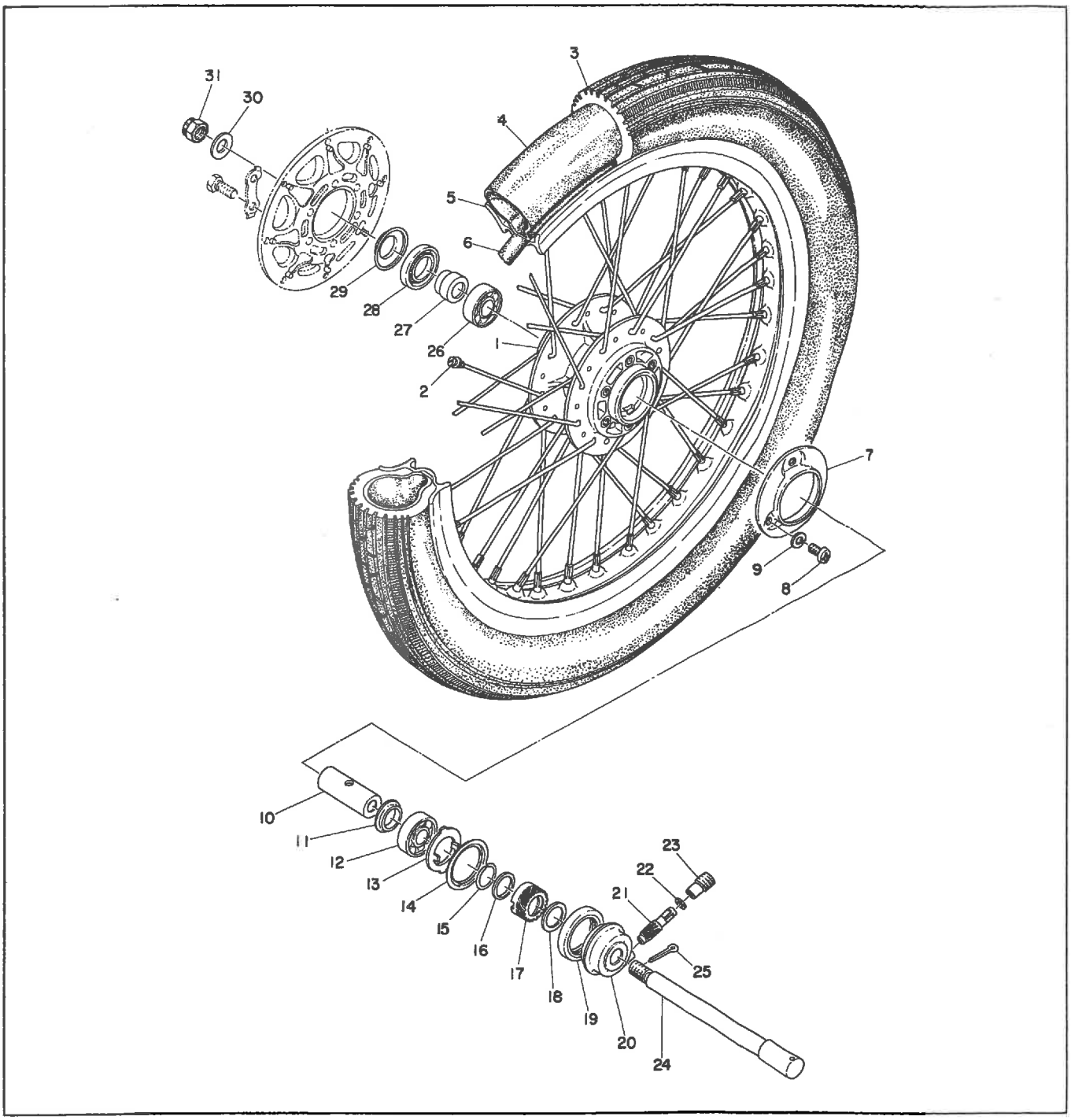
CHAPTER 5. CHASSIS

5

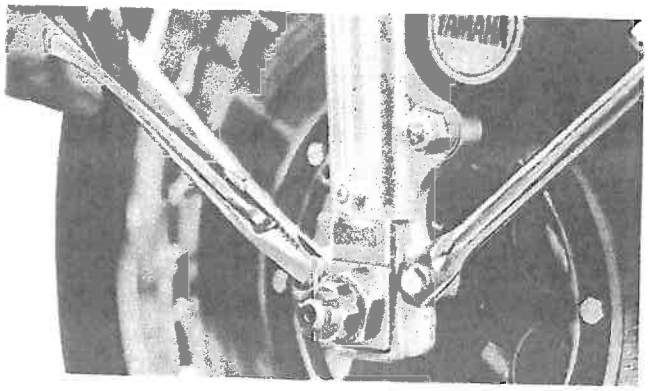
5-1. FRONT WHEEL



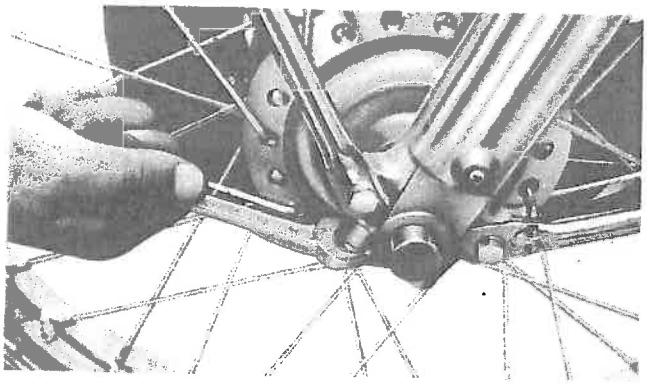
1. Front hub
2. Spoke set
3. Front tire
4. Tube
5. Rim
6. Rim band
7. Housing cover
8. Panhead screw
9. Spring washer
10. Bearing spacer
11. Spacer flange
12. Bearing
13. Meter clutch
14. Clutch meter
15. Stop ring
16. Thrust washer 2
17. Drive gear
18. Thrust washer 1
19. Oil seal
20. Gear unit housing
21. Meter gear
22. Washer
23. Bushing
24. Wheel shaft
25. Cotter pin
26. Bearing
27. Shaft collar
28. Oil seal

A. Removal

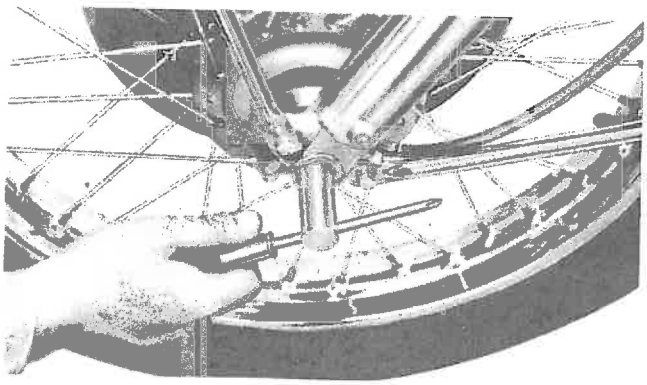
1. Remove the cotter pin.
2. Remove the front wheel shaft nut.



