

HYDROSTATIC STEERING

Type	hydrostatic control
Hydraulic system	independent, hydraulic pump feeding from transmission case oil compartment
Oil filter	paper element, same of hydraulic lift
Control valve, make	DANFOSS
Type	ORBITROL, rotating-valve type directly controlled from steering column: manual steering is assured in case of oil pump is defective
Outfit code:	
– 2 WD models	OSPC 100 ON – 150 N
– 4 WD models	OSPC 160 ON – 150 N
Pressure relief valve setting (24, page 41–3):	
– 2 WD models bar	100 = 102 kg/cm ² (1450 psi)
– 4 WD models bar	125 = 127 kg/cm ² (1822 psi)
Cylinder safety valve setting (33, page 41–3):	
– 2 WD models bar	160 = 163 kg/cm ² (2320 psi)
– 4 WD models bar	185 = 189 kg/cm ² (2682 psi)

HYDRAULIC PUMP

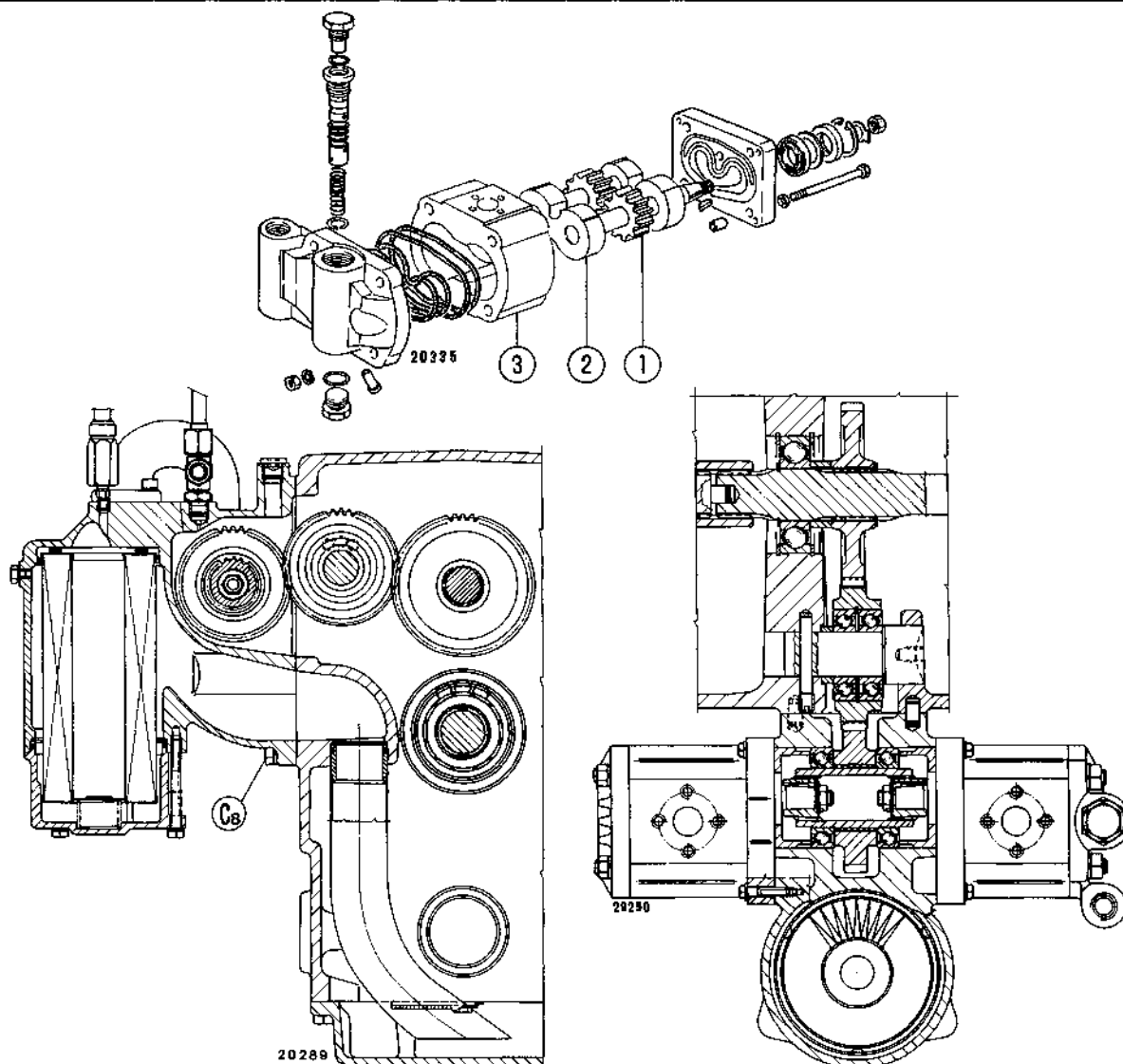
Type	gear-type, incorporated metering device, feeding from transmission oil compartment
Placement	on transmission rear drive case, R.H. side
Model	A31 XRP 2
Make	FIAT
Drive	through PTO shaft
Rotation (from drive end)	counterclockwise
Engine/pump rpm ratio	1:1.261
Rated speed (with engine turning at rated power speed)	2092 rpm
Corresponding nominal capacity	41 l/min (8.2 UK Gal/min)
Nominal capacity at 1000 rpm	14.8 l/min (3.25 UK Gal/min)
Controlled capacity starting speed	1150 rpm
Controlled delivery capacity	17 to 21 l/min (3.75 to 4.62 UK Gal/min)

