TANDEM ACTUATOR TYPE 24/24
(AIR/HYDRAULIC MODELS)

DESCRIPTION
The tandem actuator converts the energy in compressed air into the displacement necessary to operate the hydraulic master cylinder.

The actuator consists of a centre body with two end covers. The end covers form two chambers in which the diaphragms operate. The diaphragms are located and clamped between the end covers and the centre body and secured by clamp rings.

OPERATION
A controlled supply of compressed air, regulated by the brake valve, enters both pressure chambers of the actuator, pushing both diaphragms and their push rods towards the master cylinder. The foremost push rod contacts the primary piston and further movement of the diaphragms and push rods moves both primary and secondary pistons forward to produce hydraulic pressure.

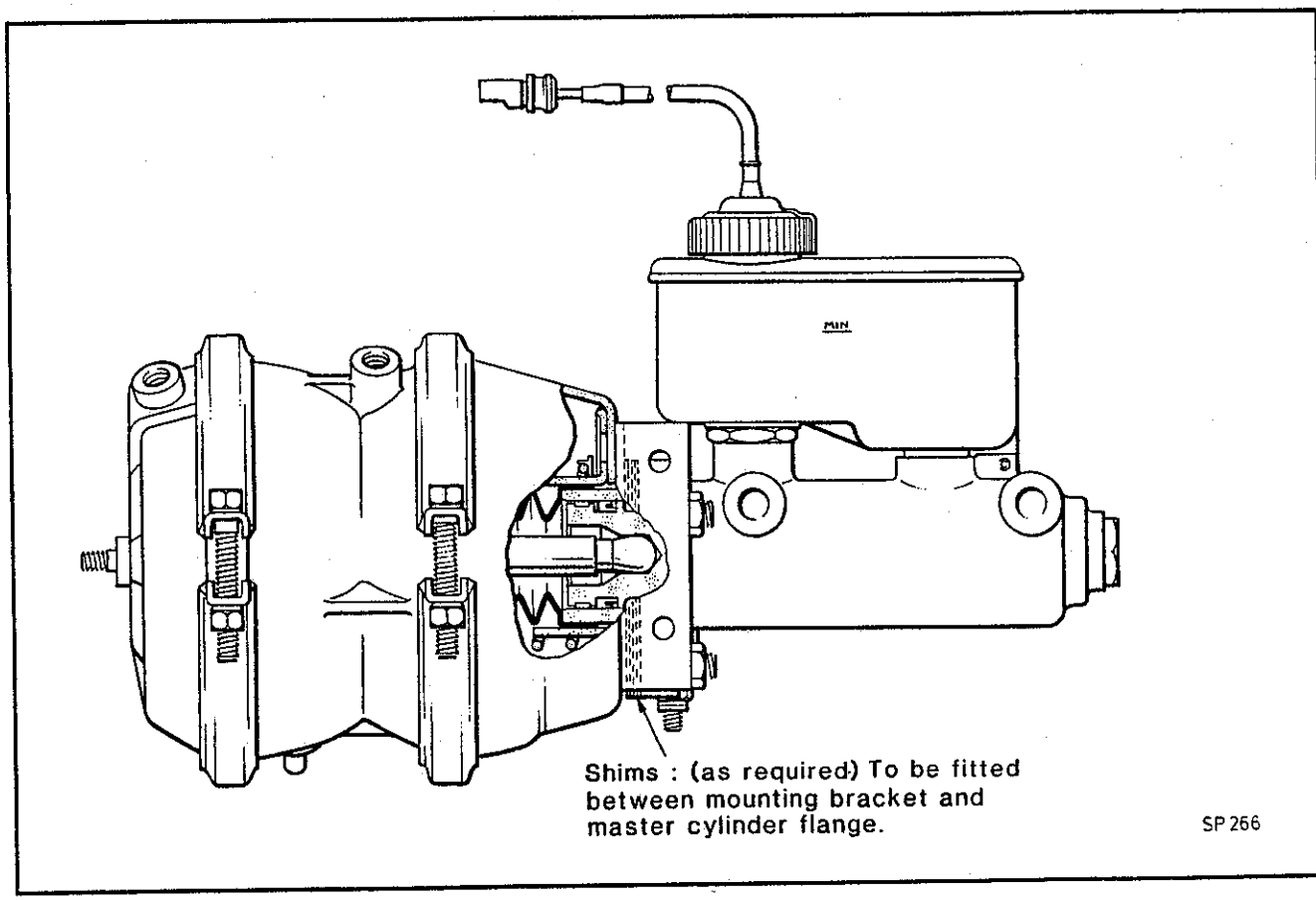


Fig. 1 *Assembly of Tandem Actuator and Master Cylinder*

Both diaphragms have support plates to which are attached push rods. The rear push rod passes through a seal in the centre body to abut directly onto the rear face of the front diaphragm. Both diaphragms are held in the off position by return springs. The front push rod has a spherical end which operates the primary piston in the master cylinder. Each chamber has a tapped inlet port on the pressure side and a breather/drain hole on the non pressure side.

MAINTENANCE
Check the mounting brackets and all fixings for security. Check the air line connections for tightness.

LEAK TEST
Charge the air system up to governor cut-out pressure and stop the engine. Using a soap solution, coat the clamp rings and surrounding area. Leakage from these joints should not exceed a 12/13mm soap bubble in 5 seconds.

Tandem Actuator (Air/Hyd.)

CHECKS

Charge the system to govenor cut-out pressure and stop the engine.

Fully apply the brakes and hold for thirty seconds. During this period there should be no appreciable drop in the pressure shown on the gauges. Any excessive drop on either gauge indicates a serious leak which must be rectified before driving the vehicle. The fault could be in the piston seals.

Push in the stroke indicator rod and watch the rod when the brakes are applied. The rod should move out smoothly with no sign of sluggishness or irregular movement.

