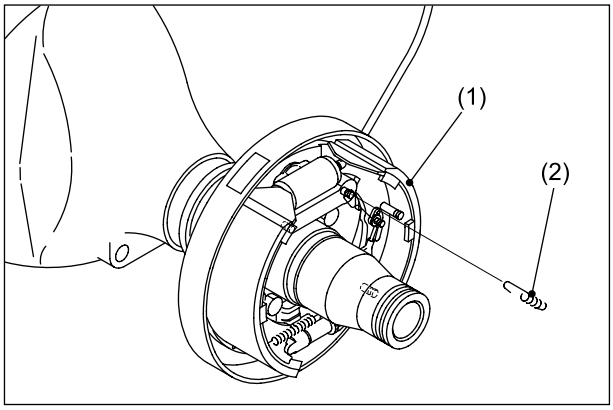


Fig. 3.256

③ Remove the return spring (2) from the primary shoe (1).

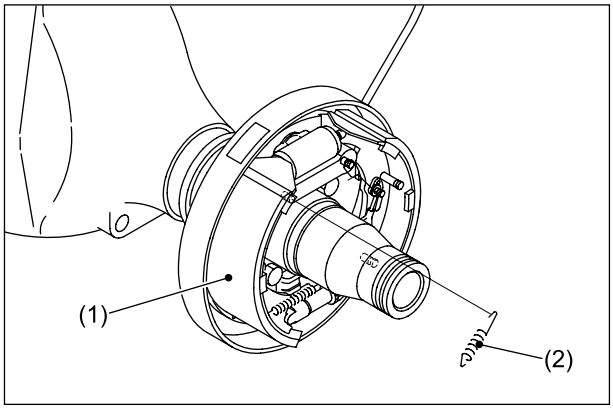


Fig. 3.257

④ Remove the strut (1).

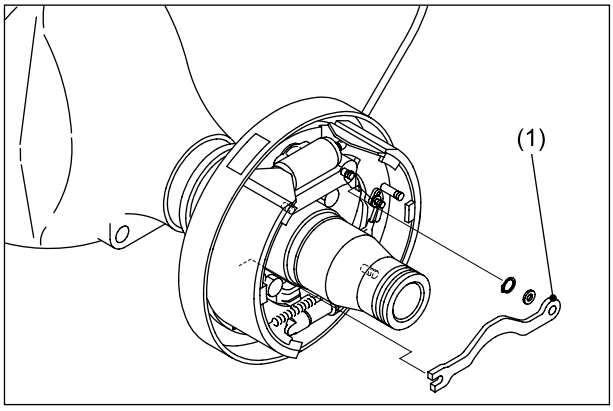


Fig. 3.258

⑤ Remove the parking brake cable (3) from the parking lever (2) on the primary shoe (1).

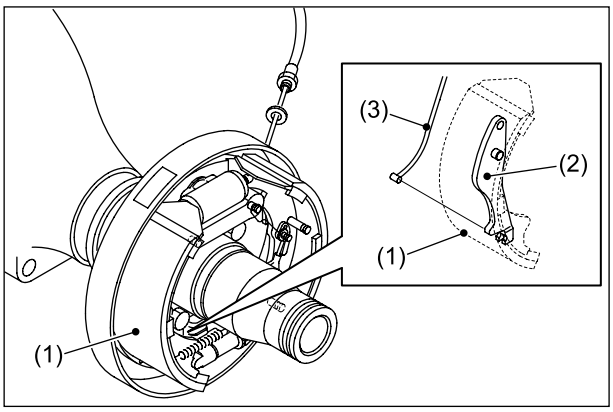


Fig. 3.259

⑥ Remove the adjuster lever (1) and spring (2).

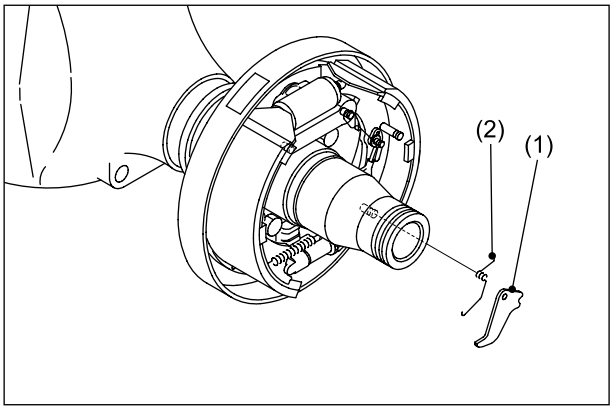


Fig. 3.260

⑦ Remove the linkages (1 and 2), lever (3), washer (4), and split pin (5).

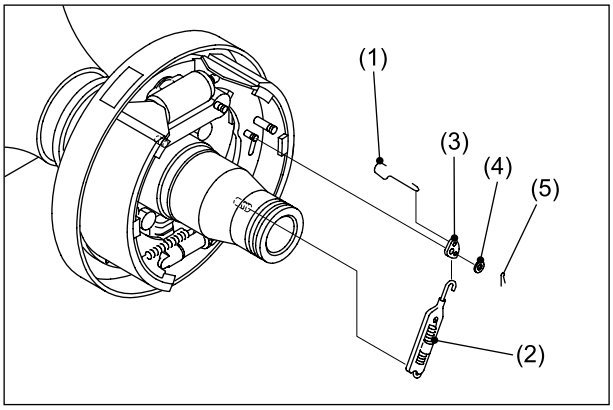


Fig. 3.261

⑧ Remove the primary shoe (1) and secondary shoe (2) with the adjuster (3) and spring (4) installed.

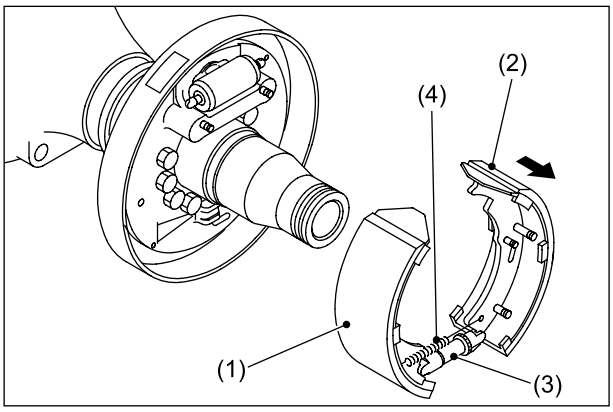


Fig. 3.262

⑨ Twist the primary shoe (1) and secondary shoe (2) in opposite directions, and remove the adjuster (3) and spring (4).

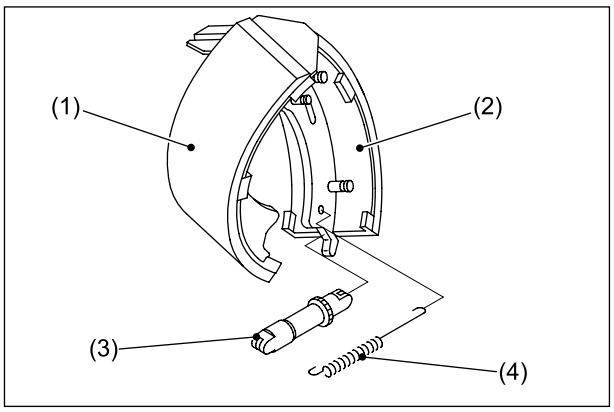


Fig. 3.263

⑩ Remove the brake pipe from the wheel cylinder (1). Remove the two wheel cylinder mounting bolts (2) and then remove the wheel cylinder (1) from the backing plate (3).

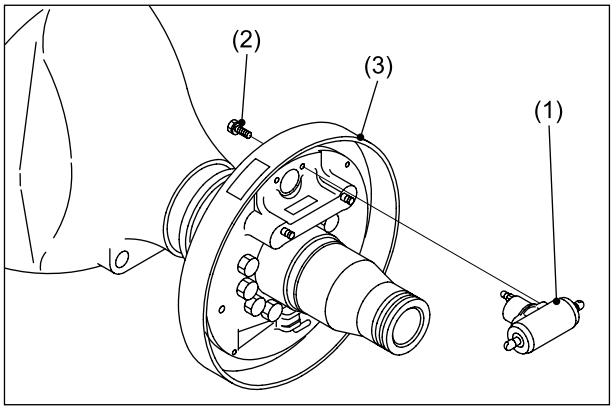


Fig. 3.264

⑪ Remove the eight backing plate mounting bolts (1), and then remove the backing plate (3) from the drive axle (2).

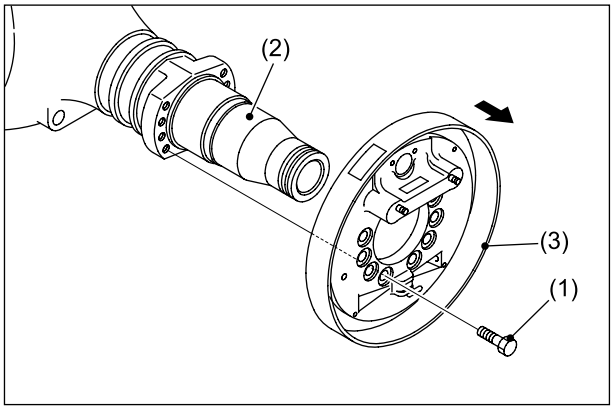


Fig. 3.265

⑫ Remove the retainer (1) and washer (2), and then remove the brake lever (4) from the primary shoe (3).

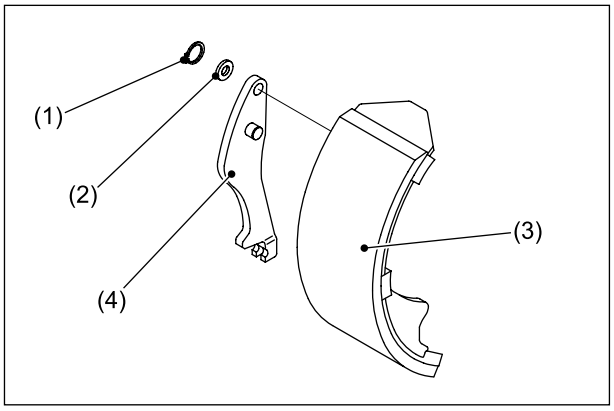


Fig. 3.266

⑬ Disassemble the wheel cylinder as follows:

- Remove the push rod (1) and dust cover (2) from each side of the wheel cylinder.
- Press one piston (3) into one end of the cylinder to remove the piston (4), back-up ring (5), piston cup (6) and spring (7) from the other end of the cylinder.
- Press the piston (3) with the fingers to remove from the cylinder.

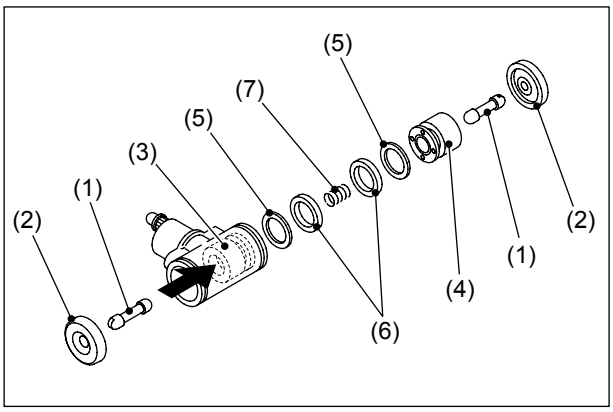


Fig. 3.267

■ INSPECTION

Inspect all the parts for wear or damage. Repair or replace any defective parts with new ones.

① Inspect the wheel cylinder's inner surface and piston's outer surface for sign of corrosion. Measure the clearance between the piston and cylinder.
Standard value: 0.03 - 0.10 mm
[0.0012 - 0.0039in.]
Limit: 0.15 mm [0.006 in.]

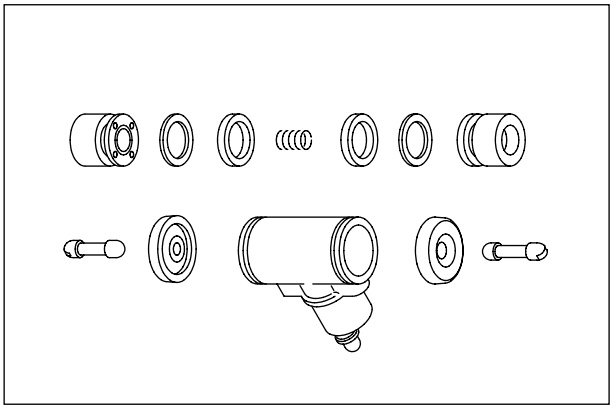


Fig. 3.268

② Visually check the piston cup for damage or deformation, replacing any defective piston cup with a new one.

③ Measure the free length of the wheel cylinder spring.
If unsatisfactory, replace.

Unit: mm [in.]

	4.5 - to 5.0-ton
Load (N) / length	16/14 [0.551] or 7/25 [0.984]
Free length (Ref.)	33.5 [1.319]

④ Measure the brake lining thickness, and if worn beyond the limit, replace with a new one.

Unit: mm [in.]

	4.5 - to 5.0-ton
Standard size	10 [0.394]
Limit	4.7 [0.185]

(Wear allowance: 5.3 [0.209])

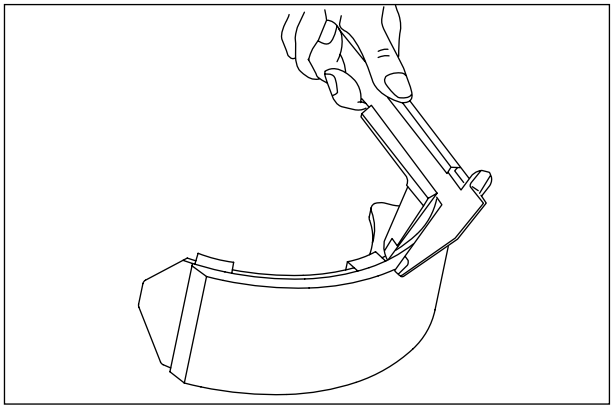


Fig. 3.269

⑤ Visually check the brake drum inner surface for scratches, nicks or uneven wear, and if any defect is found, repair by grinding. If the surface is badly scratched or worn beyond repair, replace.

Unit: mm [in.]

	4.5 - to 5.0-ton
Standard size	317.5 [12.5]
Limit	319.5 [12.6]

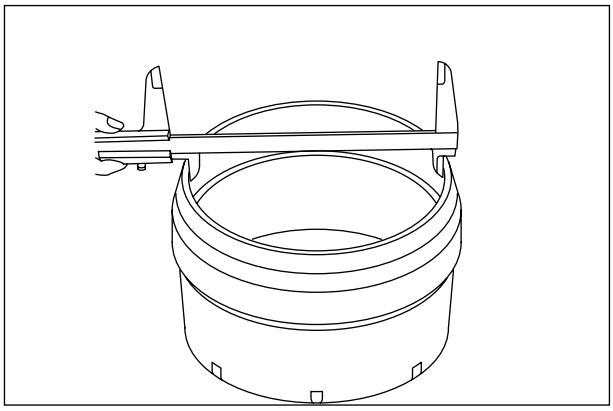


Fig. 3.270

■ REASSEMBLY

① Reassemble the wheel cylinder as follows:
- Apply brake fluid on the piston cup (1) and piston (2).
- Insert the spring (3), piston cup (1), back-up ring (4), and piston (2) into the cylinder in that order.
- Install the dust cover (5) and push rod (6) to each side of the cylinder.

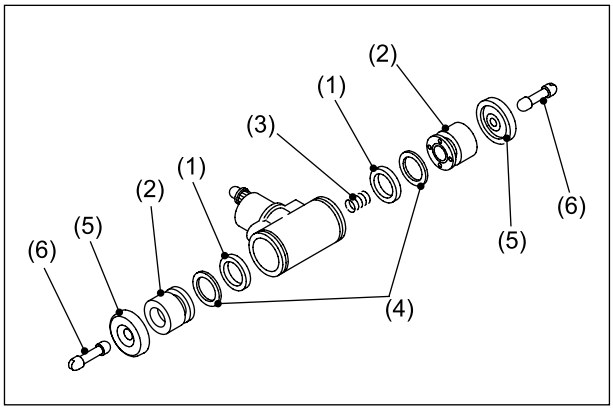


Fig. 3.271

② Install the backing plate (1) to the drive axle (3) with eight bolts (2).

274 - 323 N-m {30.0 - 33.0 kgf-m} [202.1 - 238.2 lbf-ft]

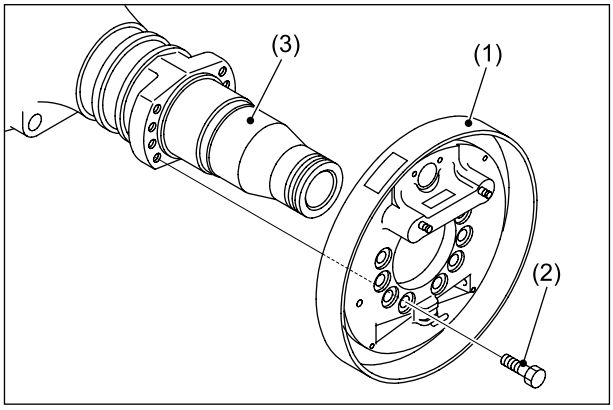


Fig. 3.272

③ Install the wheel cylinder (1) to the backing plate (3) with two bolts (2).

17.7 - 26.5 N-m {1.8 - 2.7 kgf-m} [13.1 - 19.5 lbf-ft]

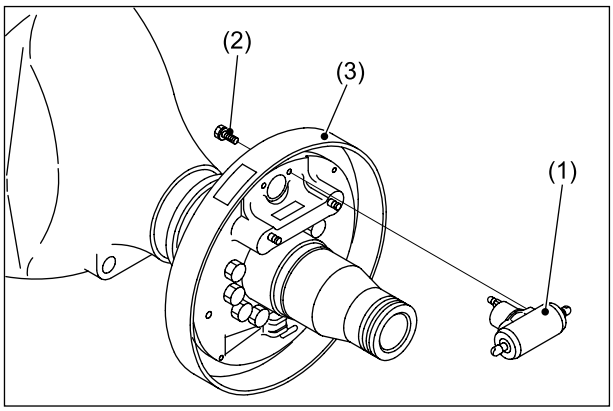


Fig. 3.273

④ Apply heat-resisting grease to the following areas (shown in Figure 3.274):

Note: Use caution not to contaminate the lining with grease.

(a) Backing plate in shoe contact area
(b) Anchor pin
(c) Parking brake lever pin
(d) Adjuster threads and other rotating parts

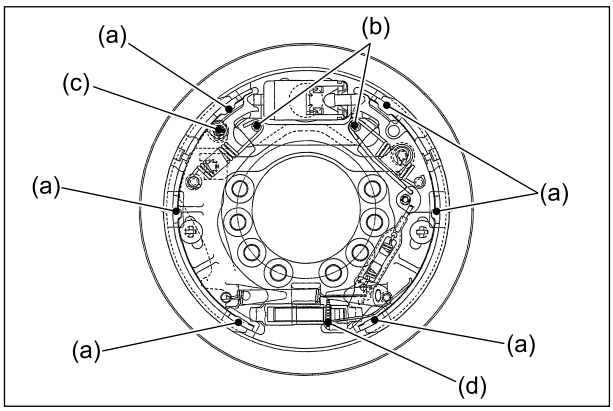


Fig. 3.274

⑤ Install the brake lever (2) to the primary shoe (1), and secure with the retainer (3) and washer (4).

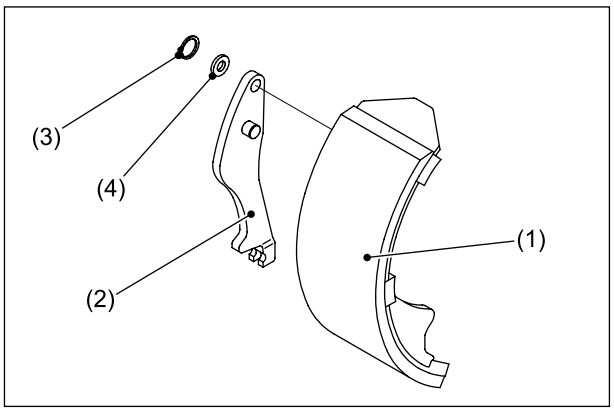


Fig. 3.275

⑥ Install the adjuster (3) and spring (4) that connect between the primary shoe (1) and secondary shoe (2).

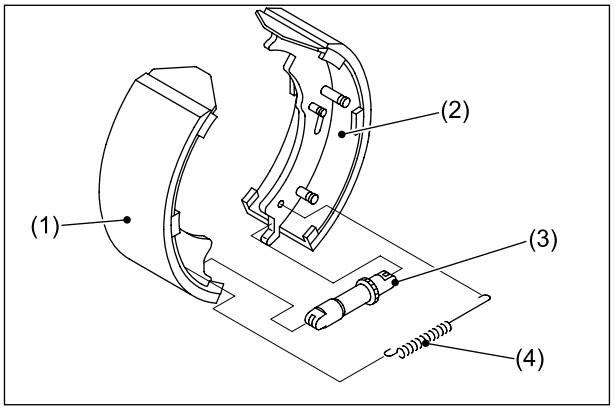


Fig. 3.276

⑦ Install the primary and secondary shoe assembly (1) onto the backing plate (2).

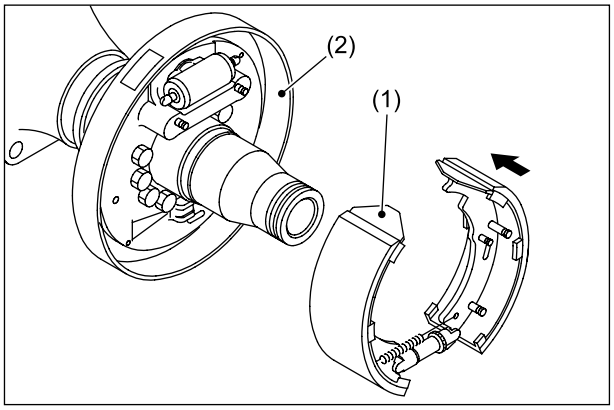


Fig. 3.277

⑧ Install the linkages (1 and 2), lever (3), washer (4), and split pin (5).

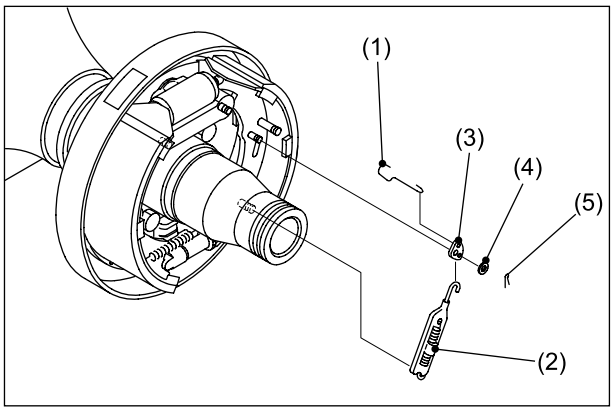


Fig. 3.278

⑨ Install the adjuster lever (1) and spring (2) onto the backing plate.

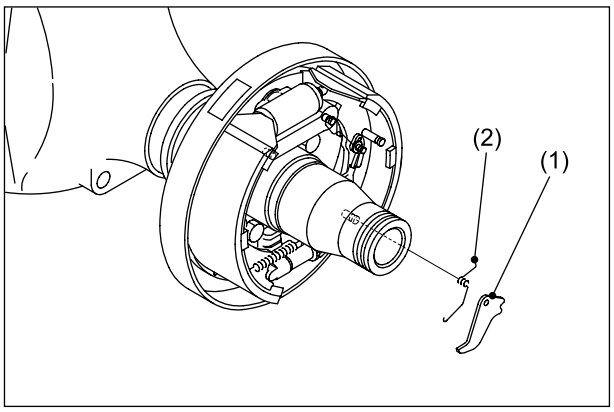


Fig. 3.279

⑩ Connect the parking cable (3) to the parking lever (2) on the primary shoe (1).

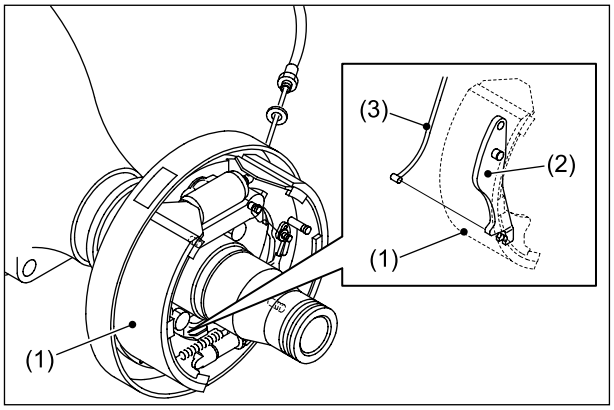


Fig. 3.280

⑪ Install the strut (1).

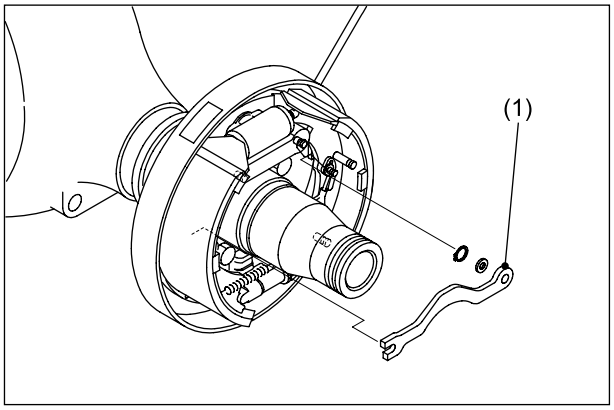


Fig. 3.281

⑫ Install the return spring (2) on the primary shoe (1).

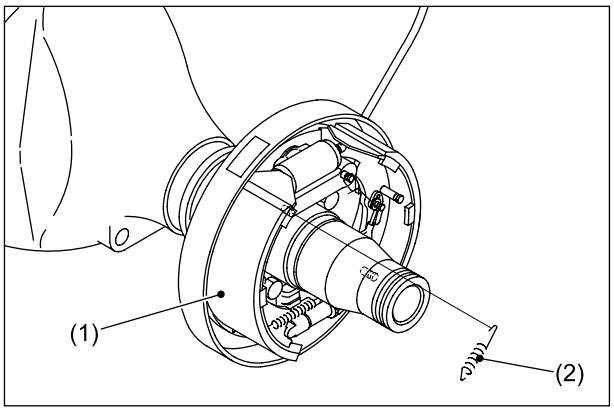


Fig. 3.282

⑬ Install the return spring (2) on the secondary shoe (1).

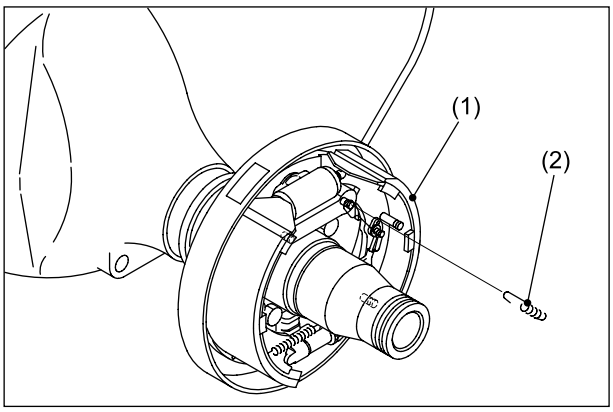


Fig. 3.283

⑭ Install the brake pipe to the wheel cylinder.

⑮ Secure the primary shoe (1) and the secondary shoe (2) in place with the hold pins (3) and the spring retainers (4).

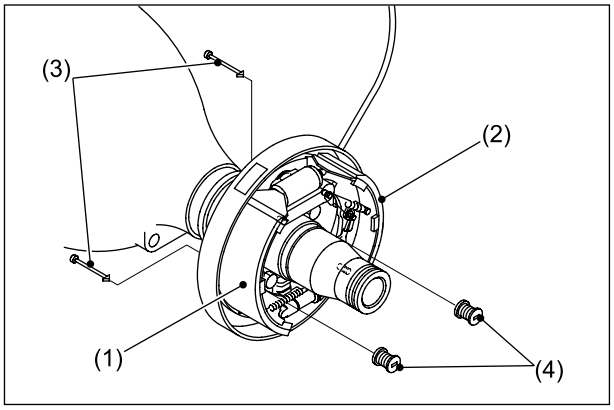


Fig. 3.284

⑯ Measure the inner diameter (a) of the brake drum and the outer diameter (b) of the shoe assembly.
Adjust the adjuster (1) so that (a) - (b) equals 1.0 mm [0.04 in.].

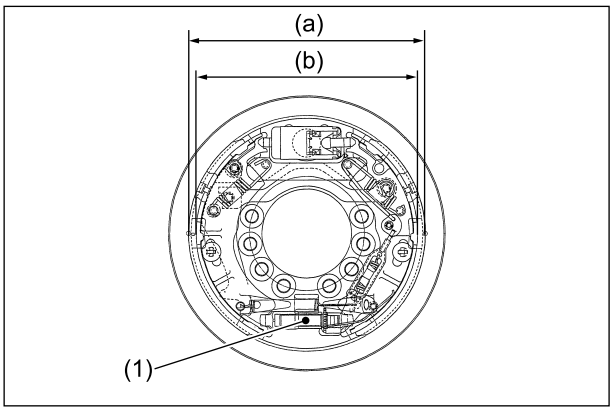


Fig. 3.285

■ OPERATION TEST OF AUTOMATIC CLEARANCE ADJUSTER (4.5- to 5.0-ton trucks)

① Adjust the brake shoe outer diameter nearly to the specified setting size. Push up the adjuster lever with the fingers to turn the adjuster teeth.
When the adjuster lever is released, it returns to the original position.

Note: The adjuster teeth may turn back slightly along with the adjuster lever when your fingers are removed, but the adjuster will operate normally when it is mounted back on the truck.

② If the adjuster won't operate as mentioned above when the adjuster lever is pushed up or released, take the following steps:

- Check the adjuster lever, adjuster, adjuster spring, adjuster cable and shoe return springs for proper installation.
- Check the shoe return springs and adjuster spring for deterioration and the adjuster for rotation, damaged tooth, or improper engagement with the adjuster lever teeth. If any defect is found, replace.

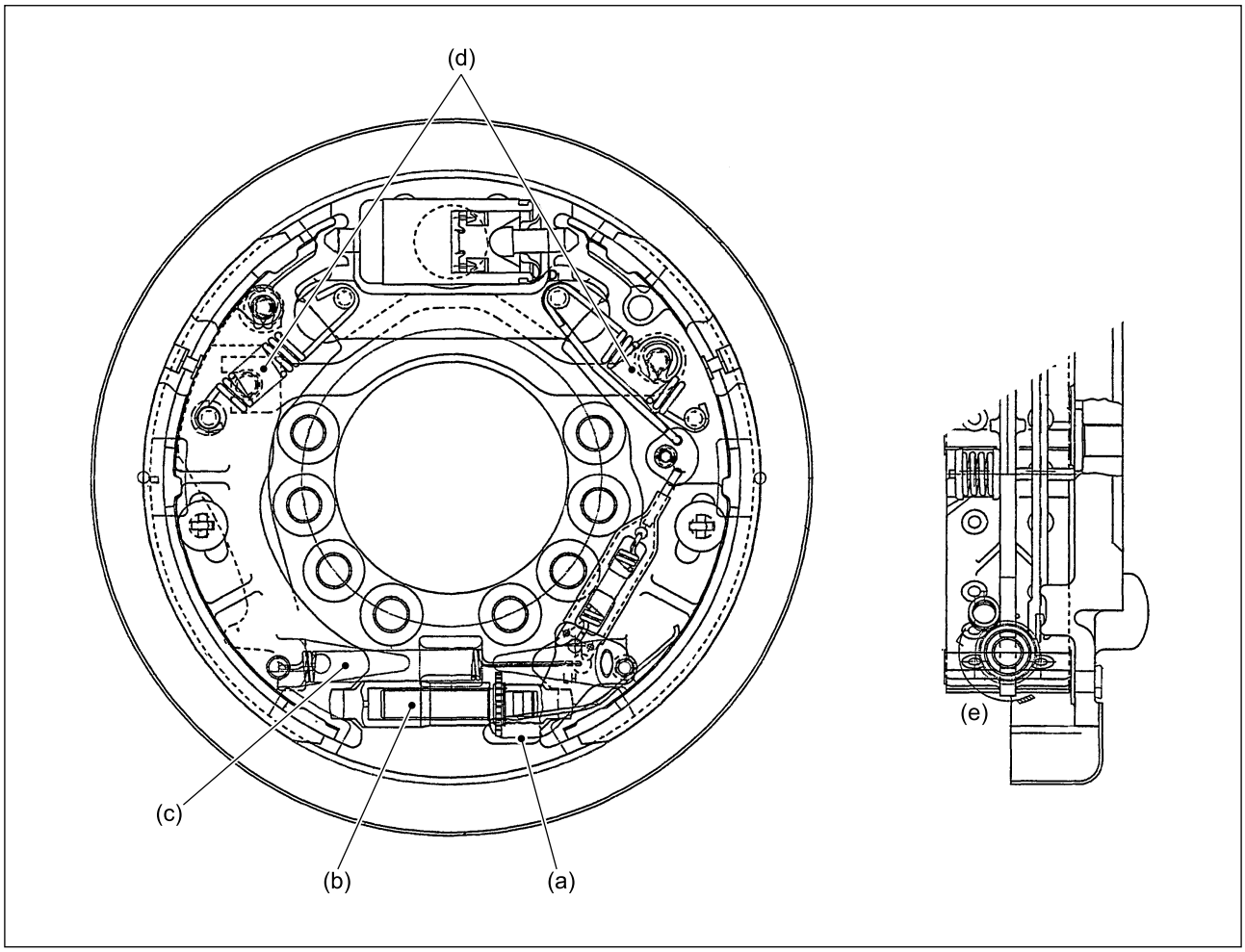


Fig. 3.286

(a) ADJUSTER LEVER
(b) ADJUSTER
(c) ADJUSTER SPRING
(d) SHOE RETURN SRPINGS
(e) Shoes expand in this direction

3.5 STEERING AXLE

■ DISASSEMBLY

① Remove the wheel cap (2) from the hub (1).

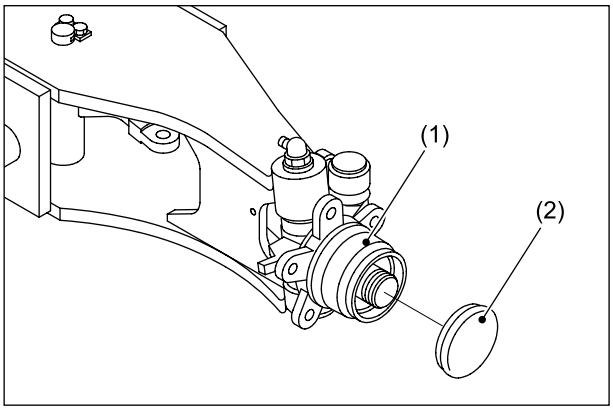


Fig. 3.287

② Release the lock on the lock washer (1) and then remove the lock nut (2).

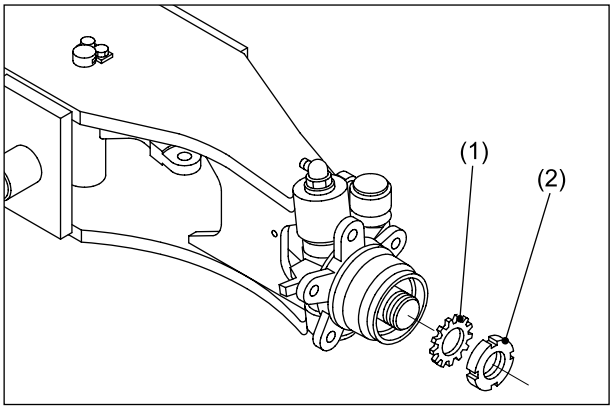


Fig. 3.288

③ Remove the bearing nut (1).

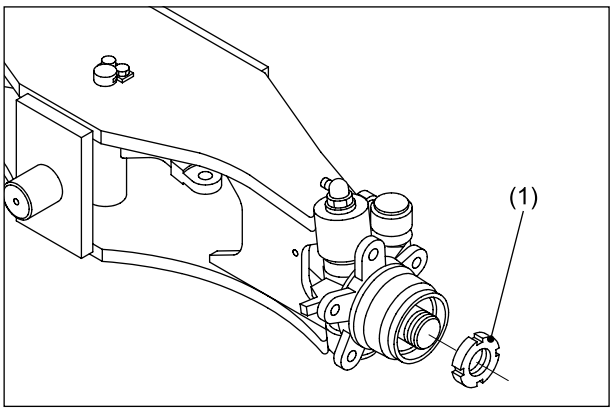


Fig. 3.289

④ Using a puller, remove the hub (1) together with the tapered roller bearing.

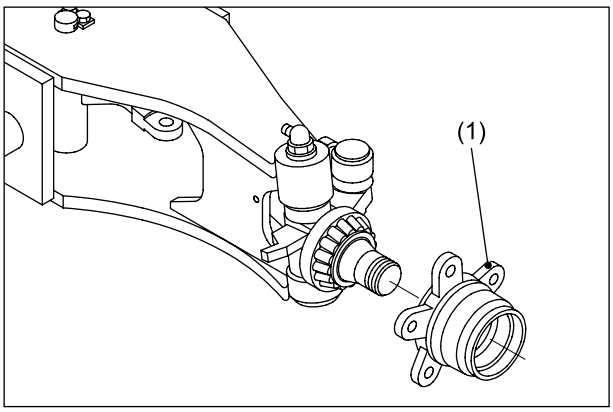


Fig. 3.290

⑤ Using a puller, remove the tapered roller bearing cone (2) from the spindle of the knuckle (1).

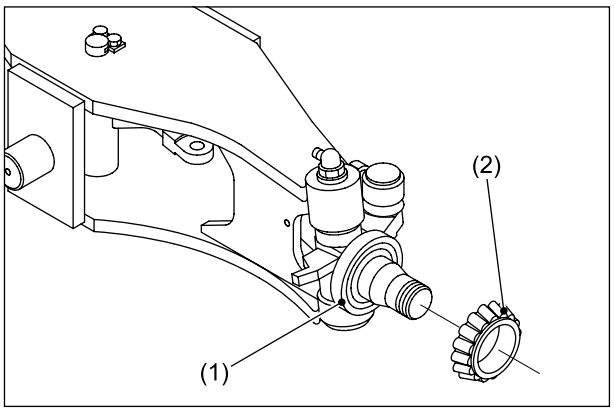


Fig. 3.291

⑥ Remove the oil seal (1).

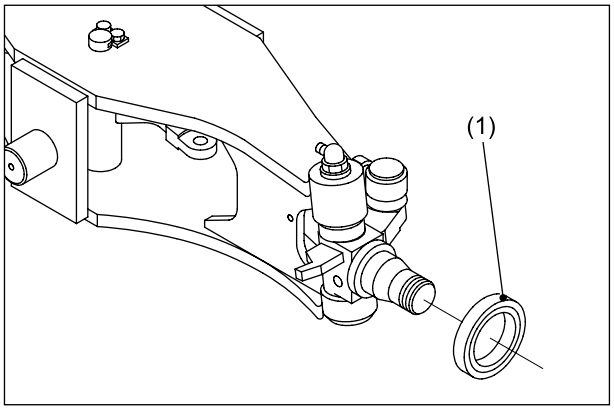


Fig. 3.292

⑦ Remove the nut (1) and split pin (2) and remove each tie rod (3).