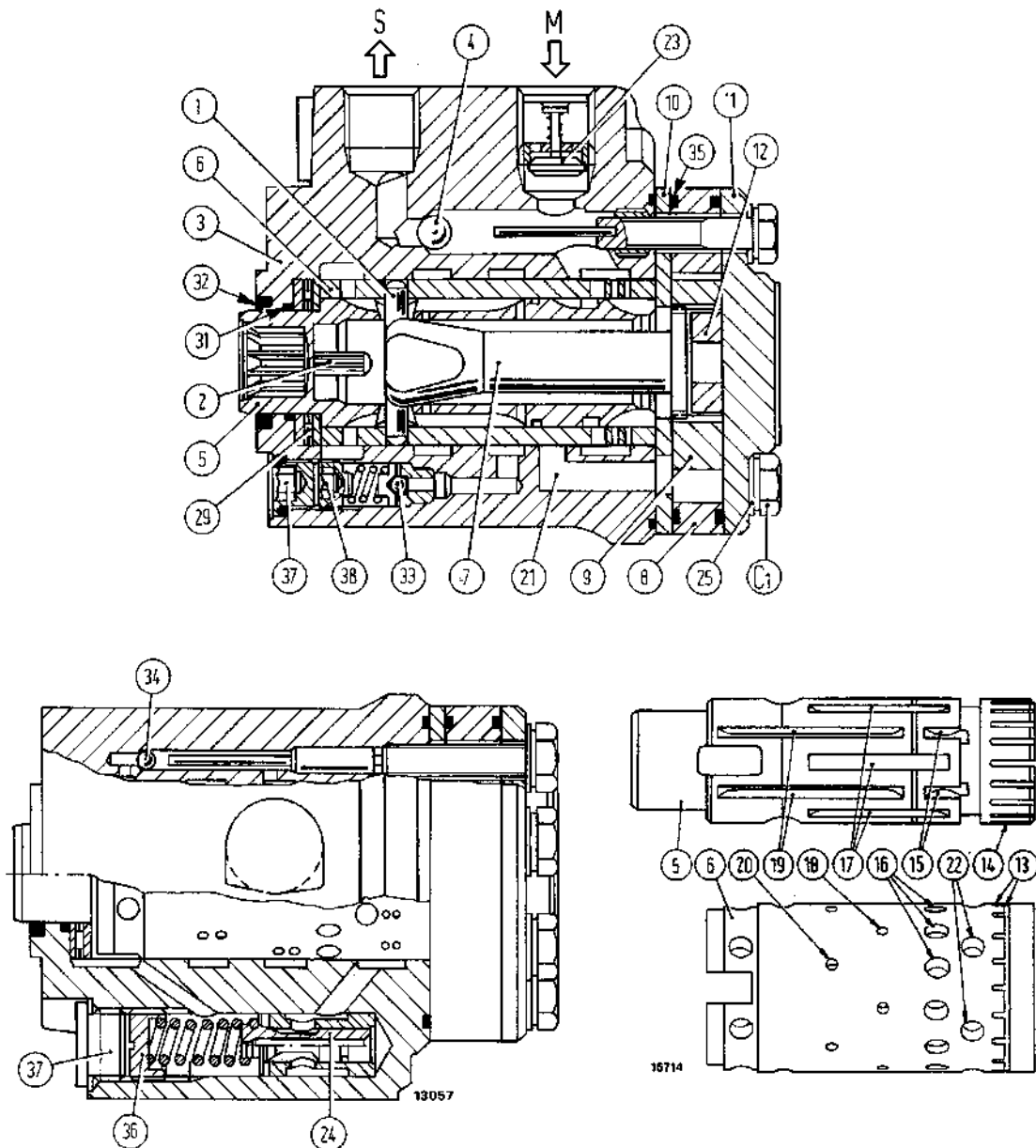
(follows)

HYDRAULIC PUMP

(cont.)

O.D., drive and driven gear shafts	17.400 to 17.418 mm (.6850 to .6857 in)
I.D., bearing seats	17.450 to 17.470 mm (.6870 to .6878 in)
Running fit, shaft/seat clearance	0.032 to 0.070 mm (.0012 to .0027 in)
– permissible wear limit	0.1 mm (.0039 in)
Radial clearance, pump gears w/body	0.020 to 0.064 (.0008 to .0025 in)
Max. permissible pump wear, suction end, gear compartment	0.1 mm (.0039 in)
Width, gears (1)	24.000 to 24.015 mm (.9449 to .9649 in)
Width, bearings (2)	24.490 to 24.510 mm (.9642 to .9649 in)
Width, gear and bearing seat, pump body (3)	73.135 to 73.160 mm (2.8793 to 2.8803 in)
End play, gear/bearing in pump body (manufacturing and reconditioning dimension)	0.100 to 0.180 (.0039 to .0071 in)





Sectional views of the hydrostatic steering control valve

C₁. Control valve cover screws – M. Pump delivery – S. Discharge – 1. Drive pin, sleeve (6) and rotor shaft (7) – 2. Sleeve (6) return springs – 3. Control valve body – 4. Check valve – 5. Rotary valve – 6. Sleeve, valve (5) seat – 7. Rotor (9) drive shaft – 8. Rotor stationary ring – 9. Rotor – 10. Abutment plate – 11. Cover – 12. Spacer – 13 and 14. Neutral position oil ports – 15. Rotor feeding oil passages (q.ty:6) – 16. Oil ports (q.ty:12) communicating with passages (15 and 17), alternatively – 17. Outlets (q.ty:6) to power cylinder connecting with with rotor outlet passages and ports (18 and 20) – 18. Power cylinder RH chamber outlet or exhaust ports (q.ty:6) – 19. Power cylinder exhaust passages (q.ty:6) communicating with ports (18 and 20) – 20. Power cylinder LH chamber outlet or exhaust ports (q.ty:6) – 21. Connecting ports (16) to rotor inlets or outlets – 22. Feed ports to passages (15) – 23. Check valve – 24. Pressure relief valve – 25. Washer – 26. Connecting line to power cylinder LH chamber – 27. Connecting line to power cylinder RH chamber – 29. Thrust bearing – 31. Oil seals – 32. Dust shield – 33. Power cylinder safety valves – 34. Compensating valves – 35. O-ring seals – 36. Valve (24) set screw – 37. Plugs – 38. Valve (33) set screw.