3. Loosen the wheel shaft lock nuts.

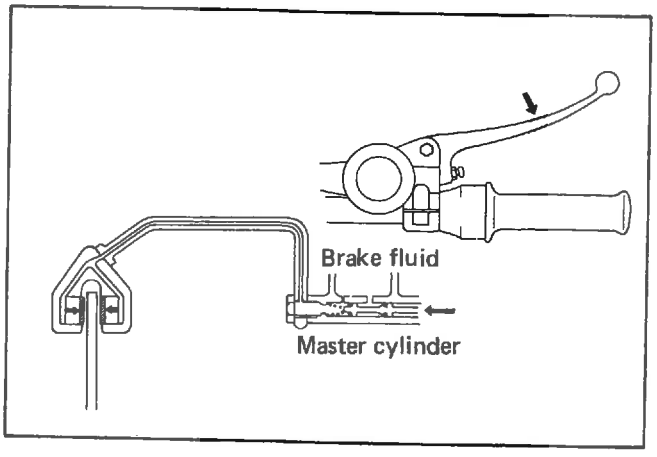


4. Remove the front axle by simultaneously twisting and pulling out on the axle.
5. Raise the front of the machine off the ground, remove the wheel assembly.

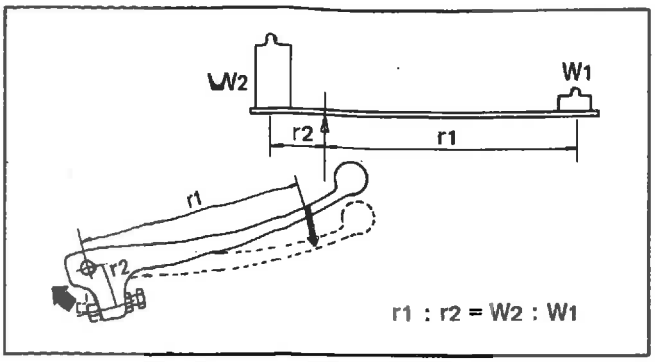


B. Disc Brake Operation

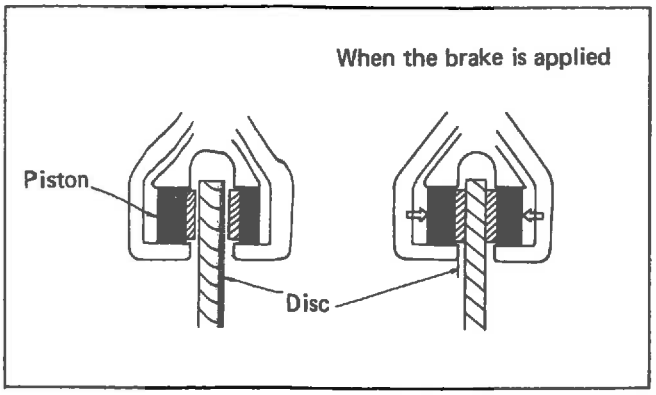
When the front brake lever is squeezed, it forces the master cylinder piston to move. As the piston cup moves past the compensating port, it traps the brake fluid in the cylinder. Pressure rises rapidly, and the fluid is forced through the brake hose to the caliper cylinders. The brake fluid forced into the caliper cylinders pushes against the pistons in the cylinders, and the pads (or "pucks") located on each side of the disc are forced against the disc. The friction between the pads and revolving disc then provides the braking action. As the brake lever is released, both brake lever and pistons are forced back to their respective original positions by the force of return springs.



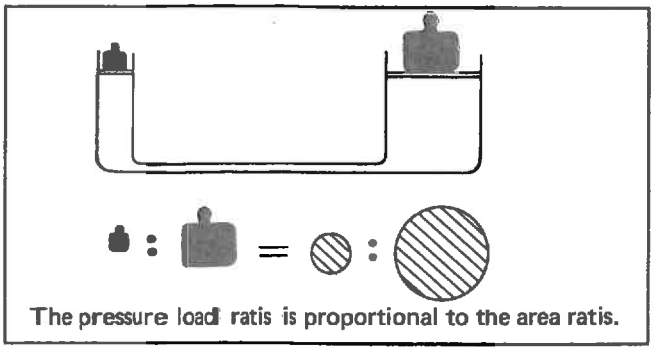
1. Brake lever
When the brake lever is squeezed, it produces a push, at the master cylinder piston about four times greater than the force applied to the brake lever.



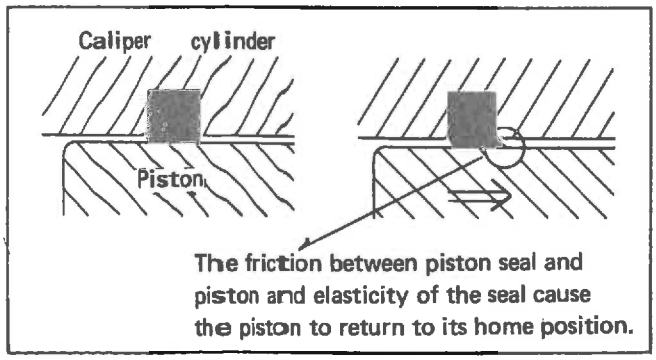
2. Brake hose and pipe
The brake hose and pipe carry hydraulic pressure to the calipers.
The brake hose is flexible and capable of withstanding a hydraulic pressure of 350 kg/cm^2 in conforming to SAEJ-1401.
The brake pipe is made of double steel tubing. For better corrosion resistance it is plated with zinc.
3. Calipers
The hydraulic pressure carried to the calipers forces the caliper pistons out; by which action the pads are pushed out to grip the revolving disc.



4. Piston
The caliper pistons are forced against the pads by hydraulic pressure which is about nine times greater than the pressure produced in the master cylinder. This is because the caliper cylinder piston surface area is much larger than the master cylinder piston surface area.

