

II – POWER STEERING

CHARACTERISTICS

Rack and pinion steering, hydraulically powered

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|--|----------------------|
| – Tracking (<i>adjustment by means of the two link rods set to the normal driving position</i>) : | 0 to 3 mm toe-out |
| – Steering ratio | 1/15.5 |
| – Number of turns of the steering wheel, from stop to stop | 2.83 |
| – Turning circle | 11.23 m |
| { between walls | |
| { between kerbs | 10.35 m |
| – Steering lock angle | 33° |
| { outer wheel | |
| { inner wheel | 41° |

SPECIAL FEATURES

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|--|--|
| – Number of pinion teeth | 9 |
| – Number of rack teeth | 34 |
| – Rack plunger clearance (at min. free-play point) | 0.01 to 0.06 mm |
| – Thickness of plunger adjustment shims | 0.10 - 0.12 - 0.15 - 0.18 |
| – Track rod preset length, "L" Fig. II (<i>between the swivel ball joint coupling and the contact face of the ball joint resting on the steering rack</i>). | 0.20 to 0.80 in steps of 0.10 mm about 355 mm |
| – Steering wheel with splined coupling quadrant offset by 90°. | |

Fitting position of the steering with vehicle wheel in a "straight line" position.

| | |
|------------------------|--------------------------------|
| – Steering wheel spoke | pointing VERTICALLY downwards |
| – Pinion flange | PARALLEL with the steering box |

Steering geometry :

| | |
|--|-------------------------|
| – Shims between steering-gear housing and axle (3 different thicknesses) (1) Fig. II : | 0.5 - 1 - 2 mm |
| – Wheel alignment difference, per wheel , between the NORMAL and the TOP position : | 1.5 to 2.5 mm toe-in |

Ex : 1 mm thick shim added = 1 mm toe-out change.

POWER STEERING

The power steering assembly comprises, **Fig. I** :

- a source of pressure (high-pressure pump (1) for general supply),
- a flow distributor (2) (fitted between the high-pressure pump and the pressure-regulator),
- a control valve (3) integral with the rack steering pinion,
- a power operating ram (4), parallel to the rack.

Flow distributor : Fig. II**Functions :**

Controls the flow distribution between the steering circuit and the main circuit (suspension, brake).
Limits the pressure in the steering circuit.

Description :

- ① : High pressure inlet from the pump
- ② : Pressure regulator supply
- ③ : Steering supply
- ④ : Return to reservoir
- ⑤ : High pressure inlet from the pressure regulator

a : Flow distribution slide-valve.

b : Flow regulating slide-valve.

c : Calibrated ports.

d : Pressure limiter valve.

e : Filters.

Control valve : Fig. III**Function :**

Distributes the pressure to power operating cylinder according to the steering force exerted, the valve is of the « centre open » type.

« Centre open » type valve : **Fig. IV.**

In neutral, the flow distributor is open (return to reservoir), i.e. the pump delivers a permanent pressure corresponding to the operating circuit pressure, then the pressure or volume of the flow distributor varies more or less according to the calibrated ports.

Description :

- ① : Inlet of the fluid (from the flow distributor).
- ② : Return to reservoir.
- ③ : Hydraulic ram larger chamber **A**.
- ④ : Hydraulic ram smaller chamber **B**.

a : Cast-iron unit secured on the rack housing.

b : Distributor integral with the rack steering pinion.

c : Rotor fitted on the steering column end.

d : Torsion bar fitted between the distributor and the rotor (angular shifting between the two elements, on the R.H.S. or on the L.H.S. : 7° approx.).

e : Sealing gaskets.

NOTE : the mechanical connection of the rack pinion is ensured by two flat spots at « **f** » at rotor « **c** » extremity and in distributor « **b** ».

Power operating ram : Fig. V**Function :**

Parallel with the steering rack, it provides power assistance to the steering rack movement.