HYDROSTATIC STEERING TROUBLE-SHOOTING CHART

Fault	Diagnosis	Correction
Oil leakage at hydrostatic unit: a. Drive end. b. Cover end.	1. Defective O-ring seal (31, page 41-3).	Replace seal and associated anti-extrusion ring using special tool 293955 .
	2. Insufficient tightening of capscrews (C ₁).	Tighten capscrews to specification torque value (24 to 36 Nm – 2.5 to 3.7 Kgm = 18 to 27 ft.lb), as indicated on page 41-20.
	3. Defective gaskets (25) or O-ring seals (35).	Replace gaskets and seals.
Hard steering.	1. Hydraulic pump inoperative.	Rectify pump.
	2. Check valve (4) stuck open, presence of impurities or missing ball.	Remove impurities and clean filter; fit a new ball in valve seat (if missing).
	3. Misadjusted pressure relief valve (24).	Adjust valve pressure setting.
	4. Pressure relief valve (24) stuck or open due to presence of impurities.	Remove impurities and clean filter.
	5. Steering column binding in bushing owing to rust, seizure, etc.	Rectify causes.
Loose steering.	1. Excessive clearance fit of steering column and rotary valve (5, page 41-3).	Replace worn parts.
	2. Excessive clearance fit of shaft (7) and drive pin (1).	Replace worn parts.
	3. Excessive spline clearance fit of shaft (7) and rotor (9).	Replace worn parts.
	4. Summation of previous clearances.	Replace parts evidencing more wear.
	5. Broken or weakened leaf springs (2).	Replace springs.
Steering wheel turns normally but:	1. Poor fluid tightness of power cylinder seal.	Replace seal.
a. Steering is too slow.	2. Broken cylinder rod.	Replace damaged part.
b. No steering.	3. Broken rotor shaft (7, page 41-3) or pin (1).	Replace damaged part.
With engine stopped, steering is inoperative.	1. Excessive wear between rotor (9, page 41-3) and stationary ring (8).	Replace worn parts.
	2. Damaged check valve (23).	Replace control valve.
	3. Power cylinder safety valves (33) stuck open owing to presence of impurities or because damaged .	Remove impurities and clean filter or replace control valve.

(follows)

HYDROSTATIC STEERING TROUBLE-SHOOTING CHART

(cont.)

Fault	Diagnosis	Correction
Jerking and chattering at steering wheel, steering out-of-control, tractor wheels turning opposite to steering direction.	1. Wrong hydrostatic phasing. 2. Inverted oil lines to power cylinder.	Rectify phasing. Rectify connections.
Impossible to hold selected course, continuous corrections needed.	1. Worn cylinder piston gland. 2. Power cylinder safety valves (33, page 41–3) or compensating valves (34) stuck open owing to presence of impurities, or damages. 3. Worn control valve mechanical components.	Replace gland. Remove impurities and clean filter or replace control valve. Replace control valve.
Impossible to obtain hydrostatic neutral phase. When manually controlled, steering is normal, otherwise steering wheel tends to turn on its own, or remains stationary, but steering action slowly continues along the direction originally selected ("motor-ing" effect), requiring continuous corrections of steering wheel asset.	1. Broken or weakened leaf springs (2) controlling sleeve (6) return to neutral. 2. Sleeve (6) and rotary valve (5) stuck on delivery owing to presence of impurities. 3. Sleeve (6) squeezed on rotary valve (5) owing to excessive fluid pressure.	Replace leaf spring pack. Remove impurities and clean filter. Check pressure setting of pressure relief valve (24, page 41–3).
Front wheel shimmy.	1. Air inside power cylinder. 2. Worn steering linkage mechanical joints. 3. Power cylinder safety valves (33) or check valve (34) stuck open owing to presence of impurities, or damaged.	Bleed system and remove causes of any entry of air. Replace worn parts. Remove impurities and clean filter or replace control valve. Check pump and pressure relief valve (24, page 41–3) setting.
Difficult steering in general or in one direction only.	1. Fluid pressure insufficient. 2. Poor fluid tightness inside control valve. 3. Misadjusted power cylinder safety valves (33) or presence of foreign particles tightness of either valve.	Check oil pump and relief valve pressure setting (24, page 41–3). Replace control valve. Remove impurities and clean filter. If problem persists, replace control valve.

SERVICE TOOLS

ATTENTION – Operations included in this section of the Manual must be performed using the **ESSENTIAL** tools further evidenced by the identification code (X). Besides, to work safely and achieve the best technical results, with additional savings of time and fatigue, these mandatory tools should be used in conjunction with the suggested special tools listed below and further integrated with the self-made ones for which you will find the necessary working drawings and specifications directly on this manual.

List of the special tools necessary to perform service operations covered by this section of the Manual:

75297784	Test bench checking equipment for hydrostatic steering control valve (see page 22 for service tools).
293390	Retaining lever, rotor.
X 291182/1	Puller, steering wheel.
292870	Universal pressure gauge kit.
X 293955	Installer, toroidal seal.
292927	Extractor, power cylinder hinge pin.

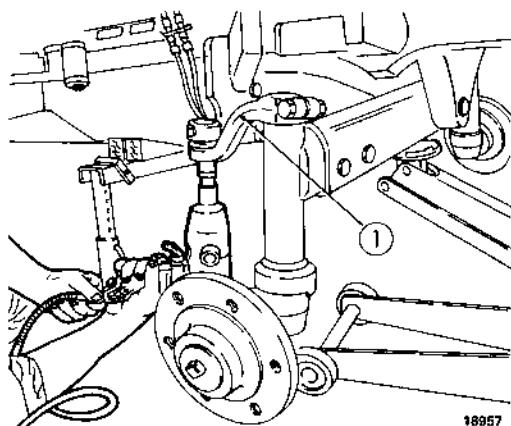
FRONT AXLE – POWER STEERING CYLINDER Removal – Installation (Op. 41 216 20)