If on brake application the mark or red panel on the indicator rod shows or the brake warning light on the instrument panel shows, the brakes require adjusting or the linings renewed.

Reset the rod after ALL adjustments.

The warning light can also indicate low brake fluid level in the master cylinder.

Coat the breather ports with a soap solution and tape up the small drain hole fitted with a split pin. Apply the brakes and notice that air is expelled from both breather ports. If no air issues from either port, the piston or piston rod may be seized or sticking or the master cylinder pistons may be seized or sticking. If air is expelled from one port, the other piston may be suspect. Excess air from either port would denote suspect piston seals.

Remove the tape after testing.

TO REMOVE

Apply the handbrake, immobilize the vehicle and check the wheels.

Clean the assembly thoroughly whilst still mounted on the vehicle.

Disconnect the hydraulic pipes from the master cylinder, drain the reservoirs and seal all open ends.

Disconnect the air pipes from the tandem actuator and seal all open ends.

Label all pipes for correct re-assembly.

Disconnect electrical connections.

Remove the complete assembly from the vehicle by detaching the centre bracket from the frame. The centre bracket is sandwiched between the actuator and the master cylinder.

Lay the complete unit on a clean bench. Release the three nuts securing the master cylinder to the actuator and withdraw. Retain the shims and centre bracket.

Mark the cylinders and centre body so that they can be fitted back in their original positions.

Remove the nuts and bolts securing the cylinders to the centre body and remove the rear cylinder with its piston.

Extract the piston fitted into the rear cylinder, using air pressure if necessary. Ensure that this is done in complete safety with no danger to anyone in the vicinity.

Take up the spring load with a suitable tool before attempting to remove the nut from the end of the push rod.

Remove the nut from the end of the push rod and slowly release the spring pressure.

Remove the spring retainer, both springs and the contact plate.

Separate the centre body from the front cylinder by sliding it back along the push rod.