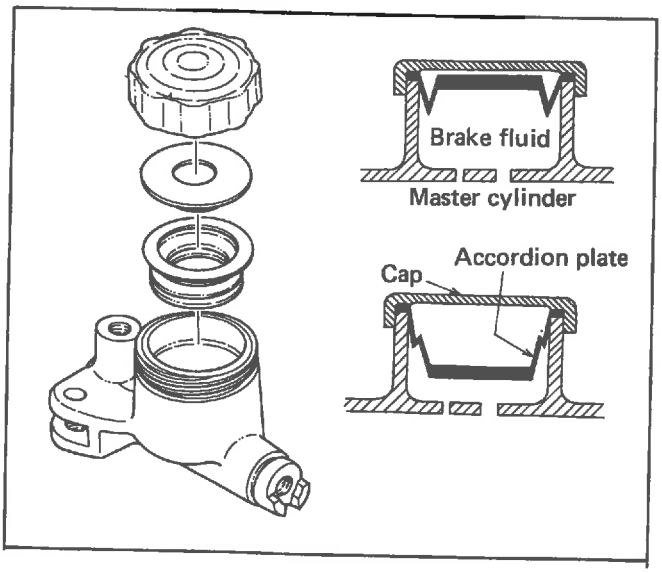


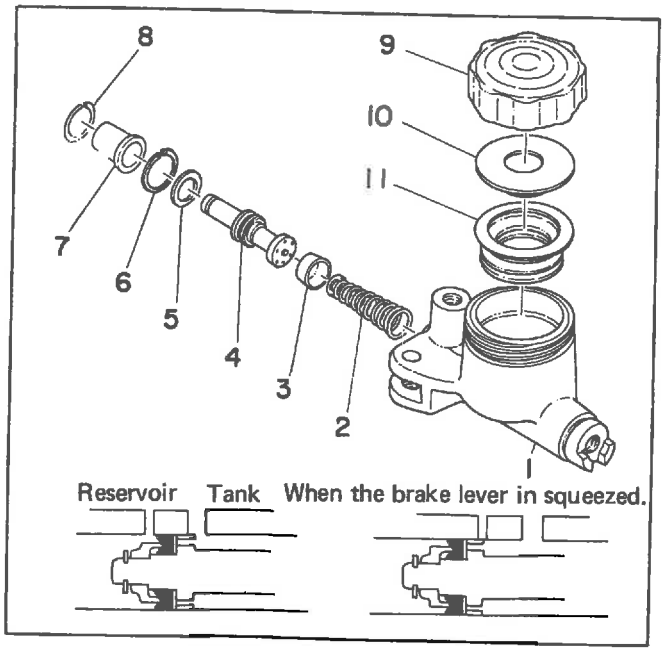
5. Seals
Each caliper cylinder has a piston seal (to maintain good sealing between the piston and the caliper cylinder wall) and a dust seal (to prevent dirt and water from entering the cylinder).
The piston seal is designed to move the piston back to its home position by making use of its tortional moment after the brake lever is released. The tortional moment is produced by the frictional force and elasticity of the piston seal. The piston seal also serves as an automatic adjuster of the clearance between the disc and the pad. (The clearance between the disc and the pad is normally 0.1 to 013 mm.)



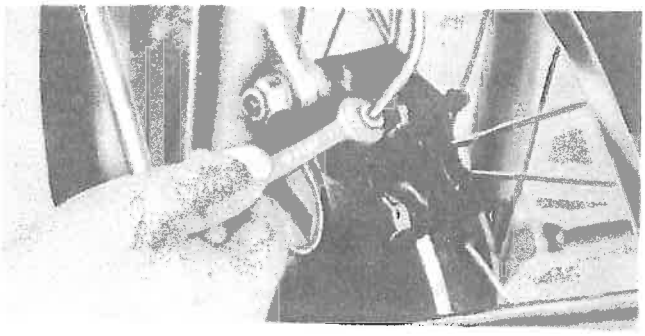
6. Pads
   The pads are forced against the revolving disc by the caliper cylinder pistons to grip the disc. They are composed of resin mold asbestor.
7. Bleed screw
   Air in the hydraulic line impairs hydraulic action. To expel air out of the caliper cylinder, a bleed screw is provided on the caliper assembly.
8. Disc
   The stainless steel disc is held to the front wheel hub and it is gripped by the pads located on each side of the disc.
9. Brake fluid
   The brake fluid is compressed in the master cylinder, and hydraulic pressure thus produced is carried to the caliper cylinder pistons. In this sense, the brake fluid plays a very important role.
   The brake fluid must meet the following requirements:
   1. Proper viscosity and liquidity can be maintained at working temperatures.
   2. Good stability is maintained. (That is the fluid will not separate, change in viscosity, and/or precipitate.)
   3. Boiling point is high. (No vapor lock will result.)
   4. It will not deteriorate rubber.
   5. Water resisting proparty is excellent.

   Note that the disc brake fluid must be of genuine quality, because the fluid temperature tends to rise as compared with the drum brake.
   Suggested brake fluid specifications: SAE J1703B.
10. Master cylinder
    The master cylinder piston is linked to the brake lever. When the brake lever is squeezed, the piston forces the brake fluid through the hose and pipe to the calipers.
11. Reservoir tank
    As wear on the brake pads increases, the amount of brake fluid must be increased to maintain proper hydraulic pressure. The reservoir tank supplies this brake fluid. (tank capacity is approximately 30 cc.) To prevent air from entering the brake line when the brake fluid level lowers, especially on a rough road or in an inclined position, a compensating diaphragm is provided for the reservoir tank.
12. Piston
    The master cylinder piston has two cups; one maintains good sealing between the cup and the cylinder wall of the master cylinder, and the other prevents the brake fluid from leaking out from the cylinder to the brake lever side. The return spring forces the brake lever to its home position, when the lever is released.





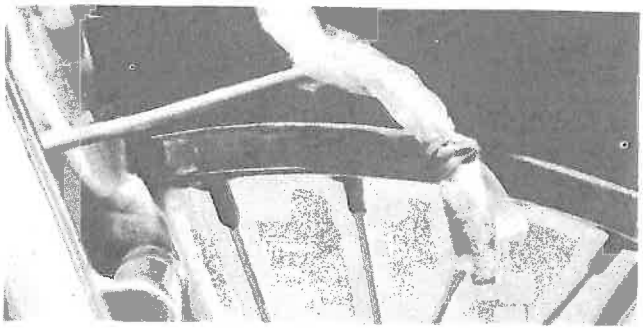
5-2. DISASSEMBLY



The tire and bearings can be disassembled without removing the brake disc. Do not remove the brake disc unnecessarily.

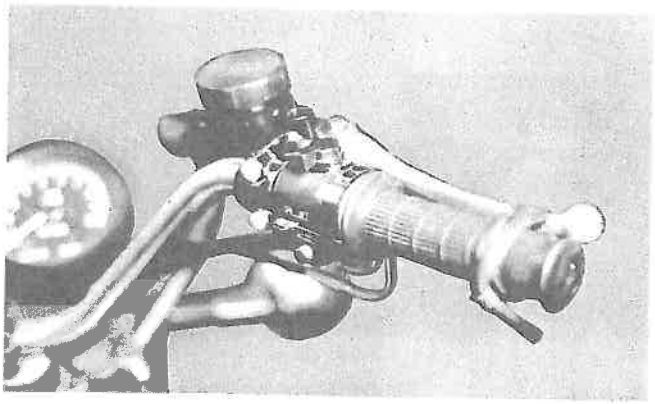
Tools and Parts required for Disassembly.
- General service tools
- Hexagon wrench, 5 mm.
- Grip pliers
- Air compressor
- Rags
- Torque wrench

A. Caliper

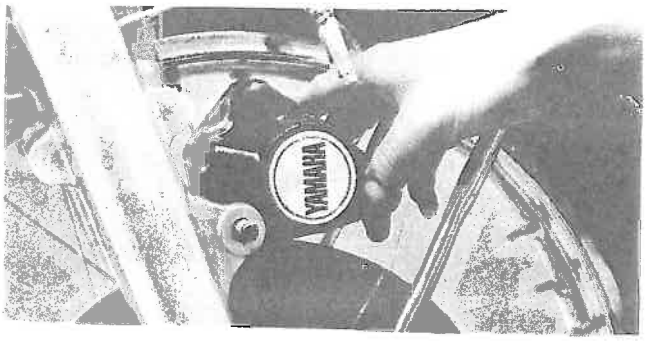


1. Removing the Caliper
   Remove the brake pipe from the caliper assembly.
   Put the removed brake pipe in a clean vinyl bag so that it can be kept free from dust and dirt.