⚠ CAUTION ⚠

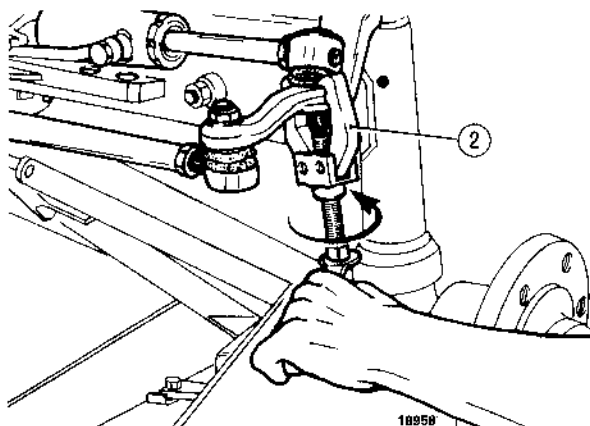
Handle all parts with great care. Do not put hands or fingers between parts.
Wear safety equipment such as goggles, gloves and special shoes

To remove the power steering cylinder proceed as follows:

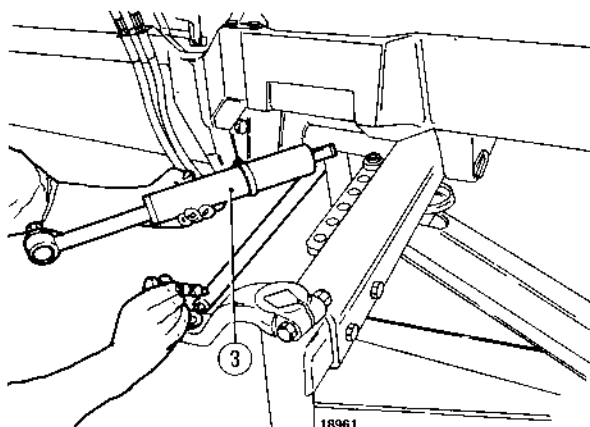
1. Disconnect battery cables.
2. Disconnect the cylinder inlet and outlet oil connections and remove hose clamps.



3. Remove the nut securing the cylinder rod ball head to the steering arm (1).



4. Using puller (2), separate ball-head socket joint from power cylinder rod.



5. Remove the power cylinder mounting pin to front axle and retrieve power cylinder (3).
6. At installation proceed by reversing the removal sequence of operations.

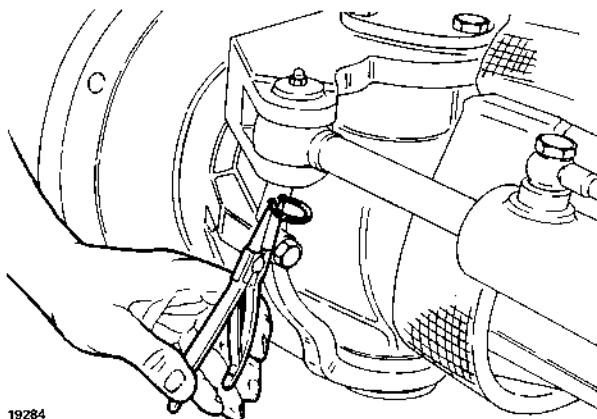
LIVE FRONT AXLE – POWER STEERING CYLINDER Removal-Installation (Op. 41 216 10)

⚠ CAUTION ⚠

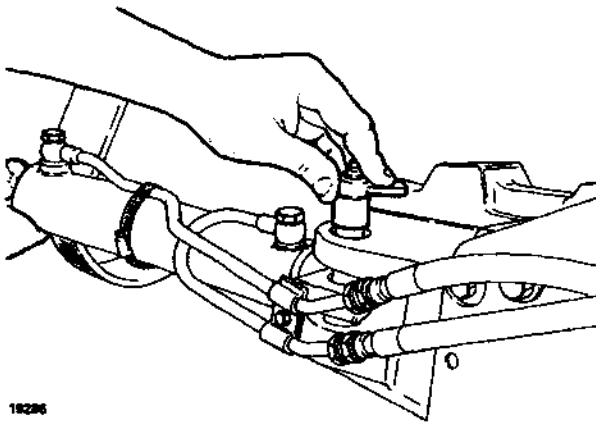
Handle all parts with great care. Do not put hands or fingers between parts.
Wear safety equipment such as goggles, gloves and special shoes

To remove the power steering cylinder from the front axle proceed as follows:

1. Disconnect battery cables.
2. Disconnect the cylinder inlet and outlet oil connections and remove hose clamps.



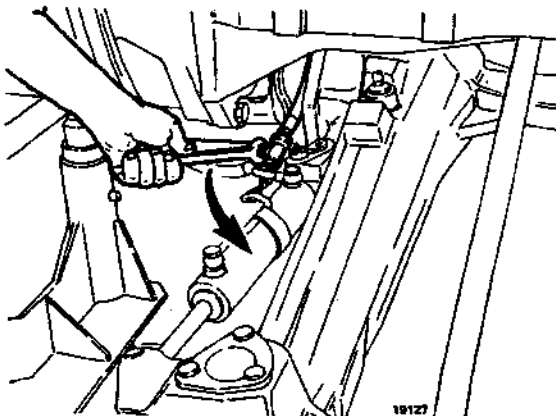
3. Remove the retaining snap ring and the cylinder rod – steering knuckle carrier pivot pin.



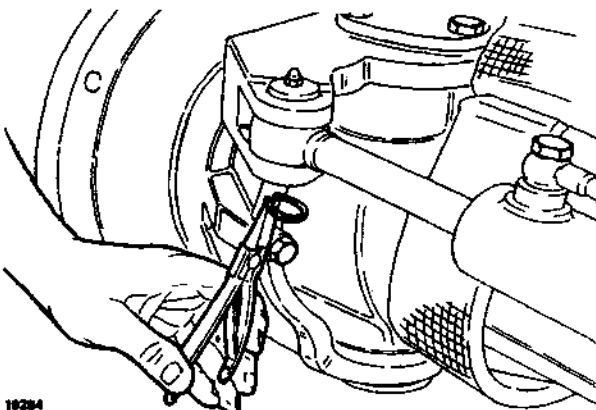
4. Remove the retaining screw, the pin securing the power cylinder to front axle housing and finally retrieve it.