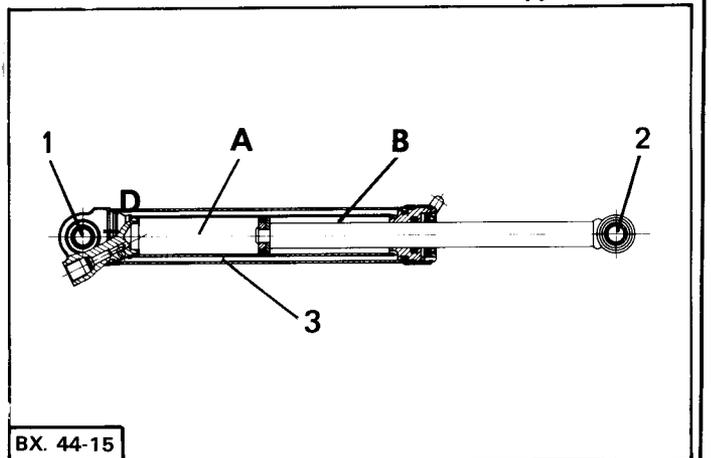
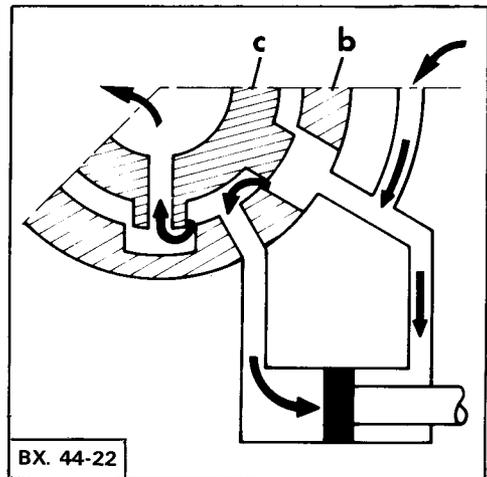
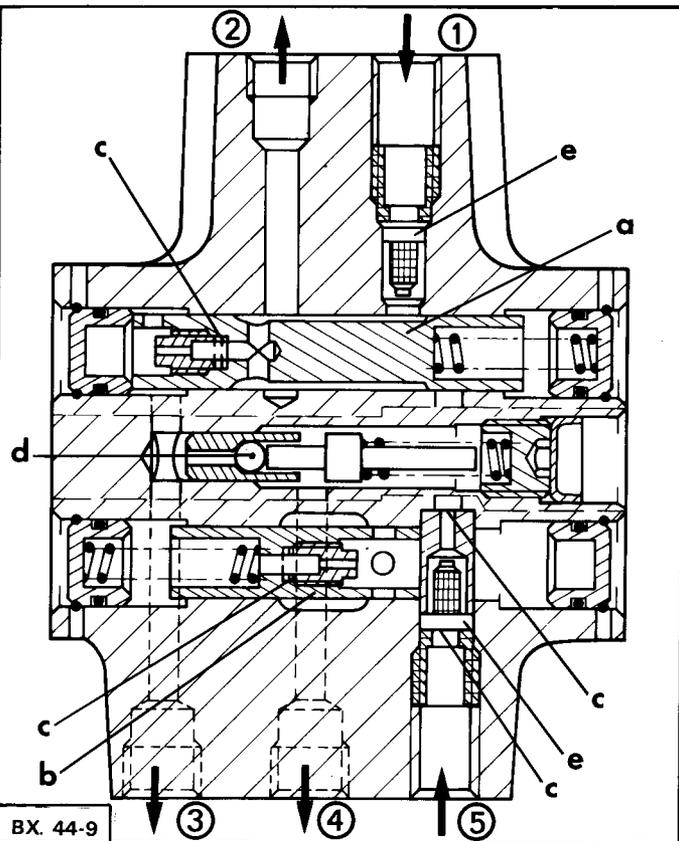