Note:
It is advisable to keep the brake lever squeezed, because this brake lever position prevents the fluid from leaking out of the reservoir. Place a heavy rubber band around the lever and handlebar grip.

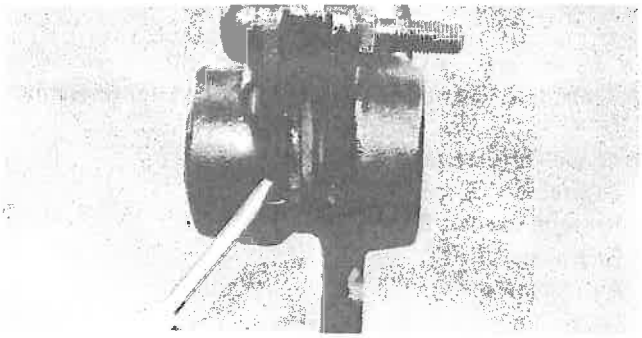


2. Remove the caliper mounting bolts and nuts.
3. Rotate the caliper assembly upward, and remove it.



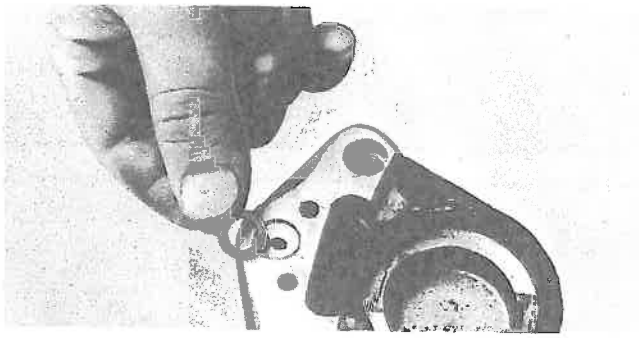
Removing the Pads

4. Remove the pads from their seats.

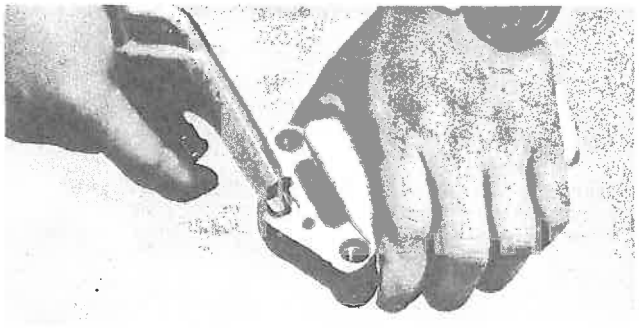


Removing the caliper pistons and seals:

5. Remove the two bridge bolts and two hexagon bolts.
6. Remove the caliper seal.

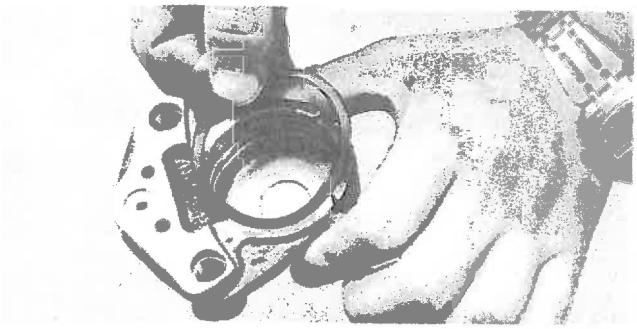


7. Force the piston from the caliper cylinder by feeding compressed air into the cylinder through the fluid inlet. Never attempt to push the pistons with a screwdriver.



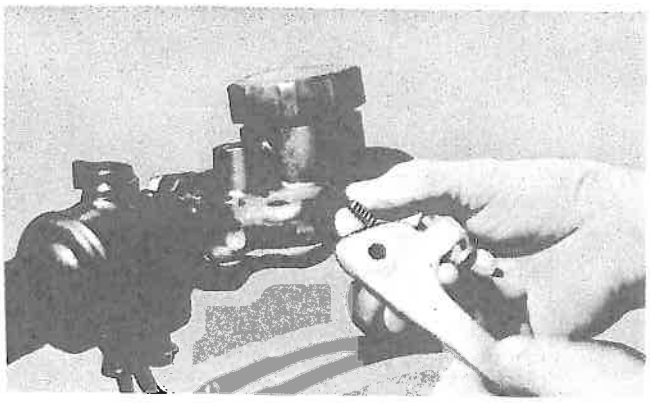
8. Remove the piston seal and dust seal from the caliper body.
   The foregoing applies to both pistons.

Note:
The removed parts should be kept free from gasoline, kerosene, engine oil, etc. If any oil attaches to a seal, it will swell up or deteriorate.

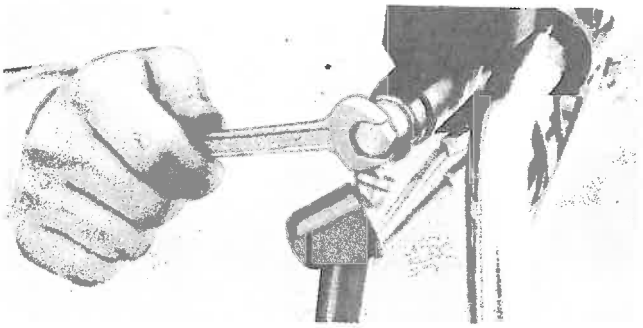


B. Master Cylinder

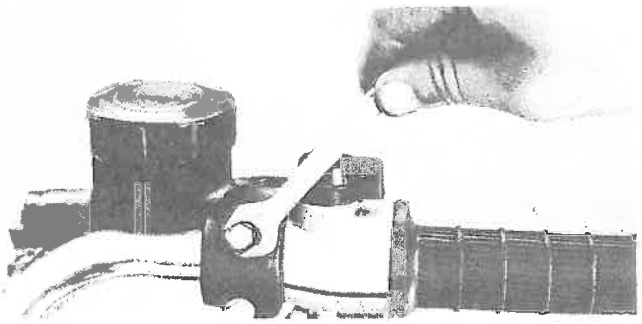
1. Remove the brake lever.
   (Take care not to misplace the brake lever return spring.)



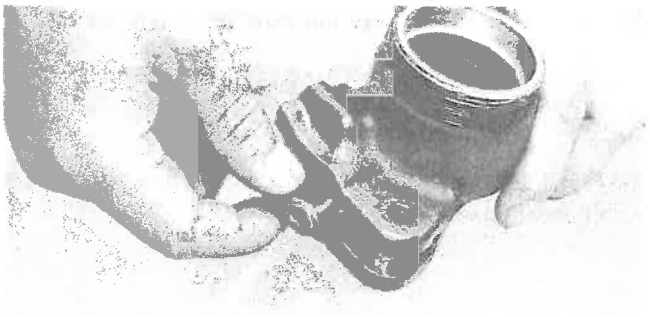
2. Remove the brake hose.