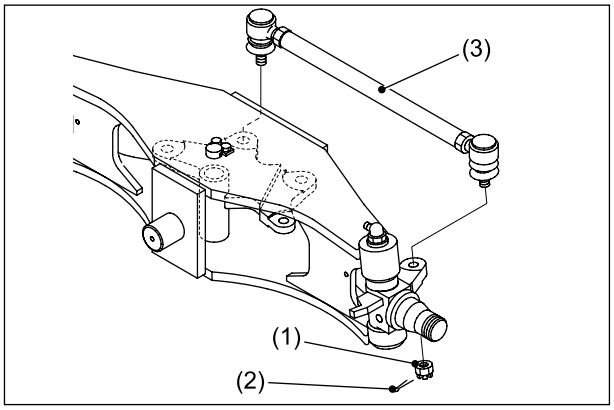


Fig. 3.293

⑧ Remove the nut (1), spring washer (2), and washer (3). Remove the lock pin (5) from the knuckle (4).

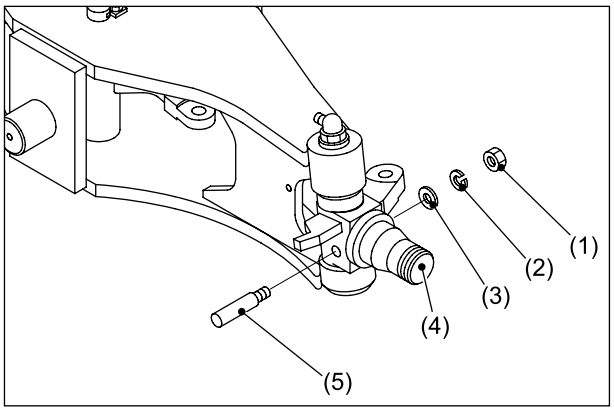


Fig. 3.294

⑨ Remove the king pin as follows:

- Remove the king pin (1).

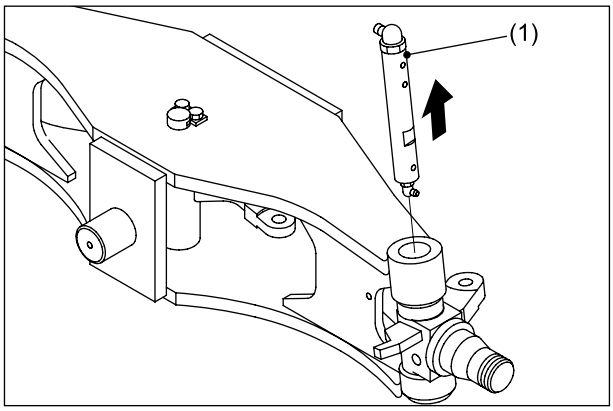


Fig. 3.295

- Remove the knuckle (2), thrust bearing (3), needle bearings (4), shims (5), spacer (6), "O"-rings (7), and oil seals (8) from between the bosses of the steering axle (1).

Note: Do not reuse the "O"-rings and oil seals that have been removed. Use new ones for reassembly.

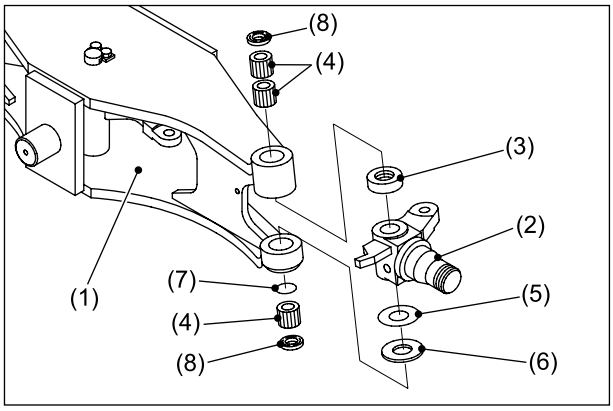


Fig. 3.296

⑩ Remove the lock plate (2) on the center arm pin (1).

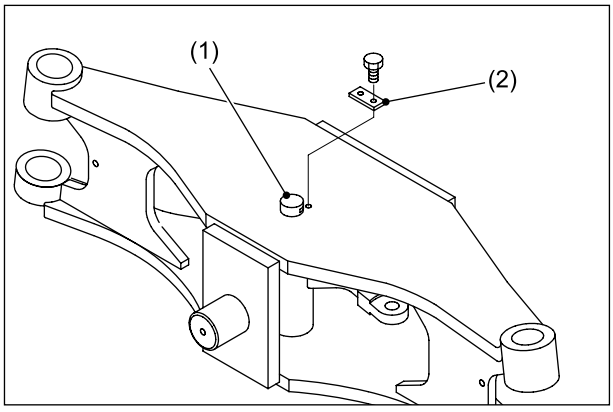


Fig. 3.297

⑪ Remove the center arm pin (1) and remove the center arm (2).

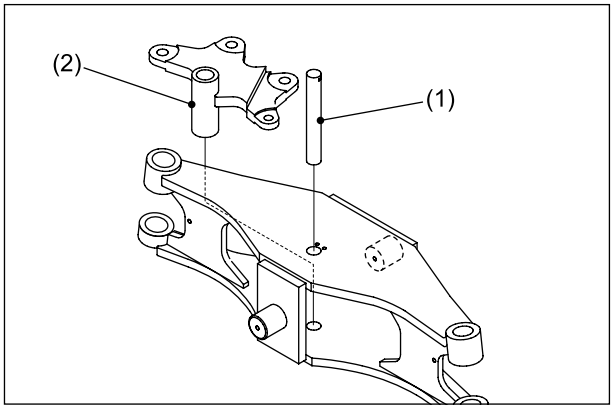


Fig. 3.298

⑫ Remove the tapered roller bearing cup (2) from the hub (1).

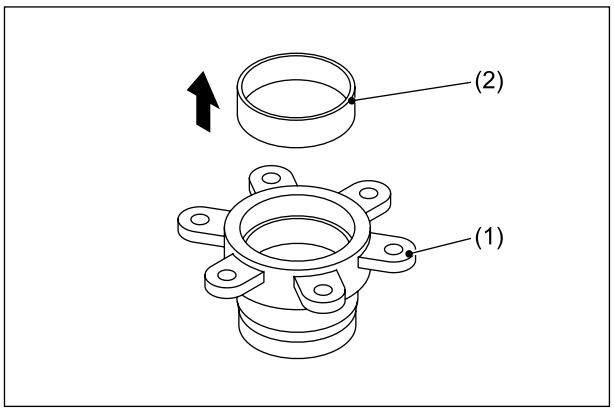


Fig. 3.299

■ REASSEMBLY

① Install the center arm (2) on the steering axle (1) using the center arm pin (3).

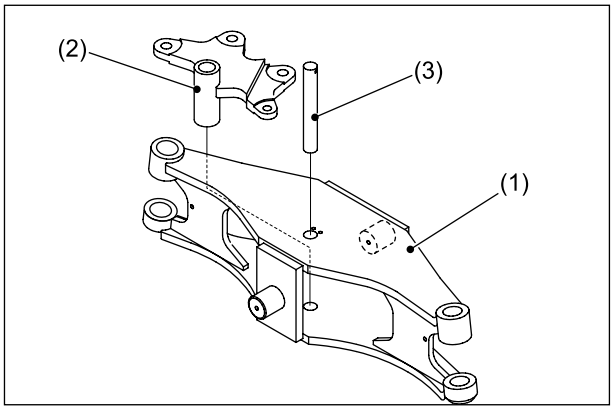


Fig. 3.300

② Install the lock plate (2) on the center arm pin (1).

7.8 - 11.7 N-m {0.8 - 1.2 kgf-m} [5.8 - 8.6 lbf-ft]

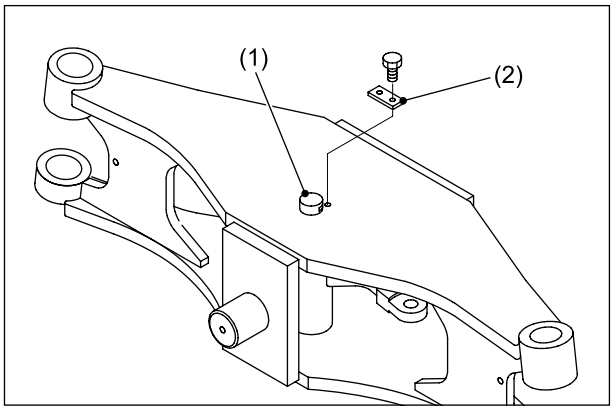


Fig. 3.301

③ Select appropriate shims as follows:
Place the thrust bearing (2) and knuckle (3) between the bosses of the steering axle (1). Select shims (4) of correct thickness to provide a clearance of 0.5 mm [0.02 in.] at "A".

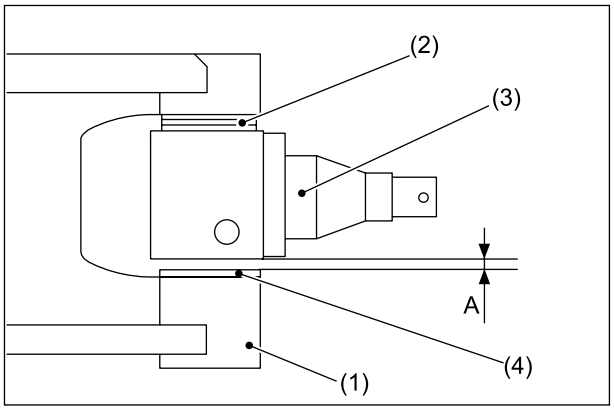


Fig. 3.302

④ Install the "O"-ring (2) to the bottom of the lower boss (1) of the steering axle.

Note: Use a new "O"-ring.

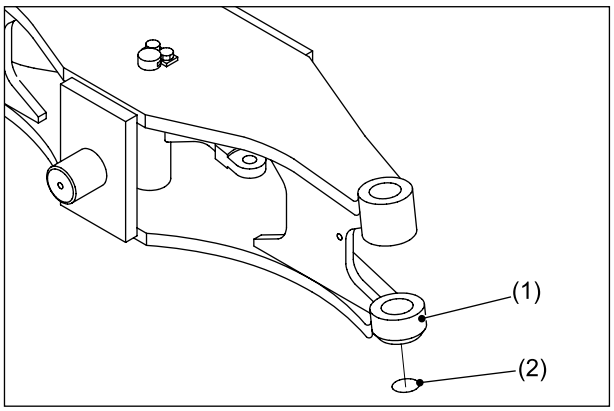


Fig. 3.303

⑤ Place the thrust bearing (1), knuckle (2), the shims (3) selected in step ③ , and spacer (4) between the steering axle bosses.

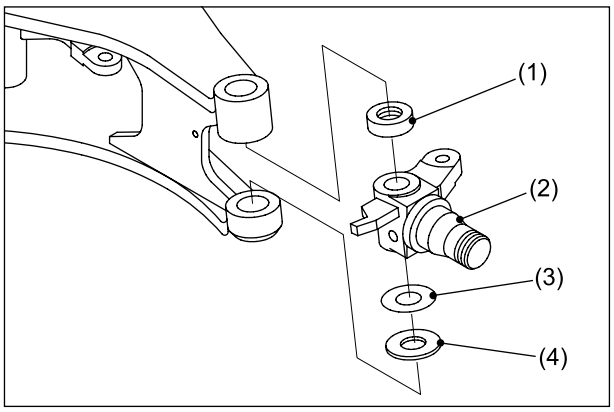


Fig. 3.304

⑥ Insert the king pin so that the notch (1) in the king pin is aligned with the lock pin hole (2) of the knuckle.

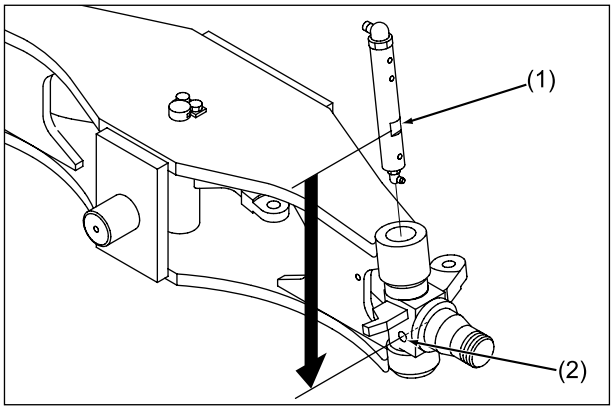


Fig. 3.305

⑦ Lock the king pin (2) with the lock pin (1), and secure with the nut (3), spring washer (4) and washer (5).

17.1 - 25.4 N-m {1.7 – 2.6 kgf-m} [12.6 - 18.7 lbf-ft]

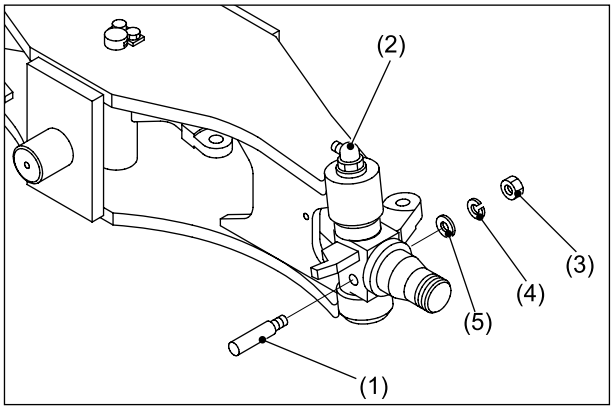


Fig. 3.306

⑧ Install the needle bearing (2) and oil seal (3) to the bottom of the king pin (1).

Note: Use a new oil seal.

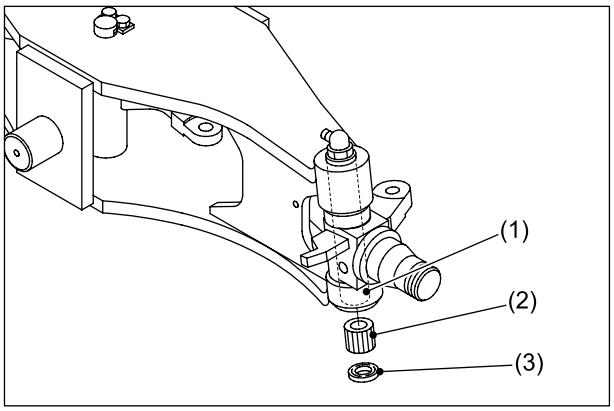


Fig. 3.307

⑨ Install the needle bearings (2) to the top of the king pin (1).

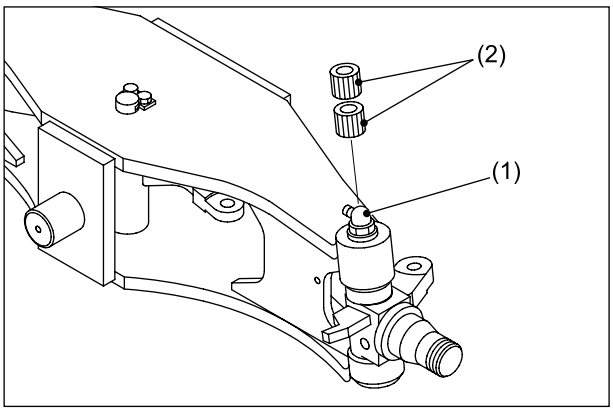


Fig. 3.308

⑩ Install the dust seal (2) to the top (1) of the king pin.

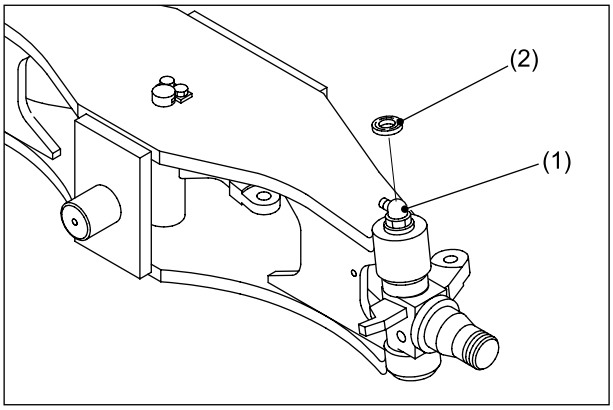


Fig. 3.309

⑪ Install the tie rod (2) on the steering axle (1) using the nut (3) and split pin (4).

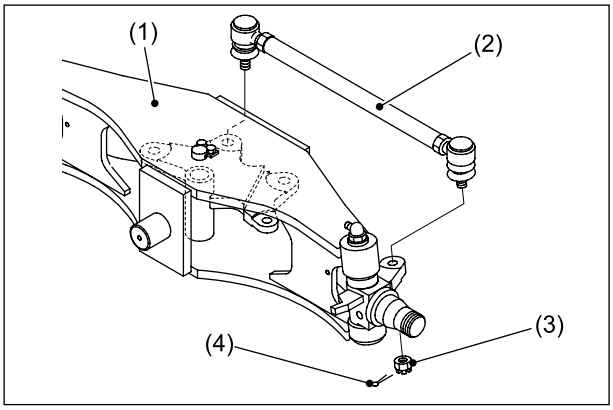


Fig. 3.310

⑫ Install the tapered roller bearing cup (1) into the hub (2).

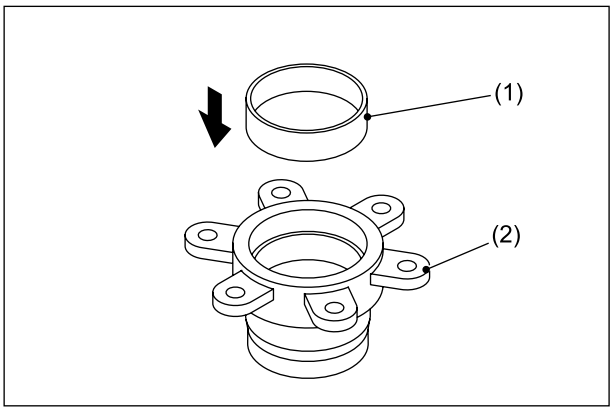


Fig. 3.311

⑬ Install the oil seal (2) onto the spindle (1) of the knuckle.

Note: Pay attention to the direction of the oil seal.

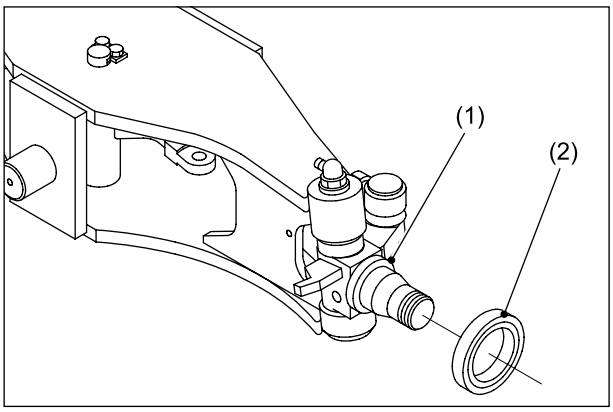


Fig. 3.312

⑭ Install the tapered roller bearing cone (1) onto the spindle of the knuckle.
Install the hub (3) onto the spindle against the oil seal (2) installed in step ⑬ .

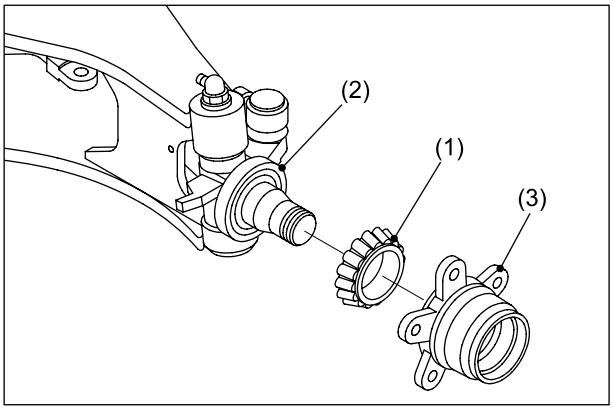


Fig. 3.313

⑮ Install the tapered roller bearing (1) and bearing nut (2) onto the knuckle spindle. Adjust the preload with the bearing nut.
Preload: 2.9 - 7.9 N-m {0.3 - 0.8 kgf-m}
[2.14 - 5.8 lbf-ft]

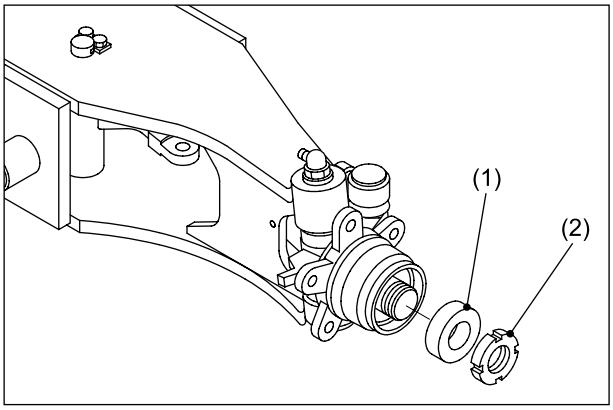


Fig. 3.314

⑯ Lock the knuckle spindle with the lock washer (1) and lock nut (2), and install the wheel cap (3).

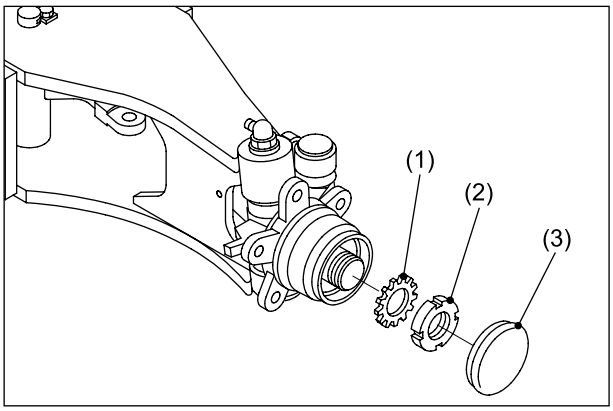


Fig. 3.315

3.6 STEERING CYLINDER

■ DISASSEMBLY

① Hold the steering cylinder assembly (1) in a vise.

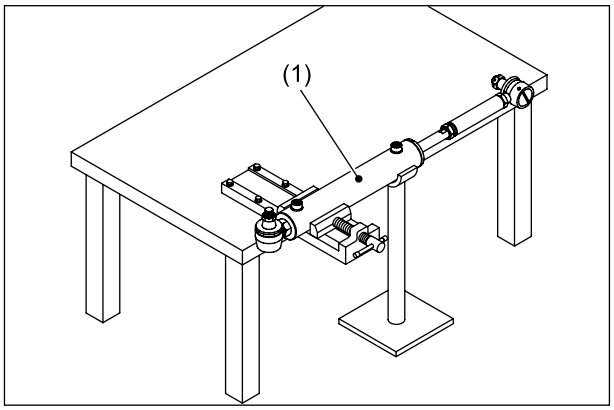


Fig. 3.316

② Loosen the nut (2) on the rod (1) and remove the ball joint assembly (3).

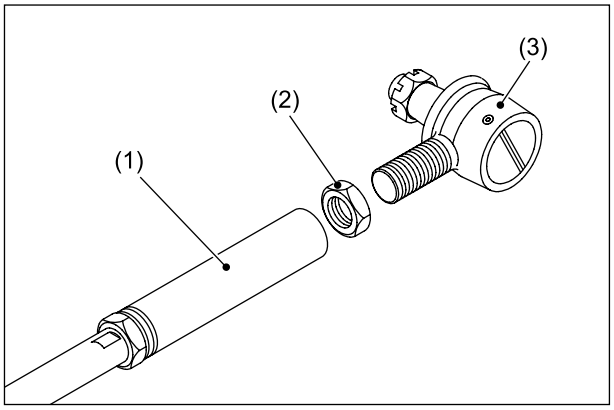


Fig. 3.317

③ Loosen the nut (2) on the rod (1) and remove the rod (1).

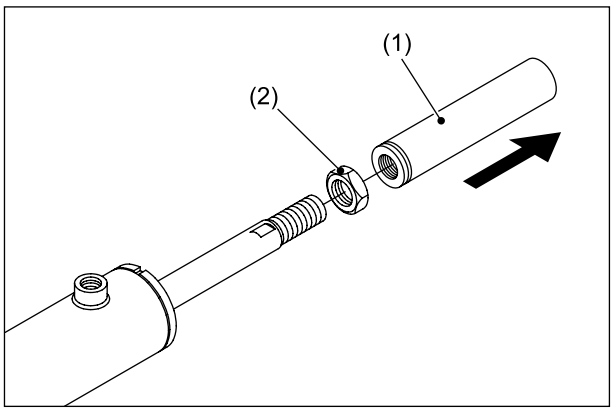


Fig. 3.318

④ Extend the caulked part of the cylinder (1) outward and remove the cylinder cap (2).

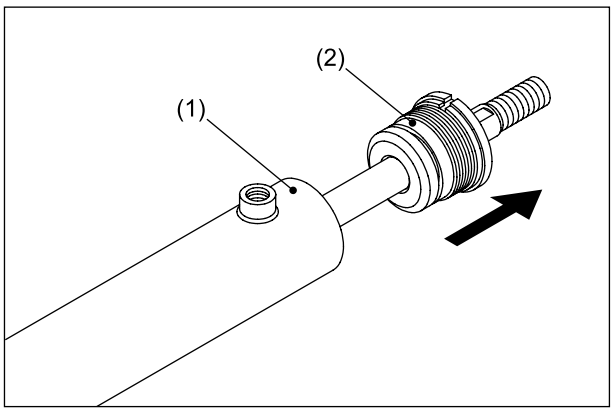


Fig. 3.319

⑤ Remove the rod assembly (1) from the cylinder (2).

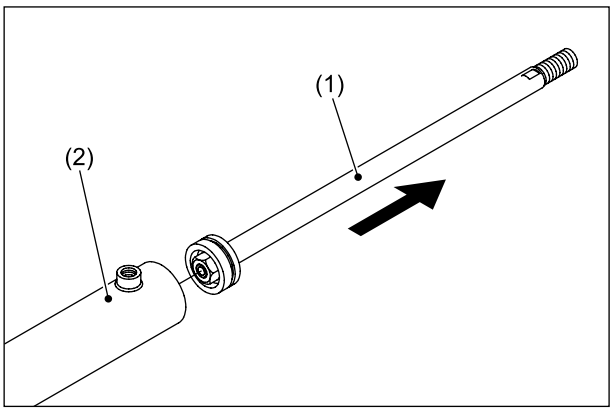


Fig. 3.320

⑥ Remove the nut (2) from the rod (1) and remove the piston (3).

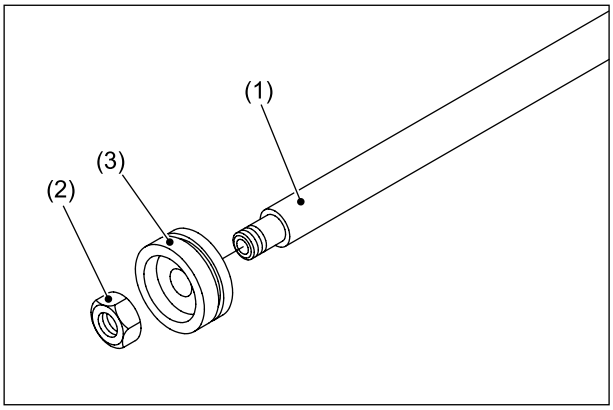


Fig. 3.321

⑦ Remove the slipper seal (2) from the piston (1).

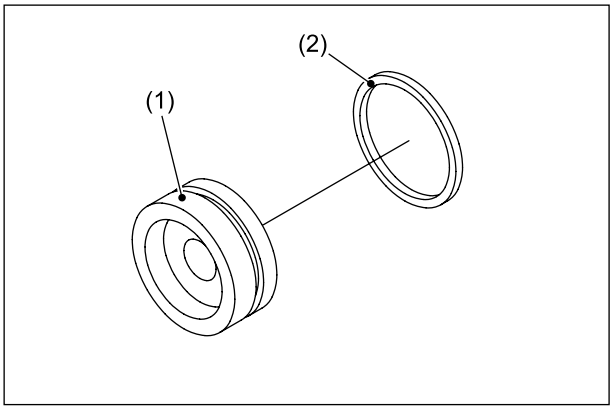


Fig. 3.322

⑧ Remove the snap ring (2) from the cylinder cap (1) and remove the oil seal (3) and bushing (4).

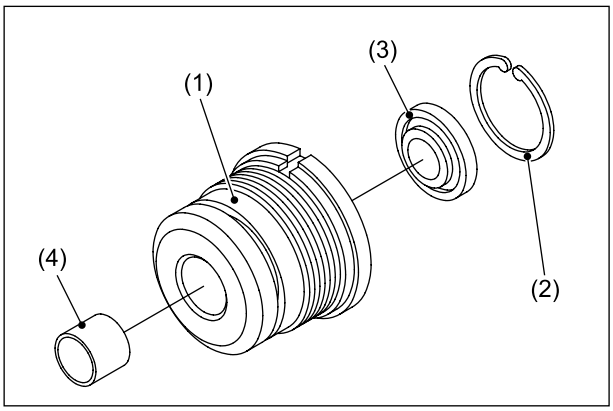


Fig. 3.323

⑨ Remove the packing (2) from the cylinder cap (1).

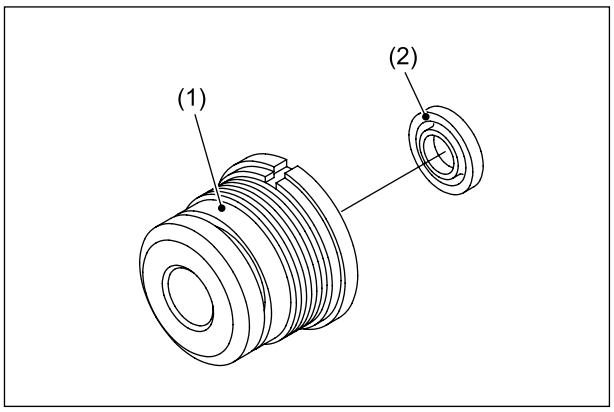


Fig. 3.324

⑩ Loosen the nut (2) on the tail end (1) of the cylinder and remove the ball joint assembly (3).

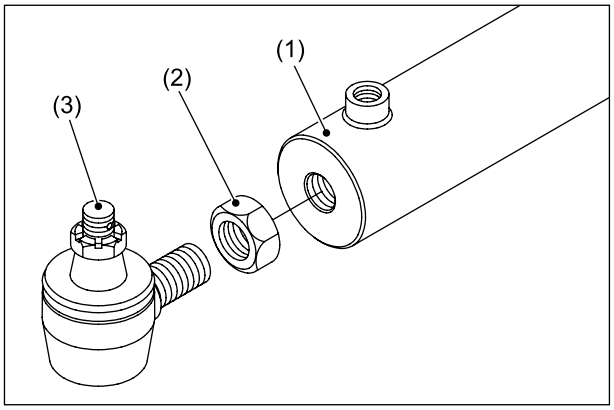


Fig. 3.325

■ REASSEMBLY

① Install the ball joint assembly (2) on the tail-end (1) of the cylinder.

294 N-m {30 kgf-m} [216.8 lbf-ft]

Apply LOCTITE#270 on the threaded part.

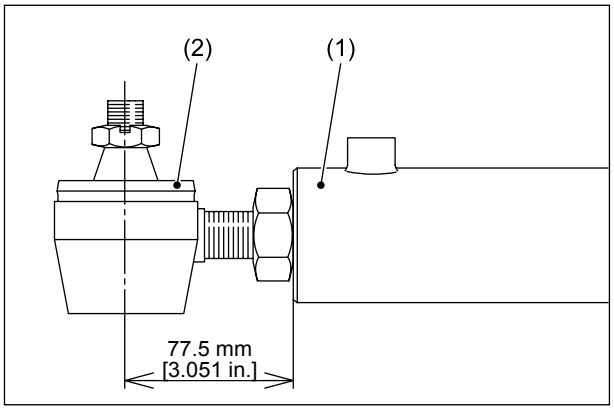


Fig. 3.326

② Install the packing (2) and oil seal (3) on the cylinder cap (1), and secure with the snap ring (4).

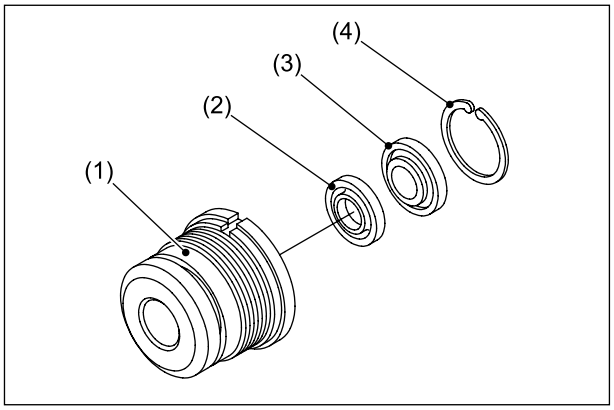


Fig. 3.327

③ Install the "O"-ring (2) and bushing (3) on the cylinder cap (1).

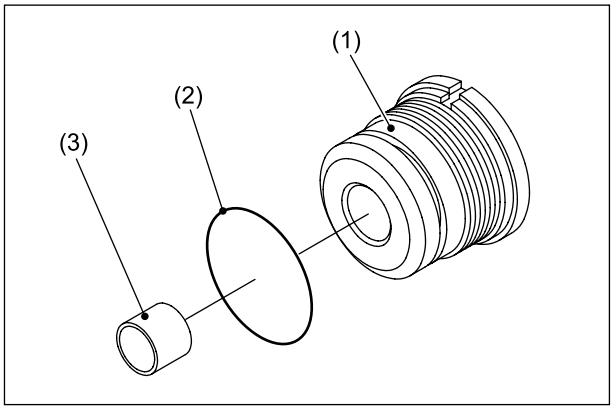


Fig. 3.328

④ Install the slipper seal (2) on the piston (1).

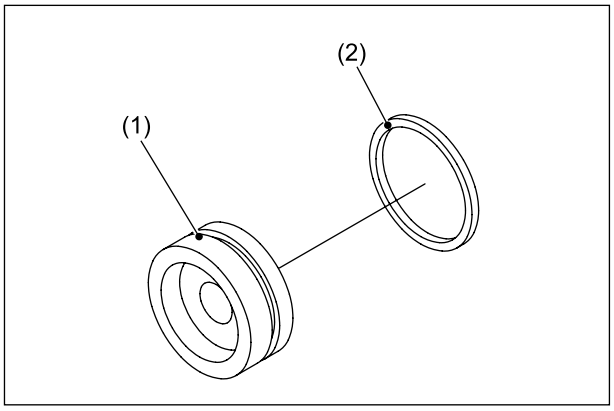


Fig. 3.329

⑤ Install the piston (1) on the rod (2) using the nut (3).

167 N-m {17 kgf-m} [123.2 lbf-ft]

Apply LOCTITE#270 on the threaded part.

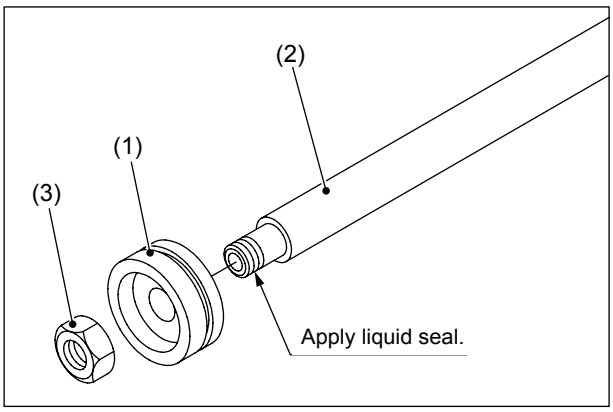


Fig. 3.330

⑥ Insert the rod assembly (1) into the cylinder (2) and install the cylinder cap assembly (3) on the cylinder (2). Stake the cylinder (2) at one place.

98 N-m {10 kgf-m} [72.3 lbf-ft]

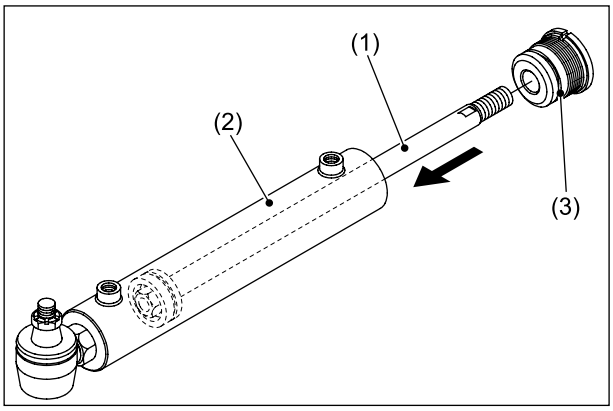


Fig. 3.331

⑦ Install the rod (1) and secure with the nut (2).

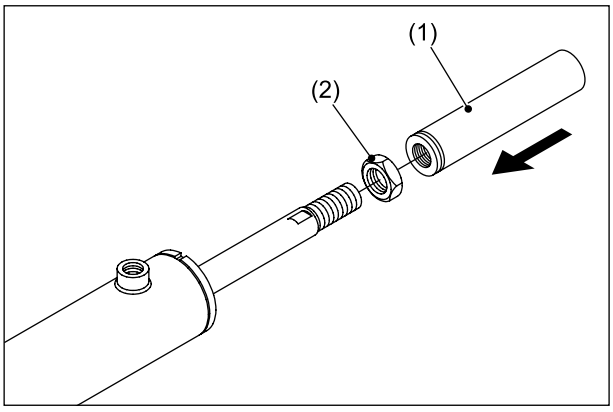


Fig. 3.332

⑧ Install the ball joint assembly (1) on the rod (2).

294 N-m {30 kgf-m} [216.8 lbf-ft]

Apply LOCTITE#270 on the threaded part.

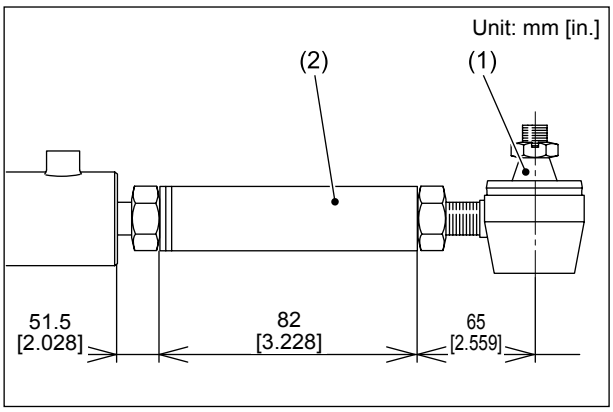


Fig. 3.333

3.7 STEERING GEAR BOX

■ DISASSEMBLY

① Hold the steering gear box assembly in a vise.

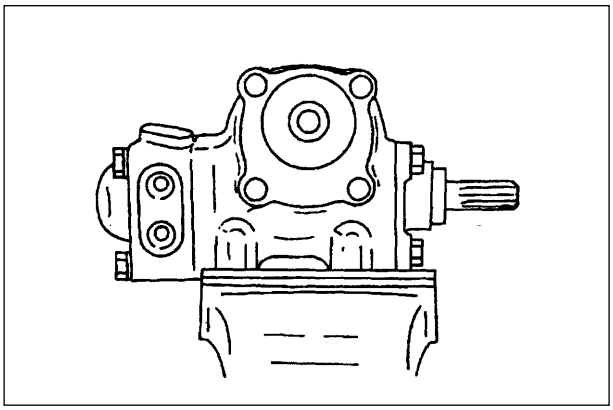


Fig. 3.334

② Remove the cap nut and packing from the adjustment screw. Remove the bolts securing the side cover in place. Then remove the side cover by turning the adjustment screw clockwise.