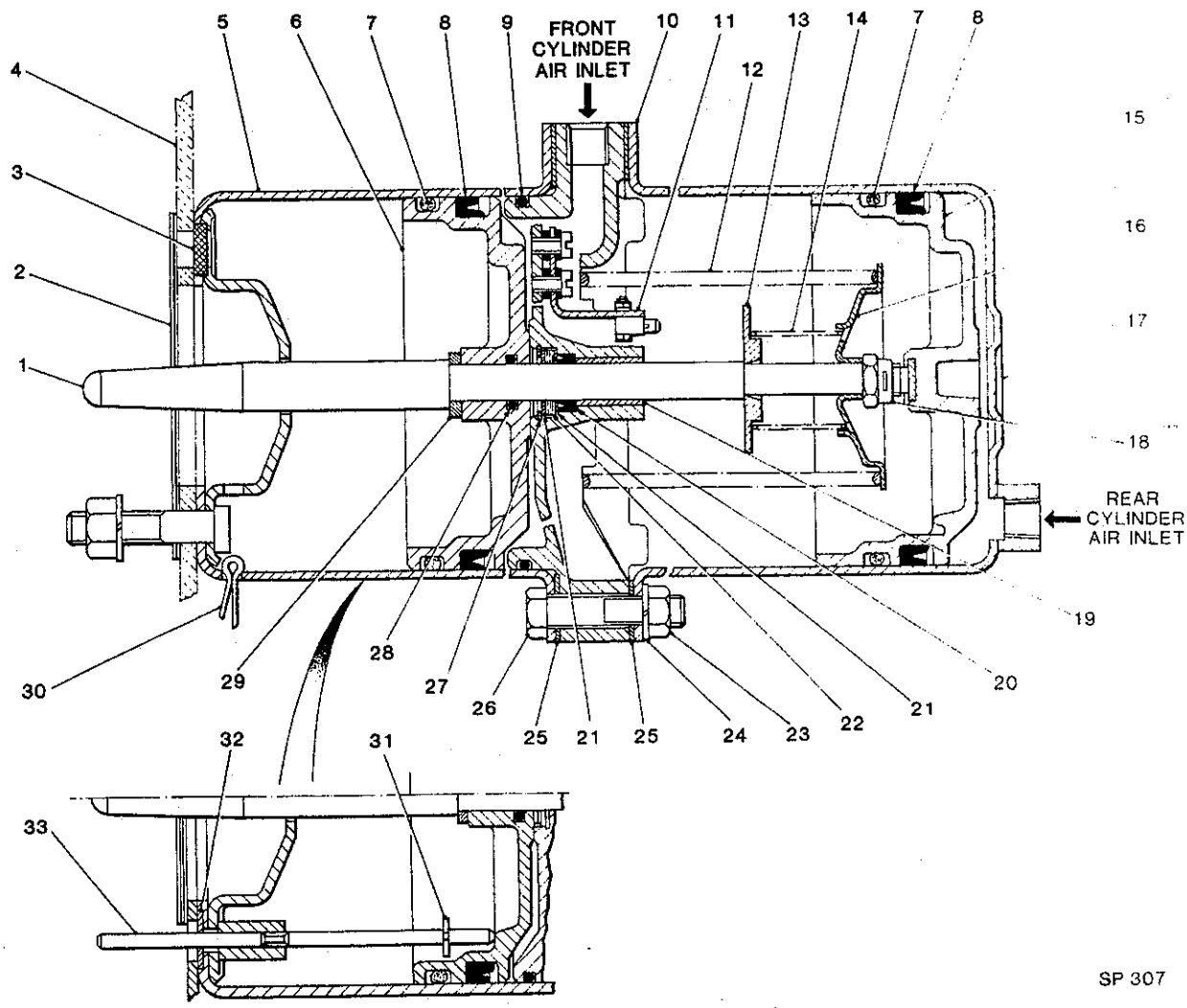
Remove the front piston by using the push rod to pull or push it from the cylinder. Then withdraw the push rod and thrust washer from the piston.

Remove the breather from the front cylinder.

Remove the circlip from the indicator rod and withdraw the rod and friction disc.

Remove the breather element from the centre body.

Extract the circlip from the centre body and remove the retaining plate, felt lubricator, retaining plate and seal.



1	PUSH ROD	12	RETURN SPRING	23	NUT
2	SHIMS	13	CONTACT PLATE	24	SPRING WASHER
3	BREATHER	14	CONTACT PLATE SPRING	25	CYLINDER JOINT
4	MTG. BRACKET	15	REAR PISTON	26	BOLT
5	FRONT CYLINDER	16	SPRING RETAINING PLATE	27	CIRCLIP
6	FRONT PISTON	17	REAR CYLINDER	28	FRONT PISTON BORE SEAL
7	LUBRICATING RING	18	NUT	29	THRUST WASHER
8	PISTON SEAL	19	BUSH	30	SPLIT PIN
9	CENTRE BODY SEAL	20	CENTRE BODY SEAL	31	CIRCLIP
10	CENTRE BODY	21	RETAINER	32	FRICTION DISC
11	WEAR SWITCH	22	FELT LUBRICATION WASHER	33	WEAR INDICATOR ROD

Fig. 2 *Section through 475 Tandem Actuator*

Remove all sealing rings from the pistons and body including the lubricating rings and the seal in the bore of the front piston.