In case both cylinders complete with oil intake lines should be removed, proceed as follows:

1. Remove battery cables.

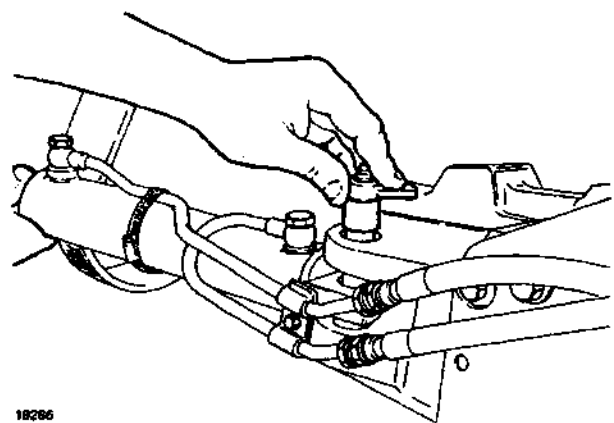


2. Remove the two connections of power steering plant and cylinder oil lines.

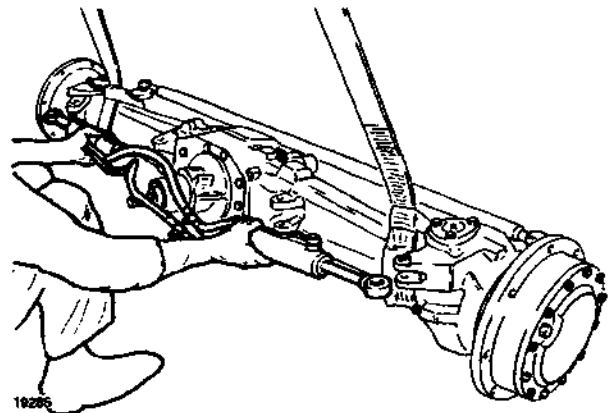


3. Remove the retaining rings and the cylinder rod - steering knuckle carrier pivot pin.

FIAT



4. Remove the screws and the pins securing cylinders to front axle housing.



5. Remove both cylinders complete with their oil intake lines.

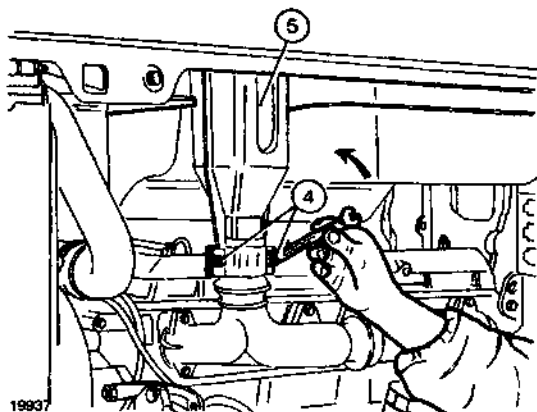
POWER STEERING CONTROL VALVE Removal-Installation (Op. 41 204 30)

CAUTION

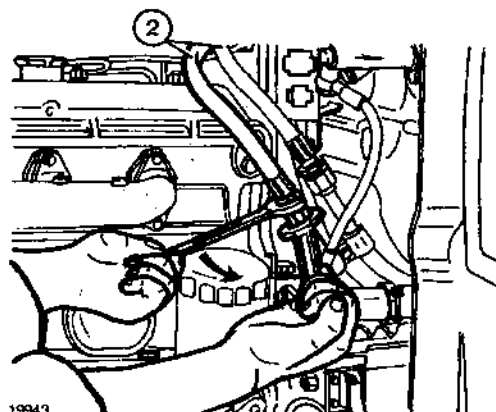
Handle all parts with great care. Do not put hands or fingers between parts.
Wear safety equipment such as goggles, gloves and special shoes

To remove the power steering control valve proceed as follows:

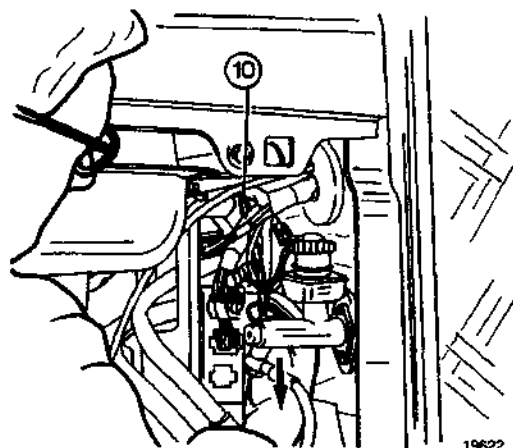
1. Remove side panels.
2. Disconnect battery cables.



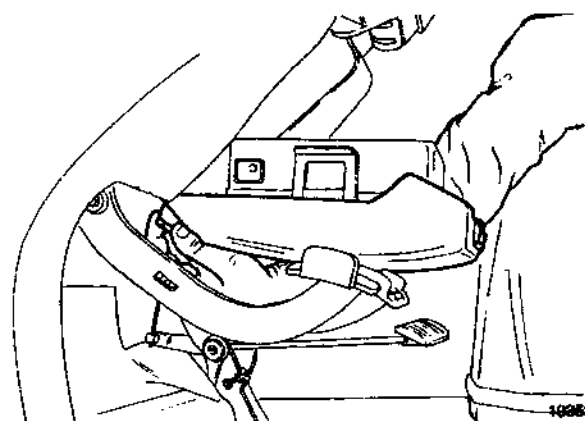
3. Remove attaching screws (4) and the exhaust muffler (5).