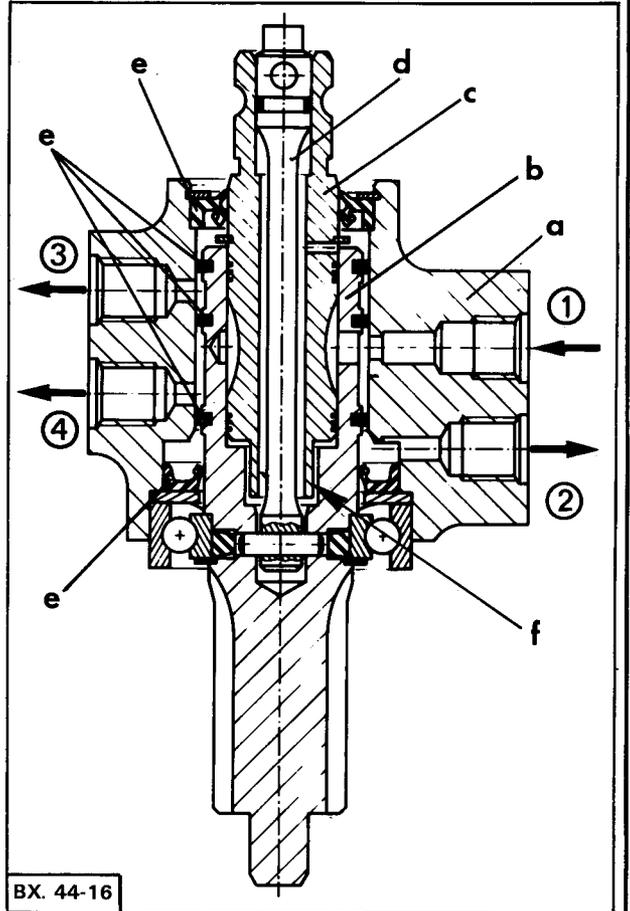
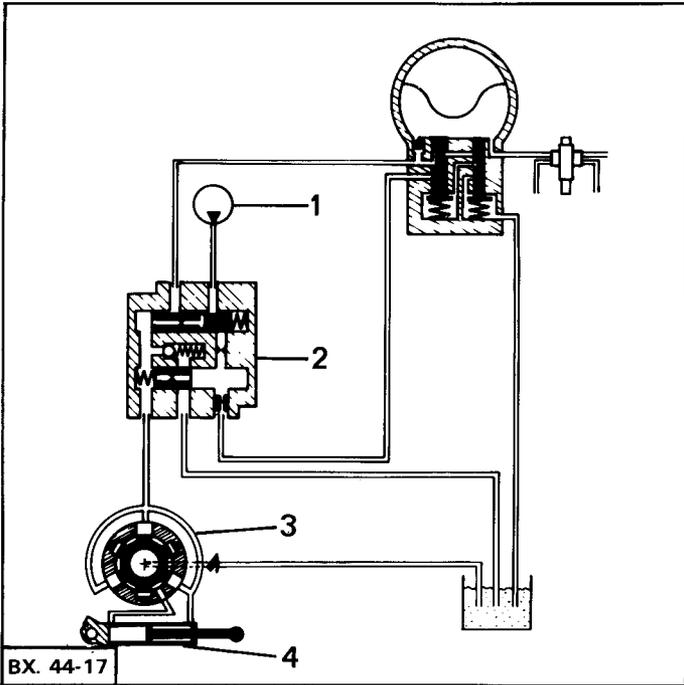
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