Note: Use caution not to lose the side cover "O"-ring.

Remove the adjustment screw and shims from the sector shaft.

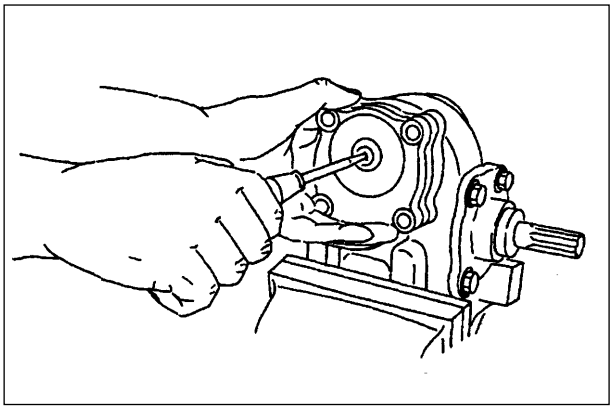


Fig. 3.335

③ Rotate the worm shaft so that the sector shaft teeth are positioned as shown in Fig. 3.336. Remove the sector shaft by tapping gently on the serrations of the sector shaft with your hand.

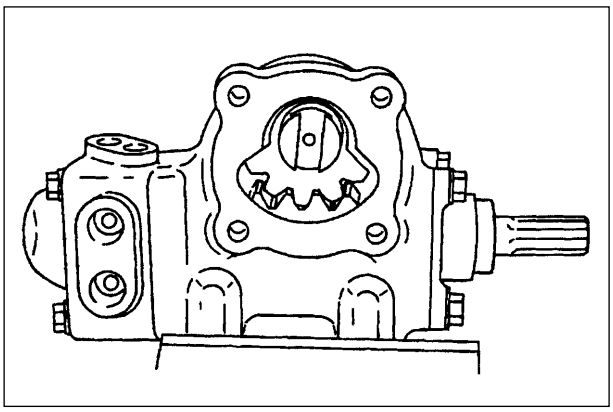


Fig. 3.336

④ Remove the bolts securing the end cover and remove the end cover. Use caution not to lose the "O"-ring.

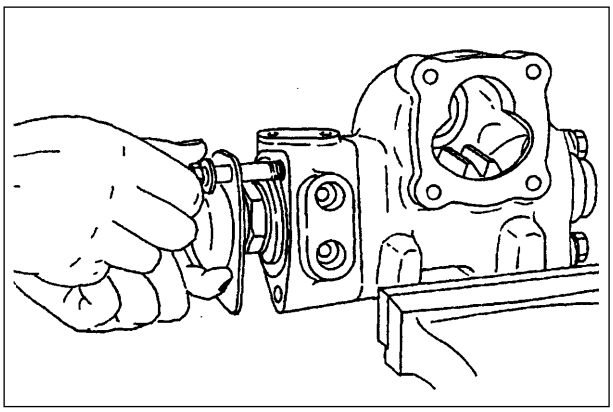


Fig. 3.337

⑤ Install the jig (Figure 3.339), as shown in Figure 3.338.
Raise the staked portion of the lock nut using a screwdriver and remove the thrust race and thrust bearing.

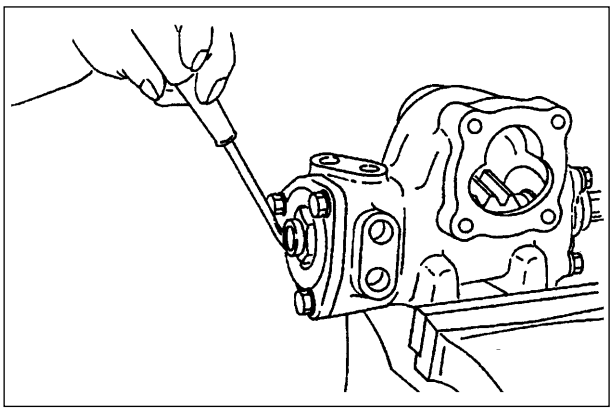


Fig. 3.338

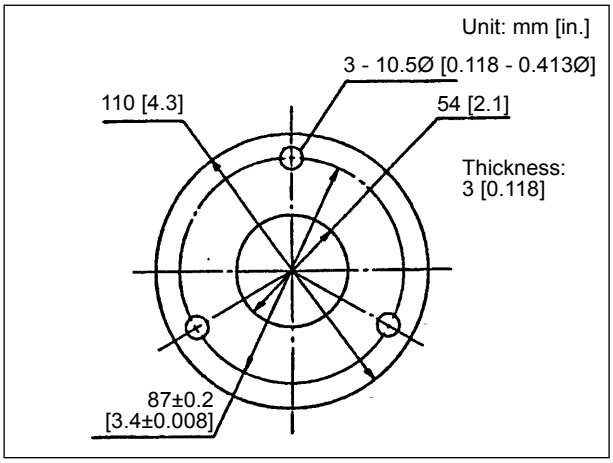


Fig. 3.339

⑥ Remove the three bolts by loosening them alternately, so that the jig does not tilt. Use caution not to allow the action piston to drop out.
Make sure to hold the control valve with one hand while removing each bolt. Failure to do so will cause the control valve to drop out of the gear box.

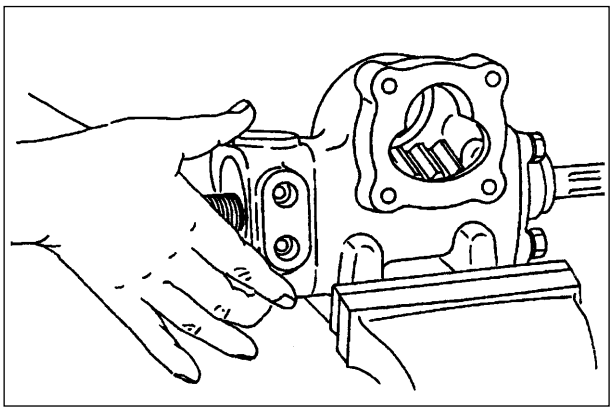


Fig. 3.340

⑦ Remove the bolts securing the top cover. Remove the top cover by prying it carefully with a screwdriver. Use caution not to damage the “O”-ring.

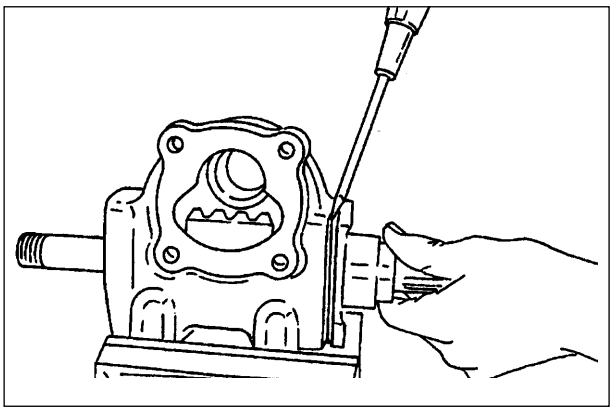


Fig. 3.341

⑧ Remove the ball nut assembly from the gear box carefully. Make sure to keep the ball nut assembly horizontally at all times. If it is turned vertically, the ball nut may fall off by itself and get damaged, which will prevent the ball nut assembly from operating properly.

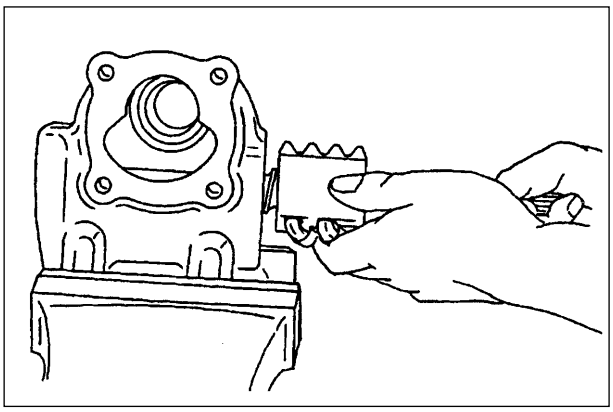


Fig. 3.342

■ INSPECTION

Clean all the disassembled metal parts in clean oil. The "O"-rings and oil seals must be replaced with new ones. After cleaning those metal parts, check them for scratches, wear, or cracks. Place them in a clean location to keep them free of dust and dirt.

① Replace the "O"-rings and oil seals with new ones. Replace the side cover bushing with a new one if it is damaged or worn.

② Check the ball nut operation. If it fails to operate smoothly, clean it by operating it in a oil bath. Also check the threads on the nut for stripping, nicks, indentations, or abnormal wear. If any defects are found, replace the ball nut assembly with a new one.

③ Check the sector shaft gear teeth for scoring. Also check the sector shaft for excessive wear. Replace as needed.

④ Check the radial bearings of the gear box assembly and the side cover bushing for wear. Replace any defective parts with new ones.

⑤ Check the radial bearings in the top cover. If any damage is found, replace them with new ones.

⑥ Check the control valve as follows:

1) Check the inner surface of the valve housing, paying special attention to the orifice, for dents. If any defects are found, replace the complete control valve assembly with a new one.
2) Check the spool's outer diameter and the orifice for dents or damage. Replace any defective parts with new ones.
3) Check all the springs for cracks or breaks. Replace any defective spring with a new one.
4) Check to see if the reaction pistons slide smoothly in the valve housing. If defective, replace the complete valve assembly with a new one.

■ REASSEMBLY

① Reassembling control valve

1) Install the spool into the valve housing, aligning the “P” mark on the valve housing with the end of the spool that has a smaller chamfer on the inner diameter.
2) Install the reaction pistons and centering springs in the valve body.

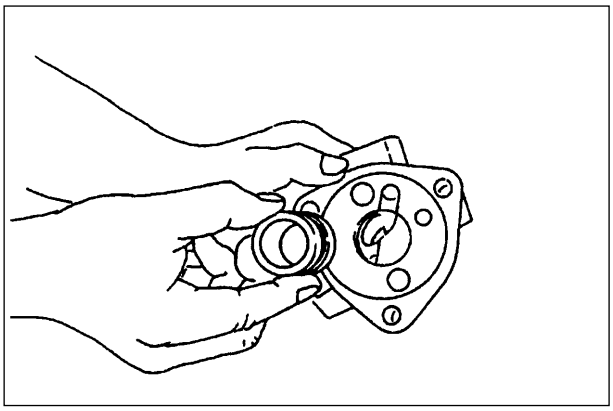


Fig. 3.343

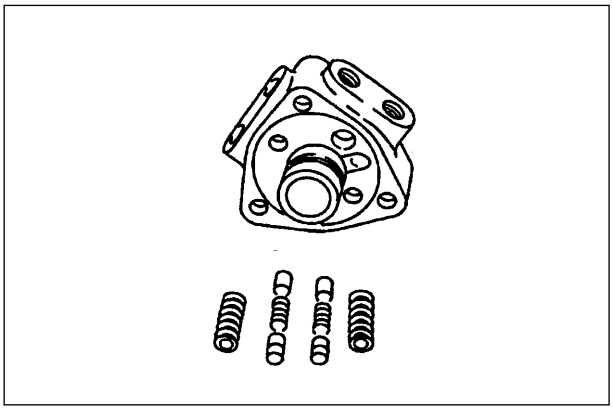


Fig. 3.344

② Hold the gear case in a vise and apply grease to the oil seal in the gear case.

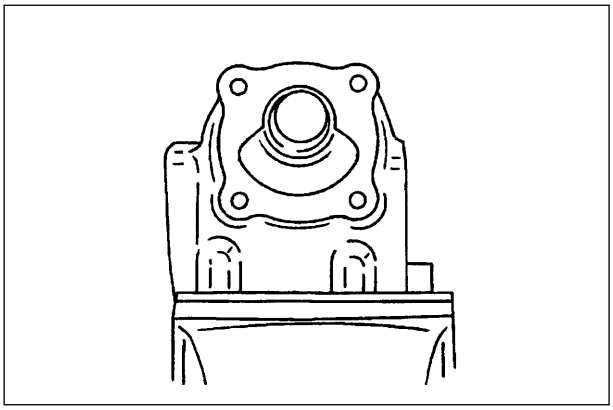


Fig. 3.345

③ Install the ball nut assembly in the gear case, with the rack gear section facing up.

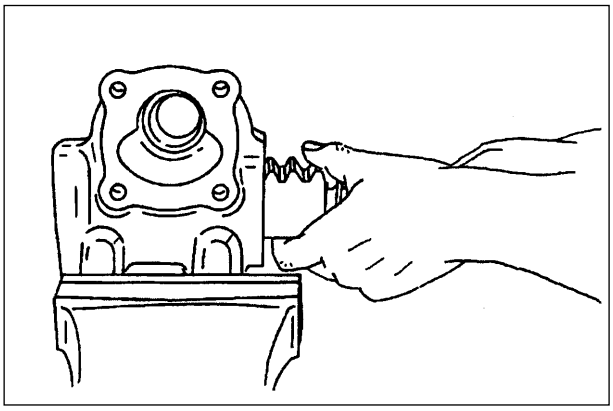


Fig. 3.346

④ Install the top cover on the gear case as follows. Apply grease to the oil seal. Also apply a thin coat of grease to the “O”-ring in the gear case where the top cover will be installed. Gradually press the top cover against the gear case. Do not force it into position, to prevent damaging the “O”-ring.

34.3 - 53.0 N-m {350 - 540 kgf-cm} [25.3 - 39.1 lbf-ft]

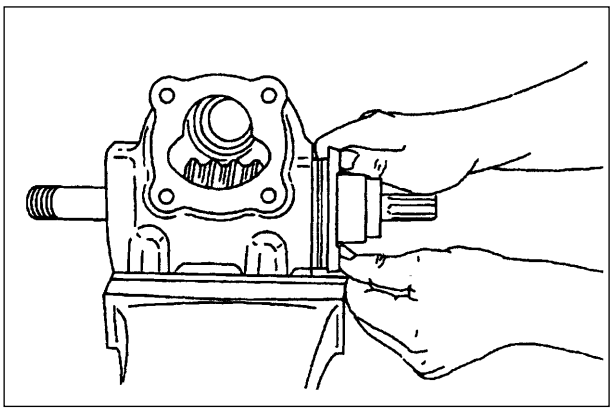


Fig. 3.347

⑤ Install the thrust race, needle bearing, and thrust race on the worm shaft.

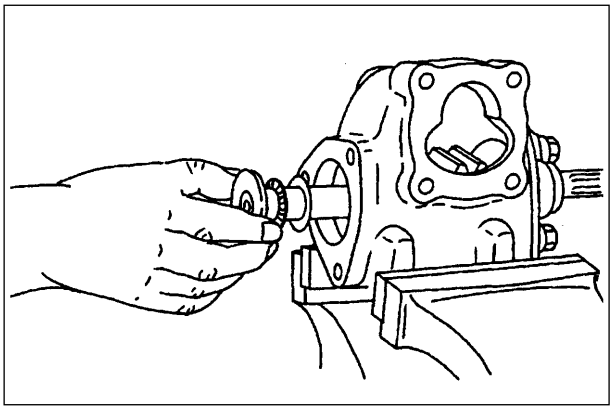


Fig. 3.348

⑥ Install the control valve assembly on the gear case, using caution not to allow the reaction pistons to fall out. Make sure that the “O”-ring in the gear case is seated snugly in the groove.

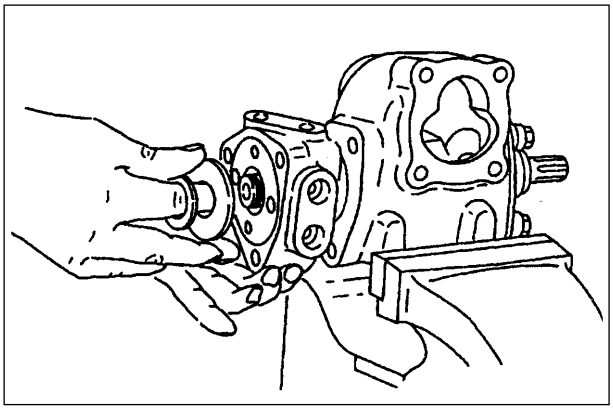


Fig. 3.349

⑦ Install the jig, shown in Fig. 3.339, on the control valve. Then install the thrust race, needle bearing, and the other thrust race, in that order.

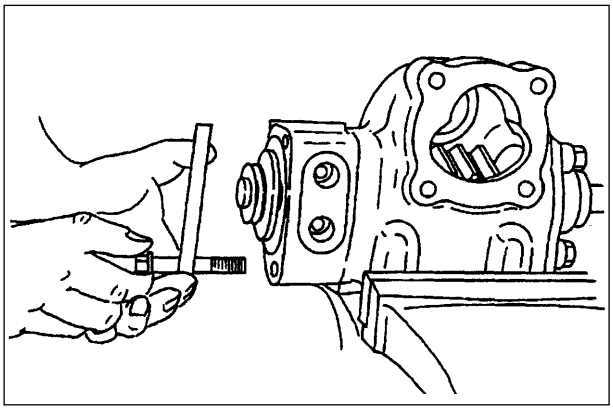


Fig. 3.350

⑧ Install the lock nut as follows. With the worm shaft turned fully counterclockwise, finger-tighten the lock nut until there is no play in the thrust bearing. Mark the lock nut to identify the position of the groove in the worm shaft. Then loosen the lock nut and make it finger tight again. Check to make sure if the position of the mark has not changed. If it is unchanged, tighten the lock nut about 5 degrees further.

- Starting torque: 0.98 N-m {10 kgf-cm} [0.72 lbf-ft] or less

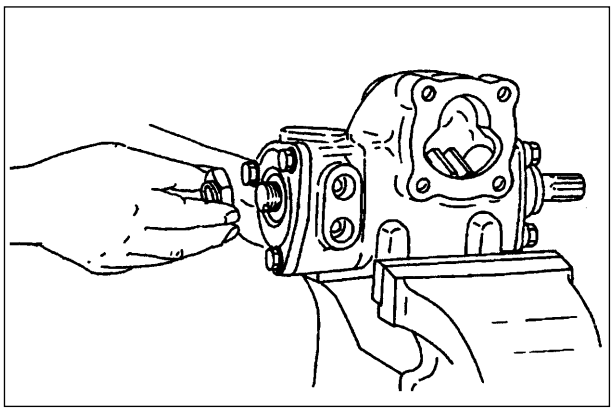


Fig. 3.351

⑨ Stake the lock nut.

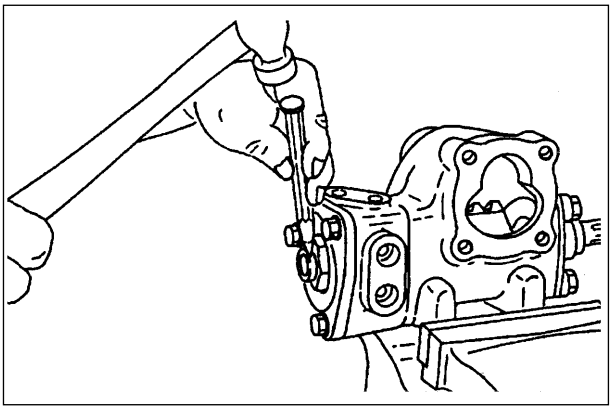


Fig. 3.352

⑩ Install the "O"-ring in the end cover groove and install the end cover.

37.3 - 56.9 N-m {380 - 580 kgf-cm} [27.51 - 41.97 lbf-ft]

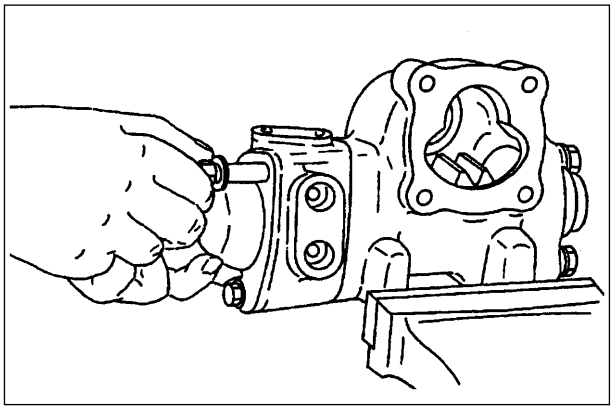


Fig. 3.353

⑪ Align the center of the rack gear in the ball nut with the center of the opening where the side cover will be installed.

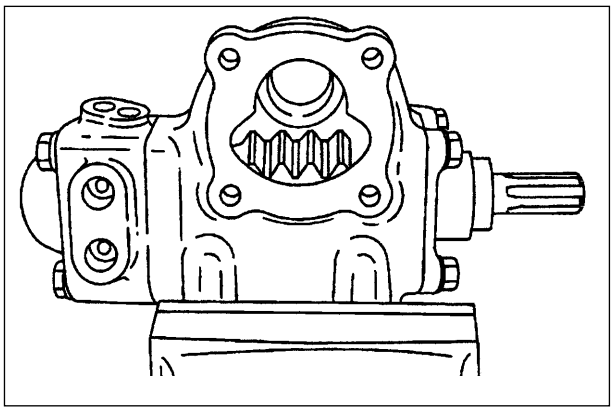


Fig. 3.354

⑫ Install the sector shaft in the gear case. Install the adjustment screw and shims in the sector shaft groove. Install the "O"-ring in the groove in the side cover. Align the screw hole in the side cover with the adjustment screw. Then install the side cover by turning the adjustment screw.

34.3 - 53.0 N-m {350 - 540 kgf-cm} [25.3 - 39.1 lbt-ft]

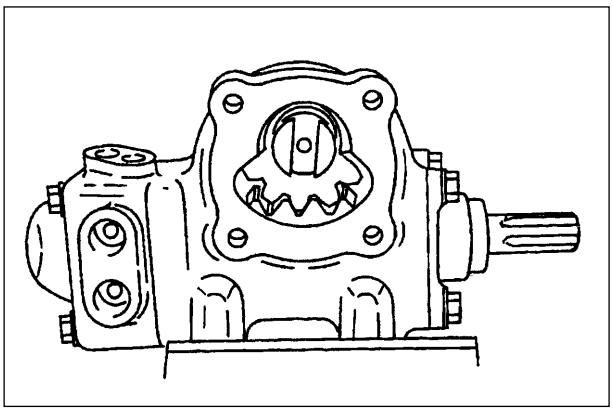


Fig. 3.355

⑬ Install the pitman arm in the middle of the worm shaft range of movement. Next, place a dial gauge 150 mm [5.906 in.] away from the center of the pitman arm. Measure any looseness in the pitman arm.

● Tolerance: less than 0.3 mm [0.012 in.]

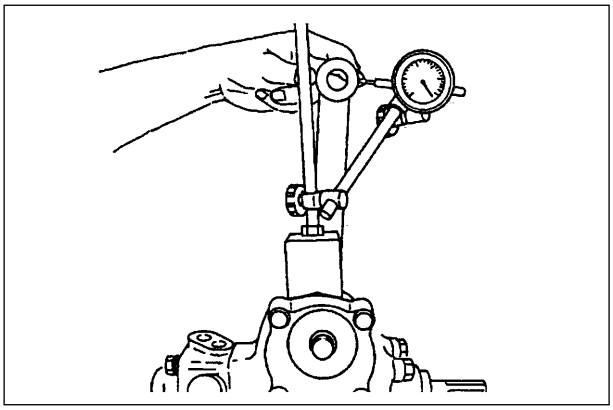


Fig. 3.356

If the measured looseness is greater than 0.3 mm [0.012 in.], adjust it using the adjustment screw. After making any needed adjustment, install the packing and secure with the lock nut. Then install the packing and the cap nut.

19.6 - 29.4 N-m {200 - 300 kgf-cm} [14.5 - 21.7 lbf-ft]

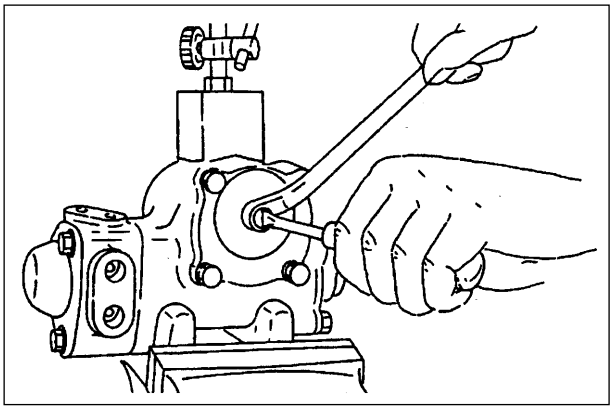


Fig. 3.357

⑭ Turn the worm shaft and count the total number of turns to the end.

● Total number of turns: 4-2/3

⑮ Turn the worm shaft fully clockwise or counterclockwise until it reaches the stop. Release the worm shaft and it should turn back about 50 degrees smoothly by itself.

3.8 TILT CYLINDER

■ DISASSEMBLY

① Hold the tail-side boss (1) of the tilt cylinder in a vise (2), and support the other side of the tilt cylinder with the block (3).
② Loosen the lock nut (4) and remove the joint (5) and collar (6) from the rod.

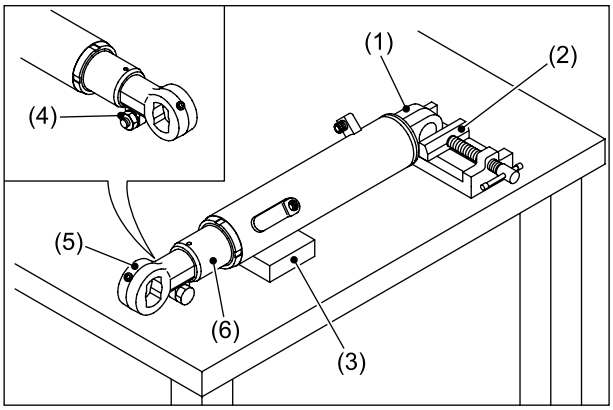


Fig. 3.358

③ Remove the cylinder cap (1) using a hook wrench.

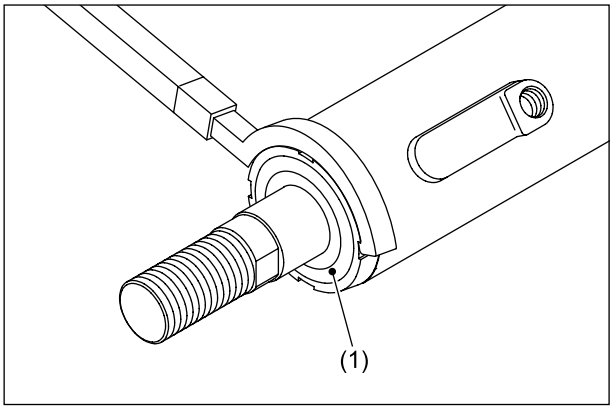


Fig. 3.359

④ Pull out the rod (1) to remove the piston (3) from the cylinder (2).

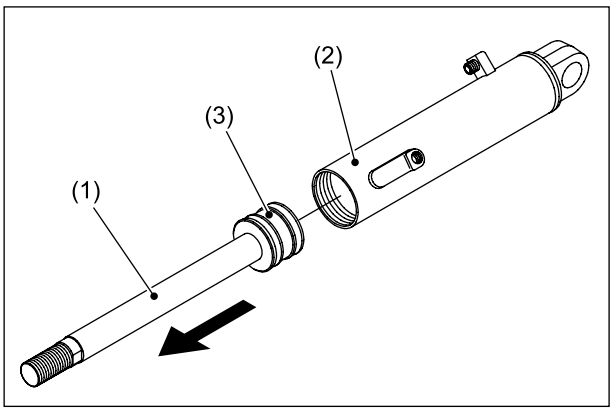


Fig. 3.360

⑤ Raise the staked parts of the nut (2) securing the piston (1) and remove the nut (2).
⑥ Remove the piston (1) from the rod (3).

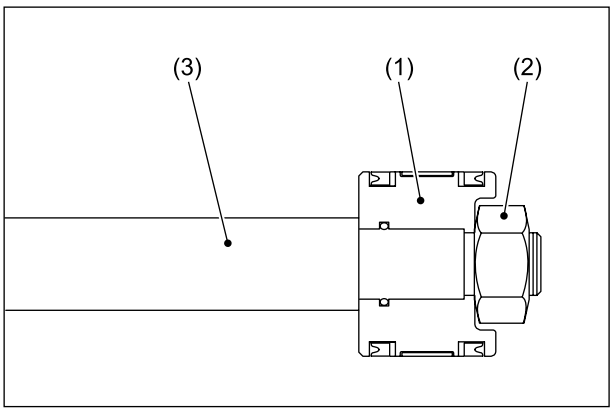


Fig. 3.361

⑦ Remove the wear ring (1), packings (2), and back-up rings (3) from the outer diameter of the piston.
⑧ Remove the “O”-ring (4) from the piston groove.

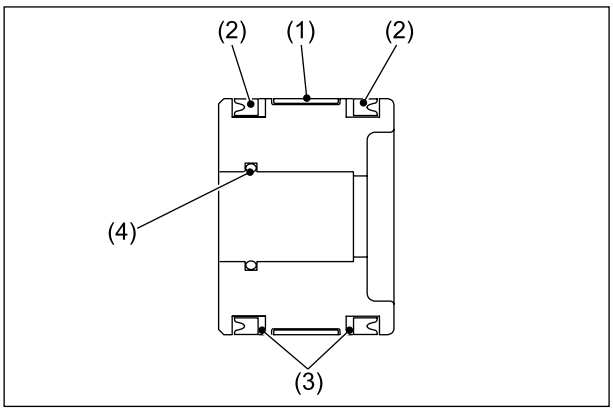


Fig. 3.362

⑨ Remove the “O”-rings (1) from the outer diameter of the cylinder cap.
⑩ Remove the packing (2), back-up ring (3), dust seal (4), and bushing (5) from the inner diameter of the cylinder cap.

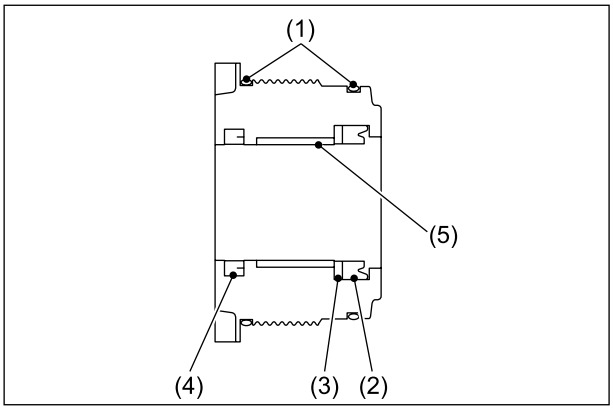


Fig. 3.363

■ REASSEMBLY

① Install the back-up ring (1), packing (2), dust seal (3), and bushing (4) on the inner diameter of the cylinder cap.
② Install the “O”-rings (5) on the outer diameter of the cylinder cap.

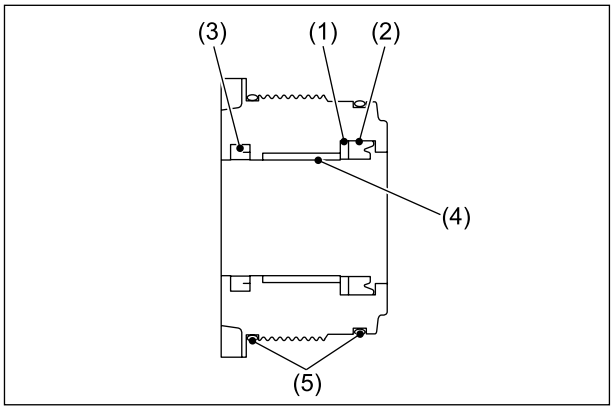


Fig. 3.364

③ Install the wear ring (1), packings (2), and back-up rings (3) on the outer diameter of the piston.
④ Install the “O”-ring (4) in the piston groove.

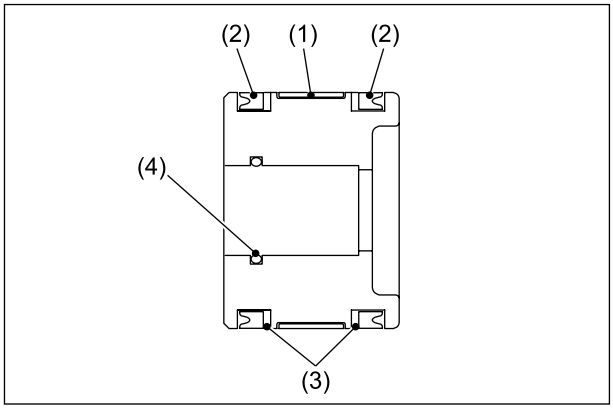


Fig. 3.365

⑤ Install the piston (2) on the rod (1).

⑥ Install the nut (3) on the rod (1). Stake the nut at three places around the edge.

735±74 N-m {75±7.5 kgf-m} [542.1±54.6 lbf-ft]

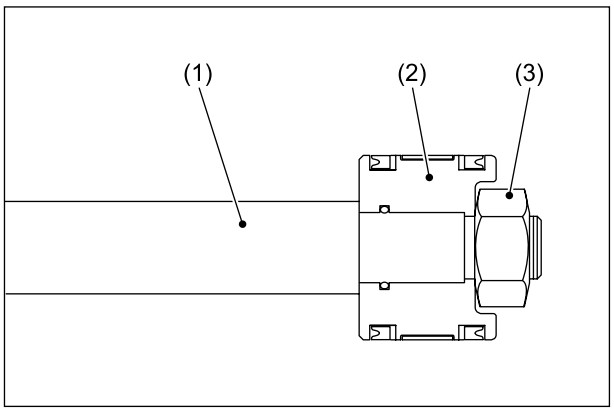


Fig. 3.366

⑦ Install the rod assembly (1) into the cylinder (2).

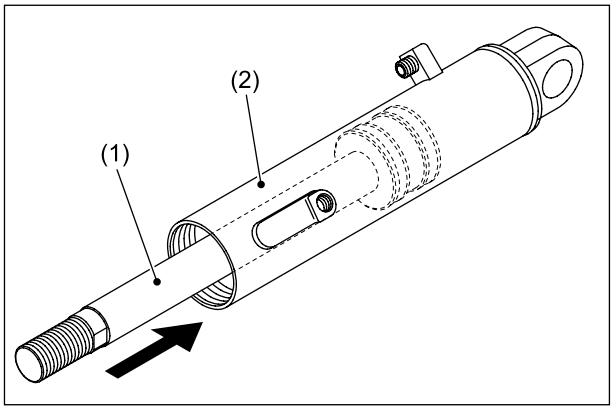


Fig. 3.367

⑧ Install the cylinder cap (1) on the cylinder (2).

392±49 N-m {40±5 kgf-m} [289.1±36.1 lbf-ft]

Apply THREEBOND#1344 on the threaded part.

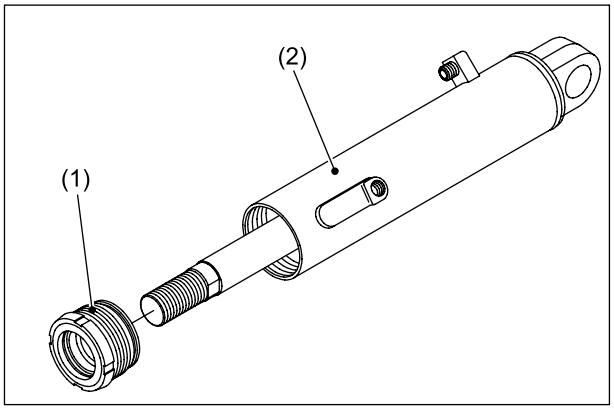


Fig. 3.368

⑨ Install the joint (2) and collar (3) on the cylinder (1).

(mm [in.])

Forward tilt angle	10°	6°	3°
Collar (3) length	22 [0.866]	66 [2.598]	98 [3.858]

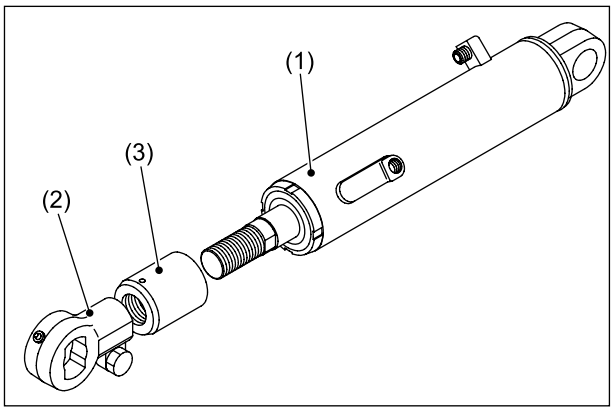


Fig. 3.369

3.9 MAIN PUMP

■ DISASSEMBLY

① Hold the front cover (2) in a vise with the input shaft (1) side downward.

Note: 1. The bolts will be loosened during disassembly. Make sure to hold the front cover in a vise securely as shown in Figure 3.370, to prevent the pump from the vise when a force is applied on the pump.

2. Mark the rear cover (3), adapter (4), and front cover (2), and the drive gear side of the pump body half 2 (5) and pump body half 1 (6) with oil paint.

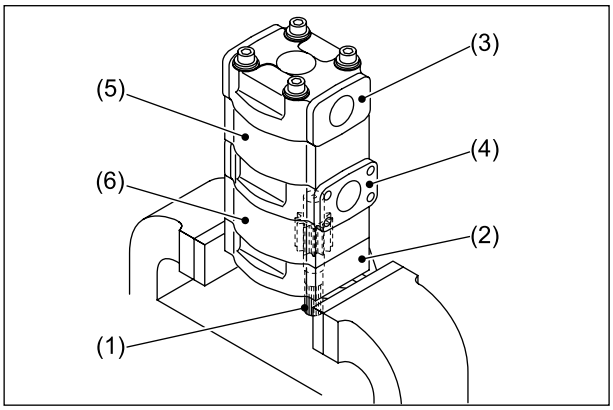


Fig. 3.370

② Turn the four fitting bolts (1) with a torque wrench in the tightening direction, to check whether they are properly tightened to the specified torque.

88.3 - 98.1 N-m {9 - 10 kgf-m} [65.1 - 72.3 lbs-ft].

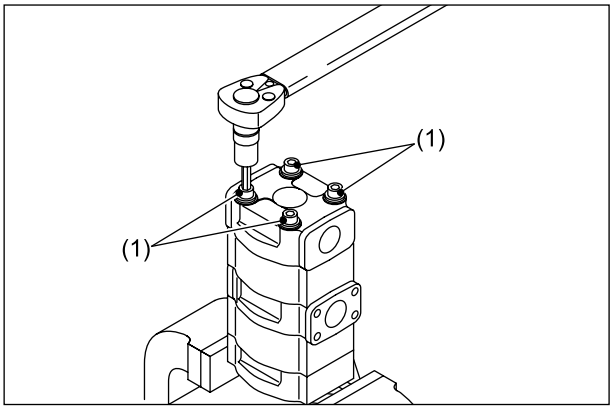


Fig. 3.371

③ Remove the four fitting bolts (1) and four spring washers (2).