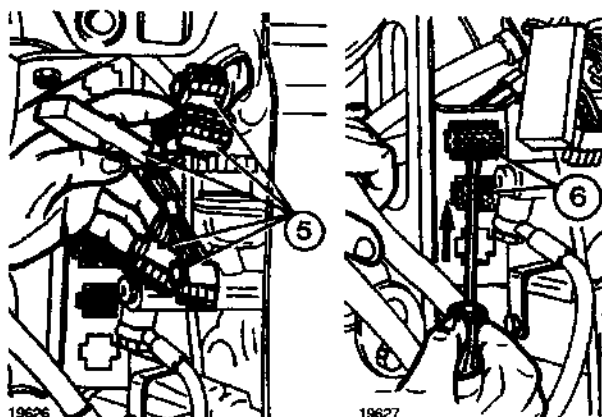
7. Disconnect the four oil inlets and outlets from the control valve.



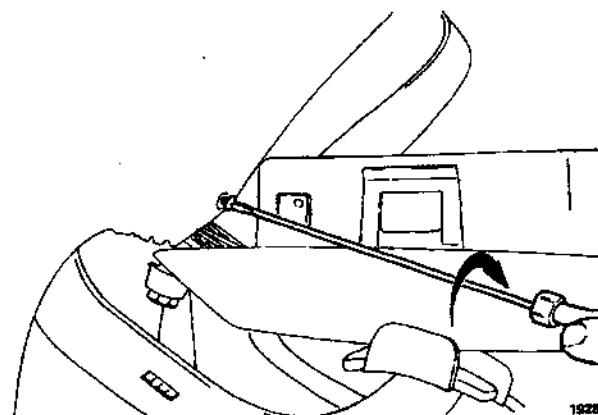
4. Disconnect the windshield washer tubelet (10) withdrawing it from the fitting located on the fixed central hood section.
5. Remove the fixed central hood section.



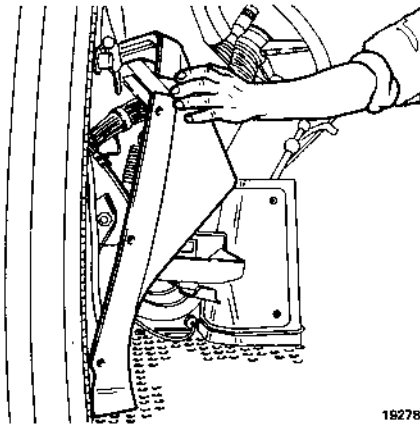
8. Loosen the knob and open the lid of the electrical fuse and relay compartment.



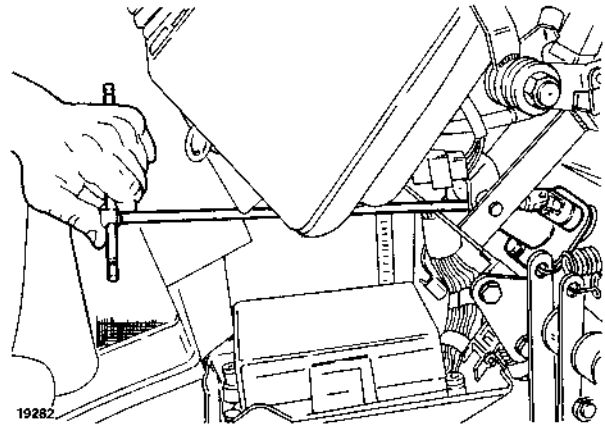
6. Disconnect electrics (5 and 6).



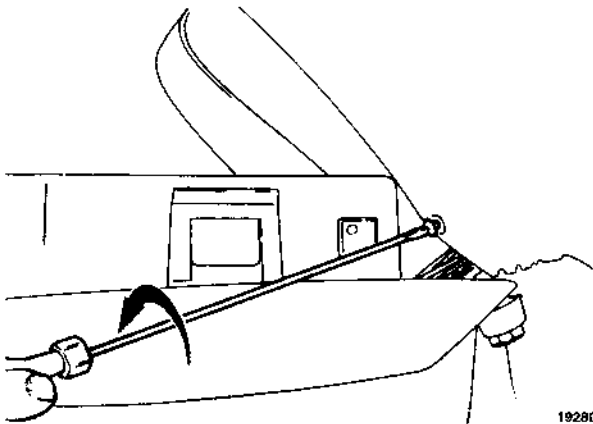
9. Remove the three plugs located on the L.H. side of the protection panel on the left of the control board and the four retaining screws (three of these are located under the three plugs while the fourth one is positioned in the central part of the panel, corresponding to the electrical fuse and relay compartment).



10. Remove the control board L.H. side panel.



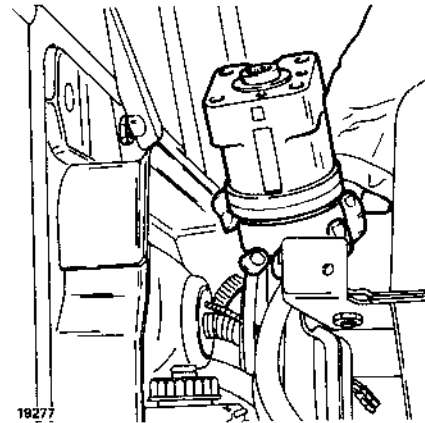
13. Remove the four screws securing the control valve onto the steering shaft.



11. Remove the three plugs located on the R.H. side of the protection panel on the left of the control board and the four retaining screws (three of these are located under the three plugs while the fourth one is positioned in the central part of the panel, corresponding to the electrical fuse and relay compartment).

12. Remove the control board R.H. side panel.

Note - Removing the L.H. and R.H. side control board protection panels is not mandatory for the subsequent removal of the power steering control valve; however, it is recommended because it allows considerably easier performance of the operations that follow.



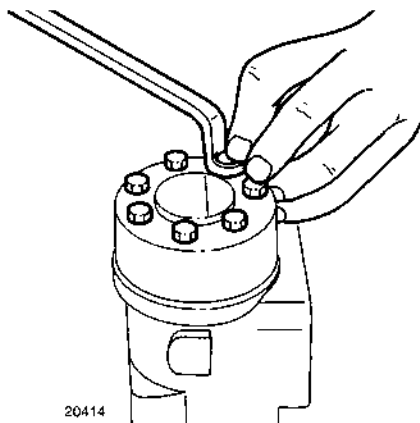
14. Retrieve the control valve from the outside, cabin or platform.