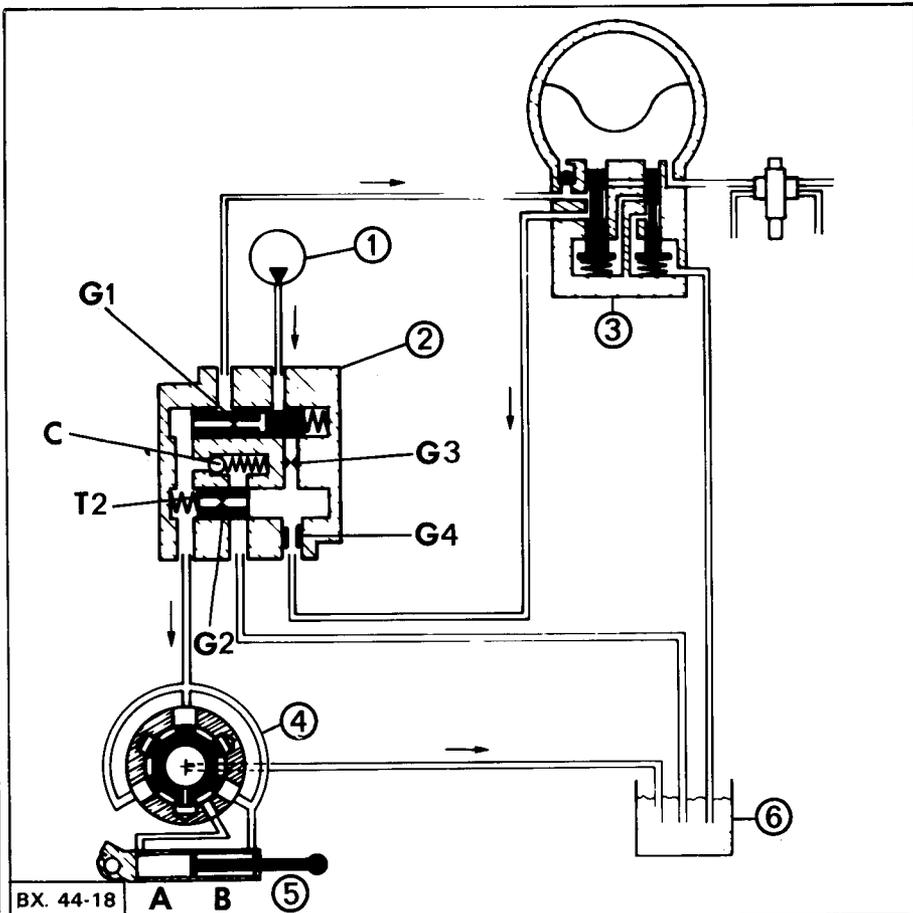
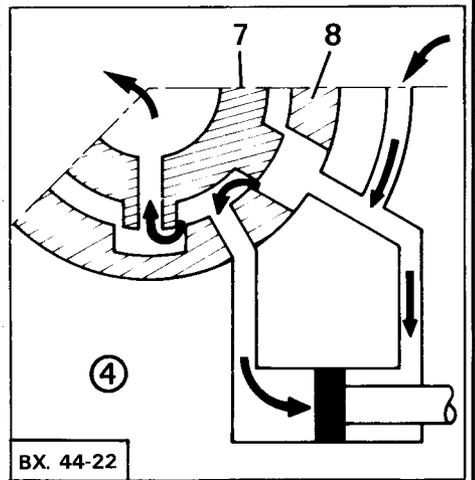
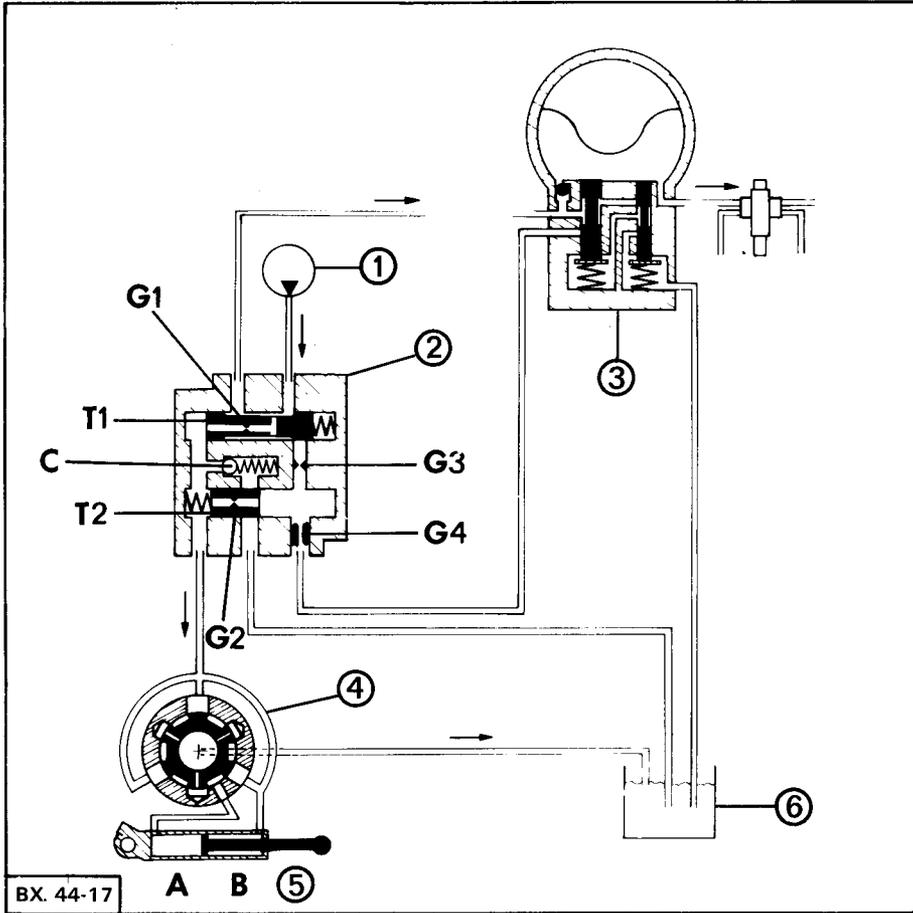
It comprises two chambers :

