

# MASTER CYLINDER

## General

The piston in the master cylinder is connected to the brake pedal by the actuating rod. When depressing the brake pedal, the pressure applied to the brake fluid through the piston is equally transmitted to the pistons of the wheel brake cylinders.

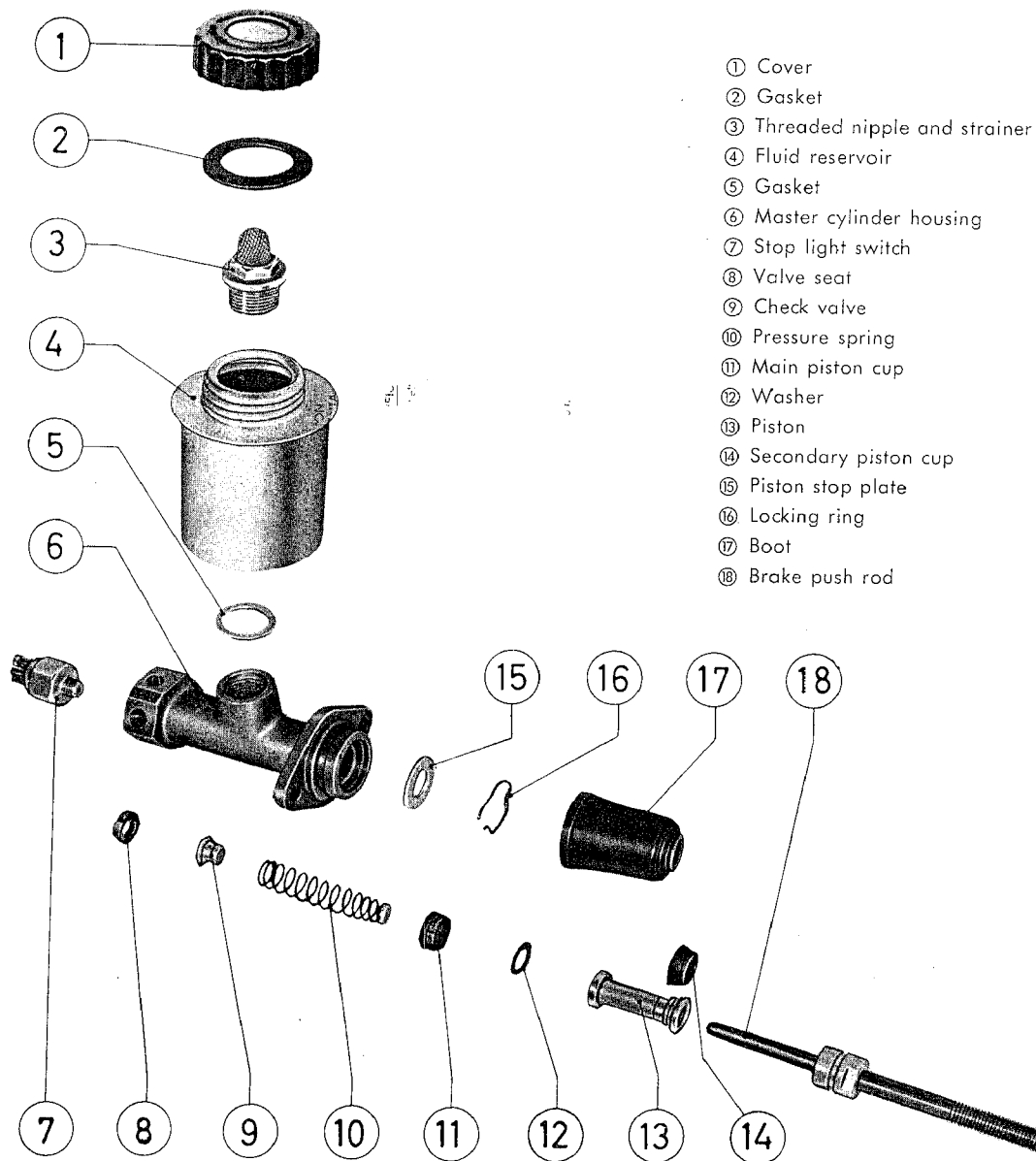


Fig. 2

## Fluid reservoir

Make sure the vent hole in the cover is always clear to allow the brake fluid to flow into the master cylinder (be careful when painting). When filling the reservoir, take care that the cover is absolutely clean to avoid dirt entering the brake system. There must always be sufficient fluid in the reservoir. Replenish brake fluid to  $\frac{5}{8}$ " to  $\frac{3}{4}$ " (15–20 mm) below upper edge of the fluid reservoir.