15. When re-installing the control valve pay attention to the following important points:

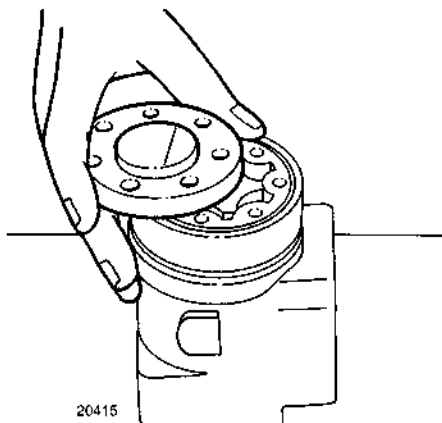
- a. proceed by reversing the removal sequence of operations starting from no. 14 back to no. 1;
- b. make sure that the holes on the hydrostatic control valve are aligned with the screws securing it to the steering column.

HYDROSTATIC STEERING CONTROL VALVE Disassembly – Assembly (Op. 41 204 34) w/ control valve removed

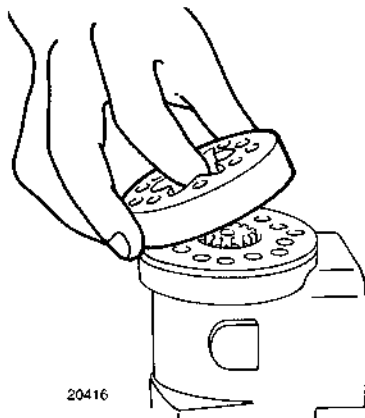
To disassemble the hydrostatic steering control valve, removed from tractor, proceed as follows:



1. Remove cover screws.

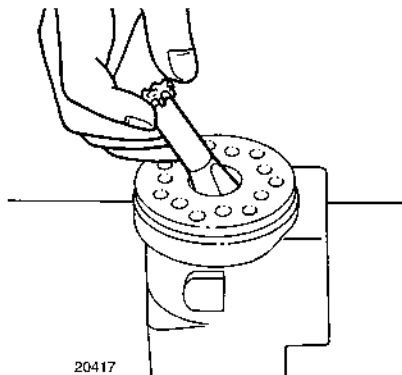


2. Remove cover by sliding it sideways.

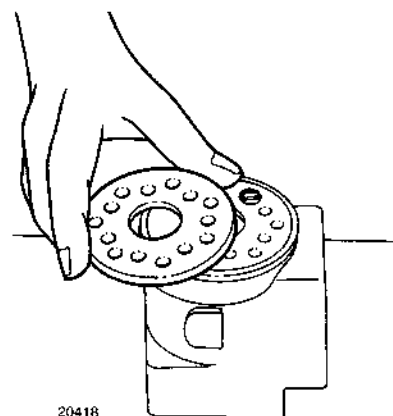


3. Remove the rotor stationary ring, rotor and associated inside spacer.

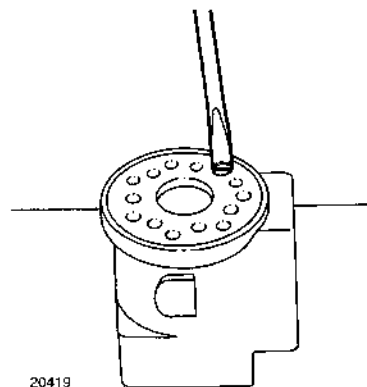
4. Remove the two o-rings fitted on the rotor stationary ring.



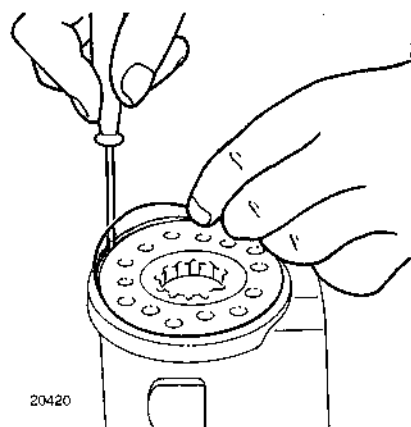
5. Pull rotor drive shaft out.



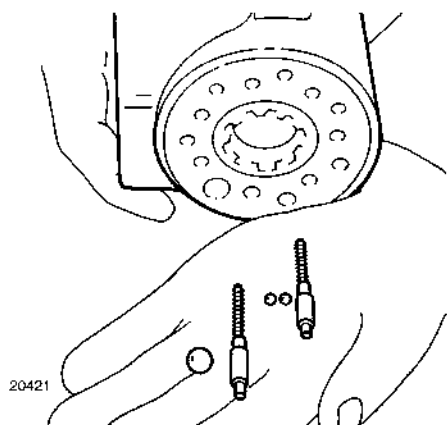
6. Remove thrust washer.



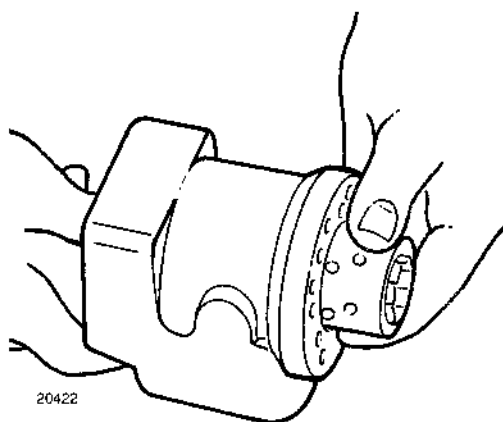
7. Remove threaded plug from the check valve seat.