Carefully clean and inspect all parts. Discard the parts to be replaced from the repair kit.

Check the brake wear warning switch in the centre body for security and for electrical integrity.

Examine the cylinder bodies for dents or cracks. The sliding surfaces should be smooth with no score marks.

Check the centre body and pistons for cracks.

RE-ASSEMBLY

Soak the felt lubrication washer from the bore of the centre body and the two lubrication rings from the pistons in Clayton Dewandre "Power Cylinder Oil" CDS.107 for thirty minutes.

Coat all sliding, load bearing and working surfaces, sealing rings and seals with Clayton Dewandre grease CDS.156.

Fit the lubrication rings into the grooves nearest the open ends of the pistons.

Fit the seals for the pistons into the other grooves with the open side of the seals facing away from the lubrication rings.

Fit the sealing ring into the bore of the front piston.

Fit the seal for the centre body bore in place with the lips facing away from the bush.

Fit into the centre body bore a retaining washer, the felt lubrication washer, the other retaining washer and secure with the circlip.

Assemble onto the push rod the thrust washer, the front piston, open end first (ensure that the sealing ring is in place in the bore), the centre body, circlip end first. Be careful that the lips of the seal are not turned back or dammaged when eased over the step in the push rod.

Fit the switch contact plate upto the step in the push rod, flat side first.

Position the large spring onto the centre body and the small spring onto the spigot diameter of the switch contact plate.

Position the spring retaining plate onto the large spring, convex side first. The small spring will be held in position by the pressed out tabs.

With a suitable tool carefully compress the springs. Ensure that both springs are properly located in the retaining plate. Screw up the nut to the shoulder on the push rod and tighten securely.

Gradually release the spring pressure until the tubed end of the spring retaining plate rests against the nut.

Insert the friction disc into the correct hole in the front cylinder followed by the indicator rod. Fit the circlip to the indicator rod.

Fit the large sealing ring into the groove on the outside diameter of the centre body.

Place a joint on the flange of the front face of the centre body (opposite side to the springs).

Slide the front cylinder over the front piston taking care not to damage the lubricating ring or the seal on the piston or the seal in the centre body. Slide the cylinder upto the flange and line up the marks on the cylinder and the centre body.

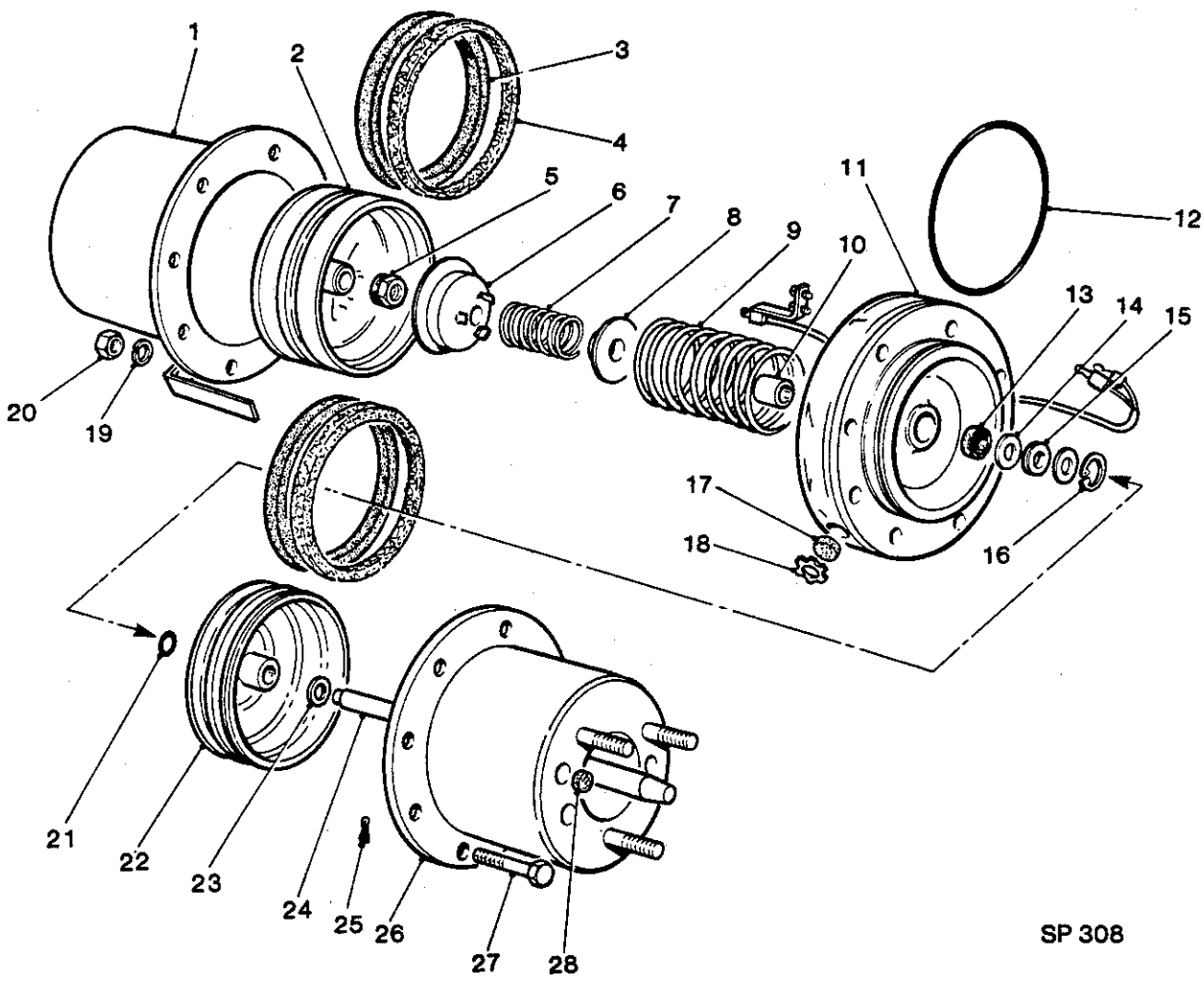
Place a joint on the flange of the rear face of the centre body.