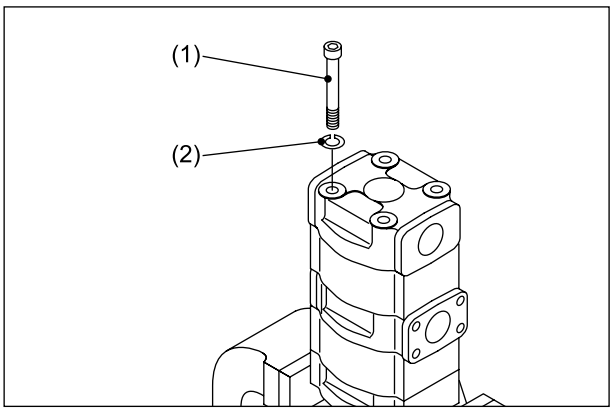


Fig. 3.372

④ Remove the rear cover (2) by tapping the side face of the pump body half 2 (1) with a plastic mallet.

If the gaskets remain inside the pump body half 2 (1), move them toward the rear cover (2) side.

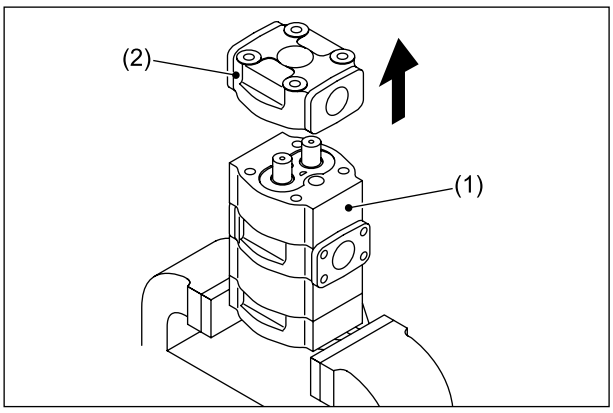


Fig. 3.373

⑤ Remove the pump body half 2 (1).
If the gaskets remain inside the pump body half 2 (1), move them toward the adapter (2) side.

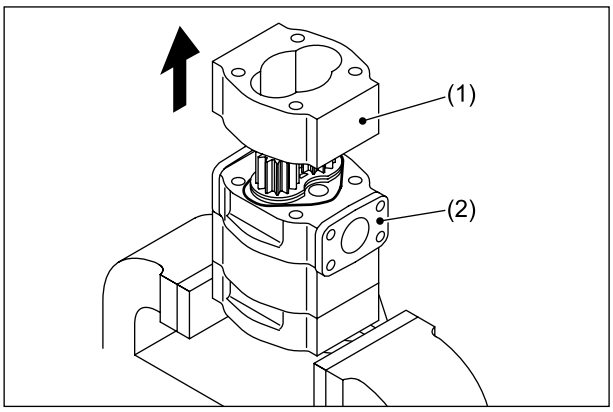


Fig. 3.374

⑥ Put the mark “RV2” on the rear cover side plate (1) at the drive gear (2) side before removing the side plate (1).

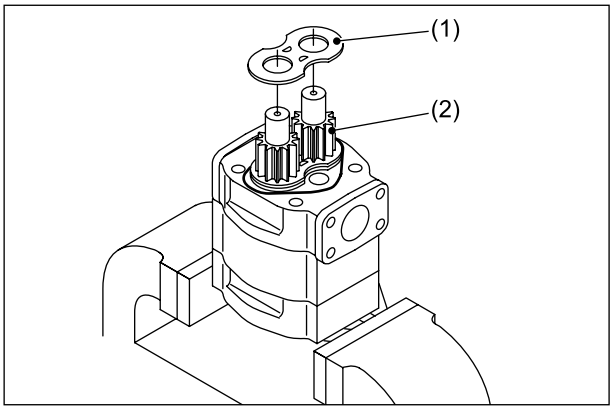


Fig. 3.375

⑦ Put the mark “R2” on the driven gear (1) shaft end and remove the driven gear (1).

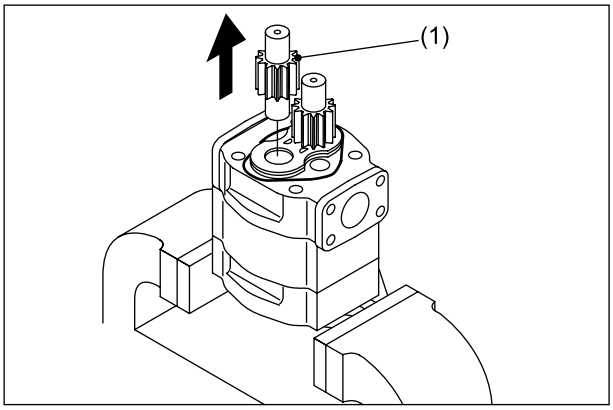


Fig. 3.376

⑧ Holding the adapter side plate (1), remove the drive gear (2).

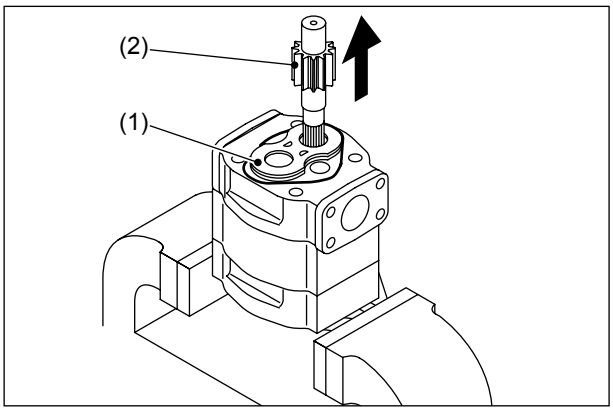


Fig. 3.377

⑨ Put the mark “FV2” on the adapter side plate (1) at the drive gear side, and remove the side plate (1).

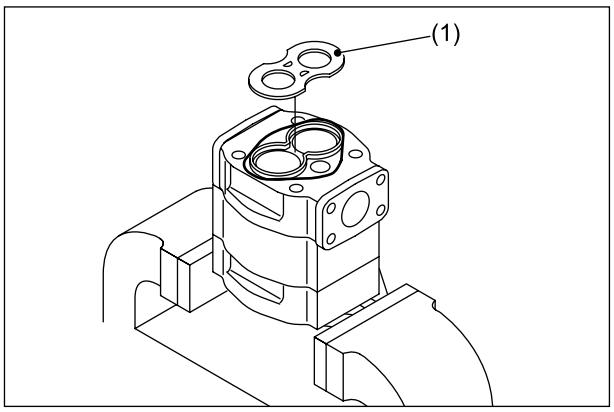


Fig. 3.378

⑩ Remove the adapter (2) by tapping the side face of the pump body half 1 (1) with a plastic mallet.
If the gaskets remain inside the pump body half 1 (1), move them toward the adapter (2) side.

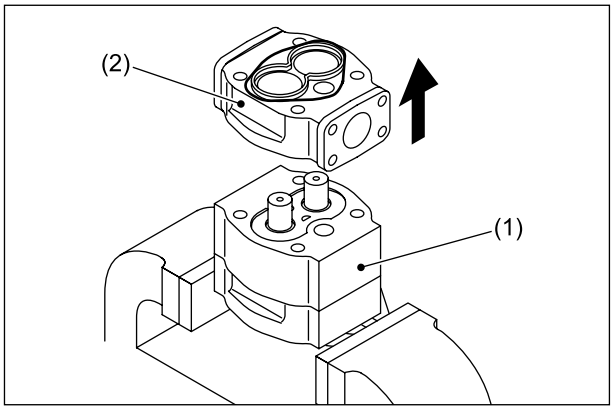


Fig. 3.379

⑪ Remove the pump body half 1 (1).
If the gaskets remain inside the pump body half 1 (1), move them toward the front cover (2) side.

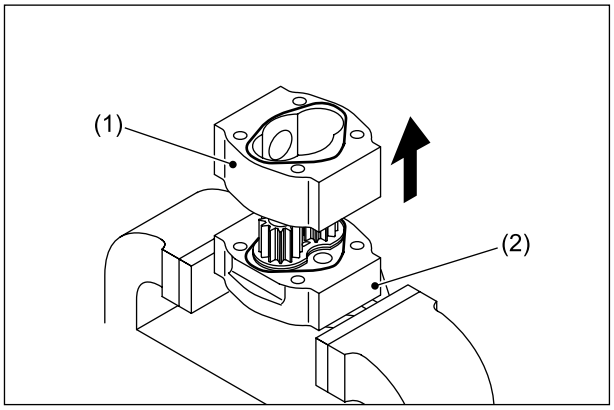


Fig. 3.380

⑫ Put the mark “RV1” on the adapter side plate (1) at the drive gear (2) side before removing the side plate (1).

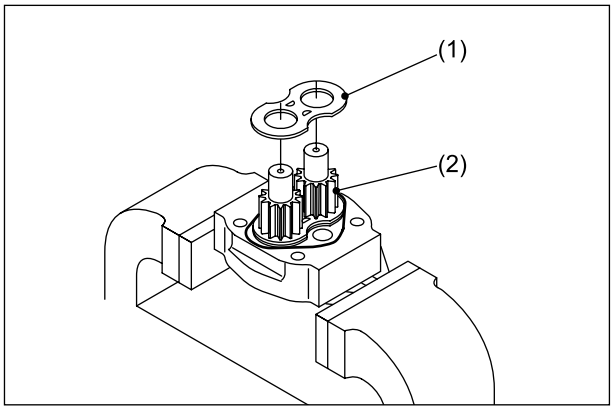


Fig. 3.381

⑬ Put the mark “R1” on the driven gear (1) shaft end and remove the driven gear (1).

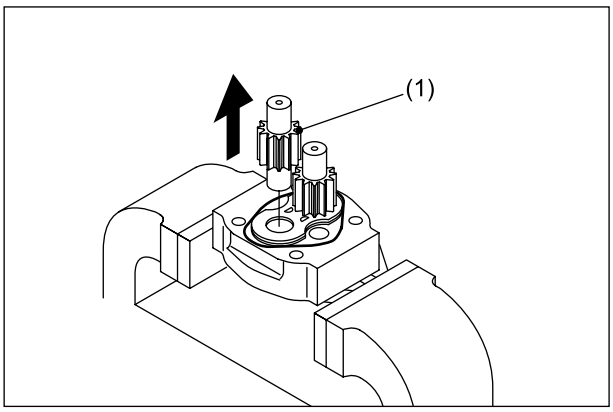


Fig. 3.382

⑭ Holding the front side plate (1), remove the drive gear (2).

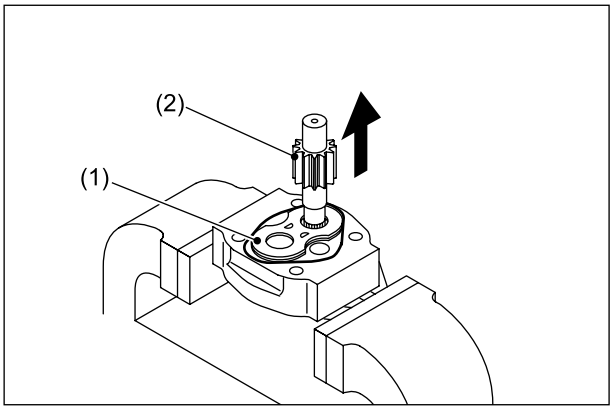


Fig. 3.383

⑮ Turn over the front cover (1) and hold it again in the vise. Remove the snap ring (2) and oil seal (3).

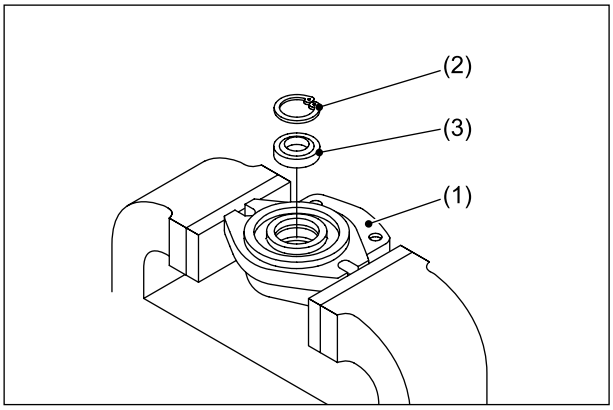
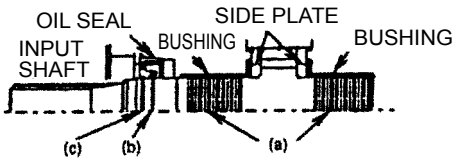


Fig. 3.384

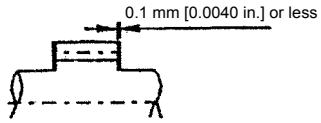
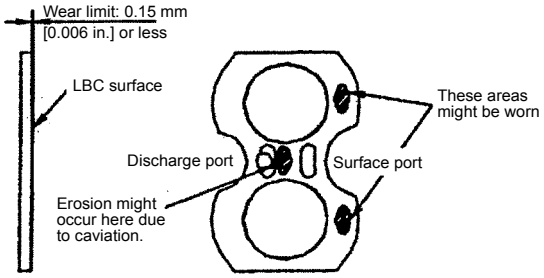
■ Inspection

⚠ CAUTION

1. **Inspections are carried out to locate the cause of troubles and to determine whether parts are reusable or not. Inspections must be carried out only by personnel with a certain amount of knowledge and experience in hydraulic equipment.**
2. **The "useful limit" shown in this section should be used as a rough guide. We do not always guarantee the performance of a part if it does not reach its useful limit.**

<table>
<tr><th>Name of component</th><th>Items to be checked</th><th>Remarks (cause and others)</th></tr>
<tr><td rowspan="2">(1) Front cover</td><td>(a) Check for cracks or damage.</td><td>Oil pressure is too high.</td></tr>
<tr><td colspan="2">⚠ CAUTION
The mating section between the front cover and the pump body looks black in some parts. This is caused by the friction between aluminum parts and is not a problem.</td></tr>
<tr><td rowspan="4">(2) Pump body (cast iron)</td><td>(a) Check for cracks or damage.</td><td>Oil pressure is too high</td></tr>
<tr><td>(b) Check wipe depth or wipe surface.</td><td>Oil pressure is too high.</td></tr>
<tr><td colspan="2">Useful limit
Wipe depth limit: less than 0.04 mm [0.0016 in.]</td></tr>
<tr><td>(c) Check for signs of interference with gear at discharge side.</td><td>Runout of gears
Pump's performance is not affected if there is a sign of interference.</td></tr>
<tr><td rowspan="4">(3) Drive and driven gears</td><td>(a) Check shaft ends and keyways for cracks, damage or undue wear.</td><td>They might occur when gears are runout or insufficiently lubricated, or when oil pressure is too high.</td></tr>
<tr><td>(b) Check journal (in the area which slides on the bearing) for discoloration, undue wear, or roughness.</td><td>Contaminants in oil, too high oil temperature (248°F or 120° or higher), too frequently idle operations</td></tr>
<tr><td colspan="2">⚠ CAUTION
 

The shaft might have the following scratches or scores on its outer diameter:
(a) Those caused by a hard object between the shaft and bushing.
(b) Those caused by the oil seal's main lip
(c) Those caused by the oil seal's dust lip</td></tr>
<tr><td colspan="2">Useful limit
Roughness on journal (a): 0.8S – 1.6S
Roughness on oil seals (b and c): 1.6S – 3.2S</td></tr>
</table>

<table>
<tr><th>Name of component</th><th>Items to be checked</th><th>Remarks (cause and others)</th></tr>
<tr><td>(continued from previous page)</td><td>(c) Check for discoloration, undue wear, or roughness on the gears.</td><td>Contaminants in oil, too high oil temperature (248°F or 120°C or higher), too frequently idle operations</td></tr>
<tr><td></td><td colspan="2">Useful limit
 
</td></tr>
<tr><td></td><td>(d) Check gear teeth for roughness or pitching.</td><td>Irregular rotation at high speeds</td></tr>
<tr><td></td><td>(e) Check for missing or broken gear teeth</td><td>Too high oil pressure or a hard object caught in gear</td></tr>
<tr><td>(4) Side plate</td><td>(a) Check side plate in the gear sliding area for wear or nicks or scores.</td><td>Fine dust between side plate and gears</td></tr>
<tr><td></td><td>(b) Check the gears for erosion at or near the engagement area.</td><td>Cavitation or aeration</td></tr>
<tr><td></td><td colspan="2">Useful limit
 
</td></tr>
<tr><td>(5) Bushing

The bushings are fitted into front and rear covers.</td><td>Check the inner surfaces of bushings for roughness or wear.</td><td>The bushings are made of copper with the back plate made of lead brass. The back plate consists of porous and PTFE (polytetrafluoro-ethylene) layers.</td></tr>
<tr><td></td><td colspan="2">Useful limit
When the back plate of the bushing is exposed to view.</td></tr>
<tr><td>(6) “E” Gasket</td><td>(a) Check gaskets for proper installation or cut.</td><td>Too high oil temperature</td></tr>
<tr><td></td><td>(b) Check rubber parts for swelling.</td><td>Fire retardant hydraulic oil (phosphate) or gasoline is used.</td></tr>
<tr><td>(7) Oil seal
CAUTION
The oil seal might be damaged when the drive gear is disassembled or when it is removed from the front cover. It is difficult to locate the cause of damage when removing it from the front cover.</td><td>(a) Check oil seal for round or peeled edge.</td><td>Wear occurs due to contaminants in oil, dust which enters oil due to undue external negative pressure, or rust due to moisture.</td></tr>
<tr><td></td><td>(b) Check main lip for warping outward.</td><td>Increased internal oil leaks or high oil pressure (0.2 – 0.3 MPa or more) applied on oil seal</td></tr>
<tr><td></td><td>(c) Check rubber parts for swelling.</td><td>Fire retardant hydraulic oil (phosphate) or gasoline is used.</td></tr>
</table>

■ PUMP REASSEMBLY

① As shown in Fig. 3.385, hold the front cover (1) in a vise.

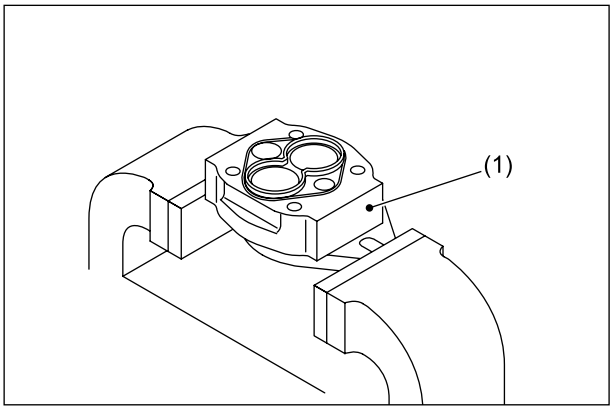


Fig. 3.385

② Install a new gasket (2) in the groove in the front cover (1).

Note: Use caution not to twist the gasket.

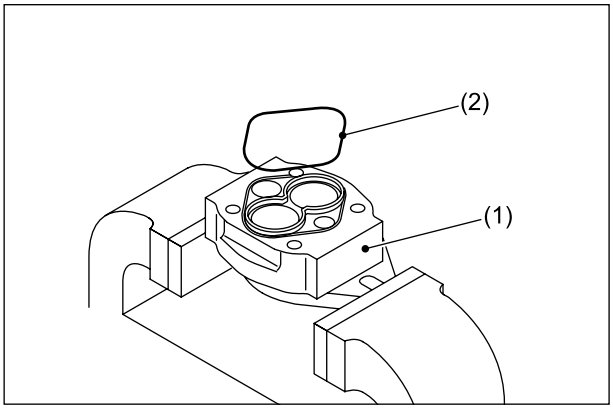


Fig. 3.386

③ Install a new "E" gasket (2) in the groove in the front cover (1), referring to Fig. 3.388.

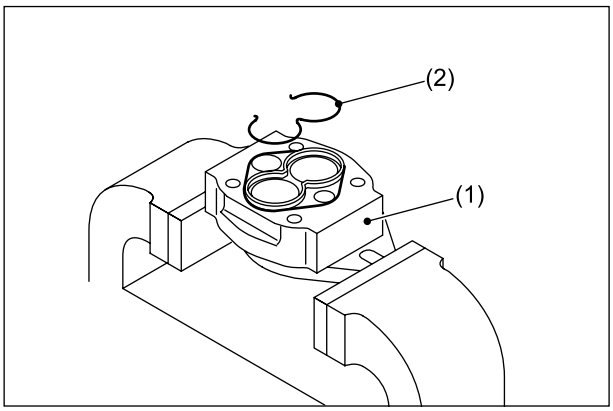


Fig. 3.387

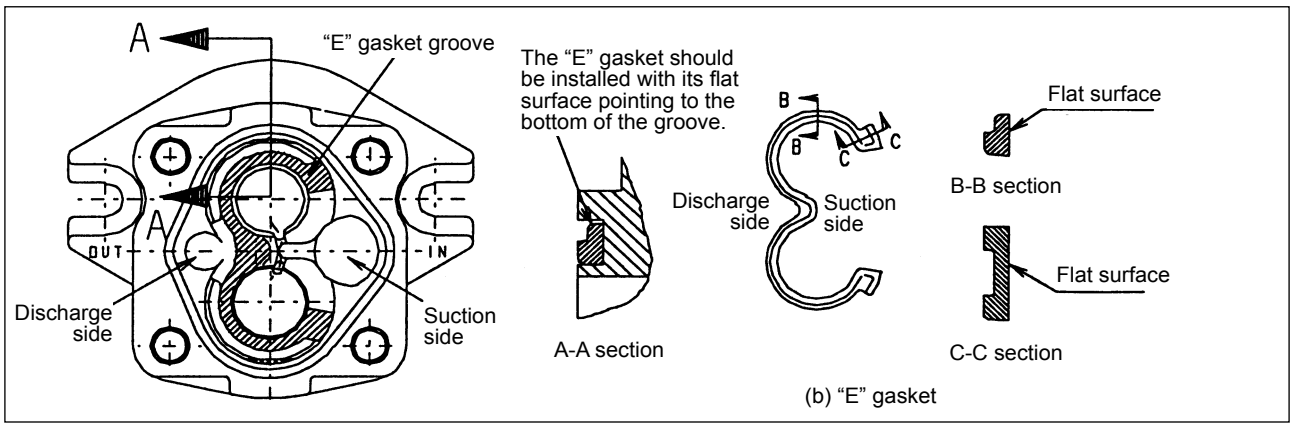


Fig. 3.388

④ Install the pump body half 1 (1) on the front cover (2), referring to Fig. 3.390.

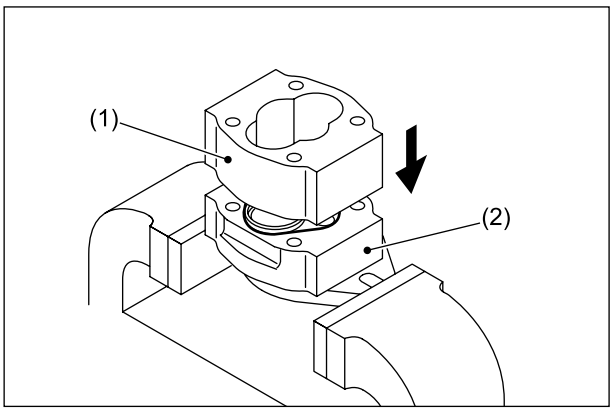


Fig. 3.389

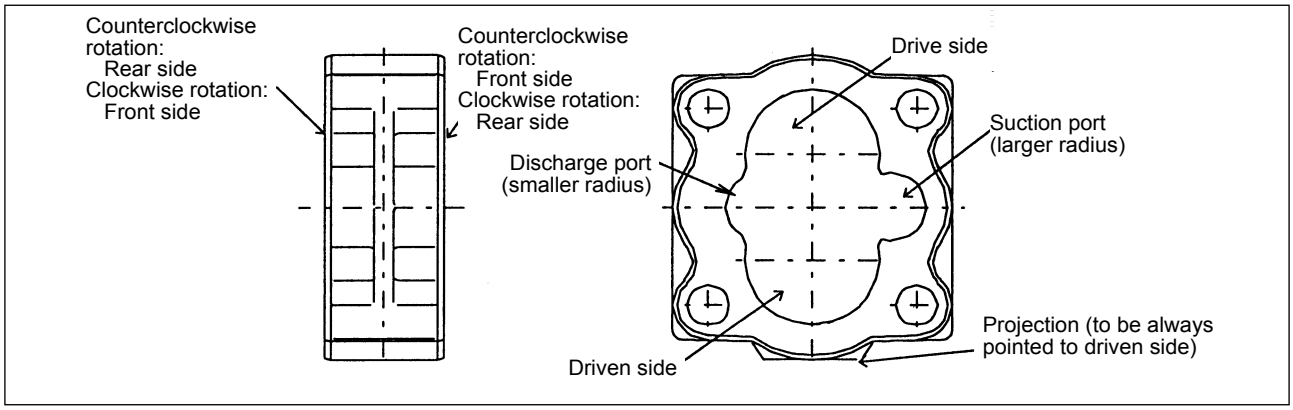


Fig. 3.390

⑤ Install the front side plate (1) on the front cover (2), referring to Fig. 3.392.

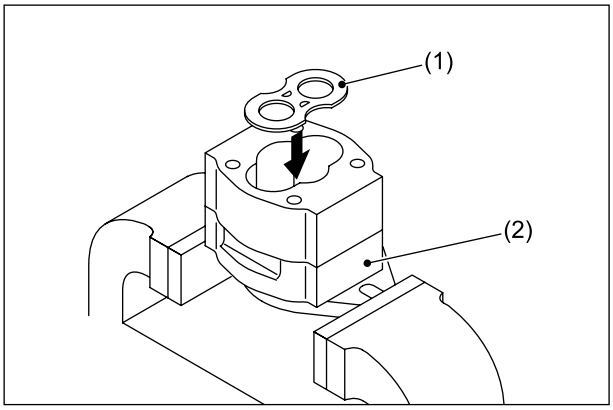


Fig. 3.391

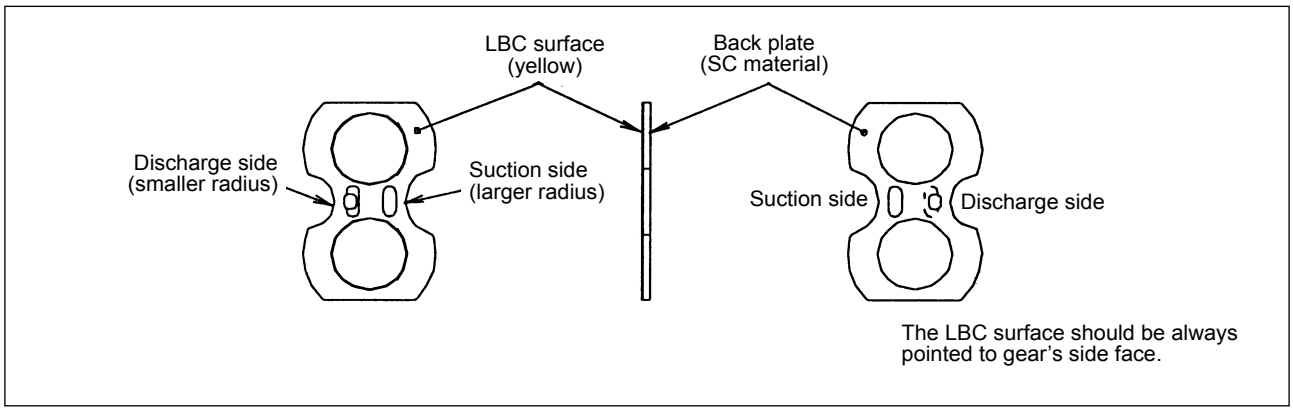


Fig. 3.392

⑥ Install the drive gear (1) in the pump body half 1 (2), with its splines pointed downward.

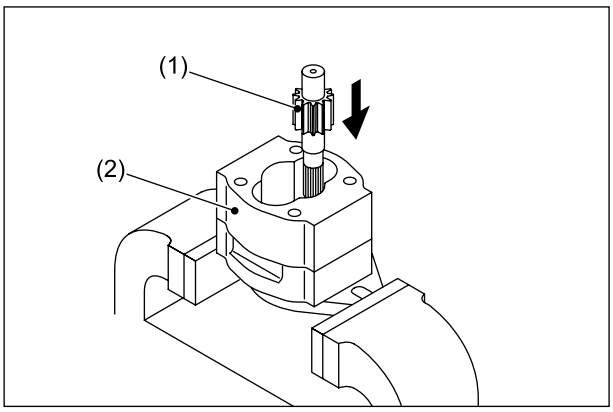


Fig. 3.393

⑦ Install the driven gear (1) in the pump body half 1 (2), as shown in Fig. 3.395.

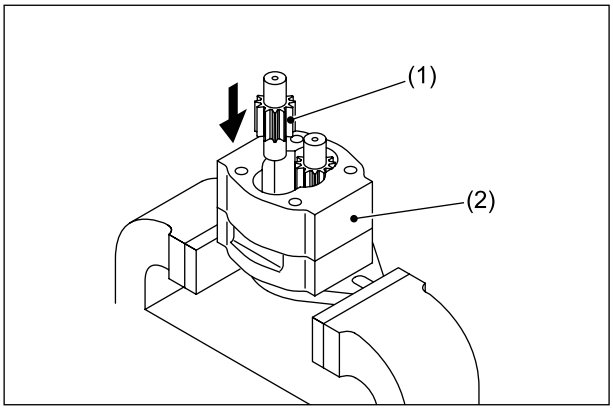
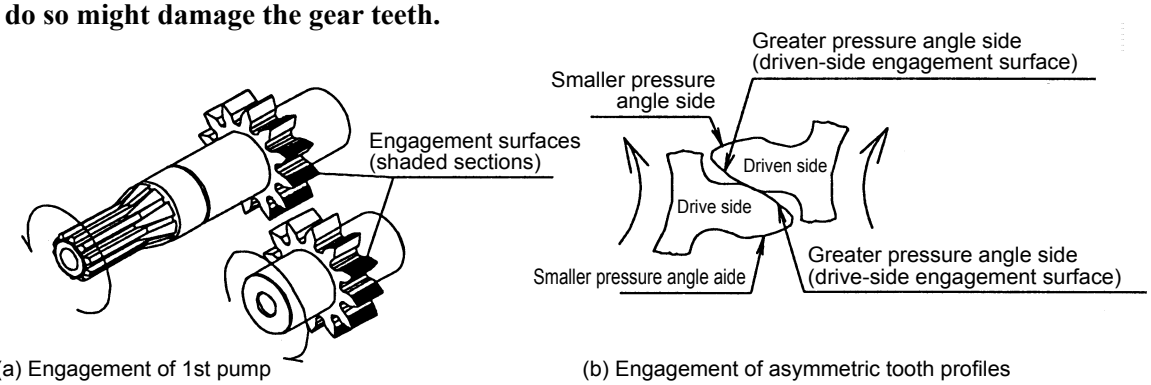


Fig. 3.394

⚠ CAUTION

The sketch shows the engagement of an L-shaped pump. Since the tooth profiles of the two gears are asymmetric, install them with their larger pressure angle sides pointed to each other. Failure to do so might damage the gear teeth.



(a) Engagement of 1st pump

(b) Engagement of asymmetric tooth profiles

Fig. 3.395

⑧ Install the adapter side plate (1) in the pump body half 1 (2), as shown in Fig. 3.392.

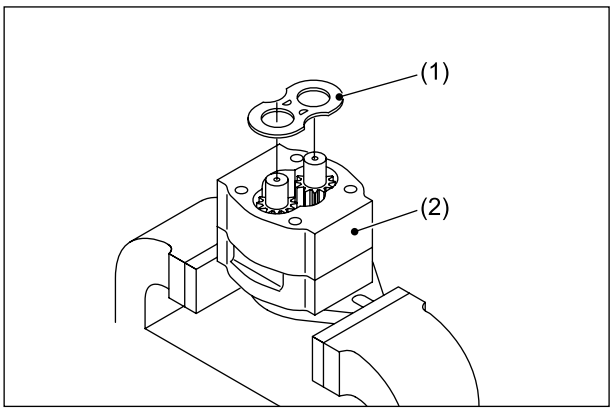


Fig. 3.396

⑨ Apply grease on a new gasket (2) in some points and install the gasket (2) in the adapter (1) groove.

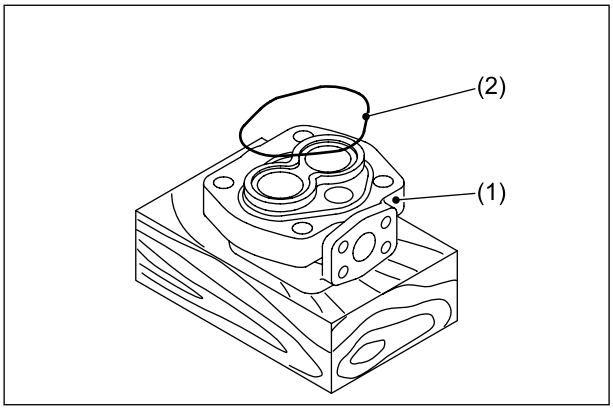


Fig. 3.397

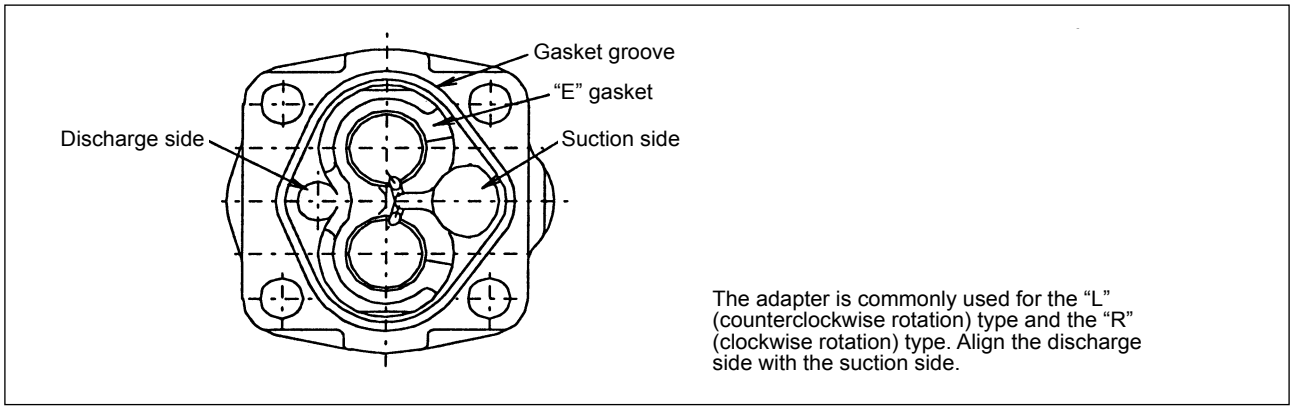


Fig. 3.398

⑩ Install the "E" gasket (1) on the adapter (2), as shown in Fig. 3.388.

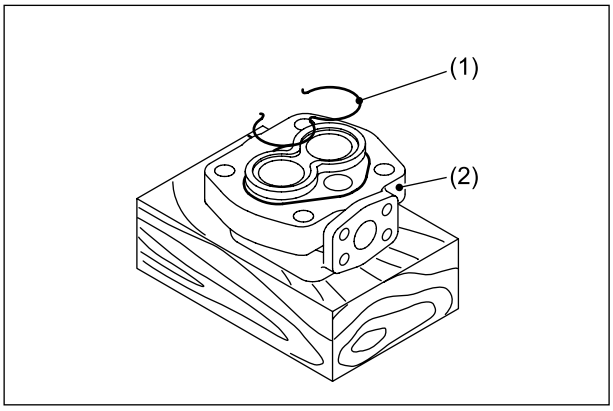


Fig. 3.399

⑪ Install the adapter (1) in the pump body half 1 (2) with its gasket pointed downward.

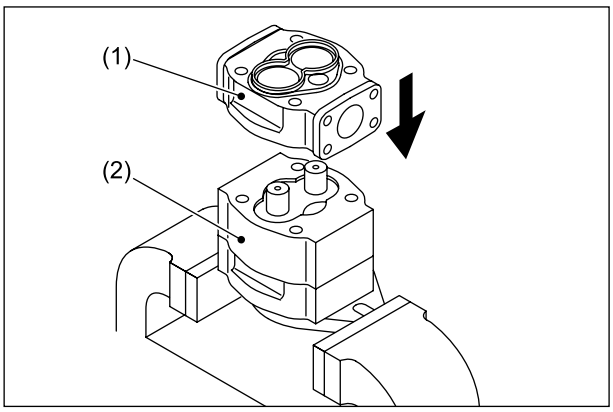


Fig. 3.400

⑫ Install a new gasket (2) in the groove in the adapter (1).

Note: Use caution not to twist the gasket.

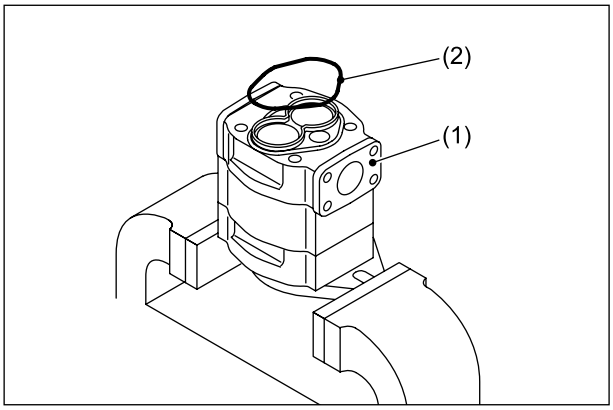


Fig. 3.401

⑬ Install a new "E" gasket (2) in the groove in the adapter (1), referring to Fig. 3.403.

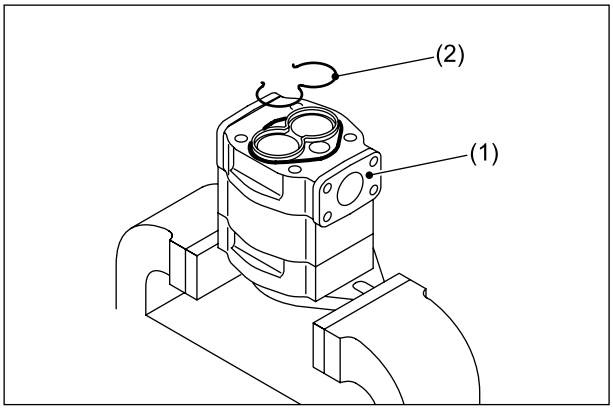


Fig. 3.402

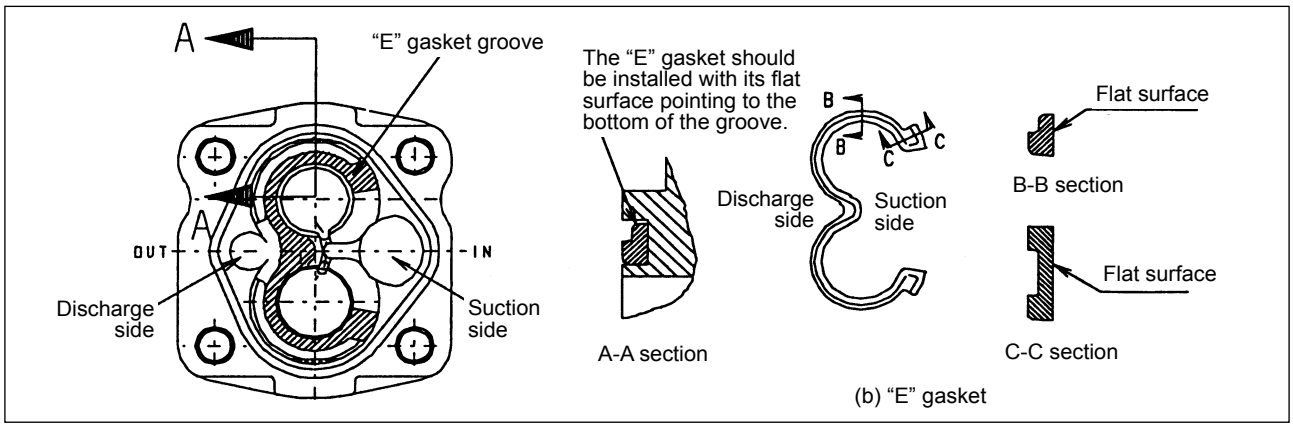


Fig. 3.403

⑭ Install the pump body half 2 (1) on the adapter (2), referring to Fig. 3.405.