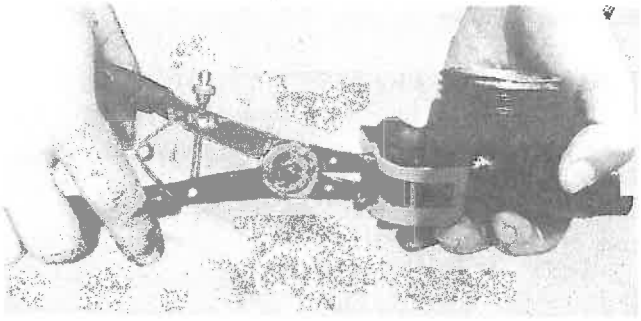
3. Remove the two master cylinder mounting bolts, and remove the master cylinder from the handlebar.
4. Remove the reservoir tank cap, and remove the diaphragm.
5. Drain the brake fluid from the reservoir tank.



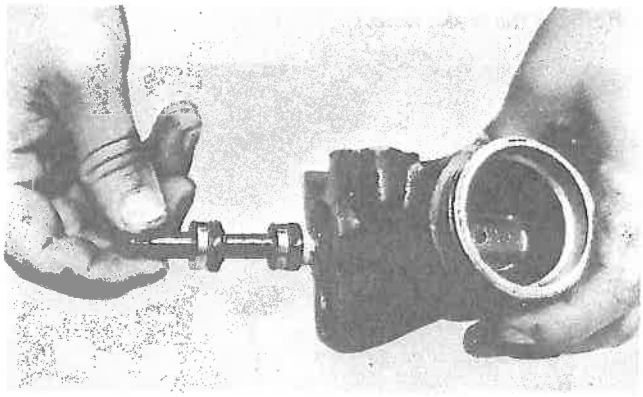
6. Remove the master cylinder boot.

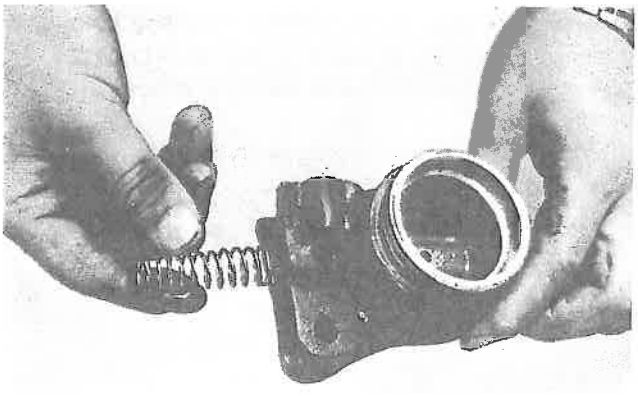


7. Remove the snap ring with clip pliers.

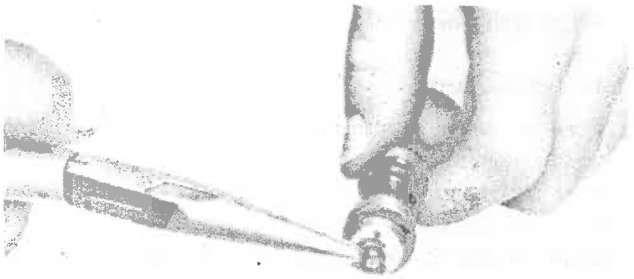


8. Remove the piston. (Note that a spring remains in the master cylinder.)

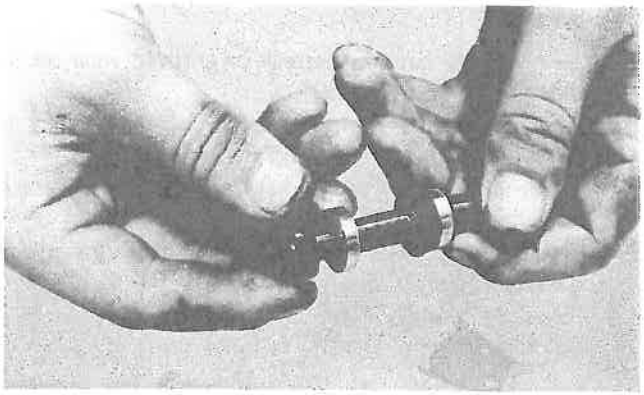




9. Remove the E clip, and remove the cylinder cup retainer.



10. Remove the cylinder cup.



5-3. INSPECTION

A. Measuring Instruments Required for Inspection

Dial gauge
Dial gauge adapter
Micrometer 0.25 mm.
Vernier calipers 150 mm.

B. Pistons

Pistons

If any piston is found scratched or worn, replace it.

Pads

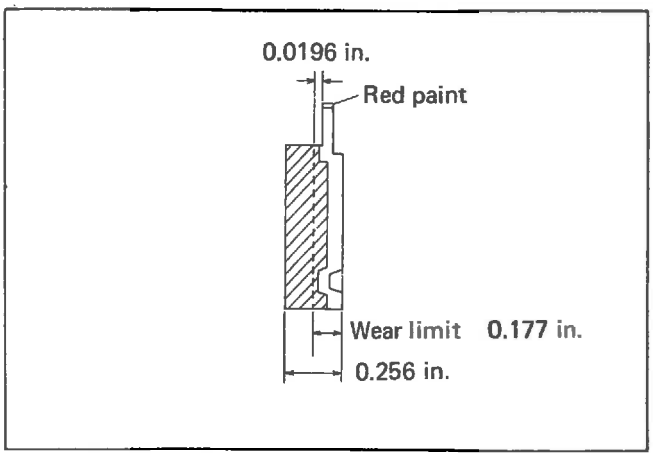
If any pad is found excessively worn, replace it.
Min allowable pad thickness: 0.5 mm.

Piston seal and dust seal

If any seal is found damaged, replace it.
It is advisable to replace the seals every two years of use, whether they appear damaged or not.

Bridge bolt

Replace the bridge bolts each time they are removed for disassembly, whether damaged or not.



C. Master Cylinder

Master cylinder body

1. If the master cylinder has any streak or grooved wear on its wall, replace it.
2. If the outlet end has any scratch or dent, replace it.
3. Check the compensating port for clogging.
4. Check for any foreign matter inside the cylinder and the reservoir tank.

Piston

1. If the piston has any streak or grooved wear, replace it.
2. If the piston has any rust, replace it.

Cylinder cups

1. If any cylinder cup has a streak or grooved wear on its contacting surface, replace it.
2. If any cylinder cup is found to be swollen, replace it together with the other seal and rubber parts.
   Thoroughly wash all areas which are exposed to brake fluid with new brake fluid.
3. Whether or not it shows wear, replace the cylinder cup every two years of use.