### Attention!

Only use genuine Ate brake fluid or Pentosin-Superfluid for refilling, on no account should mineral oils be used for this purpose.

When bleeding the brake system or when replenishing, be careful to prevent brake fluid from getting into contact with the body finish. Even the tiniest drops of brake fluid will damage the paintwork (decomposing effect!).

### Brake Fluid Compensation

The brake fluid in the master cylinder, the brake lines, and the wheel brake cylinders is subjected to external and internal influences which may cause variations in the amount of fluid. Temperature changes cause contraction or expansion of the liquid in the system. This has the effect of either increasing or decreasing the amount of volume in the brake system, which must then be compensated for correspondingly.

### Bypass port

For brake fluid compensation, the master cylinder is provided with an automatic fluid control. Directly in front of the main piston cup is a by-pass port in the cylinder wall which compensates for expansion and contraction by allowing the excess fluid to flow into or out of the reservoir, thus maintaining a constant fluid volume in the system at all times. As it is the task of the by-pass port to maintain the balance in the fluid system, troublefree operation of the brake therefore depends perfect working of the port.

### Attention!

**The by-pass port must be free when the system is at rest.**

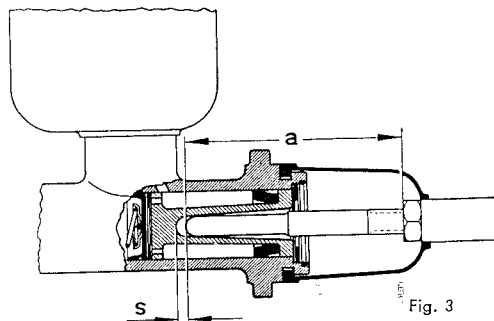
The piston push rod must be carefully adjusted at the brake pedal to assure that there is free movement (S) of approx. .04" (1 mm) between the push rod and the piston. Otherwise the main piston cup will not clear the by-pass port.

The required clearance will be obtained by adjusting the actuating rod (see fig. 3).

Obstruction of the by-pass port by foreign matter or by the main piston cup, due to incorrect pedal adjustment, results in pressure built up in the system, causing all brakes to drag (stop light does not go out).

a = approx. 5.2" (130 mm)

s = .04" (1 mm)



## Check Valve

A further part of the automatically balancing master cylinder is the double-action check valve, which serves to control the fluid and pressure balance as specified. If there is a vacuum in the system, the small inner valve (valve cap) responds even to very small variations and allows the required amount of fluid to flow from the fluid reservoir via the by-pass port and the cylinder pressure chamber into the system (see fig. 4 b).

Vice versa, if the pressure in the brake system is too high, the check valve is lifted from its seat, so that the excessive fluid may flow into the reservoir (see fig. 4 c).

If the brake pedal is depressed, the fluid reaches the lines by movement of the master cylinder piston via the check valve, when the brake pedal is released, the fluid returns. The check valve is loaded by a pressure spring, which gives the fluid system some preload. This ensures that the system remains completely filled and that the pressure applied to the brake pedal is transmitted to the braking elements without lost motion.

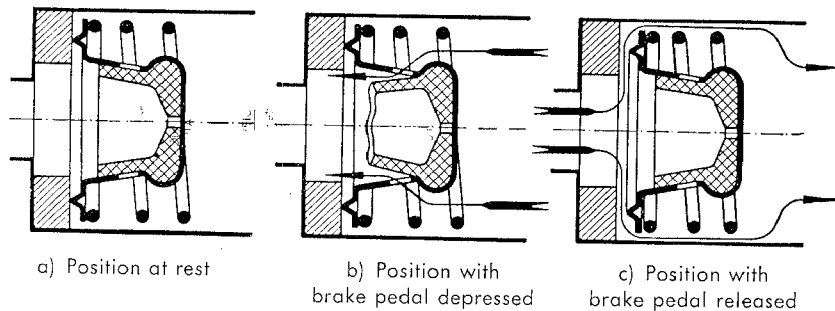


Fig. 4

## Main Piston Cup

In order to prevent air from being aspirated when releasing the brake pedal, there is an annular space behind the main piston cup at the piston skirt, so that fluid can additionally flow into the system through the bores in the piston via the washer and the main piston cup provided with grooves, if the piston rapidly returns. If therefore a rapid return of the piston causes a vacuum in the master cylinder, this will never permit air to be drawn in, but additional brake fluid will always be supplied from the rear piston space.