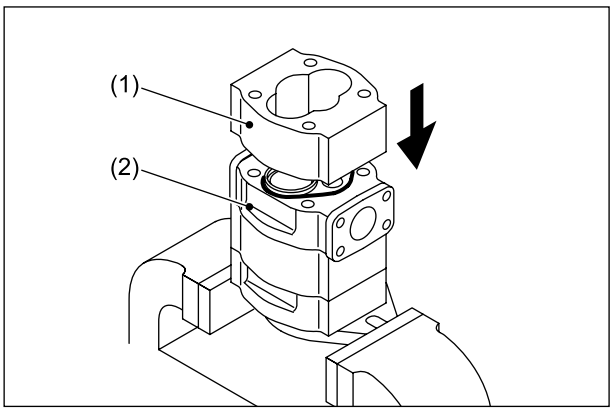


Fig. 3.404

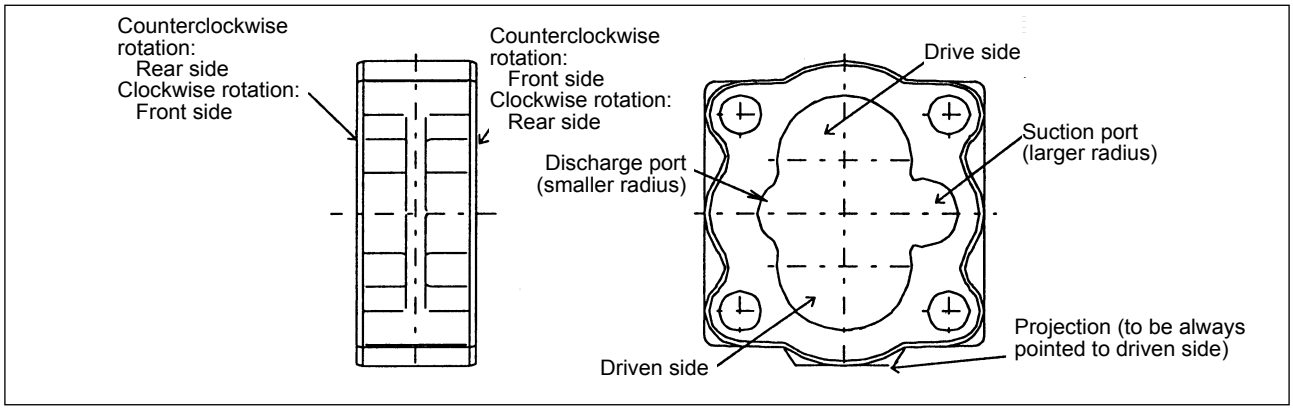


Fig. 3.405

⑮ Install the adapter side plate (1) on the adapter (2), referring to Fig. 3.407.

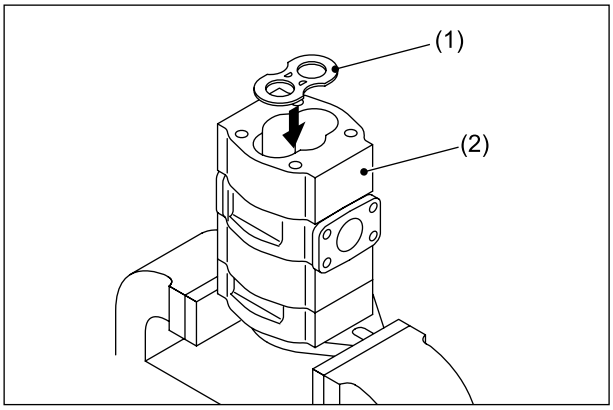


Fig. 3.406

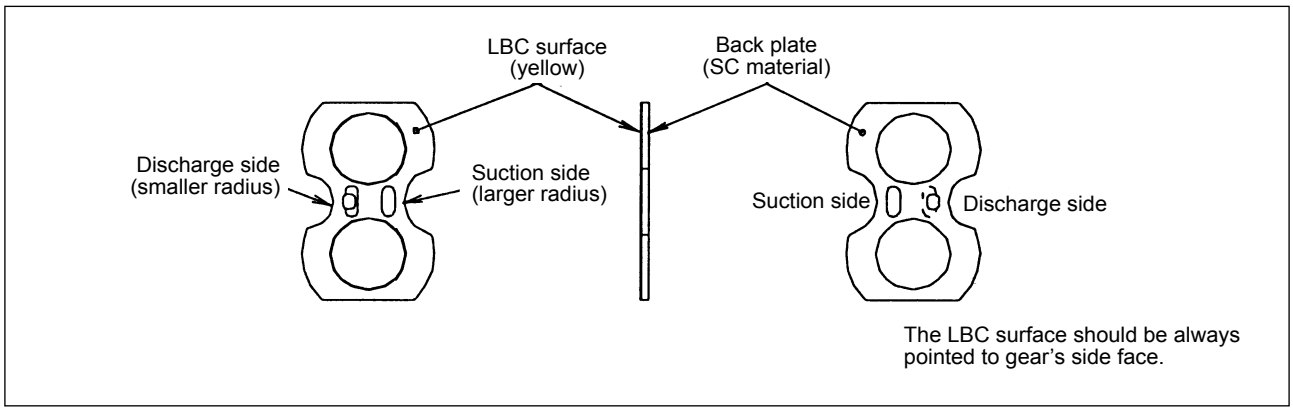


Fig. 3.407

⑯ Install the drive gear (1) in the pump body half 2 (2), with its splines pointed downward.

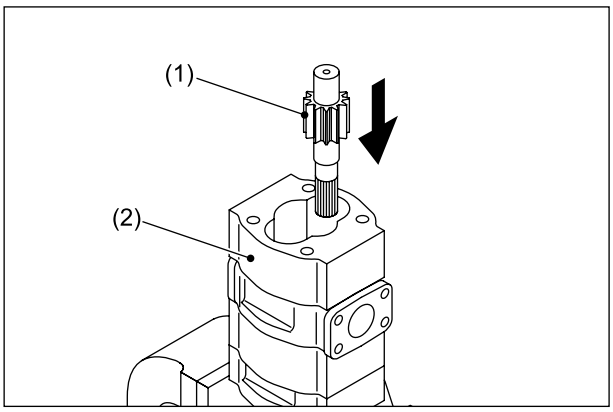


Fig. 3.408

⑰ Install the driven gear (1) in the pump body half 2 (2), as shown in Fig. 3.410.

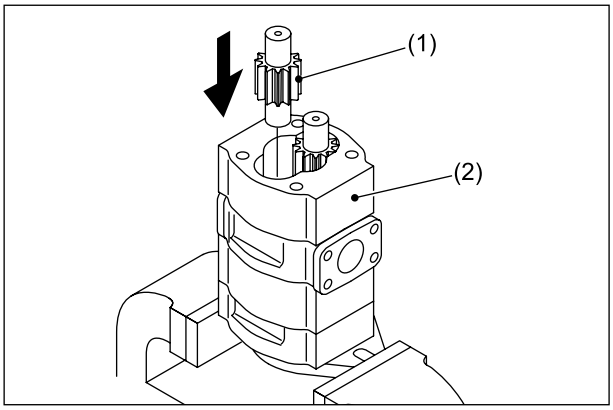
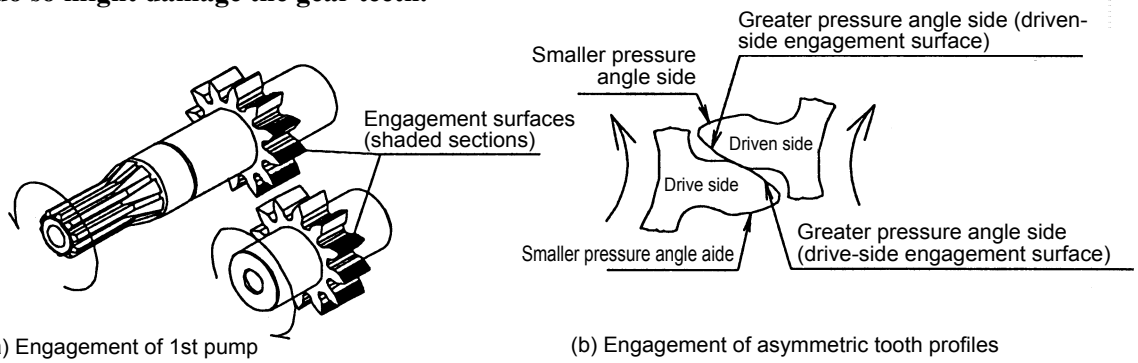


Fig. 3.409

⚠ CAUTION

The sketch shows the engagement of an L-shaped pump. Since the tooth profiles of the two gears are asymmetric, install them with their larger pressure angle sides pointed to each other. Failure to do so might damage the gear teeth.



(a) Engagement of 1st pump

(b) Engagement of asymmetric tooth profiles

Fig. 3.410

⑱ Install the rear side plate (1) in the pump body half 2 (2), as shown in Fig. 3.407.

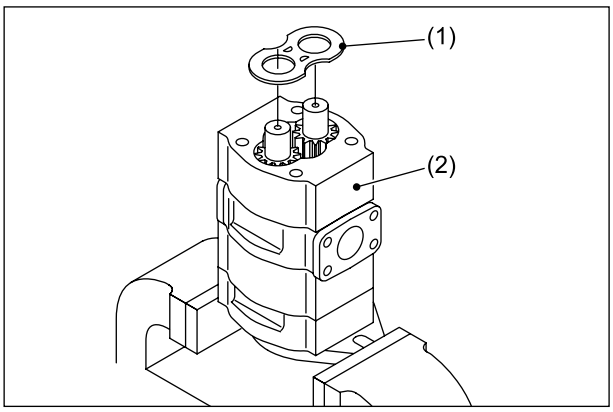


Fig. 3.411

⑲ Apply grease on a new gasket (2) in some points and install the gasket (2) in the rear cover (1) groove.

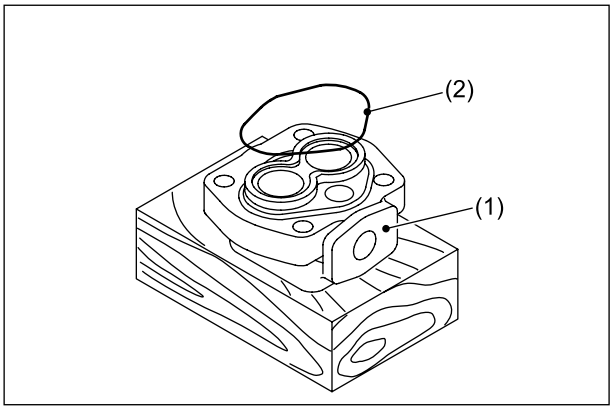


Fig. 3.412

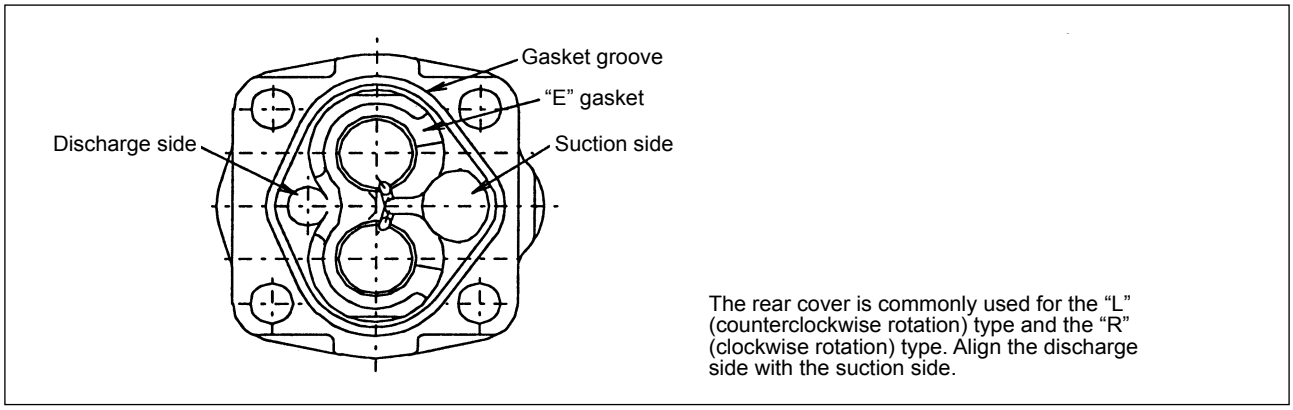


Fig. 3.413

⑳ Install the "E" gasket (1) on the rear cover (2), as shown in Fig. 3.403.

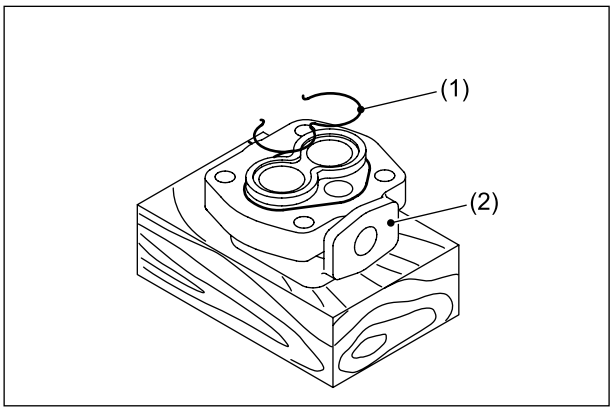


Fig. 3.414

㉑ Install the rear cover (1) in the pump body half 2 (2) with its gasket pointed downward.

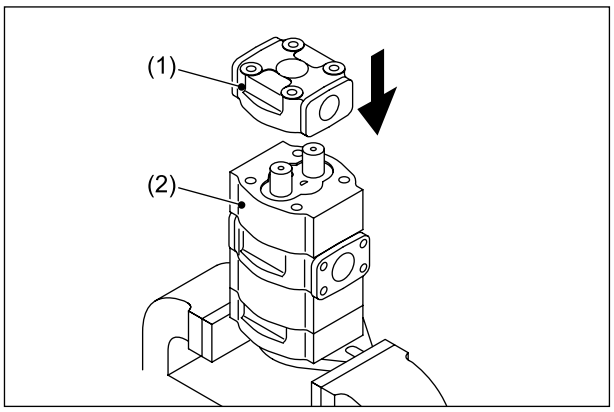


Fig. 3.415

㉒ Install the four bolts (1) and spring washers (2), and tighten them to the specified torque:

88 - 98 N-m {9 - 10 kgf-m}
[65.1 - 72.3 lbs-ft]

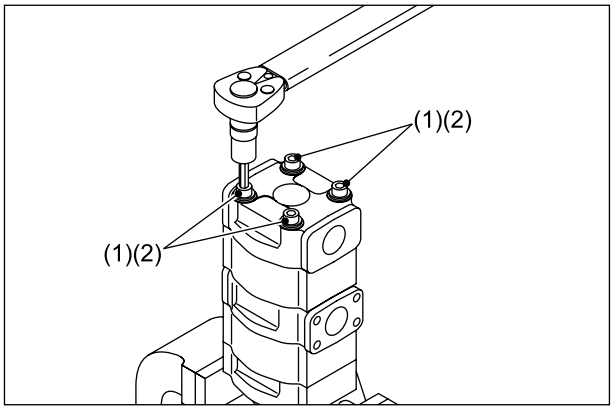


Fig. 3.416

㉓ Remove the pump from the vise and put it on a work bench.

Apply grease on the area between the lips and on the outer diameter of a new oil seal (1). Install it on the oil seal guide shown in Fig. 3.422.

Put it on the drive shaft (2) of the pump, and install the oil seal (1) onto the front cover (4) with an oil seal snap (3).

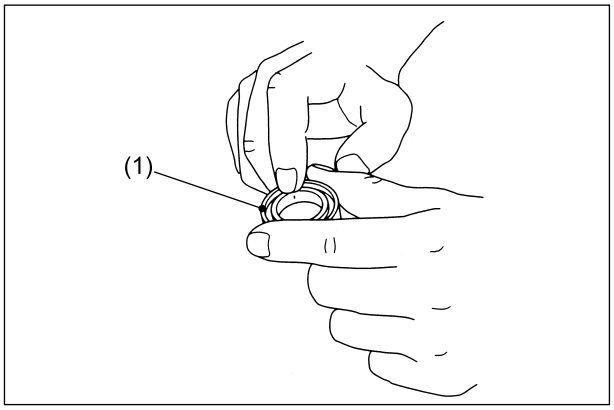


Fig. 3.417

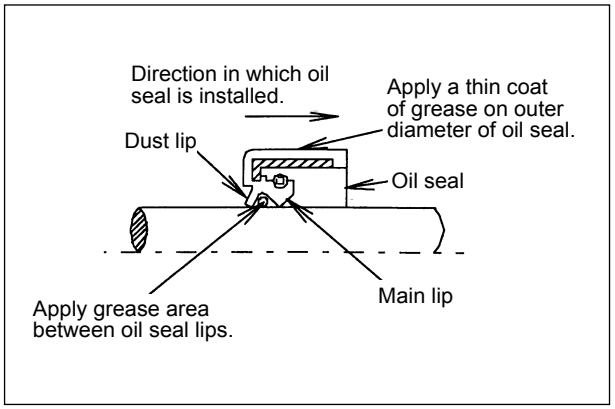


Fig. 3.418

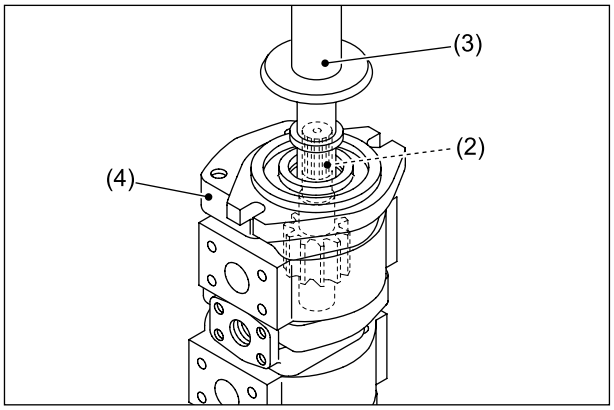


Fig. 3.419

㉔ Secure the oil seal with a snap ring (1) and remove the oil seal guide.

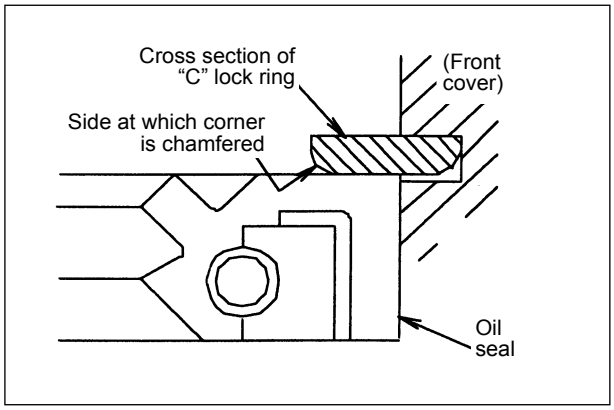


Fig. 3.420

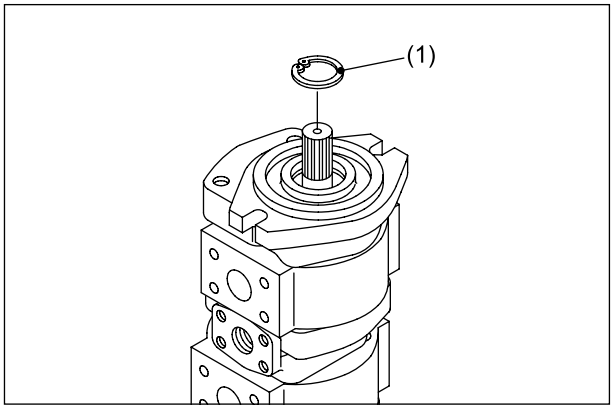


Fig. 3.421

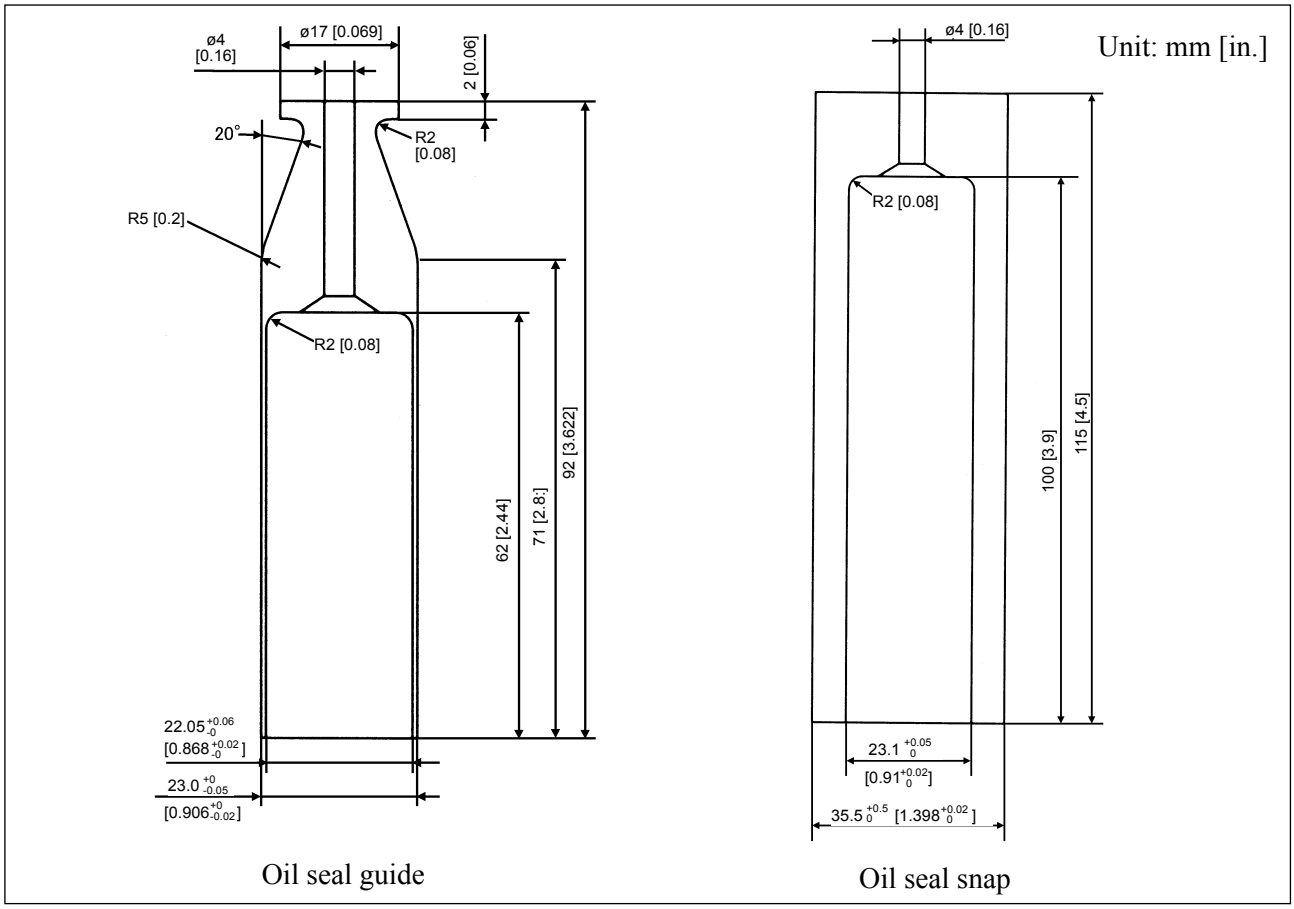


Fig. 3.422

㉕ Trial run

Trial runs should be performed to run in an assembled pump and to ensure that it delivers the specified performance. Trial runs are preferably carried on a special test stand, but may be carried out with the pump on the machine using the following manner:

(If the pump were disassembled because of a seized pump or an abnormally worn internal component, be sure to change the hydraulic oil and replace the filters with new ones before trying to make a trial run.)

(a) Install the pump on the truck. Install a pressure gauge on the oil pressure check port of the control valve.
(b) Loosen the relief valve adjustment screw and operate the pump at 500 to 1000 rpm for about 10 minutes.
Make sure the pressure is less than 1 MPa {10 kgf/cm^2} [142 psi].
(c) Increase the pump speed to 1500 to 2000 rpm and let the pump operate for about 10 minutes.
(d) Keeping the pump speed at 1500 to 2000 rpm, increase the pressure by 2 to 3 MPa {20 to 30 kgf/cm^2} [284 to 427 psi] up to 17.7 MPa {180 kgf/cm^2} [2560 psi], letting the pump operate at each pressure for about 5 minutes. Operate each circuit for 5 minutes and replace the return filter with a new one.
While increasing the pressure, check the oil temperature and pump surface temperature. Check also for operating noise. If the oil temperature or pump surface temperature rises excessively, reduce the load and drop the temperature before continuing the test.
(e) After the test is over, set the oil pressure for 17.7 MPa {180 kgf/cm^2} [2560 psi], perform a discharge test.
The pump discharge is checked by observing the lift speed.

3.10 CONTROL VALVE

■ DISASSEMBLY

Note: 1. Before disassembly, clean the exterior of the control valve to prevent the possibility of dirt and foreign matter entering the mechanism.
2. Replace all disassembled seals ("O"-rings, back-up rings, and wipers) with new ones.

(1) Disassembling valve assembly

① Remove the main relief valve (1) and PF relief valve (2) from the inlet section (3).

Note: The relief valve should be replaced as an assembly. Do not disassemble the relief valve unless necessary.

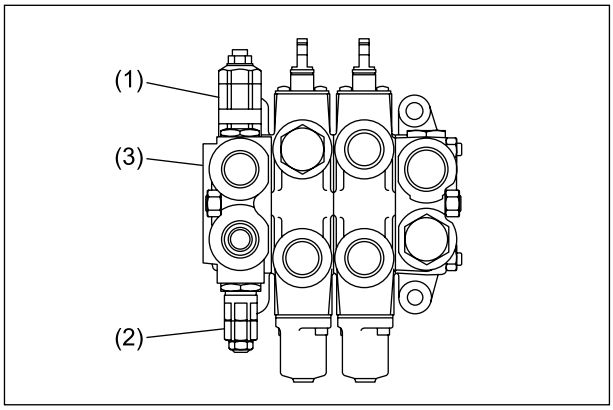


Fig. 3.423

② Remove the stud bolt nuts (1) and disassemble each section.

Note: Match mark the sections of the control valve so that they can be reassembled correctly.

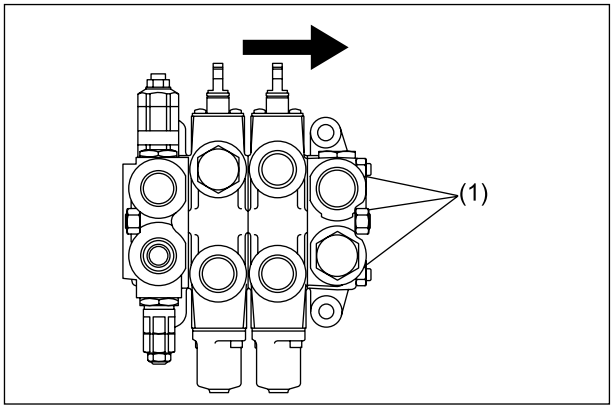


Fig. 3.424

(2) Disassembling tilt spool section

① Remove the "O"-ring (1), poppet (2), and spring (3) from the mating surfaces.

Note: Tag the spring and poppet for proper reassembly.

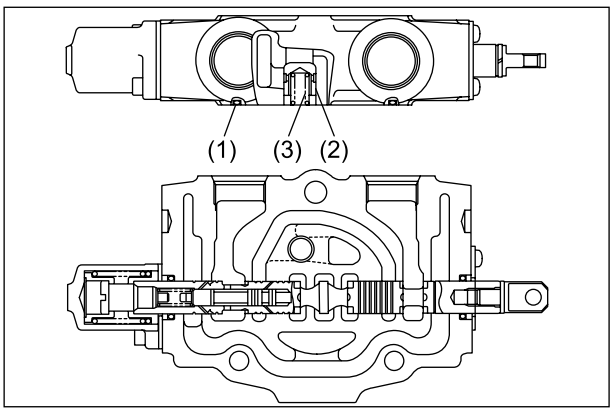


Fig. 3.425

② Loosen the socket head bolt (1) and then remove the cap (2). Remove the spool (3) as a sub-assembly, with the seal plate (4), wiper (5) and "O"-ring (6) of the cap side installed on the spool (3).

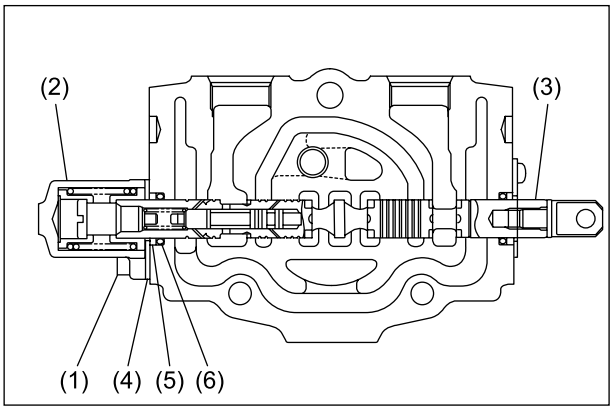


Fig. 3.426

③ Loosen and remove the screw (1) at the opposite side, and remove the seal plate (2), wiper (3) and "O"-ring (4).

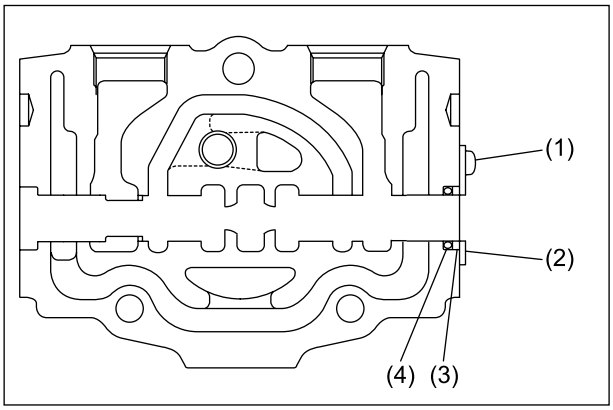


Fig. 3.427

④ Hold the sub-assembly of the spool (1) that has been removed in step ② in a vise equipped with soft jaws (pieces of hard wood) shown in Figure 3.428, with care not to damage its exterior.
Loosen the cap screw (2), and then disassemble the spring seat (3) and spring (4). Remove the “O”-ring (5) and wiper (6).

Note: Use caution when loosening the cap screw because it might pop out due to spring reaction.

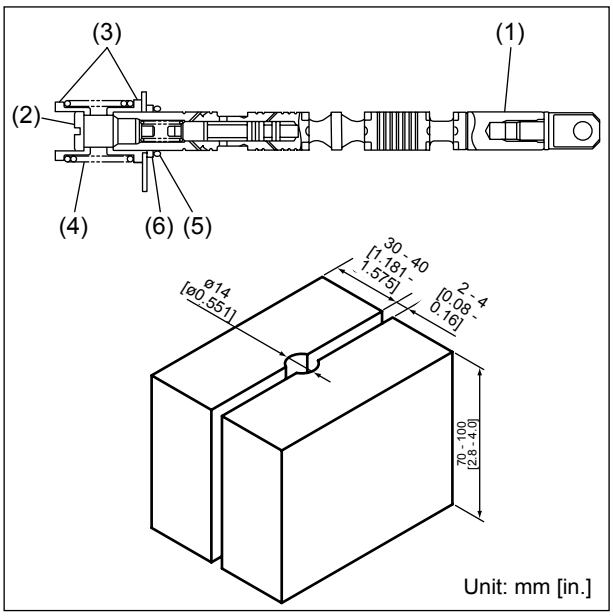


Fig. 3.428

⑤ Remove the spring (2) from inside the spool (1).
Remove the valve (3) from the spool (1) using the M4 screw on the end face.

Tag all the disassembled parts by each section so that they can be reassembled properly.

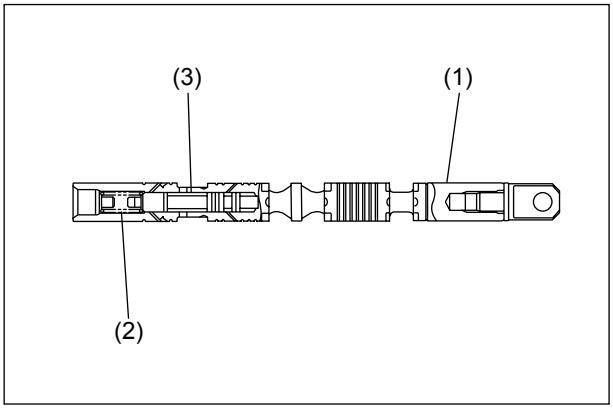


Fig. 3.429

(3) Disassembling lift spool section

① Loosen the socket head bolt (1) and remove the cap (2). Remove the spool (3) from the valve housing as a sub-assembly, with the seal plate (4), wiper (5) and "O"-ring (6) of the cap side installed on the spool (3).

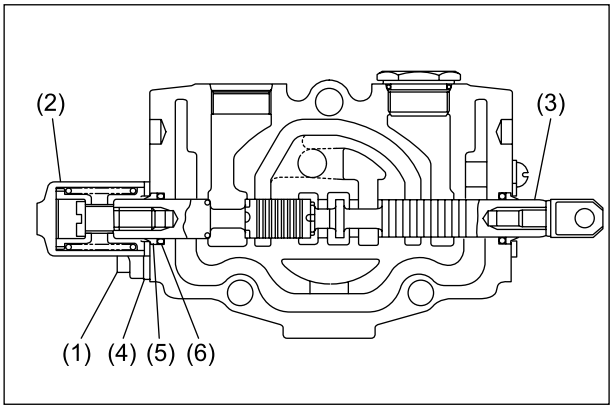


Fig. 3.430

② Loosen and remove the screw (1) at the opposite side, and remove the seal plate (2), wiper (3) and "O"-ring (4).

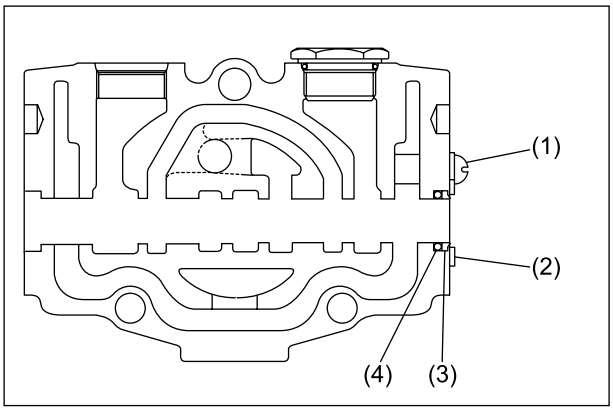


Fig. 3.431

③ Hold the sub-assembly of the spool (1) that has been removed in step ① in a vise equipped with soft jaws (pieces of hard wood) shown in Figure 3.432, with care not to damage its exterior. Loosen the cap screw (2), and then disassemble the spring seat (3) and spring (4). Remove the "O"-ring (5) and wiper (6).

Note: Use caution when loosening the cap screw because it might pop out due to spring reaction.

Tag all the disassembled parts by each section so that they can be reassembled properly.

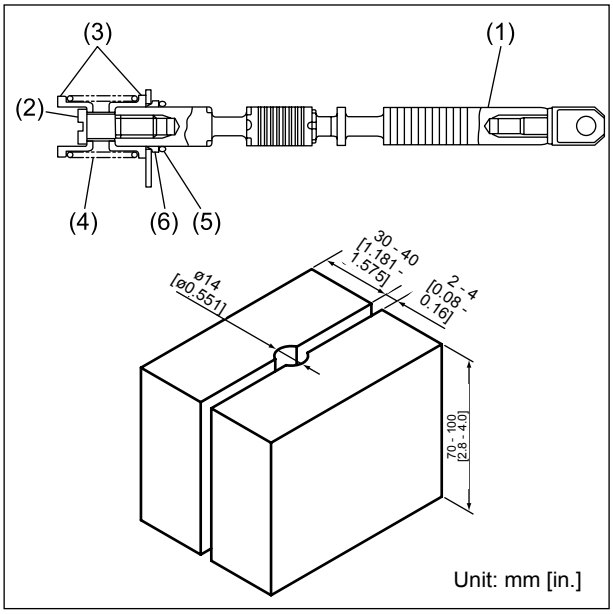


Fig. 3.432

(4) Disassembling main relief valve

Note: The relief valve should be replaced as an assembly. Do not disassemble the relief valve unless necessary.

① Remove the plug (1) from the cap (2). Loosen and remove the adjuster kit (3).

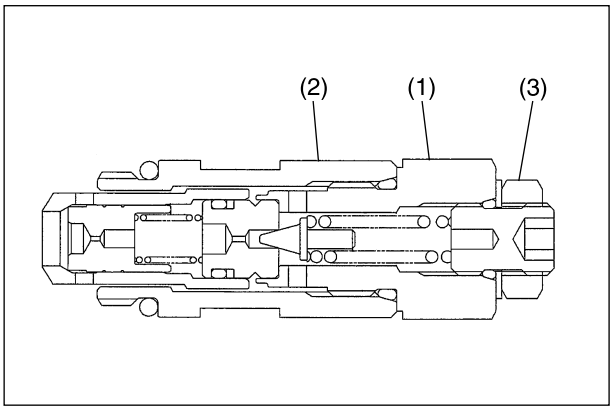


Fig. 3.433

② Remove the pilot poppet (2) and spring (3) from the plug (1).

Note: Tag the spring and poppet that have been removed for proper reassembly.

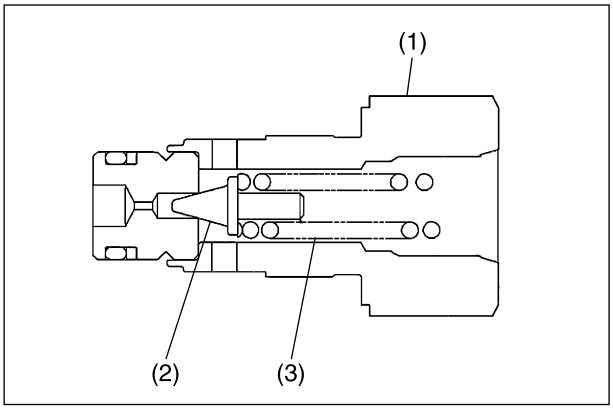


Fig. 3.434

③ Remove the sleeve (1). Remove the main poppet (2) and spring (3).

Note: Tag the spring and poppet that have been removed for proper reassembly.