Reservoir diaphragm and master cylinder boot

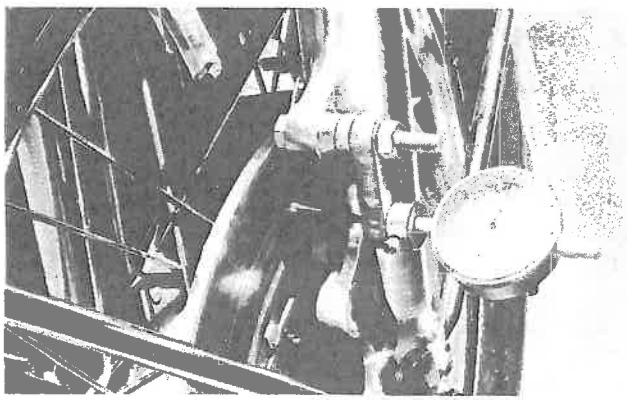
1. Check the flange and accordion pleats for damage, cracks and aging.
2. Check for swelling. (If swollen, take the same steps as in the case of the cylinder cup.)
3. Replace both every two years of use, whether they are in good condition or not.

Conical spring

1. Check the spring for breakage and wear.

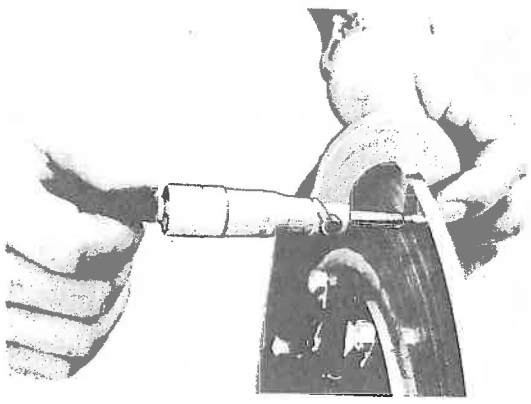
D. Brake Hose and Brake Pipe

1. Check them for leakage and damage.
2. Replace the brake hose every four years of use, whether or not it appears to be in good condition.



E. Disc

1. Check the disc assembly for run-out.
   If the disc shows a deflection of 0.15 mm. or more, check the disc itself and the bearings.
2. If the disc has excessive wear or damage, replace it.
   Min. allowable disc thickness: 6.5 mm.



5-4. Assembly and Adjustment

A. Cleaning

All the removed parts should be washed in the following manner before they are installed.

1. A new brake fluid should be used as a cleaning detergent.
   (The use of any mineral oil should be avoided, because it causes rubber parts to swell. The same can be said of alcohl. Any rubber dipped in alcohol may swell up.)
2. If an oil of any other kind (such as mineral oil) is mixed in the system by mistake, the piston cups and seals should be replaced with new one. All other parts should be washed with fresh, clean, new brake fluid. In addition, the lines, ports, passages, etc., should be thoroughly flushed with a clean, new brake fluid.

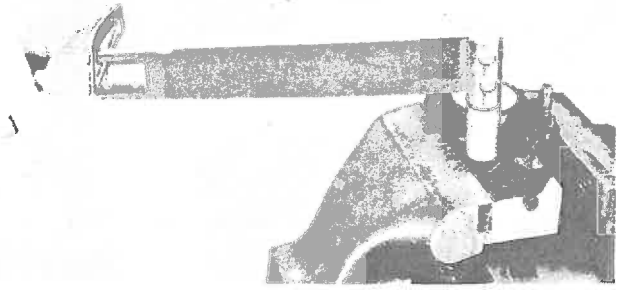
B. Calipers

Piston installation

1. Install the piston seal and dust seal in their seats in the caliper cylinder.
2. Coat the caliper cylinder walls and piston with new brake fluid.
3. Insert the piston into the caliper cylinder with your hand.
   In inserting the piston, special care should be taken so that the piston goes into the cylinder smoothly.

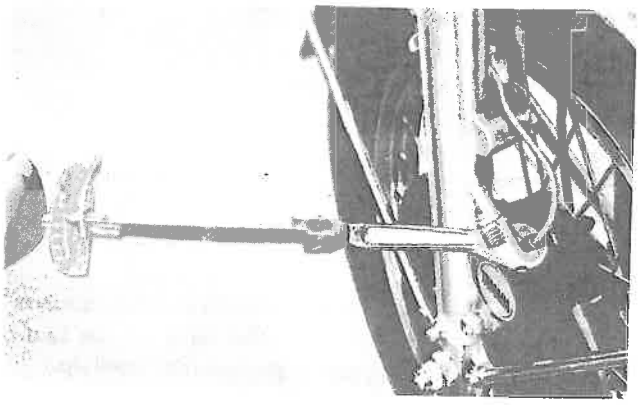
Assembling the outer and inner calipers.

4. Install the caliper seal in their seat.
5. Put together the outer and inner calipers.
   (Make sure that no dust or dirt is attached to the mating surfaces.)
6. The two bridge bolts must be replaced with new ones.
   Tighten the two hexagon bolts. (The bridge bolts should be tightened later.)
   Tightening torque: 60 ~ 100 kg-cm.
7. They are very important parts viewed from operational safety, and therefore, the removed bridge bolts should always be replaced. Be sure they are tightened with correct torque.
   Tightening torque: 750 ~ 950 kg-cm.
8. Install the pads in their seats.
9. When replacing the pads alone, it is necessary to push back the piston so that new pads can easily be installed. (When the piston is pushed back, and the compensating port is open, the brake fluid level in the reservoir tank will rise steeply. Loosen the bleed screw in necessary, and bleed off the excess brake fluid.



Installing the calipers

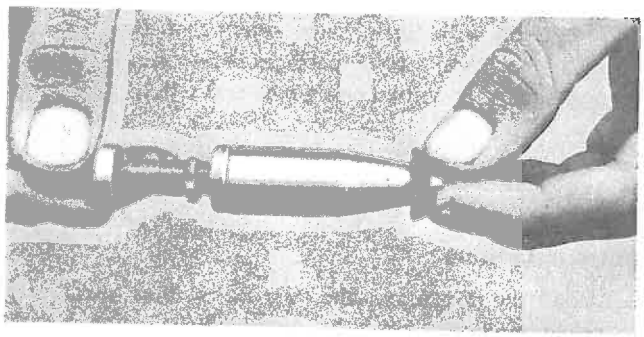
10. To install the calipers on the front fork, reverse the procedures for removal.
    Tightening torque: 400 ~ 500 kg-cm.
11. Install the brake pipe.
    Tightening torque: 130 ~ 180 kg-cm