Ⓐ : the large one (twice the small one)

Ⓑ : the small one (supplied through duct (3))

It is connected to the rack housing through head (1) and to the rack through piston rod eye (2).





OPERATING PRINCIPLE

- ① : High pressure pump.
- ② : Flow distributor.
- ③ : Pressure regulator.
- ④ : Control valve.
- ⑤ : Power operating ram.
- ⑥ : Hydraulic reservoir.

- T1**: Flow distribution slide-valve
- T2**: Flow regulating slide-valve
- C**: Pressure regulating valve
- G1 - G2 - G3 - G4**: Flow regulating jets

In a straight-line position (pressure regulator in the CUT-IN position)*Flow distributor: Fig. I*

The fluid delivered by pump (1) is distributed between the main circuit and the power steering circuit through flow distribution slide-valve **T1**.

Jet **G1** limitates the output.

The priority is given to the main circuit (1/4 of the output towards the steering and 3/4 towards the main circuit).

Control valve: Fig. I and II

The control valve rotor (7) and distributor (8) are in a neutral position (no action of the torsion bar). Both chambers **A** and **B** of the ram are fed without pressure.

All the fluid supplied to the control valve by the flow distributor returns to the reservoir.

In a straight-line position (pressure regulator in the CUT-OUT position)*Flow distributor: Fig. III*

The pressure rises inside pressure regulator (3). When the pressure reaches **170 bars** approx, the pressure regulator cuts off the supply to the main accumulator (disconnection).

The fluid supply is connected to the 2nd supply of the flow distributor by the action of the pressure regulator main slide-valve.

All the fluid delivered by the pump feeds the flow distributor.

Jet **G2** of flow regulating slide-valve **T2** limitates the quantity of fluid to be supplied to the control valve, the remaining fluid returns to the reservoir.

Control valve: Fig. II and III

Since the position of rotor (7) and distributor (8) has not been modified, both chambers of ram (**A** and **B**) are supplied without pressure.

All the fluid delivered by the distributor to the control valve returns to the reservoir.