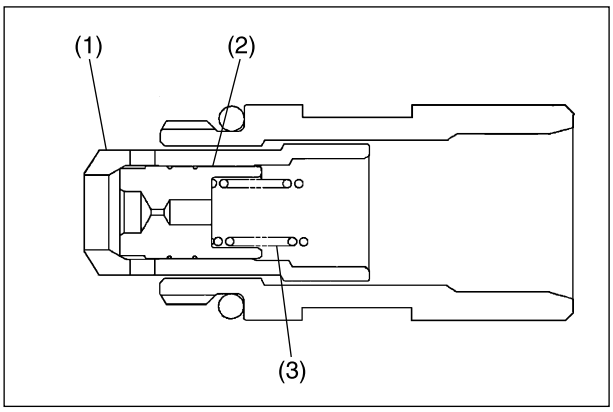


Fig. 3.435

Note: Do not try to disassemble the pilot seat (1) because it is staked.
Remove the "O"-ring (2) and back-up ring (3) and replace with new ones for reassembly.

Tag all the disassembled parts by each section so that they can be reassembled properly.

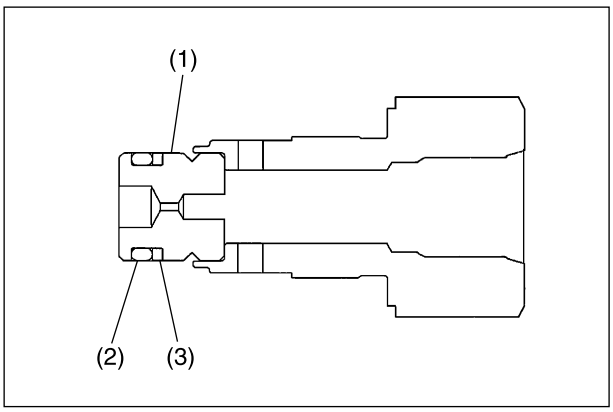


Fig. 3.436

(5) Disassemble port relief valve

Note: If the port relief valve has a higher pressure setting than the main relief valve, do not try to adjust the port relief valve. Replace the port relief valve with a new one whose pressure setting is factory set.

① Remove the plug (1) from the cap (2). Loosen and remove the adjuster kit (3).

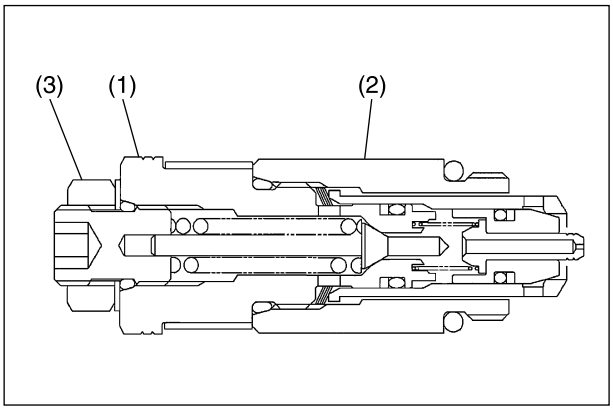


Fig. 3.437

② Remove the wave washer (2) from the plug (1) and then remove the pilot poppet (3) and spring (4).

Note: Tag the spring and poppet that have been removed for proper reassembly.

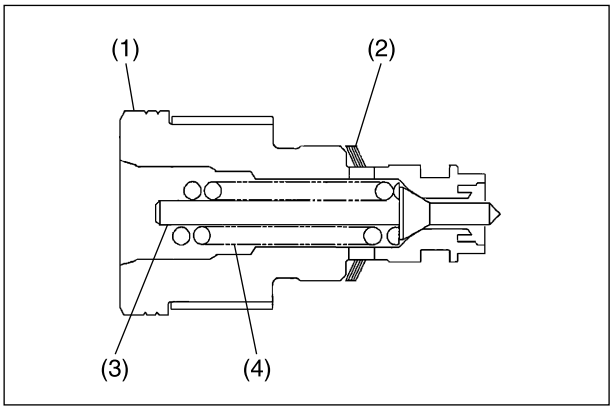


Fig. 3.438

③ Remove the sleeve (1) and then remove the poppet (2), piston (3) and spring (4).

Note: Tag the spring and poppet that have been removed for proper reassembly.

Tag all the disassembled parts by each section so that they can be reassembled properly.

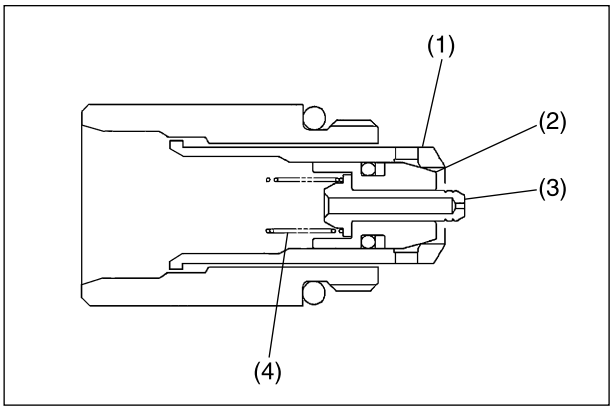


Fig. 3.439

■ AFTER DISASSEMBLY

(1) Cleaning

Clean all the disassembled parts thoroughly in clean mineral oil and dry with compressed air.
Place them on a clean sheet of paper or cloth for inspection.

(2) Inspection

Inspect all the disassembled parts for burrs, scratches, scores or other defect.

- Any dent or nicks on the load check seat of the valve housing may be repaired by lapping. Use caution not to leave behind the lapping agent inside the valve.
- Inspect the spool for scratches or dent on the periphery. Minor scratches may be removed using oil stone or a cloth and lapping agent.
- Inspect the sliding parts for smooth movement and all grooves and passages for foreign material.
- Inspect all the springs for deterioration, deformation or wear, replacing any defective spring with a new one.
- Replace any relief valve that does not operate smoothly with a new one.
- Replace all "O"-rings, back-up rings, and wiper rings with new ones.
- If the cap or plug was removed, inspect each hole and plug seat and around them for foreign matter.

■ REASSEMBLY

Note: 1. Cautions as to handling spools

- Too large torque to the threads will cause the malfunction of the spool. Observe the specified torque.
- Spools, springs and spool ends should be reassembled in the same combination as before they were removed.

2. Cautions as to applying an adhesive (to male and female threads)

- Cleaning (degreasing)
  Steam clean the adherent surfaces using acetate or ether, or clean them using an alkaline detergent.
  Do not use gasoline or kerosene.
- Drying
  Dry with clean compressed air or air dry at room temperature. Improper drying will cause poor bonding effect of the adhesive.
- Applying primer
  Spray a light coat of "LOCTITE PRIMER T" curing-accelerating agent to the adherent surfaces.
  Leave them for 3 to 5 minutes for drying.
- Applying an adhesive
  Apply a small amount of adhesive (LOCTITE#271 or equivalent) to the two or three threads of the spool from its inlet. Use caution not to allow the adhesive-coated area to come in contact with the spring seat.

(1) Reassembling port relief valve

① Install the poppet (4) (with "O"-ring (2) and back-up ring (3) attached) into the sleeve (1). Install the piston (5) and spring (6) into the poppet (4).
This is called the assembly "A".

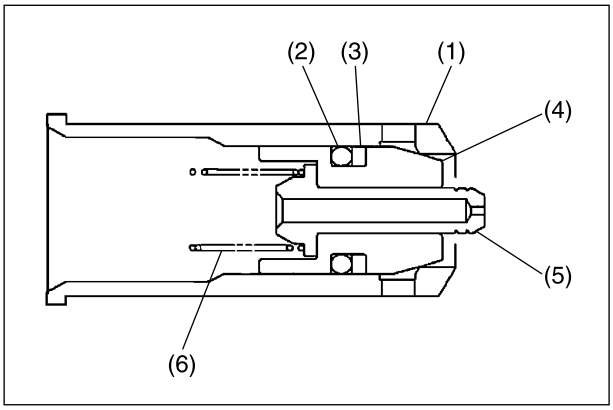


Fig. 3.440

② Place the pilot poppet (2) and spring (3) into the plug (1), and then install the adjuster kit (5) (with "O"-ring (4) attached) temporarily.

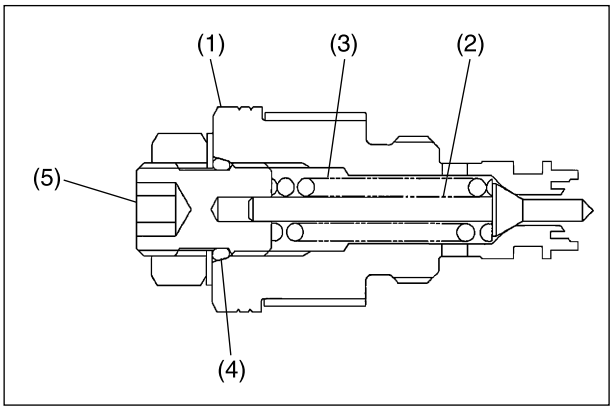


Fig. 3.441

③ Install the "O"-ring (2), wave washer (3), back-up ring (4), and "O"-ring (5) onto the plug (1).
This is called the assembly "B".

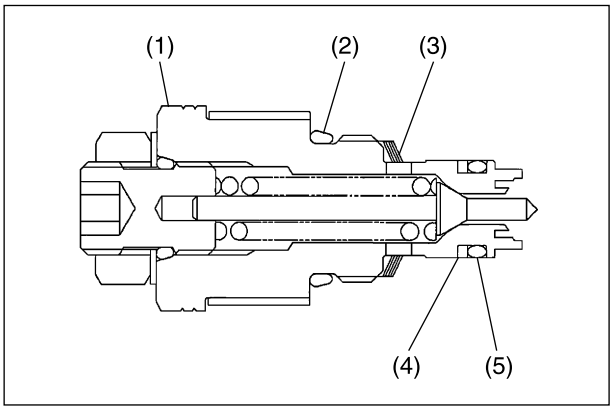


Fig. 3.442

④ Install the "O"-ring (2) onto the cap (1). Install the assembly "A" (3) into the cap (1) and then install the assembly "B" (4).

69 - 79 N-m {7.0 - 8.0 kgf-m} [50.9 - 57.5 lbf-ft]

Threads: Hydraulic oil

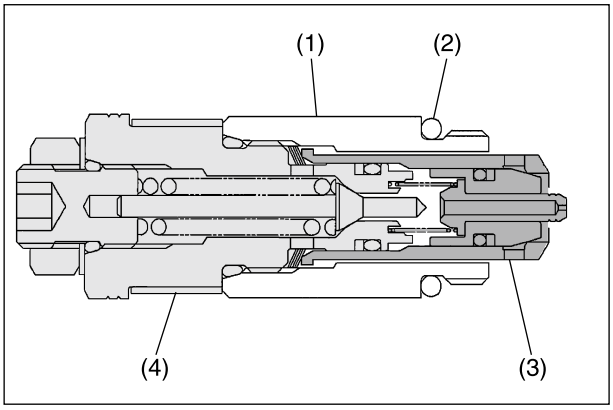


Fig. 3.443

(2) Reassembling main relief valve

① Insert the main poppet (1) and spring (2) into the sleeve (3). Install the sleeve onto the pilot seat (6) (with "O"-ring (4) and back-up ring (5) attached).

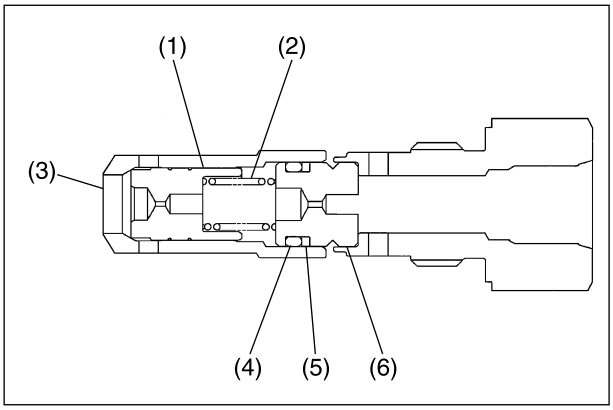


Fig. 3.444

② Install "O"-rings (3) onto the cap (1) and plug (2).

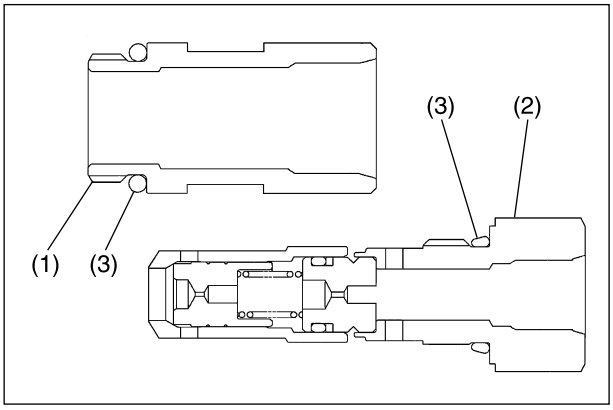


Fig. 3.445

③ Install the pilot poppet (2) and spring (3) into the plug (1). Install the adjuster kit (5) (with "O"-ring (4) attached) temporarily.

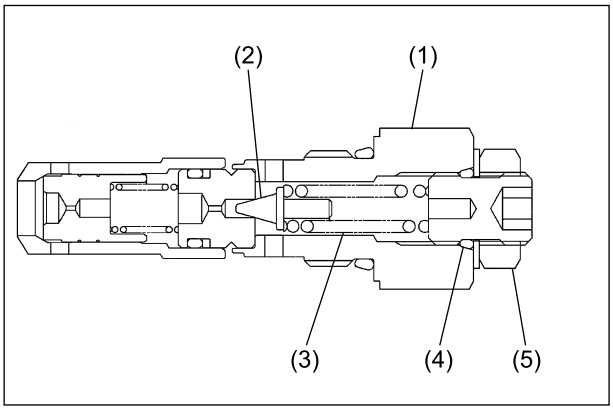


Fig. 3.446

④ Install the parts assembled in step ③ into the cap (1) and then tighten the adjuster kit (2) securely.

Cap (1) : 69 - 78 N-m {7.0 - 8.0 kgf-m} [50.9 - 57.5 lbf-ft]

Adjuster kit (2): 27 - 31 N-m {2.8 - 3.2 kgf-m} [19.9 - 22.9 lbf-ft]

Threads: Hydraulic oil

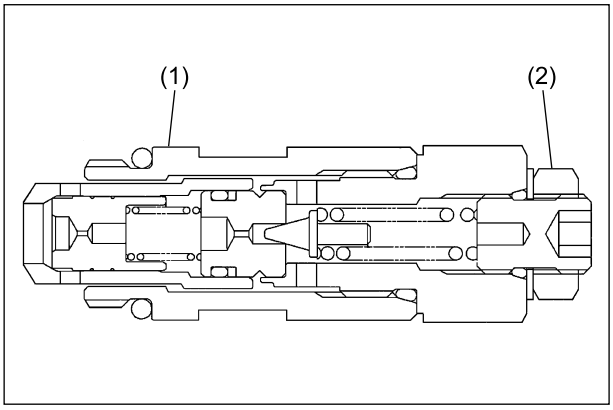


Fig. 3.447

(3) Reassembling lift spool section

① Hold the spool (1) in a vise with soft jaws (pieces of hard wood) shown in Figure 3.448, with care not to damage its exterior.
Install the "O"-ring (2), wiper (3) and seal plate (4) to the spool (1).

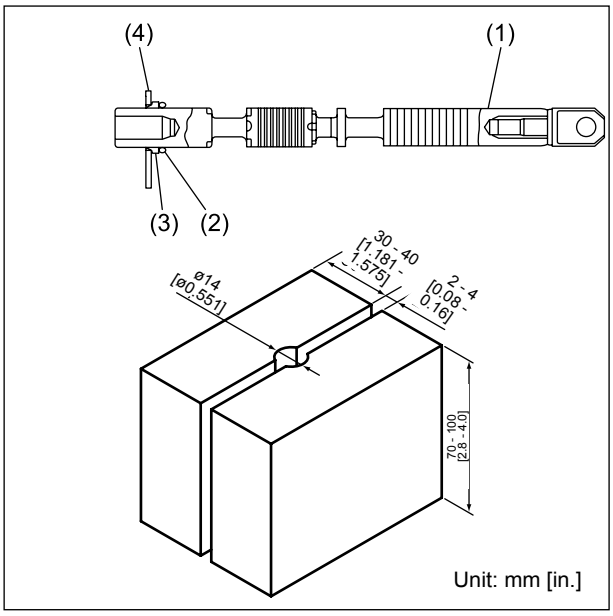


Fig. 3.448

② Install the spring seats (2) and spring (3) to the spool (1) and then tighten the cap screw (4).

18.6 N-m {1.9 kgf-m} [13.7 lbf-ft]

Threads: Hydraulic oil

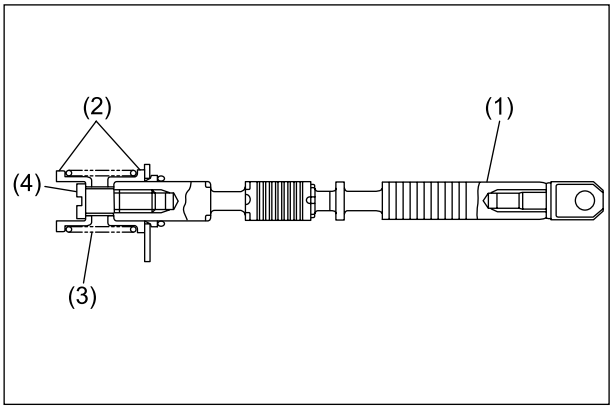


Fig. 3.449

③ Install the "O"-ring (2), wiper (3) and seal plate (4) to the valve housing (1), and then tighten the screw (5).

2.9 N-m {0.3 kgf-m} [2.14 lbf-ft]

Thread: Hydraulic oil

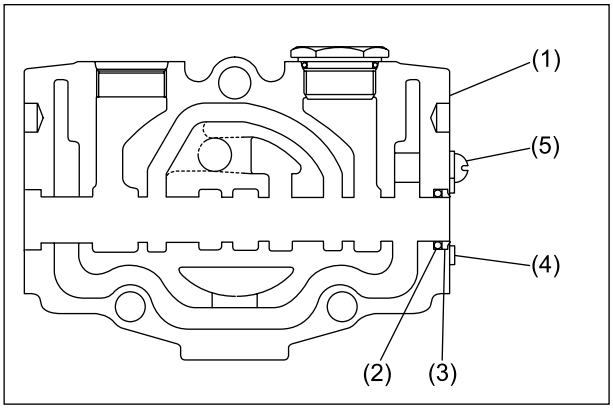


Fig. 3.450

④ Insert the spool (2) into the valve housing (1). Install the cap (3) and then tighten the socket head bolts (4).

9 - 11 N-m {0.9 - 1.1 kgf-m}
[6.6 - 8.1 lbf-ft]

Threads: Hydraulic oil

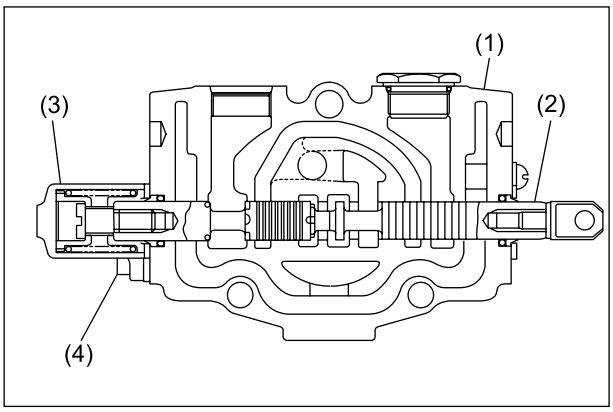


Fig. 3.451

(4) Reassembling tilt spool section

① Hold the spool (1) in a vise equipped with soft jaws (pieces of hard wood) shown in Figure 3.452, with care not to damage its exterior. Insert the valve (2) into the spool (1) using the M4 screw at the end face and then insert the spring (3).

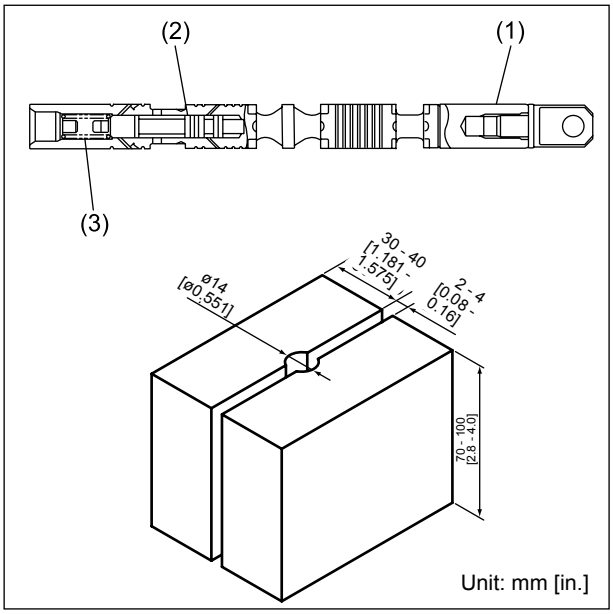


Fig. 3.452

② Install the "O"-ring (2), wiper (3) and seal plate (4) to the spool (1).

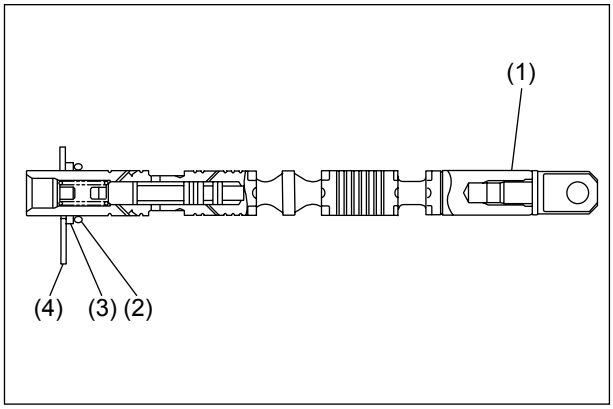


Fig. 3.453

③ Install the spring seats (2) and spring (3) to the spool (1). Tighten the cap screw (4).

12 - 14 N-m {1.2 - 1.4 kgf-m} [8.9 - 10.3 lbf-ft]

Threads: Hydraulic oil

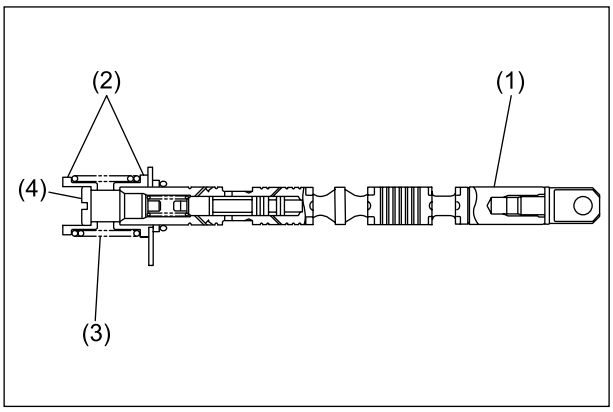


Fig. 3.454

④ Install the "O"-ring (2), wiper (3) and seal plate (4) to the valve housing (1). Tighten the screw (5).

2.9 N-m {0.3 kgf-m} [2.14 lbf-ft]

Threads: Hydraulic oil

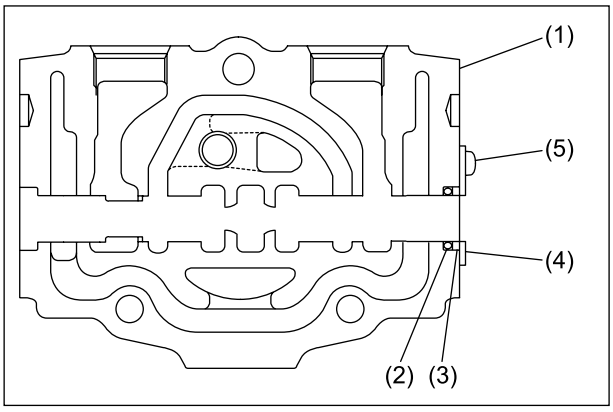


Fig. 3.455

⑤ Insert the spool (2) into the housing (1). Install the cap (3) and tighten the socket head bolts (4).

9 - 11 N-m {0.9 - 1.1 kgf-m} [6.6 - 8.1 lbf-ft]

Threads: Hydraulic oil

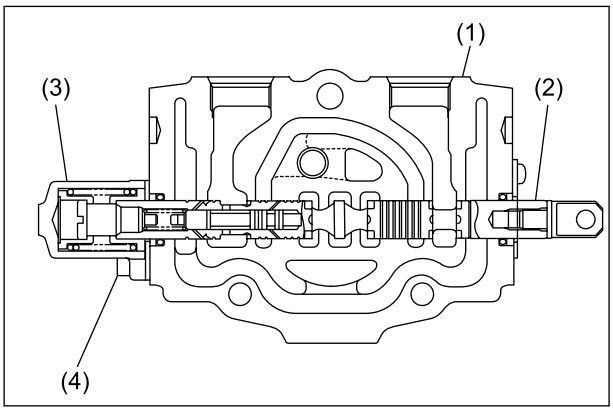


Fig. 3.456

(5) Reassembling valve assembly

① Install the poppet (1), spring (2) and "O"-ring (3) between the mating surfaces of each section.

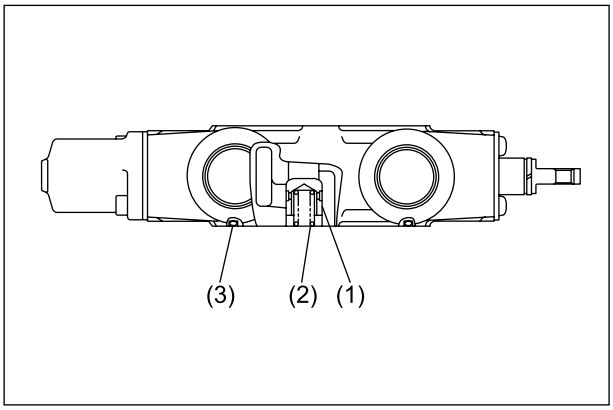


Fig. 3.457

② Insert the stud bolts (1) in the inlet section (2).

Threads: Hydraulic oil

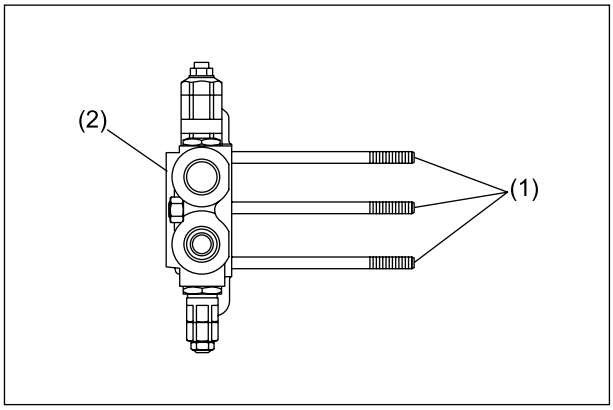


Fig. 3.458

③ Install the lift spool section (1), tilt spool section (2), and outlet section (3) to the inlet section in that order, and then secure with the nuts (4).

Nut M8: 19 N-m {1.9 kgf-m} [14.0 lbf-ft]
Nut M10: 46 N-m {4.7 kgf-m} [33.9 lbf-ft]

Threads: Hydraulic oil

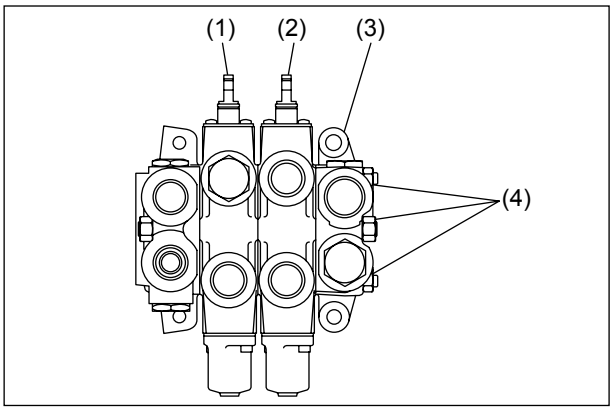


Fig. 3.459

④ Install the main relief valve (1) and PF relieve valve (2) onto the inlet section (3).

69 - 78 N-m {7.0 - 8.0 kgf-m}
[50.9 - 57.5 lbf-ft]

Threads: Hydraulic oil

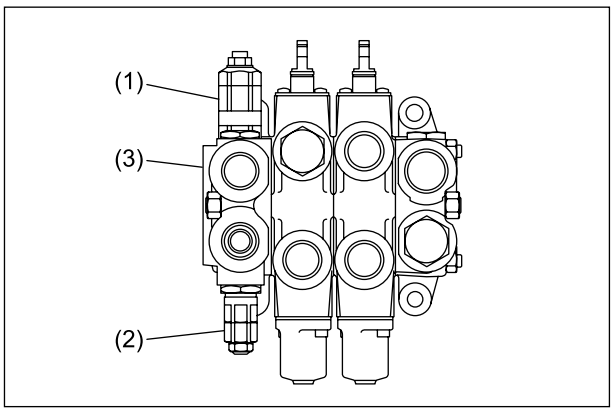
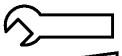


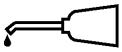
Fig. 3.460

■ ADJUSTING RELIEF VALVE

(1) Adjusting main relief valve

① Install a pressure gauge at the inlet of the circuit.
② Operate the pump at the rated speed.
③ Switch over the control valve spools and read the pressure gauge at which the cylinder rod has reached the end of its stroke.
④ Adjust the adjuster properly so that the necessary pressure be obtained.
⑤ When the specified pressure is obtained, hold the adjuster in place and tighten the lock nut.


27 - 31 N-m {2.8 - 3.2 kgf-m} [19.9 - 22.9 lbf-ft]


Threads: Hydraulic oil

⑥ Check that the specified oil pressure is obtained.

(2) Port relief valve

You cannot adjust the port relief valve. If adjustment of the port relief valve is needed, replace it with a port relief valve assembly whose pressure is factory set.

3.11 MAST

3.11.1 VM MAST

■ DISASSEMBLY

(1) Remove the carriage and forks along with the load backrest as a complete assembly.

① Lower the carriage and fork assembly on the pallet and loosen the chains.

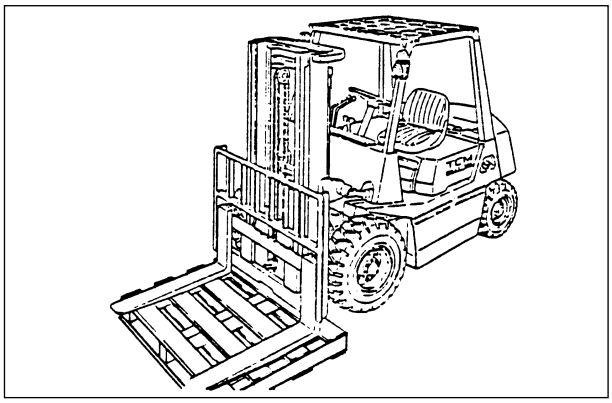


Fig. 3.461

② Remove the split pins from the joint linkage and remove the chains from the outer mast.

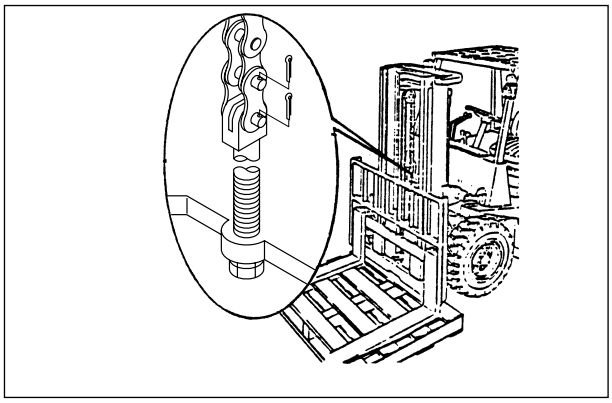


Fig. 3.462

③ Put the chains on the pallet and raise the inner mast hydraulically above the carriage end rollers.

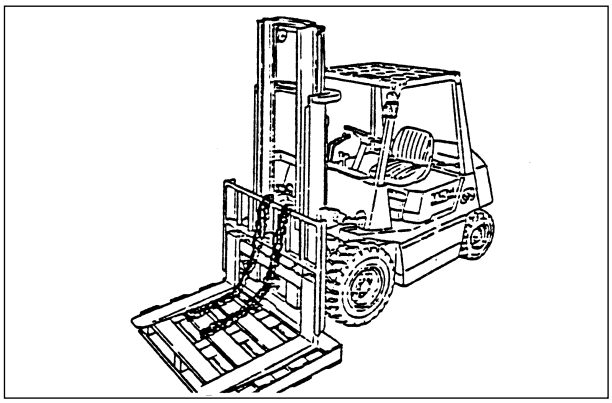


Fig. 3.463

④ Drive back the truck to ensure that you can gain access to all the carriage end rollers. Adjust or replace the carriage end rollers as necessary.

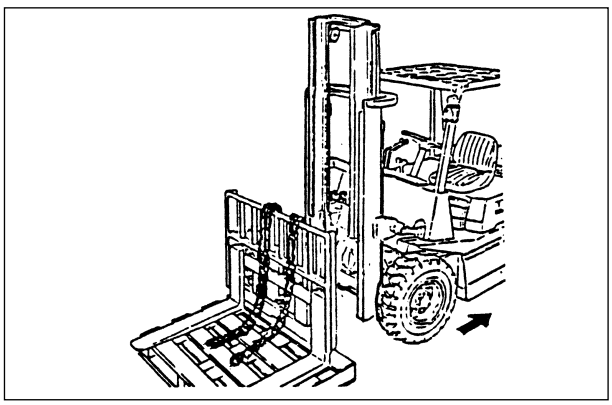


Fig. 3.464

(2) Adjusting or replacing rollers of the mast:

① Put the front tires on stands 300 mm [12 in.] high.

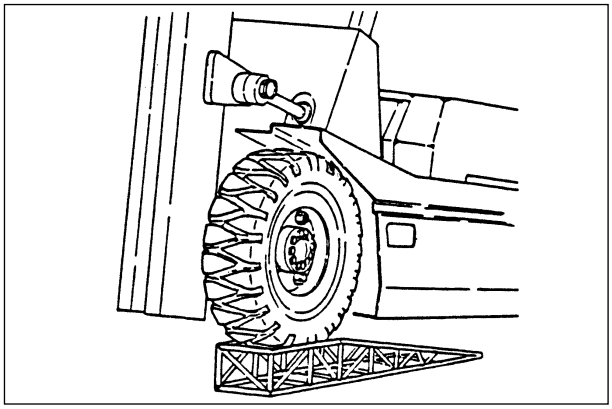


Fig. 3.465

② Remove the piston head bolt from each of both cylinders.

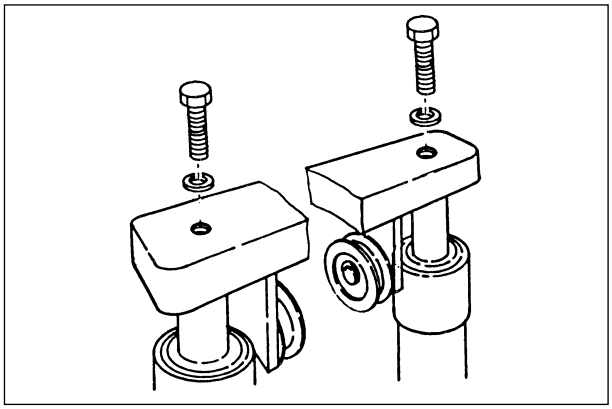


Fig. 3.466

③ Move the lift lever a few times to remove the oil pressure from the piping.

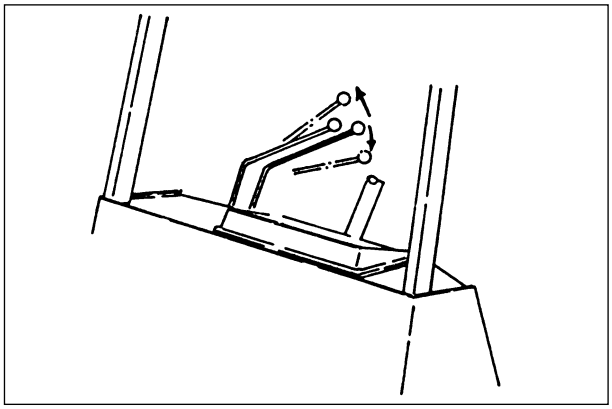


Fig. 3.467

④ Using a hoist crane, raise the inner mast about 1 m [3.28 ft.].

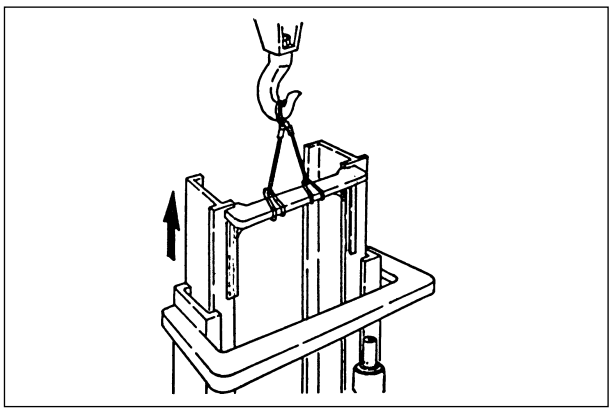


Fig. 3.468

⑤ Put an oil pan under the cylinders to receive oil drained from the cylinders and piping.

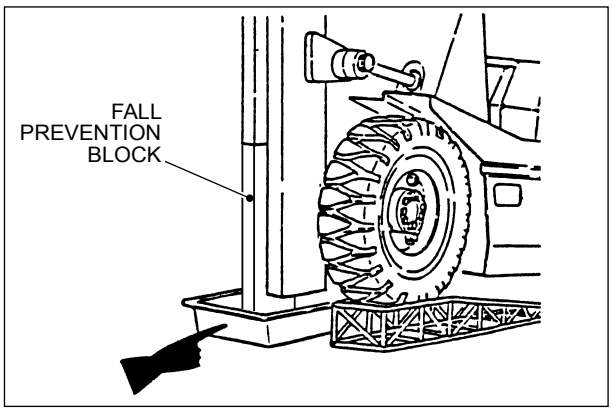


Fig. 3.469

⑥ Remove the hoses from the cylinders.

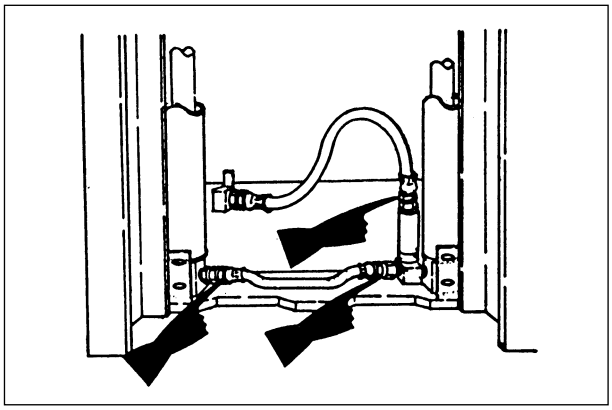


Fig. 3.470

⑦ Remove the set bolts from the bottom of each cylinder.