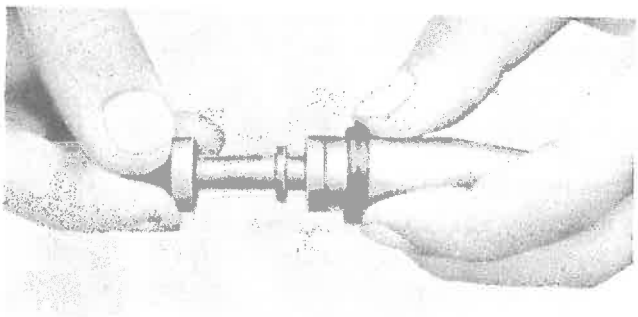


C. Master Cylinder

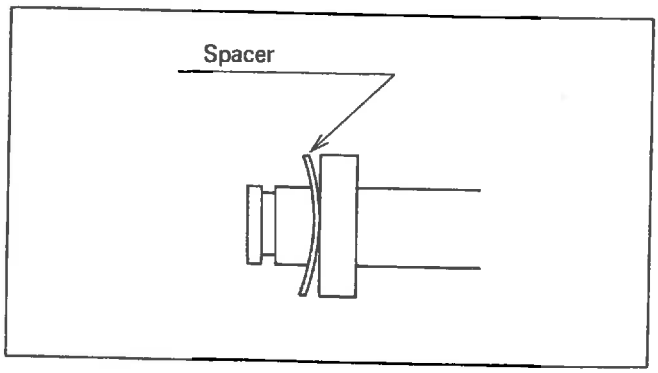
Installing the cylinder cup

1. Dip the cup in a new brake fluid, and install it.
   Take care not to scratch the cup and the piston. (Use the jigs.)

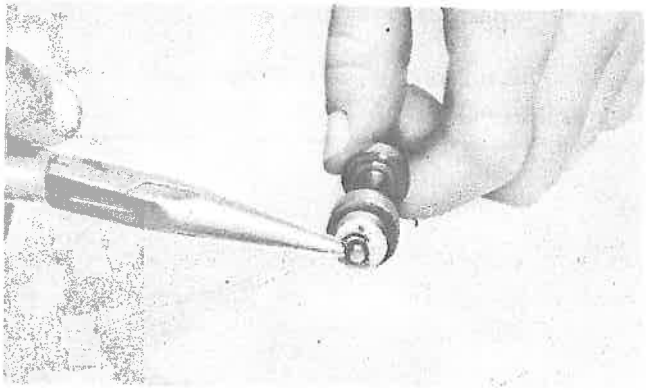




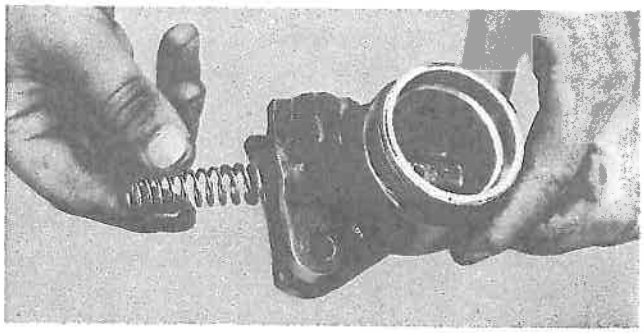
2. Install the spacer. Be sure that the spacer is positioned correctly.



3. Install the cup, retainer and E clip.



4. Insert the spring into the master cylinder body.



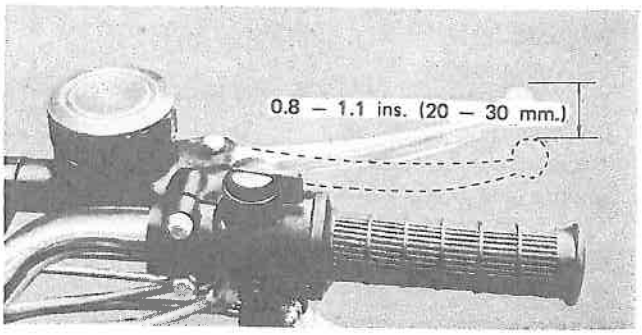
Installing the piston

5. Check the piston surfaces and cup surfaces for scratches, and then, insert the piston into the cylinder.
   Avoid forcing the piston into the cylinder; otherwise, the cylinder wall will be scratched, thus allowing the brake fluid to leak past.
6. Install the snap ring.
7. Install the boot in the master cylinder groove and the piston groove, respectively.

Installing the master cylinder on the handlebar.

8. Install the master cylinder on the handlebar.
9. Adjust the clearance between the piston and the push rod.

Brake Lever Free Play: 0.8 ~ 1.1 ins. (20 ~ 30 mm.)



Note:
Fully tighten the adjusting screw lock nut so that it will not become loose.

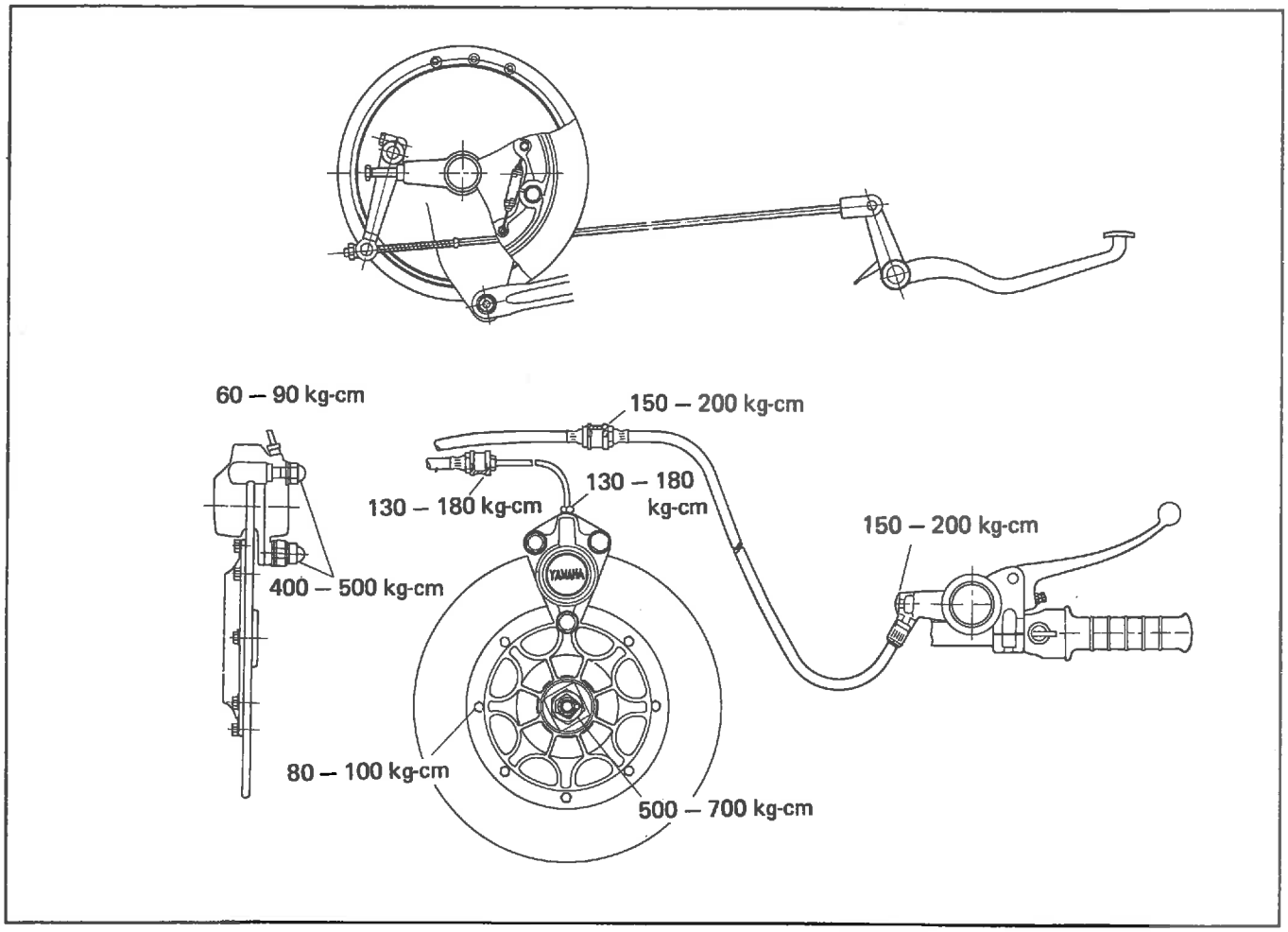
10. Fasten the brake hose to the master cylinder with the union bolt.