Turning the steering to the right: Fig. I and II

When turning the steering to the right entails an important wheel resistance on the ground, control valve rotor (7) moves angularly in relation to distributor (8).

Pressure in large chamber **A** of the ram is nil, whereas small chamber **B** is supplied by the flow distributor.

The pressure increases into the control-valve flow distributor circuit, the flow distribution is modified causing the ram to move towards the left.

Turning the steering to the left: Fig. III and IV

When turning the steering to the left entails an important wheel resistance on the ground, control valve rotor (7) moves angularly in relation to distributor (8) causing the return to reservoir to close.

The pressure increases into the control-valve flow distributor circuit.

The position of the rotor in the valve distributor enables both chambers **A** and **B** of the power operating ram to receive a pressure supply from the flow distributor.

The pressure is the same in chambers **A** and **B**.

Since chamber **A** section is twice that of chamber **B**, the ram is moving towards the right.

Flow distribution in CUT-IN position, when turning the steering

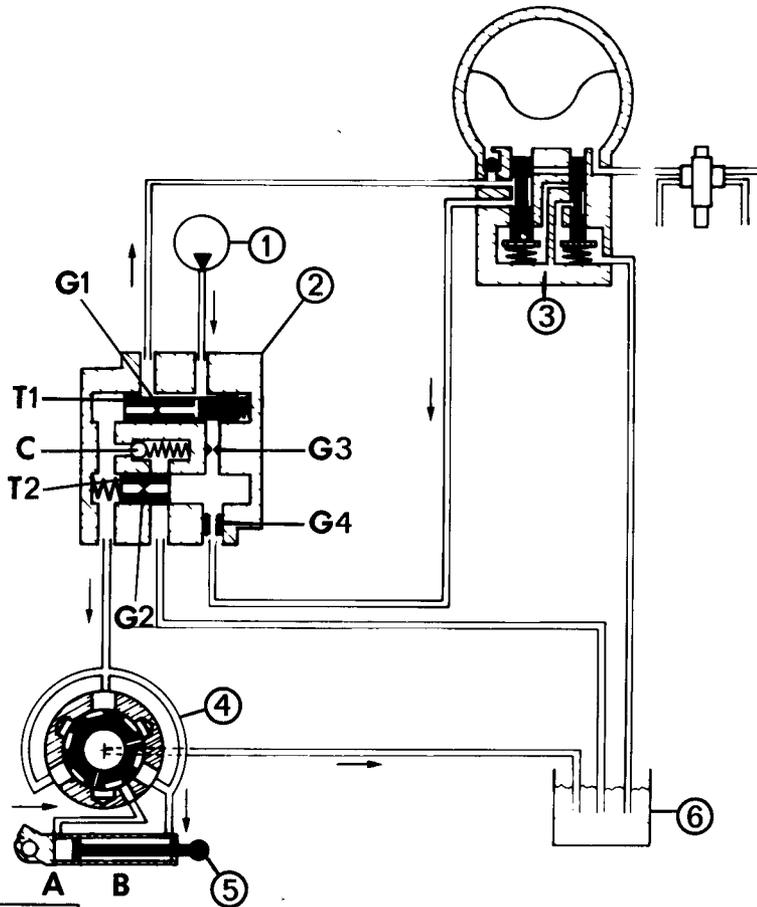
When turning the steering, pressure rises in the power circuit. In the CUT-IN position, this pressure increase causes slide valve **T1** to move and the flow distribution to be modified. The priority is given to the steering power circuit since it is supplied by jets **G1** and **G3** (3/4 of the pump flow towards the steering and 1/4 towards the main circuit).

Pressure regulating valve **C** limits the power pressure to **140 bars** approx. when the steering is turned to full lock.