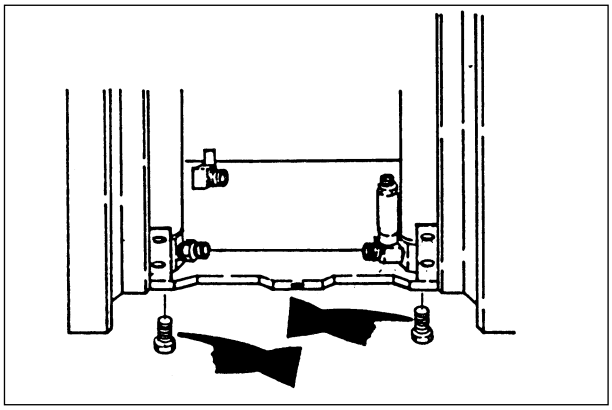


Fig. 3.471

⑧ Remove the return hose from each of the cylinder caps.

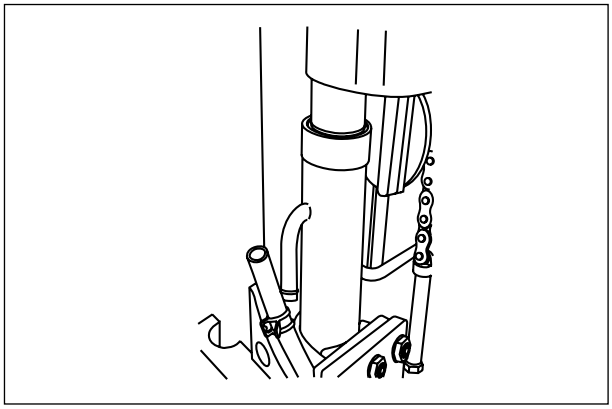


Fig. 3.472

⑨ Holding the lift cylinder, remove the U bolt. Use caution not to lose the rubber parts.

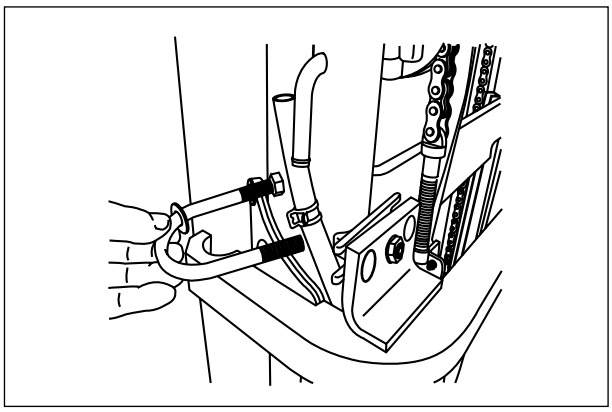


Fig. 3.473

⑩ Remove the two lift cylinders.

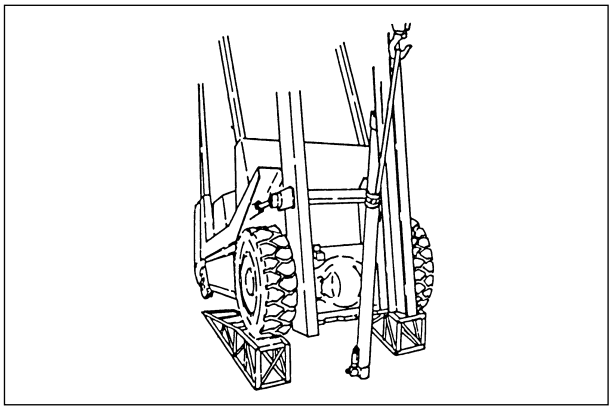


Fig. 3.474

⑪ Using a hoist crane, lower the inner mast so that the rollers at the top and bottom of the mast can be accessed.

⑫ Replace or adjust if necessary.

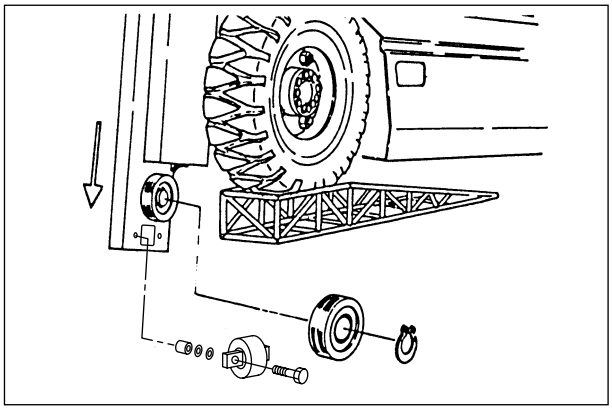


Fig. 3.475

⑬ Replace or adjust the slippers or end rollers as necessary.

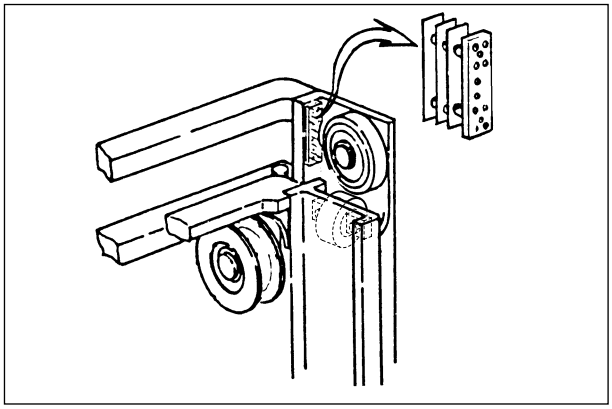


Fig. 3.476

⑭ Remove the end rollers.

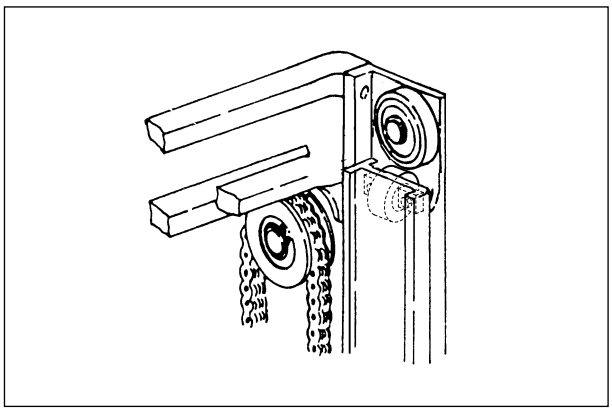


Fig. 3.477

⑮ For safety's sake, put a wooden block under the bottom of the inner mast.

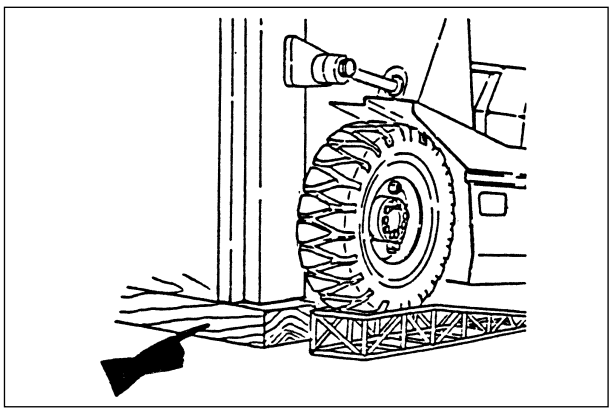


Fig. 3.478

■ REASSEMBLY

Reassemble the mast in a sequence opposite to disassembly, observing the following conditions:

(1) Select proper end rollers to ensure that the gaps between the channel and end rollers can be assured correctly: one between the outer mast end rollers and inner mast, one between inner mast end rollers and outer mast, and carriage end rollers and inner mast.
(2) Install a three-piece set of shims (t = 1.0 mm [0.039 in.]) into each of the slipper holes at the top of the outer mast.
(3) Install end rollers to the end roller shafts (outer and inner masts).
(4) Using a hoist crane, put the inner mast into the outer mast from below. Check the gap between the outer mast channel and the side of the inner mast end roller. Measure the gaps at points A, B, and C of the outer mast and adjust, if necessary, with shims so that they be within the specified value.
(5) Using the same manner, adjust the gap between the inner mast channel and the side of the outer mast end roller.
(6) Using a hoist, lift the carriage and reassemble it from the bottom end of the inner mast channel, aligning with the end roller rails.
(7) Check the gaps between the side of each roller and the inner mast channel at three points (A1, B1, and C1).
(8) The gap between each roller and the inner mast channel should be less than 0.5 mm [0.0197 in.]. Adjust, if necessary, with shims.

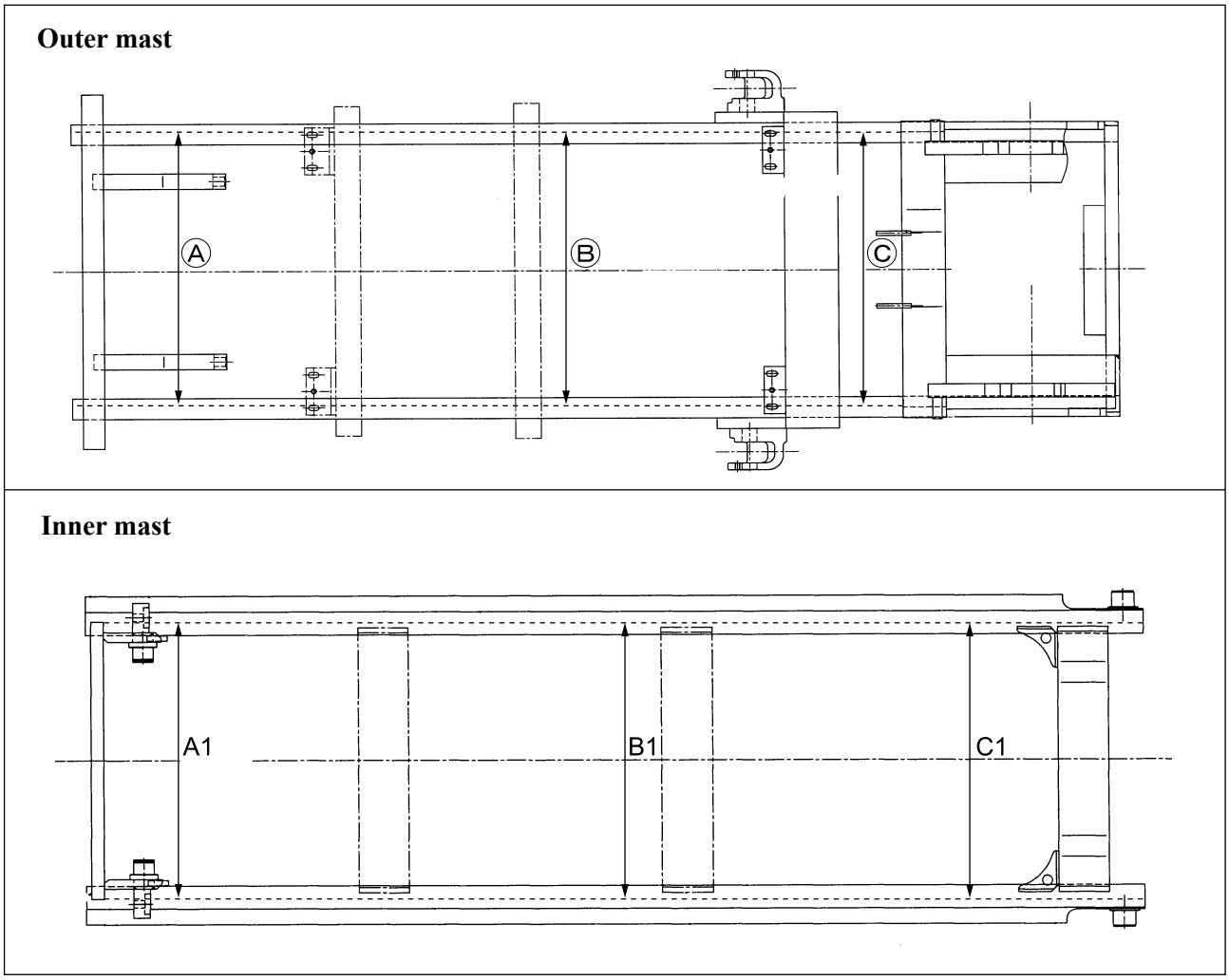


Fig. 3.479

■ CYLINDER SUPPORT “U” BOLT

Using the adjuster, adjust the distance between the outer mast and each cylinder so that it is the same for both cylinders.

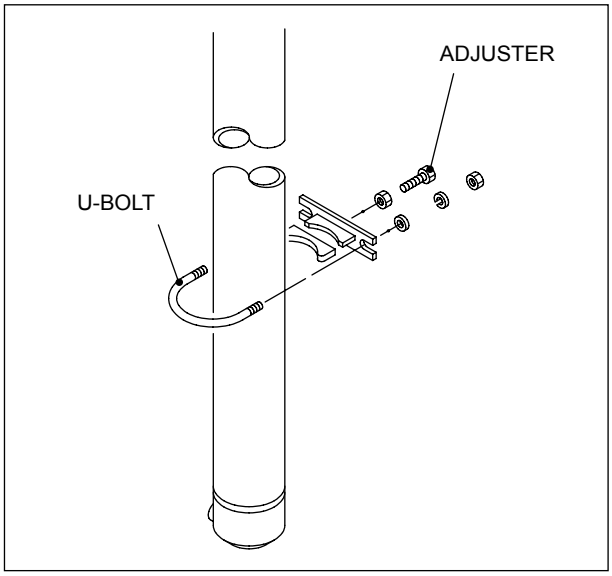


Fig. 3.480

Note: Do not overtighten the “U” bolt; otherwise the cylinder may be damaged.

14.7 – 16.7 N-m [1.5 – 1.7 kgf-m] [10.8 - 12.3 lbf-ft]

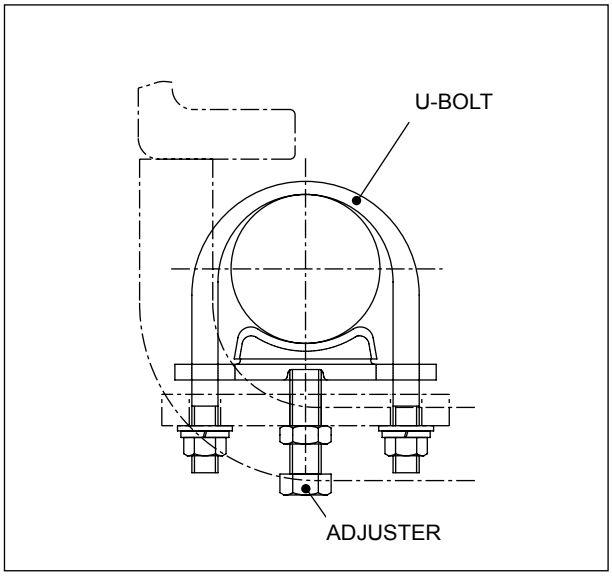


Fig. 3.481

■ ADJUSTING LIFT CYLINDER ROD WITH SHIMS

After the lift cylinder, inner channel, and outer channel are replaced, the lift cylinder rod length needs to be adjusted.

(1) Install a piston head on each rod of the right and left cylinders without shim.
(2) Extend the lift cylinder rod slowly and check the difference of the time till each of the right and left cylinder rods reaches the stroke end.
(3) Add shim between the rod and piston head which stop first.
Shim thickness: 0.2 and 0.5 mm [0.008 - 0.01 in.]
(4) Adjust the lift chain tension.

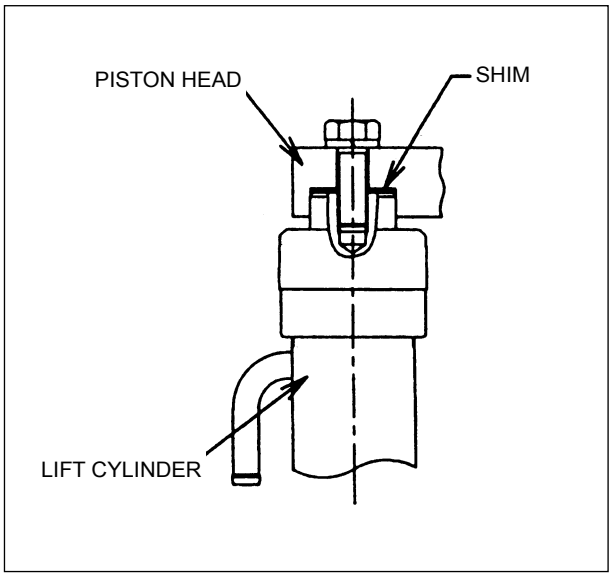


Fig. 3.482

■ ADJUSTING CARRIAGE HEIGHT

(1) Stop the truck on a level surface and stand the mast vertically.
(2) Keep the fork bottom on the ground and adjust the projected amount [A] of the carriage lower end roller to the value as shown in the table below, using the chain anchor pin at the mast side.

Model	Mast Type	[A] mm [in.]
3.5 - 4 ton	VM-43A	24 - 29 [0.945 - 1.142]
4.5 ton	VM-43F	24 - 29 [0.945 - 1.142]
5.0 ton	VM-43H	25 - 30 [0.984 - 1.181]

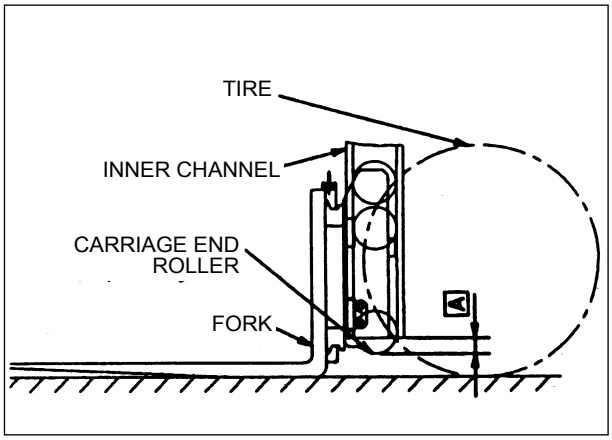


Fig. 3.483

(3) Make sure that the clearance between the carriage and the inner channel stoppers is 0 mm when the fork is raised to the maximum lifting height.

Note: When the mast lifting height is 4000 mm [157.5 in.] or more, 50 mm [2 in.] is added to dimension [B]. When the lifting height is 5500 mm [216.5 in.] or more, 100 mm [4 in.] is added to dimension [B].

Model	Mast Type	Free lift mechanism	[B] mm [in.]
3.5 - 4 ton	VM-43A	None	19 - 24 [0.75 - 0.95]
4.5 ton	VM-43F	None	19 - 24 [0.75 - 0.95]
5.0 ton	VM-43H	None	43 - 48 [1.69 - 1.89]

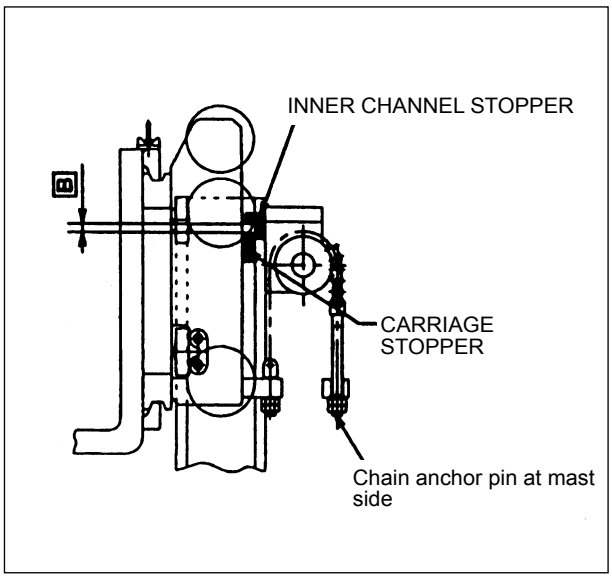


Fig. 3.484

(4) Adjust the tension of the right and left chains to the same value with the chain anchor pin at the mast side when the fork is at the bottom piston and the mast is tilted back all the way.

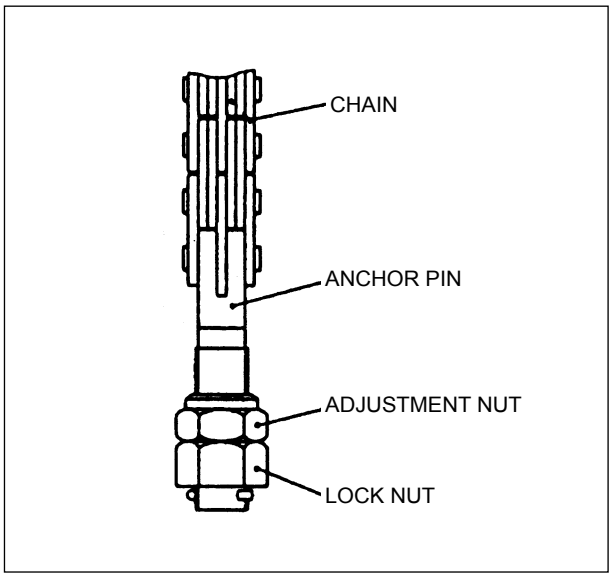


Fig. 3.485

■ ADJUSTING TILT CYLINDER

Lift the forks to the maximum height and tilt the mast forward and backward slowly. If the two cylinder rods are not the same length (if the mast is twisted), adjust them to the same length.

(1) Loosen the lock nut at the rod end.
(2) Turn the piston rod to the right or left to adjust the length.
If the piston rod is hard to turn, turn it while tilting the mast hydraulically forward or backward.

Note: For your safety, do not extrude the piston rod more than 31 mm [1.221 in.].

(3) After adjustment, retighten the lock nut securely.

107.9 ±20.6 N-m [12.1 ±2.4 kgf-m]. [79.6 ±15.2 lbf-ft]

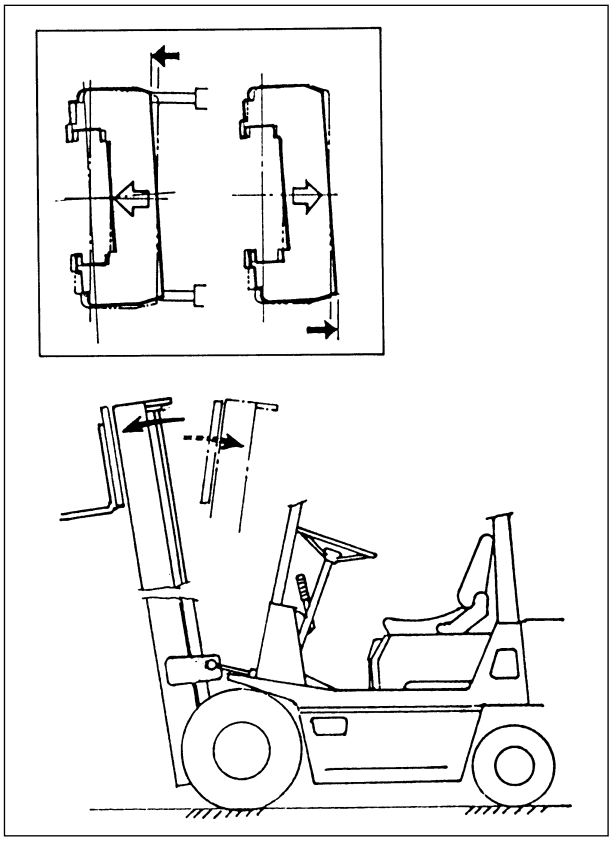


Fig. 3.486

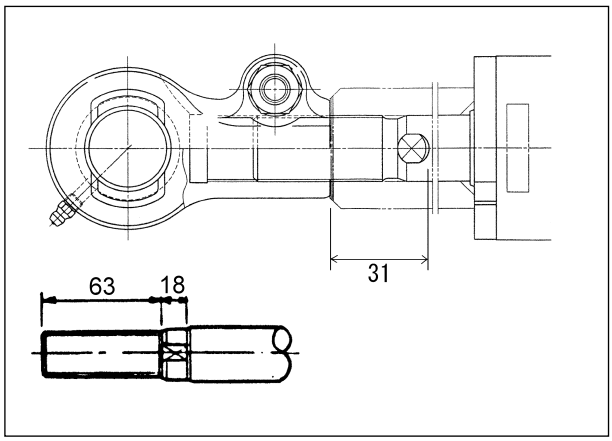


Fig. 3.487

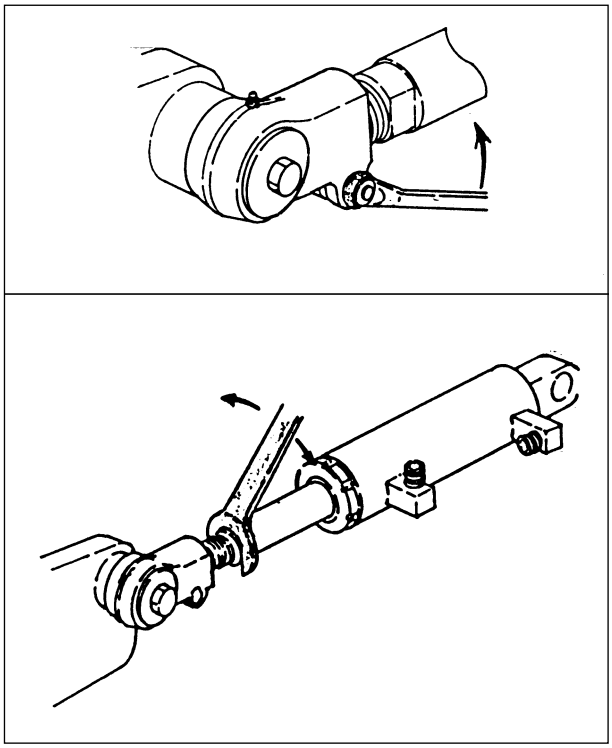


Fig. 3.488

■ CHECKING THE FORKS

(1) Using Color Check, check the upper and lower hangers of the forks for cracks at the welds. Check the forks for squareness. Check the root of the hangers for damage. In addition, install the forks on the finger bar and check the tips of both forks for alignment. Check that the fork stoppers work properly.
(2) If the hangers have cracks at the welds, repair completely by welding. Replace any defective fork stopper with a new one.
(3) If the forks have poor squareness or their lengths are not the same, repair using a press. If the defect is too severe, replace the forks with new ones.

Note: Under any circumstance, do not heat the forks for the purpose of repairing them. If the forks are heated and then cooled, the characteristics of the material will change.

■ CHECKING INNER AND OUTER MASTS

(1) Check the inner and outer masts for bends and roller sliding areas of the masts for wear. If defective, repair or replace.
(2) Visually check the inner mast connecting members for cracked welds. If defective, replace the connecting member. Check also the inner mast for deformation or warping.
(3) Measure the inner width of each of the inner and outer masts along which the end roller rolls, and calculate the distortion of the masts from the measured values. If the distortion is small, repair using a press. If severely distorted, the mast assembly should be replaced with a new one.
(4) Check the end rollers of the inner and outer masts for wear of their outer periphery. Replace any severely worn end roller with a new one. Check their bearings for wear, too.
(5) Check the outer mast support for cracks of the weld or wear and deformation of the bushing, replacing any defective part with a new one.

■ CHECKING THE CARRIAGE

(1) Check the carriage end rollers for uneven wear or damage. If any defect is found, replace the roller assembly as a complete roller assembly.
(2) Check the bearing of each end roller. If it shows undue wear or damage, replace as a complete roller assembly.
(3) Check the side rollers for uneven wear or damage in their periphery. In addition, check for looseness between the bearing and shaft. If any defect is found, replace as a complete side roller assembly.
(4) Check the carriage for bends and squareness.

■ NATURAL DROP OF HYDRAULIC CYLINDERS AND HOW TO CHECK FOR IT

(1) Lift cylinder
 (a) Put a specified amount of load on the forks, raise the forks to the eye level and shut off the engine.
 (b) Punch mark the inner mast and outer mast and hold the load for about 10 minutes. Measure for the natural drop of each lift cylinder.

(2) Tilt cylinder
 (a) Put a specified amount of load on the forks, place the mast in an vertical position, raise the forks to the eye level, and shut off the engine.
 (b) Measure the length of the piston rod from the front end of the cylinder cap to the front end of the connecting clamp lock nut. Hold the load for about 10 minutes and measure for the natural tilt of each tilt cylinder (the amount of extension).

Note: If any tilt cylinder should have a large natural tilt, there is a danger of the load spilling from the forks.
This test should be performed in a safe place with the load secured to the forks or carriage.

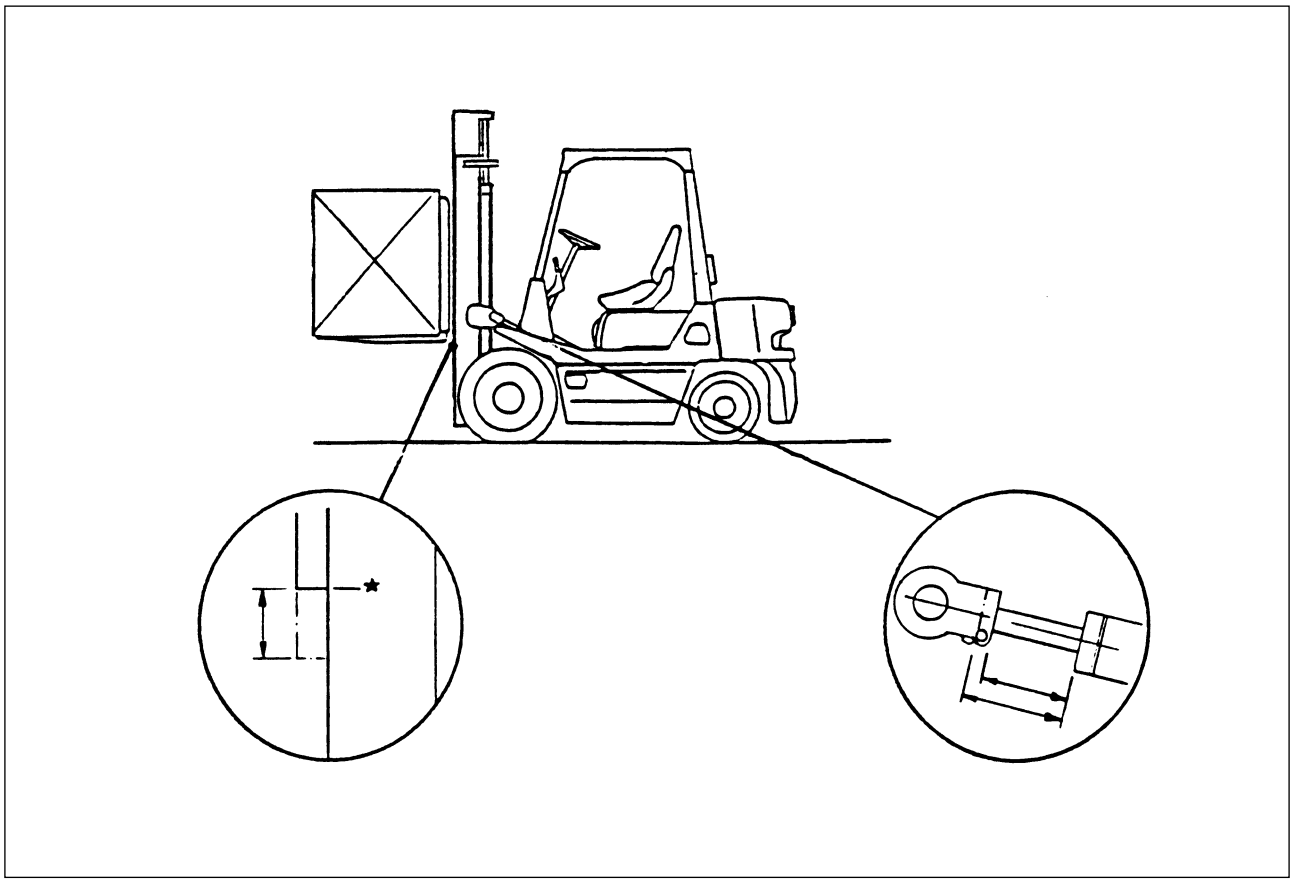


Fig. 3.489

■ MAJOR BOLT TORQUE

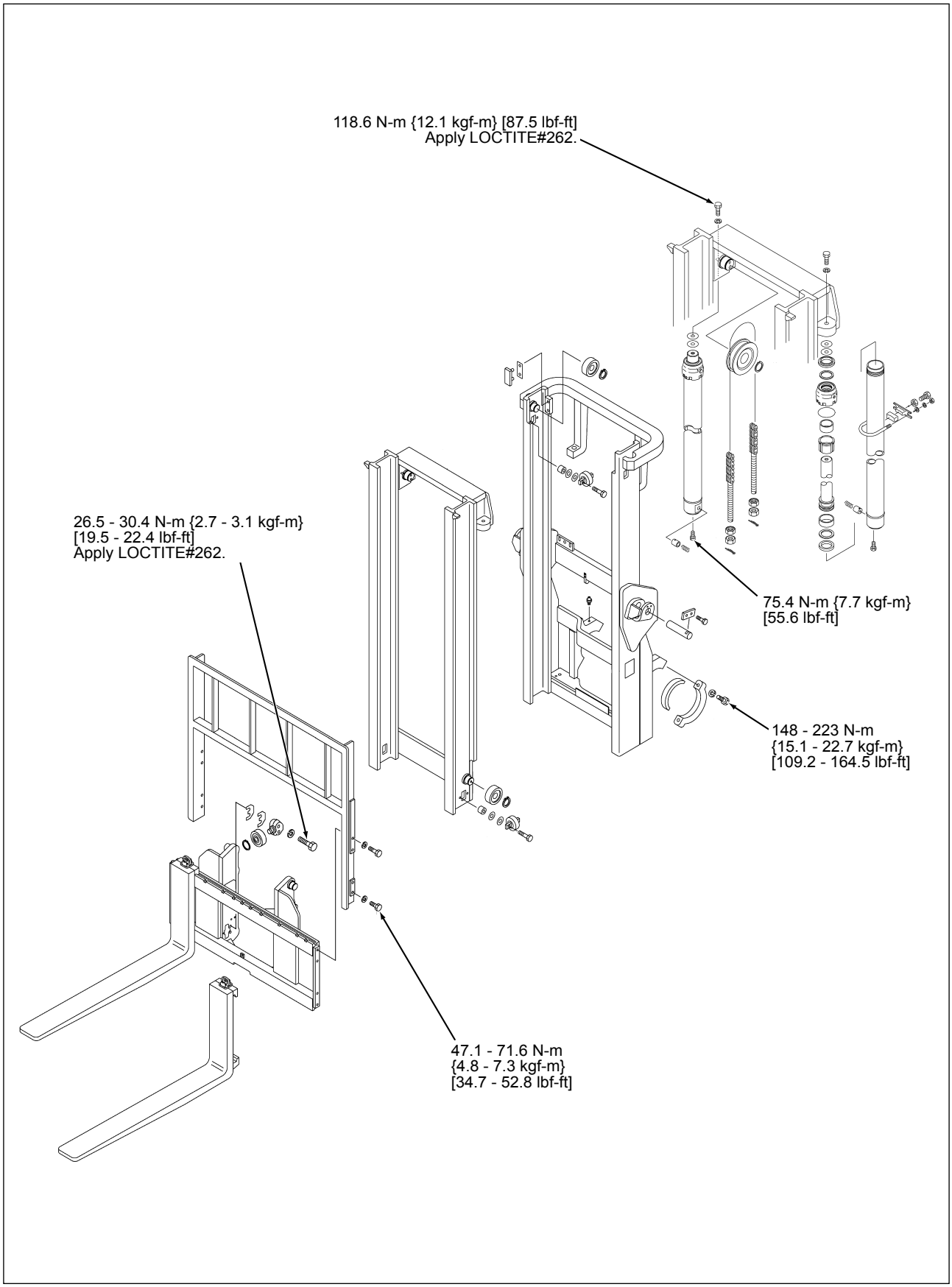
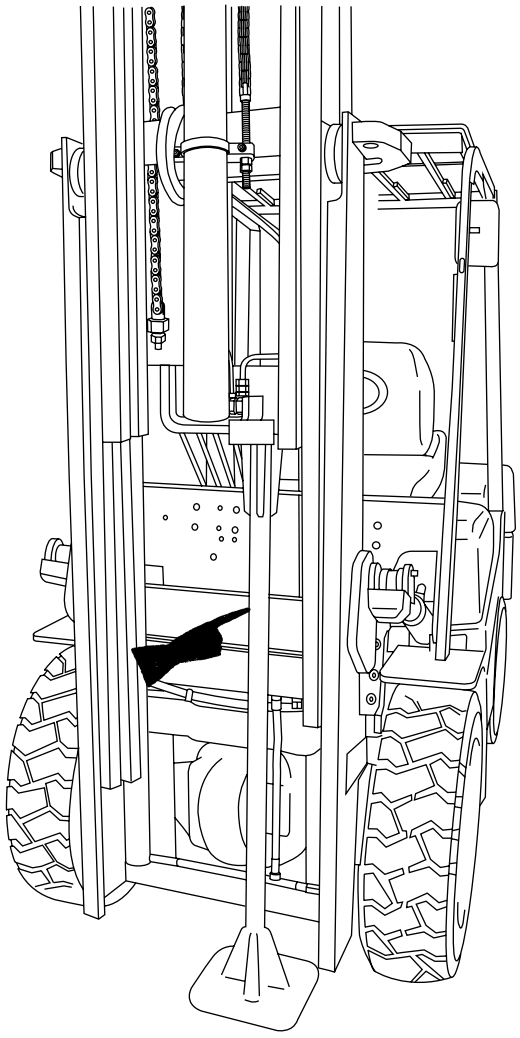


Fig. 3.490

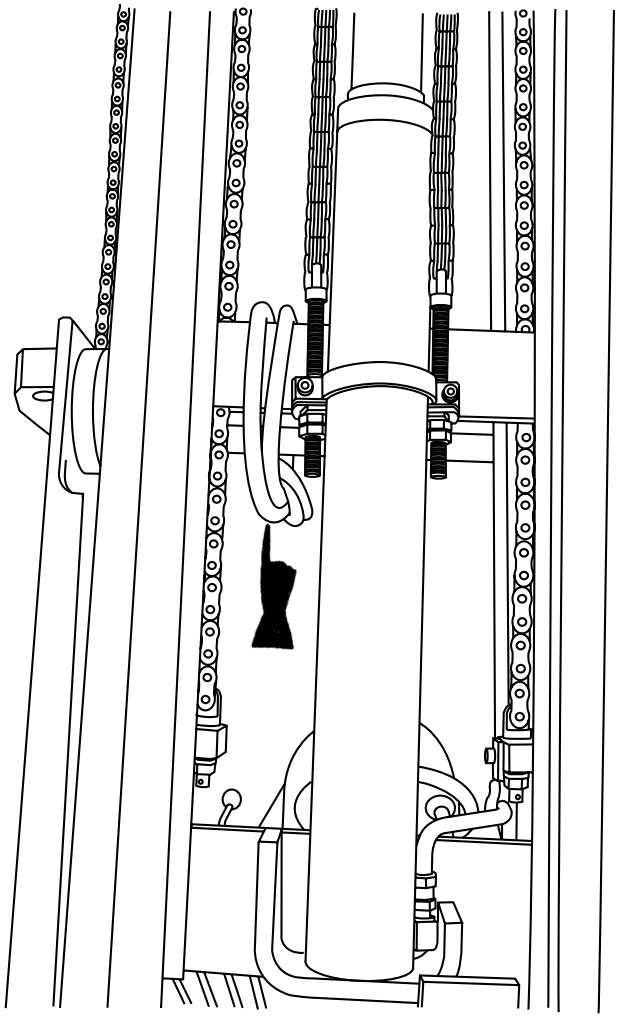
3.11.2 VFHM MAST

When adjusting or replacing the mast rollers or slippers or carriage rollers:

1. You can replace the rollers, slippers our carriage bearings without having to remove the mast from the truck.
2. Caution: When lifting the inner mast for the purpose of repairing, take necessary measures to prevent the inner mast from dropping before trying to repair. It is dangerous to rely on the hydraulic system alone to support the inner mast.