## Secondary Piston Cup

Sealing of the annular reservoir towards outside is effected by the secondary piston cup. The combined action of by-pass port, doubleaction check valve, and main piston cup will ensure a completely automatic charge control, compensate for any variations and prevent air from entering, which would jeopardize the effectiveness of the brakes.

## Attention!

Assembled master and wheel brake cylinders, as well as rubber mouldings (cups, dust boots, check valves, etc.) and brake hoses must be stored cool and dry and should be protected from dust. If brake parts of rubber are stored for too long a period, they may get unserviceable. Make sure, therefore, that assembled master and wheel brake cylinders, which have been in storage for more than 6 months, are disassembled, cleaned and checked prior to installation. Rubber mouldings should not be stored for more than 12 months, brake hoses are limited to 18 months' storage time.

## Important!

When exchanging a master cylinder, care should be taken to ensure that the inner cyl. master is .75" (19.05 mm).

## Removing and Installing Master Cylinder

### Removal

1. Jack up car.
2. Open front hood, take out spare wheel and tools.
3. Fold rubber mat (except in Roadster) sideways and unscrew cover to steering gear.
6. Take rubber mat out of car remove floor board at pedal side.
7. Pull protective cap from master cylinder. (see fig. 6)
8. Undo retaining screws of master cylinder and remove master cylinder.

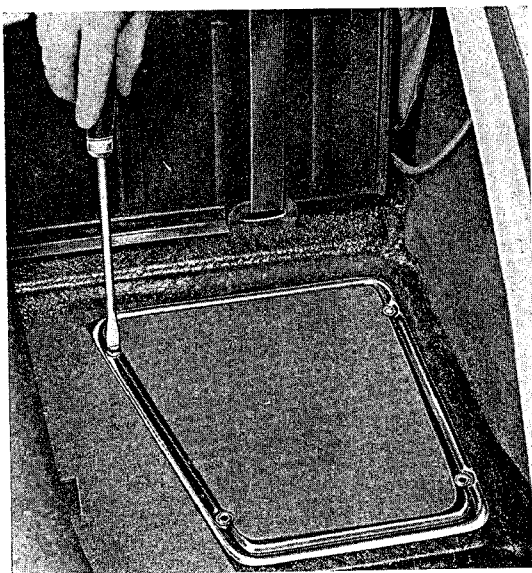


Fig. 5

### Installation

The master cylinder is installed in reverse order, observing the following points:

1. When placing the master cylinder into position, the brake push rod must be inserted correctly right from the beginning. Moreover, the master cylinder flange should be sealed with sealing compound, in order to avoid water entering the car inside.
2. Adjust clearance between brake push rod and piston in master cylinder, after loosening the locknut on the brake push rod. Clearance approx. .04" (1 mm).
4. Disconnect cable on stop light switch.
5. Unscrew brake lines from master cylinder and plug openings (with bleeder dust caps).