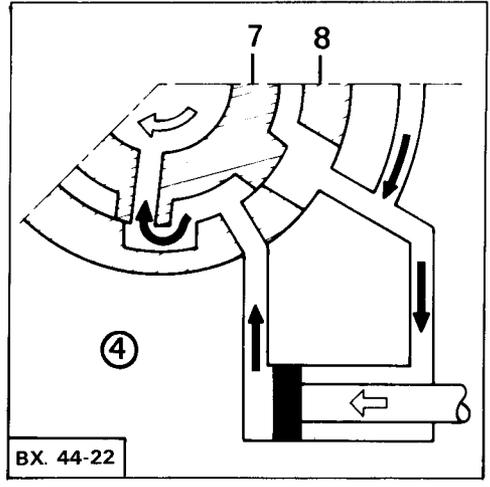
Back to straight line position

When the effort applied to the steering wheel ceases, rotor (7) pushed by the torsion bar, returns to its neutral position in relation to distributor (8).

Under the action of the front axle angles, the wheels come back to the straight line position, leading the ram.

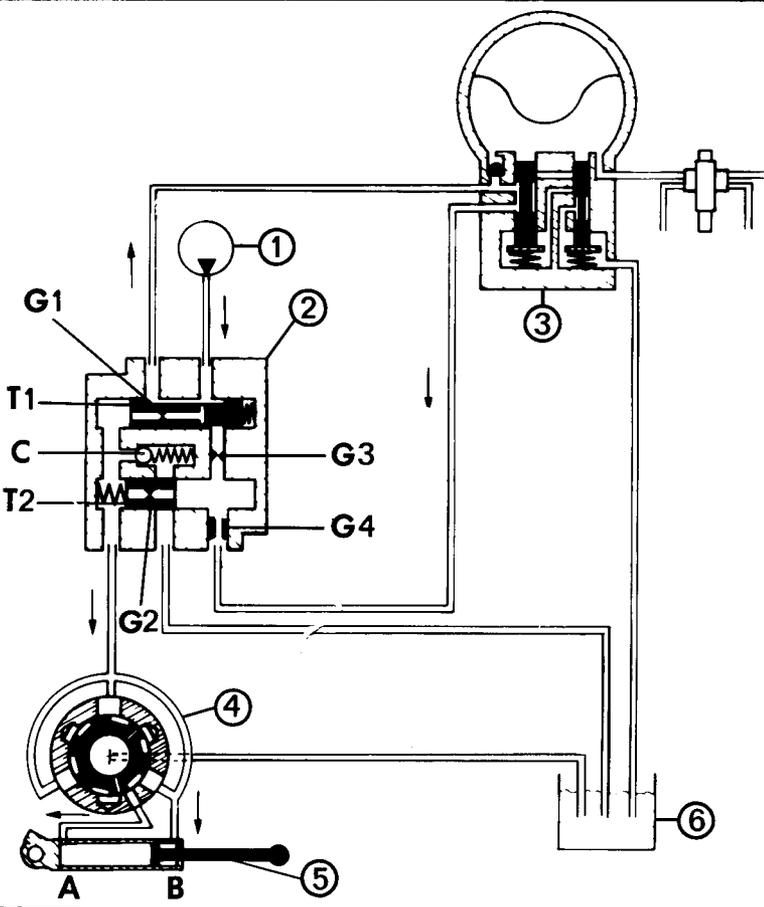


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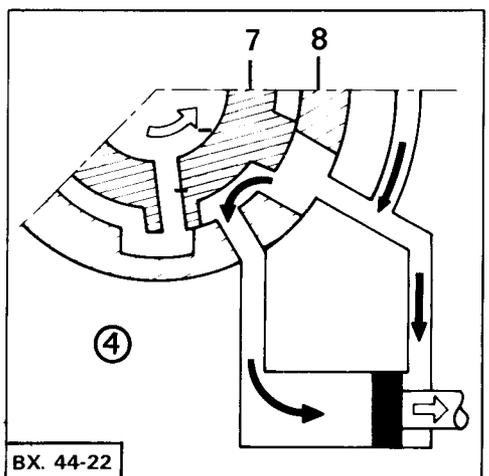


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II



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BX. 44-22

IV