Jig that prevents inner mast from dropping



The inner mast is tied together
with the outer mast to prevent from dropping

Fig. 3.491

(1) Remove the carriage and forks as a complete assembly.

① Lower the carriage and fork assembly on the pallet and loosen the chains.

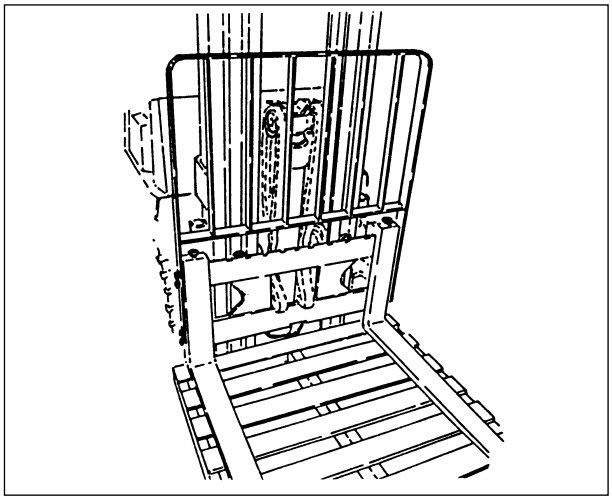


Fig. 3.492

② Remove the chain stopper and lift the chains to remove them from the chain sleeves.

③ Remove the piston heads.

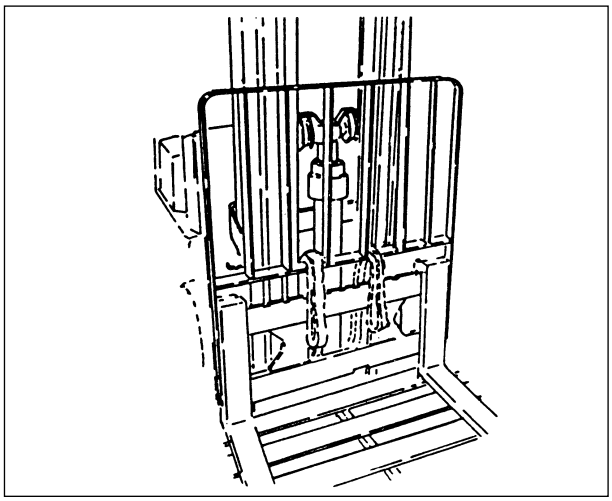


Fig. 3.493

④ Using hydraulic pressure, lift the inner masts above the carriage end rollers.

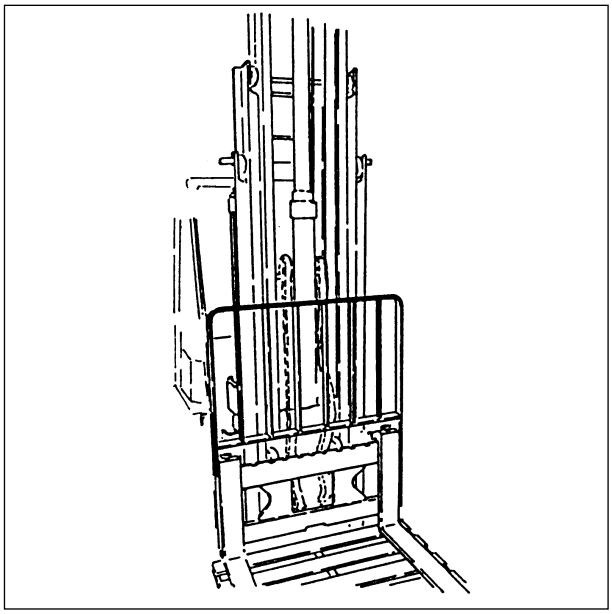


Fig. 3.494

⑤ Drive back and remove the carriage from the mast assembly.
Adjust or replace as necessary.

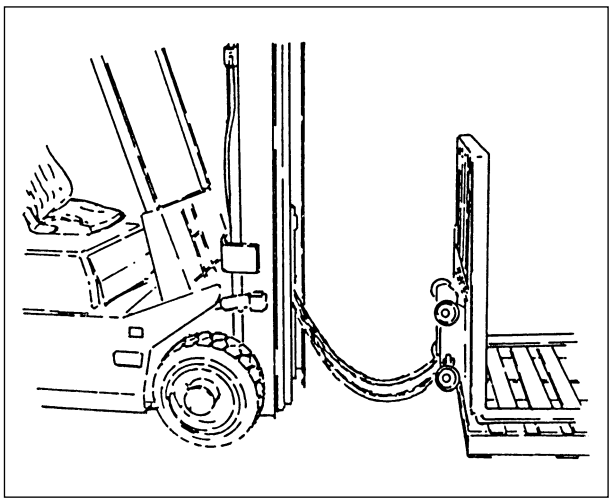


Fig. 3.495

(2) Adjusting or replacing the inner or outer mast rollers

① Put the front tires on stands 300 mm [12 in.] high.

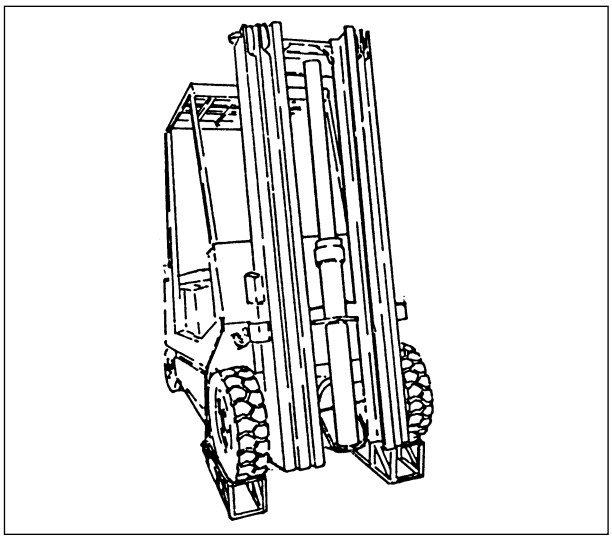


Fig. 3.496

② Put the chain over the top connecting members of the middle and inner masts.

③ Lift the middle and inner mast connecting members to loosen the chains enough to make it possible to remove the chain from the sheave.

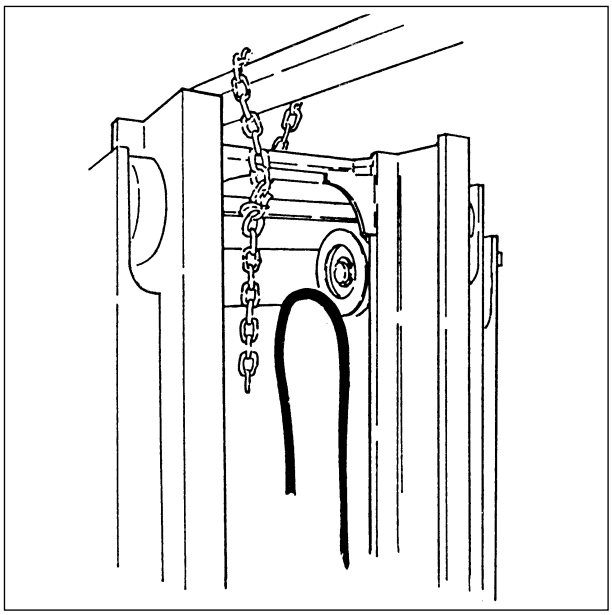


Fig. 3.497

④ Remove the hose, sheave, chain and sheave bearing assembly from each of both sides. Put the chains in free state.

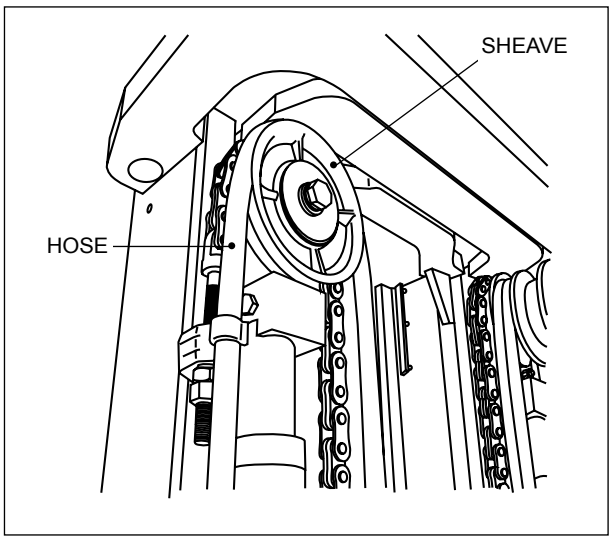


Fig. 3.498

⑤ Remove the rear cylinder ram bolts.

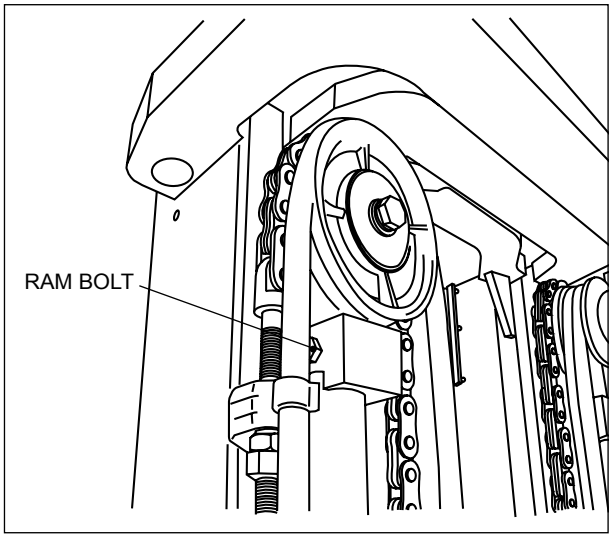


Fig. 3.499

⑥ Raise the middle and inner masts to their respective maximum heights.
Secure or support them with proper means for safety's sake.

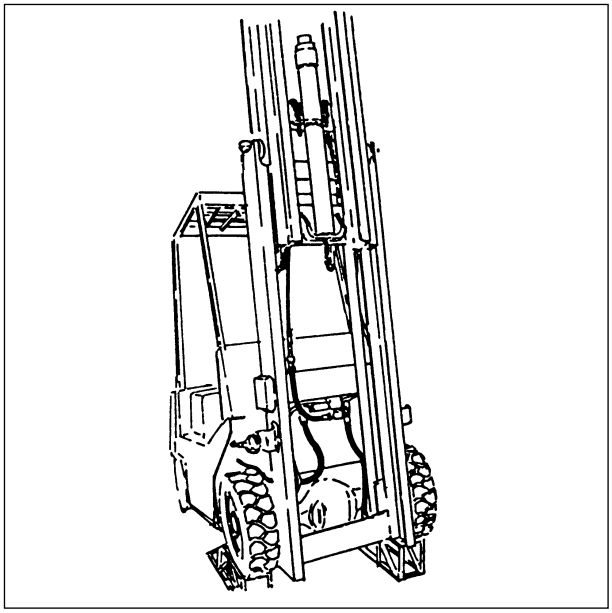


Fig. 3.500

⑦ Push forward the lift lever and hold there until all the oil is drained from the cylinders.

⑧ Remove the four bolts securing the hose guard.

⑨ Remove the right-side rear cylinder hose at its top position. Remove the left-side cylinder cross-over hose at the point connected to the right-side cylinder.

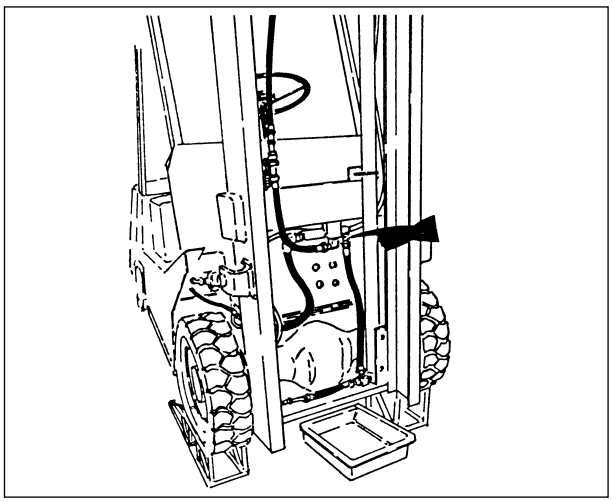


Fig. 3.501

⑩ Support both cylinders securely, remove the "U" bolt. Use caution not to lose the shims.

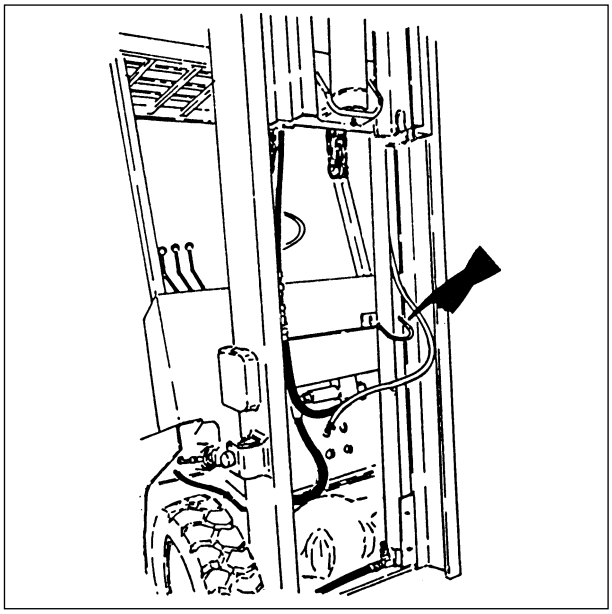


Fig. 3.502

⑪ Remove the set bolts from bottom of each cylinder.
Lift the cylinder once and tilt it slightly while putting out of the mast system.

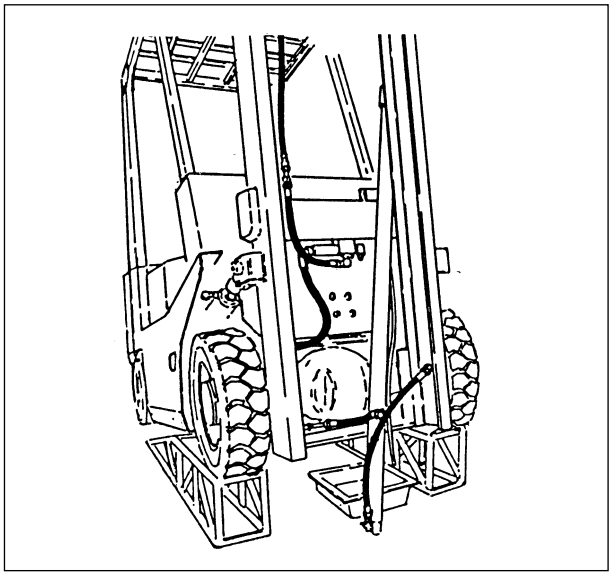


Fig. 3.503

⑫ The mast assembly with both rear cylinders removed.

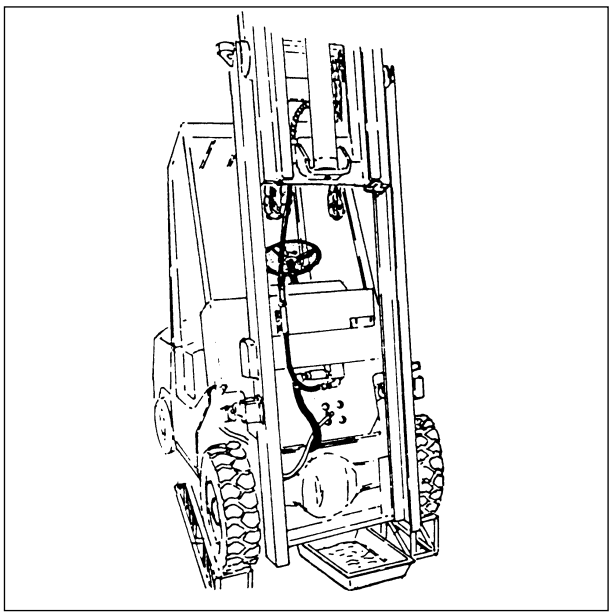


Fig. 3.504

⑬ Lower the middle and inner masts. Supporting the inner mast alone, lower the middle mast below the usual position so that the bottom rollers of the middle mast and the top rollers of the inner mast can be accessed.

⑭ Replace or adjust as necessary.

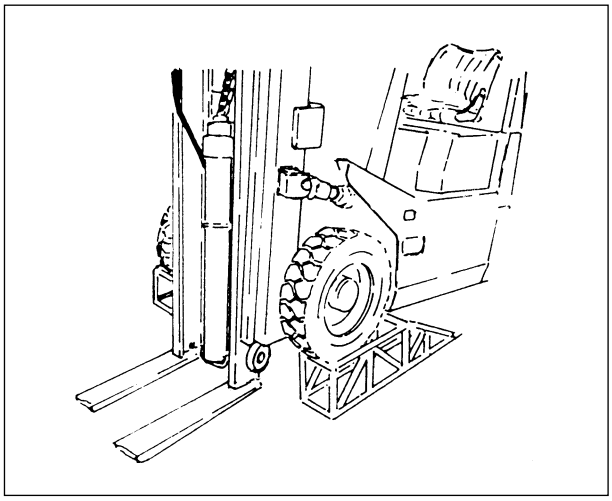


Fig. 3.505

⑮ Fig. 3.506 shows the top rollers and slippers of the inner mast.

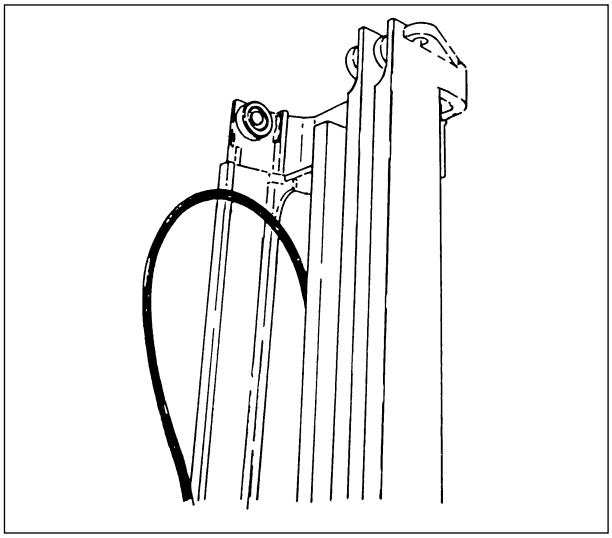


Fig. 3.506

⑯ Raise the middle mast to the usual position and remove the support securing the inner mast.

⑰ Lower the inner mast (with the middle mast in the usual position) so that the bottom rollers of the inner mast and the top rollers of the middle mast can be accessed.

⑱ Replace or adjust the rollers as necessary.

⑲ Replace the top slippers and shims of the outer and inner masts.

(3) Reassemble the inner masts in a sequence opposite to disassembly.

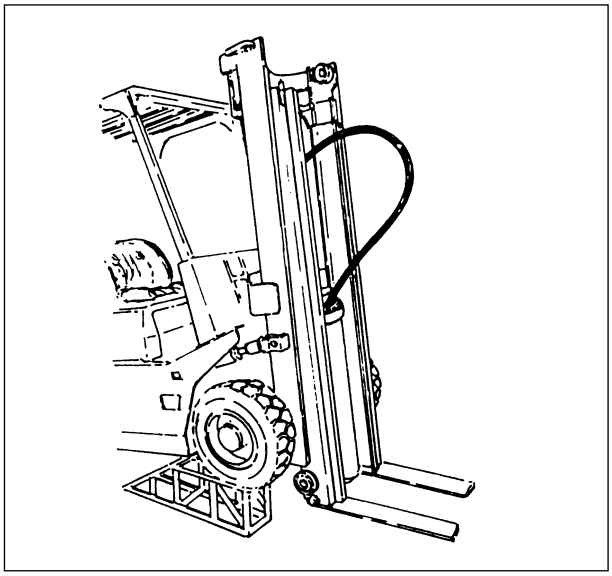


Fig. 3.507

3.12 LIFT CYLINDER

■ DISASSEMBLY

① Install a locking jig shown in Figure 3.508 onto the lift cylinder.

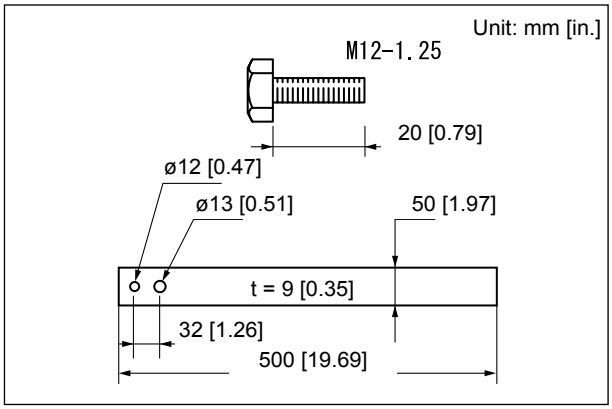


Fig. 3.508

② Remove the cylinder cap assembly from the cylinder.

③ Remove the rod and piston assembly from the cylinder.

④ Remove the wiper ring from the cylinder cap.

Note: Do not reuse the wiper ring that has been removed.

⑤ Remove the "U"-ring from the cylinder cap.

Note: Do not reuse the U"-ring that has been removed.

⑥ Remove the "O"-ring from the cylinder cap.

Note: Do not reuse the "O"-ring that has been removed.

⑦ Remove the bushing from the piston.

Note: Do not reuse the bushing that has been removed.

⑧ Remove the back-up ring and "U"-ring from the piston.

Note: Do not reuse the "U"-ring that has been removed.

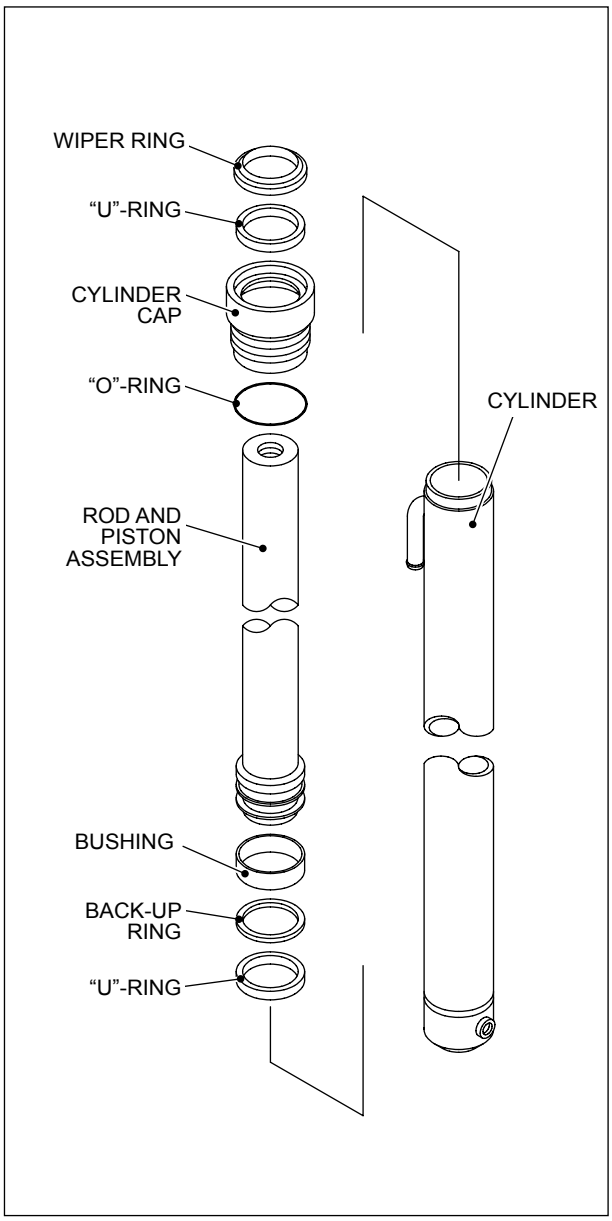


Fig. 3.509

■ REASSEMBLY

① Using a piston's "U"-ring insertion jig, install a new "U"-ring onto the piston.

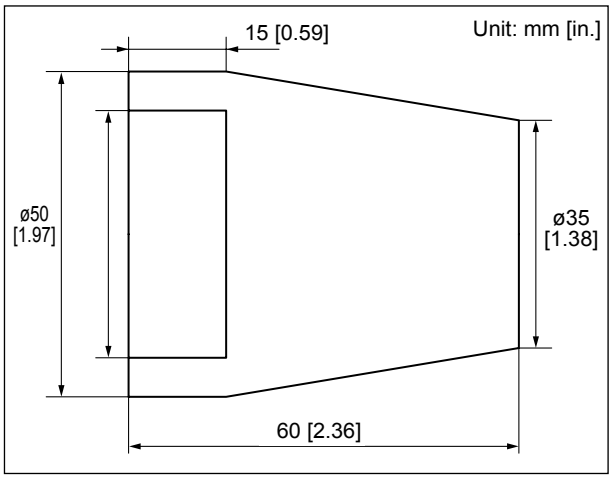


Fig. 3.510 "U"-ring insertion jig for piston

② Install a new back-up ring to the "U"-ring.

③ Install a new bushing onto the piston.

④ Install the rod and piston assembly to the cylinder.

⑤ Install a new "U"-ring to the cylinder cap.

⑥ Install a new wiper ring to the cylinder cap.

⑦ Install a new "O"-ring to the cylinder cap.

⑧ Install the cylinder cap assembly to the cylinder.

⑨ Remove the locking jig.

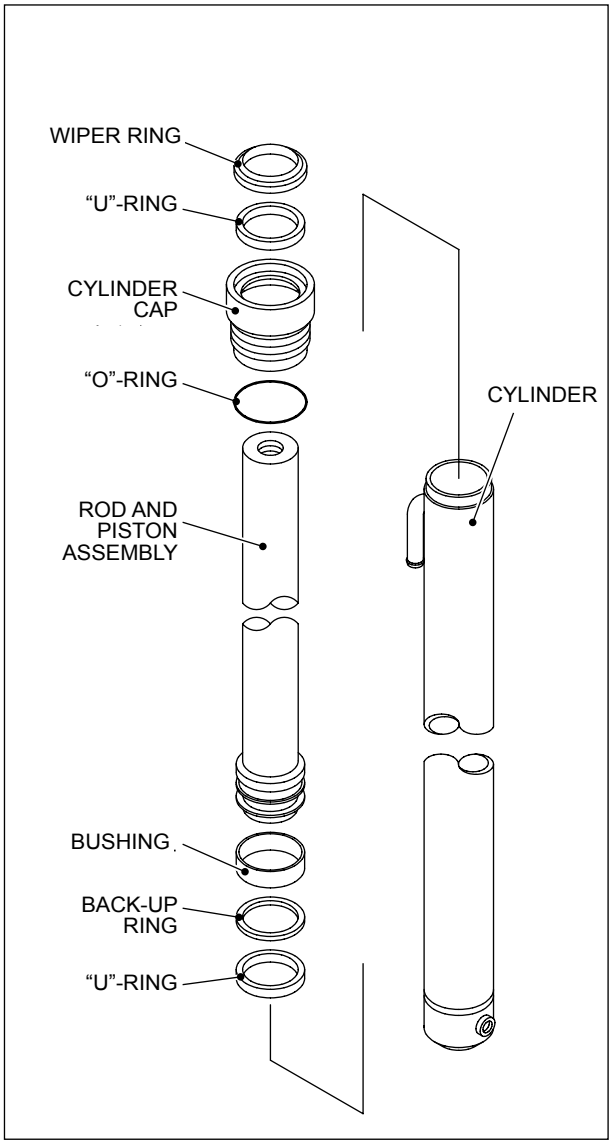


Fig. 3.511

4. TROUBLESHOOTING GUIDE

4.1 CLUTCH

Problem	Probable cause	Remedy
1. Slipping clutch	Clutch pedal dose not have play	Adjust pedal.
	Pressure spring deteriorated or damaged	Replace.
	Pressure plate unevenly worn	Correct or replace.
	Facing worn, hardened or contaminated with lubricant	Clean or replace.
	Flywheel facing contact surface worn	Correct or replace.
2. Clutch drags	Too large clutch pedal play	Adjust pedal.
	Warped clutch disc	Replace.
	Corroded splines of clutch disc and main drive shaft	Correct.
	Clutch yoke end worn	Replace.
	Release cylinder malfunctioning or oil leakage	Correct or replace.
	Clutch booster malfunctioning	Correct or replace.
3. Clutch noisy while operated	Facing hardened or worn	Replace.
	Rivet heads interfering	Replace.
	Clutch disc torsion spring deteriorated or damaged	Replace.
	Clutch disc cushioning plate deteriorated or damaged	Replace.
	Pressure spring deteriorated or damaged	Replace.
4. Thrust bearing noisy	Thrust bearing worn, seized or damaged	Replace.
	Retainer worn or damaged	Replace.
	Support worn or damaged	Replace.
	Clutch yoke end worn	Replace.

4.2 DRIVE UNIT (SYNCHROMESH TYPE)

Problem	Probable cause	Remedy
1. Transmission noisy	Low lubricant level	Add oil.
	Gears worn or damaged	Replace part.
	Bearings worn or damaged	Replace part.
2. Hard shifting into gear	Shift arm deformed or worn	Correct or replace.
	Worn shift arm groove in sleeve	Replace part.
	Block ring and synchronizing cone seized	Replace gear assembly and block ring with new ones.
	Clutch drags	Check and adjust.
	Sleeve spline chamfer ends or dog tooth chamfer ends are worn or damaged	Replace gear assembly and sleeve with new ones.
	Block ring cone friction surface worn	Replace block ring.
3. Gears disengage	Shift arm deformed or worn	Correct or replace.
	Worn notch groove in shift rod	Replace part.
	Shift arm ball worn or spring deteriorated	Replace part.
4. Differential noisy	Gears worn or damaged	Replace part.
	Improper backlash of bevel gear	Adjust.
	Bearing worn or damaged	Replace part.
	Low lubricant level	Add oil.
5. Defective operation of differential	Gear teeth worn or damaged	Replace part.
	Drive shaft damaged	Replace part.

4.3 DRIVE UNIT (TORQUE CONVERTER TYPE)

Problem	Probable cause	Remedy
1. Truck won't start when accelerator pedal is pressed.	Low torque converter oil level	Add oil.
	Clutch oil pressure is lower than specified	See Problem 3.
	Damaged parts inside transmission	Replace.
2. Poor acceleration (Truck speed does not increase)	Low torque converter oil level	Add oil.
	Strainer clogged	Clean.
	Charging pump defective	Replace.
	Clutch slips because clutch oil pressure is lower than specified	See Problem 3.
3. Low oil pressure	Charging pump damaged or pump drive unit damaged	Replace.
	Control valve defective	Replace.
	Seals damaged	Replace.
4. Clutch oil pressure is too low	Low torque converter oil level	Add oil.
	Strainer clogged	Clean.
	Clutch oil pressure relief valve damaged	Replace valve.
5. Oil temperature is excessively high	Oil cooler contaminated	Clean or replace cooler.
	Low torque converter oil level	Add oil.
	Insufficient quantity of oil circulating through the circuit due to damaged charging pump or damaged hydraulic system	Replace.

4.4 REDUCTION GEAR AND DIFFERENTIAL

Problem	Possible cause	Remedy
1. Noisy differential Problems with the differential will usually appear as a noise. However, you may confuse noise from the differential with that from the engine, muffler, torque converter transmission, reduction gear, wheels, or wheel bearings. When checking the differential, make sure that noise comes from the differential, not from other components.		
(1) Noisy gear in driving	Gear oil level is low or improper quality	Add oil or change gear oil (SAE90) API GL-4 or higher.
	Ring gear teeth worn or damaged	Repair or replace.
	Bearing worn or damaged	Replace bearing.
	Drive shaft splines worn	Replace shaft.
(2) Noisy gear during traveling	Pinion gear or side gear teeth worn or damaged	Repair or replace.
	Pinion gear or side gear thrust plate worn	Replace thrust plate.
	Spider worn	Replace spider.
(3) Noise produced when the truck makes turns	Pinion gear or side gear worn or damaged	Replace worn part.
	Spider worn	Replace spider.
	Pinion gear or side gear thrust plate worn	Replace thrust plate.
2. Malfunction of differential If the differential fails to operate normally, jack up the front wheels and check the differential from the front tire side to verify that the cause of the trouble lies in the differential.		
(1) The truck won't start when accelerator pedal is pressed	Drive shaft splines worn	Replace drive shaft.
	Drive shaft damaged	Replace drive shaft.
	Ring gear teeth damaged	Replace ring gear.
(2) The truck cannot travel or causes loud noise	Foreign matter caught in the mechanism	Clean or replace.
	Ball bearing damaged	Replace bearing.
	Drive shaft damaged	Replace drive shaft.
	Ring gear teeth damaged	Replace ring gear.

4.5 BRAKE

Problem	Probable cause	Remedy
1. Front wheel hub noisy	Improper tightening of wheel bearing	Retighten.
	Wheel bearing damaged	Replace bearing.
2. Poor braking effect	Too large clearance between drum and lining	Adjust clearance.
	Air mixed in brake oil	Bleed air.
	Low brake oil level	Add brake oil.
	Lining contaminated with oil	Disassemble and repair oil leaks and replace lining.
	Brake oil leakage	Check piping and cylinder and repair.
	Brake booster defective	Repair or replace.
3. Brake drags	Brake shoe maladjusted	Adjust properly.
	Wheel cylinder and piston seized from corrosion	Replace.
	Loosen wheel bearing	Retighten lock nut.
	Brake shoe return spring damaged	Replace spring.

4.6 STEERING WHEEL

Problem	Probable cause	Remedy
1. Hard steering	Control valve defective	Replace control valve.
	Relief valve pressure setting is low	Adjust.
	King pin bearing damaged	Replace.
	Wheel alignment improper	Correct.
	Low tire inflation pressure	Adjust inflation pressure.
	Steering gear box defective	Replace.
2. Steering wheel malfunctioning	Control valve flow divider defective	Repair or replace.
	Steering gear box defective	Repair or replace.
	Steering cylinder piston seal damaged	Replace.
3. Too large play of steering wheel	Worn ball joints on steering cylinder, knuckle arm, center arm, or drag link	Replace.
	Steering gear box defective	Repair or replace.
4. The truck wanders	Wheel alignment improper	Correct.
	Knuckle bearing defective	Replace.
	Rear axle deformed	Correct or replace.
	Tire inflation pressure improper	Adjust.
	Loose ball joints on steering cylinder, knuckle arm, and center arm	Replace.

4.7 STEERING AXLE

Problem	Probable cause	Remedy
1. Rear wheel hub is loose	Loose knuckle	Shim-adjust.
	King pin bearing worn or damaged	Replace.
	Center arm pin bearing worn or damaged	Replace.
	Hub bearing loose	Retighten lock nut.
	Hub bearing damaged	Replace.
2. Noisy while truck makes turns	King pin bearing worn or damaged	Replace.
	Center arm pin bearing worn or damaged	Replace.
	Axle support pin not greased properly	Apply grease.
	Misalignment	Adjust.
3. Hard steering	King pin bearing worn or damaged	Replace.
	Center arm pin bearing worn or damaged	Replace.
	Misalignment	Adjust.
	Steering wheel defective	See “4.6 STEERING WHEEL.”
	Low tire inflation pressure	Adjust to specified pressure.
4. Oil leakage	Hub oil seal defective	Replace.

4.8 MAIN PUMP

Problem	Probable cause	Remedy
1. Insufficient oil discharge from pump	Low oil level in tank	Add oil.
	Air mixed in suction line	Retighten pipe connections.
	Clogged suction line or strainer	Clean hydraulic line and change oil.
	Bushing, gear or pump body damaged due to foreign matter	Clean hydraulic line and replace pump assembly.
2. Noisy pump	Cavitation due to clogged strainer	Clean strainer or replace filter element.
	Bushing and gear worn or seized	Replace bushing and gear.
	Pump body worn or seized	Replace pump assembly.
	Improper centering of pump	Adjust.
3. Oil leakage from pump	"O"-ring or oil seal damaged	Replace.
	End cover loose	Check bolts and retighten evenly.

4.9 CONTROL VALVE

Problem	Probable cause	Remedy
1. Plunger fails to operate normally	Foreign matter in valve	Clean hydraulic line and change oil.
	Lever or linkage bent	Repair.
	Plunger bent	Replace valve assembly.
	Return spring damaged	Replace.
2. Oil leakage from oil seal	Seal contaminated with paint	Replace seal and clean control valve.
	Foreign matter caught in seal	Replace seal and clean control valve.
	Plunger damaged	Replace valve assembly or plunger section.
	Seal plate loose	Clean and retighten.
	Seal damaged	Replace seal.
3. No pressure builds up	Relief valve defective	Replace relief valve assembly.
	Relief valve pressure setting improper	Adjust relief valve pressure setting.

4.10 LIFT CYLINDER

Problem	Probable cause	Remedy
1. Oil leakage	Cap "O"-ring damaged	Replace.
	Cap oil seal defective	Replace.
	Piston rod damaged or bent	Repair or replace.
2. Cylinder jolts	Piston rod bent	Repair or replace.
	Low hydraulic oil level	Add oil to specified level.
	Defective pump	See "4.8 MAIN PUMP."
3. Natural drop of piston	Piston packing damaged or worn	Replace.
	Cylinder inner surface damaged or worn	Repair or replace.
	Control valve defective	See "4.9 CONTROL VALVE."

4.11 TILT CYLINDER

Problem	Probable cause	Remedy
1. Oil leakage	Damaged "O"-ring between cap and cylinder	Replace.
	Oil leakage from cap packing	Replace.
	Piston rod damaged or bent	Repair or replace.
2. Noisy while operating	Piston packing seized	Replace.
	Cylinder inner surface damaged	Repair or replace.
	Piston rod damaged or bent	Repair or replace.
	Pump or control valve defective	See "4.8 MAIN PUMP" and "4.9 CONTROL VALVE."
3. Natural drop of piston	Piston packing damaged or worn	Replace.
	Cylinder inner surface damaged or worn	Repair or replace.
	Control valve defective	See "4.9 CONTROL VALVE."

4.12 MAST

Problem	Probable cause	Remedy
1. Noisy while lifting or lowering	Side rollers unevenly worn or bearing damaged	Replace.
	End roller bearing damaged	Replace.
	Carriage bent	Repair or replace.
	Inner mast bent	Repair or replace.
	Lift cylinder piston rod bent	Repair or replace.
	Sheave bearing improperly greased or damaged	Apply grease or replace.
2. Noisy while tilting	Mast support improperly greased or bushing worn	Apply grease or replace.
	Tilt cylinder connecting pin improperly greased or bushing worn	Apply grease or replace.
	Tilt cylinder piston rod bent	Repair or replace.
3. Mast jolts when lifting or lowering	Side rollers unevenly worn or bearing worn	Replace.
	End roller bearing damaged	Replace.
	Carriage or inner mast bent	Repair or replace.

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TCM CORPORATION

MARKETING GROUP: **1-15-5, Nishi-shimbashi, Minato-ku, Tokyo 105-0003, Japan**

FAX: JAPAN +81-3-35918154

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