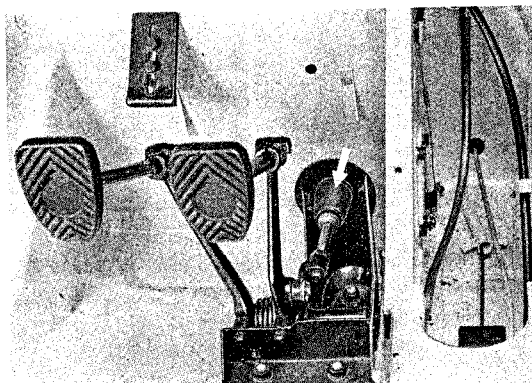


Fig. 6

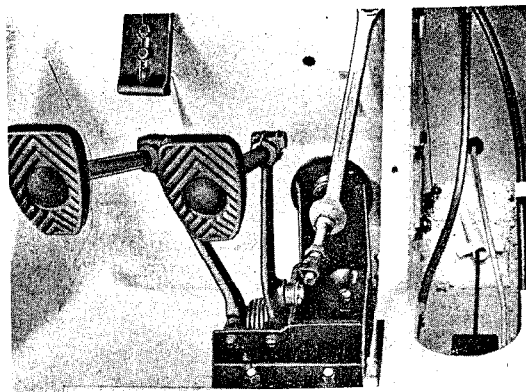


Fig. 7

3. Adjust and bleed brakes (13 Ti). Do not forget bleeder dust caps.

## Reconditioning Master Cylinder

2 Ti

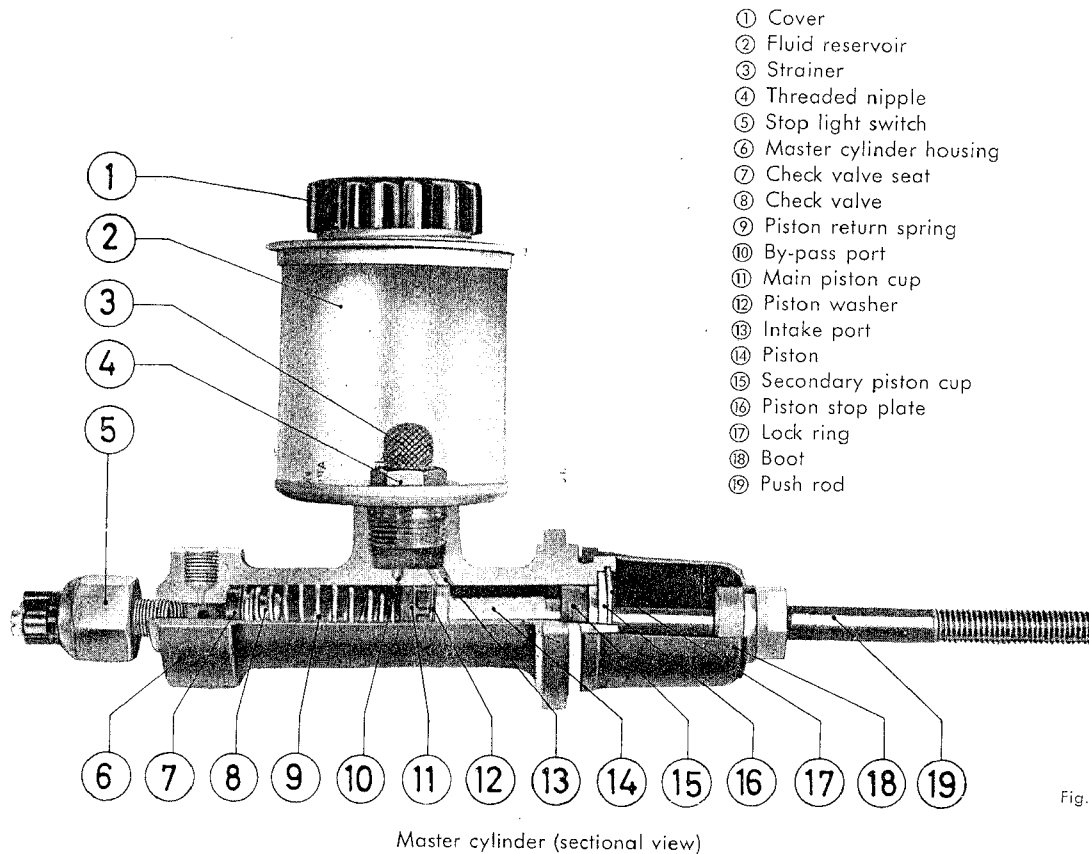


Fig. 8

### Disassembly

1. Empty and remove fluid reservoir.
2. Unscrew stop light switch.
3. Remove spring for stop plate (see fig. 9).
4. Take out stop plate, piston with secondary piston cup.
5. Remove washer, main piston cup, return spring with spring retainer, check valve and valve seat.

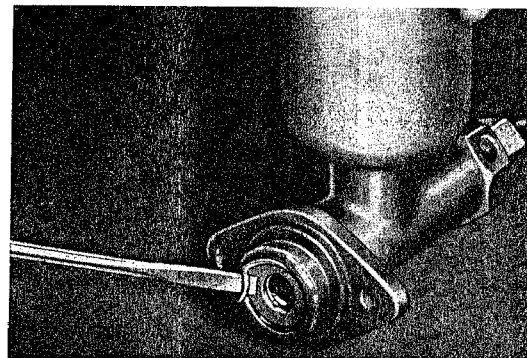


Fig. 9

### Assembly

To assemble, proceed in reverse order, observing the following points:

1. Clean all parts, using exclusively spirit or genuine Ate brake fluid. Gasoline (petrol), benzol, glycerin etc. destroy rubber parts.
2. Check all parts for wear and damage. Make sure that the intake and by-pass ports are open and free from burrs. The cleaned and dried piston must move with suction in both directions in the cylinder.
3. It is necessary to replace the two piston cups whenever rebuilding a master cylinder (Note specified diameter of master cylinder, .75" = 19.05 mm).
4. Apply a thin film of genuine Ate brake cylinder paste on piston, cylinder wall and rubber parts.
5. Make sure the lock ring is properly seated.
6. When tightening the reservoir in place, make sure that the mark at the bottom of the reservoir points towards the stop light switch and is in line with the center line of the master cylinder housing.
7. Check for obstructions in the ventilation hole of the fluid reservoir cover.