Note:
If the gasket is found scratched, it should be replaced.

11. Feed approximately 30 cc. of brake fluid into the reservoir tank prior to bleeding.

D. Brake Hose and Brake Pipe

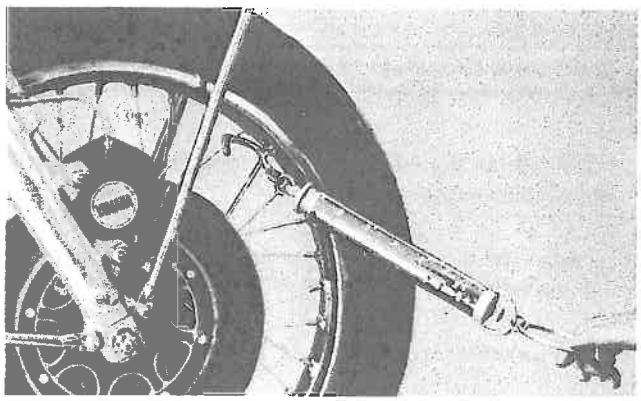
The brake hose and brake pipe fittings should be fastened with the following torque.



E. Disc

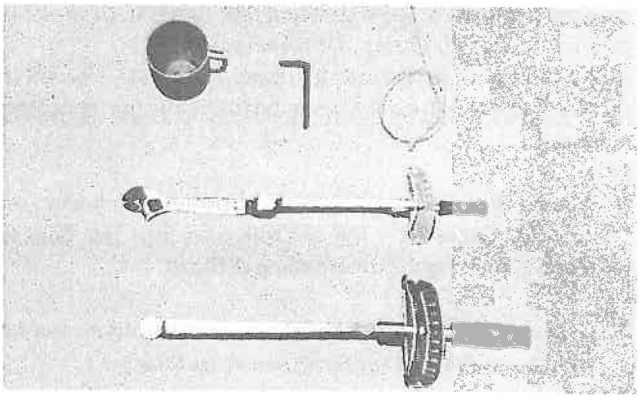
1. The disc mounting bolts should be tightened gradually and in pattern with correct torque. The lock tabs should be properly positioned and bent tightly over the bolt heads.
   Tightening torque: 80 ~ 100 kg-cm.
2. The deflection of the disc assembly should be within the specified value. (0.15 mm.)
3. The disc trailing torque should be within the specified amount after it is assembled.
   Torque: 2~4 m-kgs. when assembled as shown in the figure on the right.
   If the value exceeds this limit, check the disc run out.

* On the disc brake, a slight drag is normal.



F. Air Bleeding

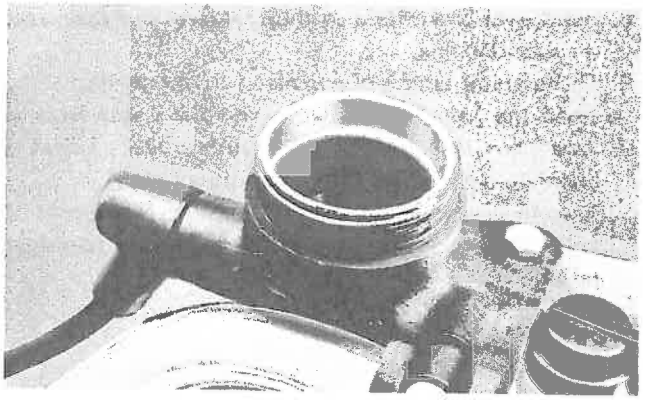
When any parts relating to the brake fluid are reinstalled, be sure that each metal fastner is fully tightened and then bleed the air.



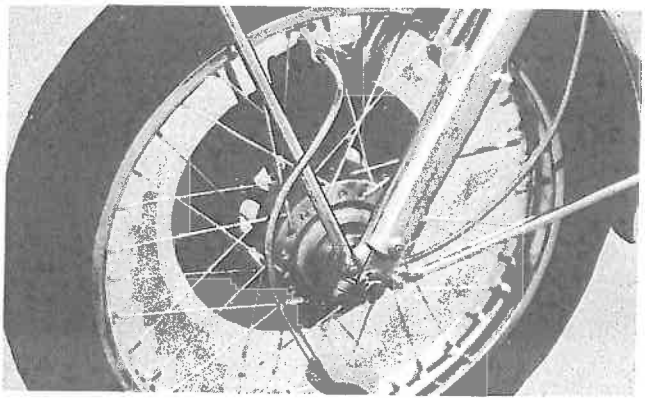
Tools and parts

Wrench
Torque wrench
Vinyl tube inside diameter 4 mm.
Brake fluid (SAE grade #J1703B)
Clean container
Rags

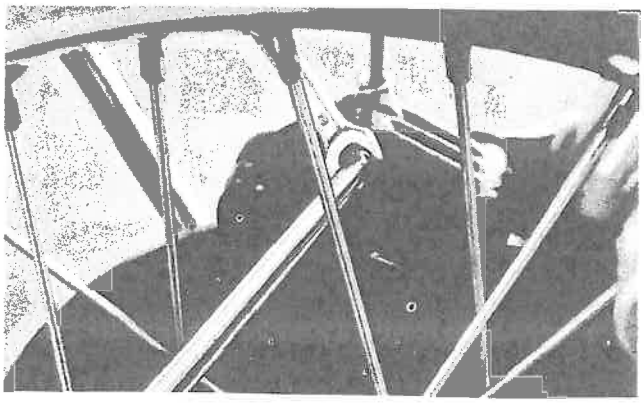
1. Fill with brake fluid so that the reservoir level reaches the specified line.
2. Install the diaphragm to trap the brake fluid.



3. Connect the vinyl tube to the caliper bleed screw tightely so that no brake fluid will leak out.



4. Place the clean container at the end of the vinyl tube.



5. Apply the brake lever slowly a few times. With the brake lever squeezed, loosen the bleed screw.
6. As fluid and air escape, the lever will close. Tighten the bleed screw before the lever bottoms on the handlebar grip.

Note:

When bleeding the air, do not operate the brake lever quickly. Otherwise, the air will turn into the bubbles, thereby making the air bleeding difficult.

7. Repeat the procedures in 5) ~ 6) above until air bubbles will completely disappear in the vinyl tube.

Note:

Bleed screw tightening torque: 60 ~ 90 kg-cm.

8. Refill with brake fluid so that the level will again reach the specified line.
9. The reservoir tank is of complete airtight design.
   When the pads become worn, the brake fluid level will lower, but the diaphragm will automatically adjust the brake fluid level by shifting its position.
   Therefore, when the reservoir tank is filled with the brake fluid, the diaphragm must be reset to its original position.