Fit the rear piston into the rear cylinder taking care that the lips of the seal are not damaged or turned over when entering the cylinder.

Assemble the rear cylinder upto the centre body flange.

Line up the marks on both cylinders with the mark on the centre body and fit the bolts with their heads on the front cylinder side. Assemble the nuts and washers and tighten securely.

Insert the breather elements into the recesses in the front cylinder and the centre body. Secure the centre body breather with its retainer.



1	REAR CYLINDER	11	CENTRE BODY	21	FRONT PISTON BORE SEAL
2	REAR PISTON	12	CENTRE BODY SEAL	22	FRONT PISTON
3	PISTON SEAL	13	CENTRE BODY SEAL	23	THRUST WASHER
4	LUBRICATING RING	14	RETAINER	24	PUSH ROD
5	PUSH ROD NUT	15	FELT LUBRICATING WASHER	25	SPLIT PIN
6	SPRING RETAINING PLATE	16	CIRCLIP	26	FRONT CYLINDER
7	CONTACT PLATE SPRING	17	BREATHER	27	BOLT
8	CONTACT PLATE	18	RETAINER	28	BREATHER
9	RETURN SPRING	19	SPRING WASHER		
10	BUSH	20	NUT		

Fig. 3 *Exploded view of 475 Tandem Actuator*

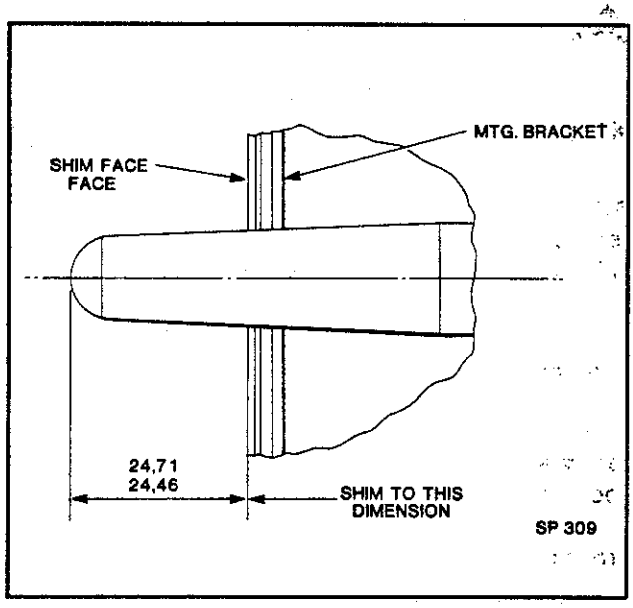


Fig. 4. *Push rod setting dimension*