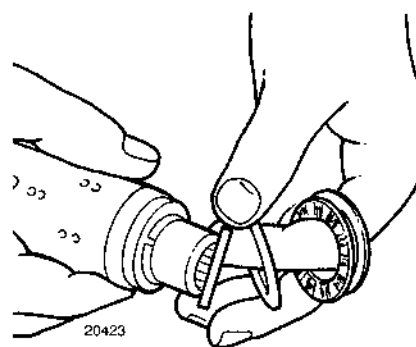
8. Remove O-ring from control valve.



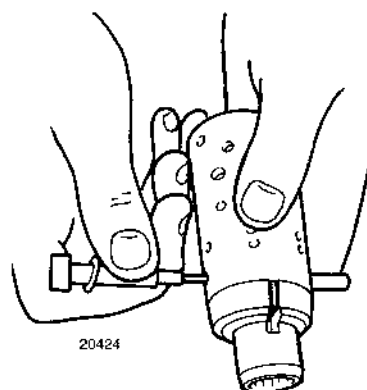
9. Turn the control valve over and remove the check valve ball, the two balls with associated pins and the flow valve springs.



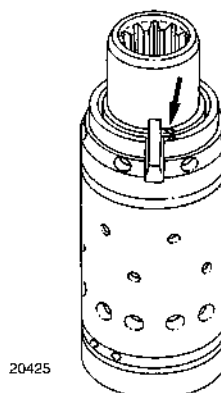
10. Place the control valve body and rotor drive shaft with the sleeve-drive shaft drag pin horizontal.
11. Push rotating valve inwards to allow withdrawal from control valve body of the same valve, sleeve and thrust bearing.



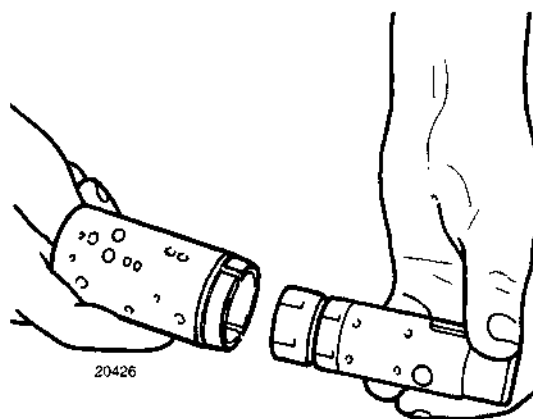
12. Remove the rotating valve thrust bearing complete with the two outer rings and withdraw the spring retainer ring from the valve seat sleeve.



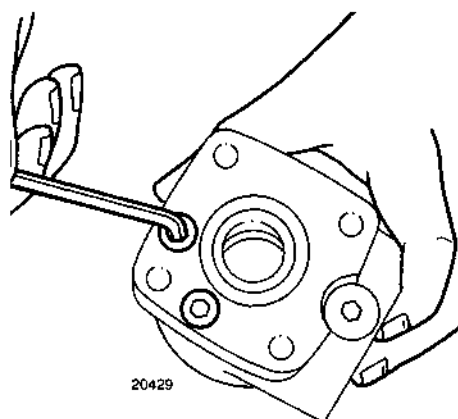
13. Push the valve-sleeve drag pin out



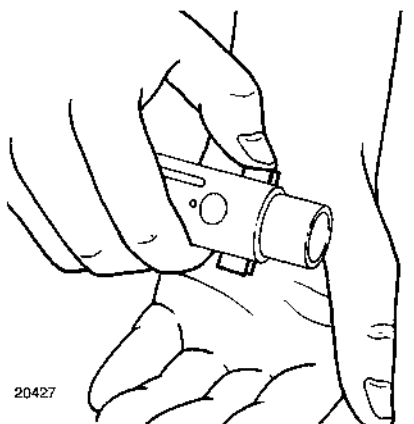
Attention: at assembly, two reference marks have been made on both rotary valve and sleeve, corresponding to the neutral position held by the springs. Prior to removing the springs, make sure that reference marks are clearly visible; if not, re-make them.



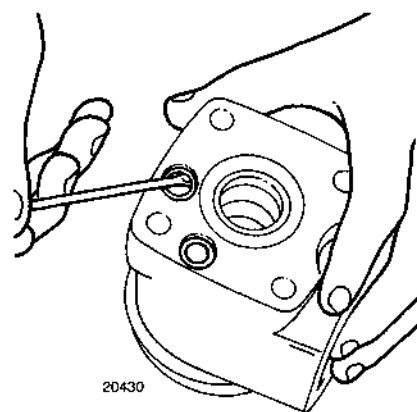
14. Pull rotary valve out of valve seat sleeve.



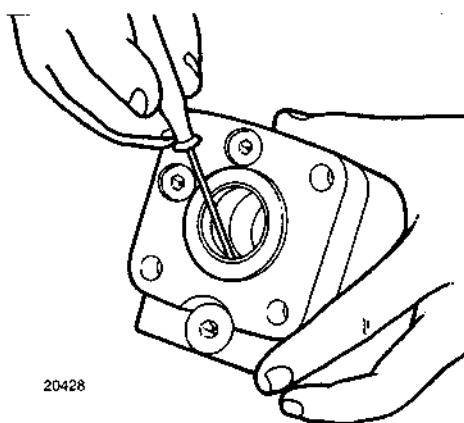
17. Remove the cylinder safety valve plugs using a 6 mm Allen wrench.



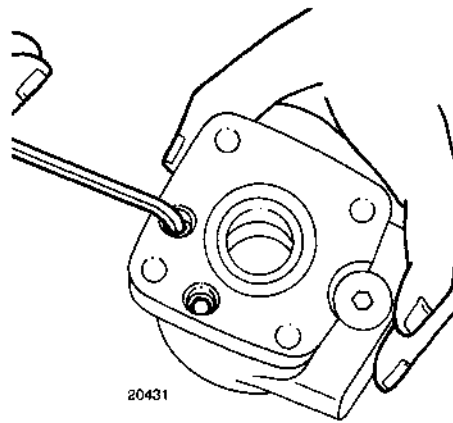
15. Remove springs of the **neutral** position by withdrawing them from their seats.



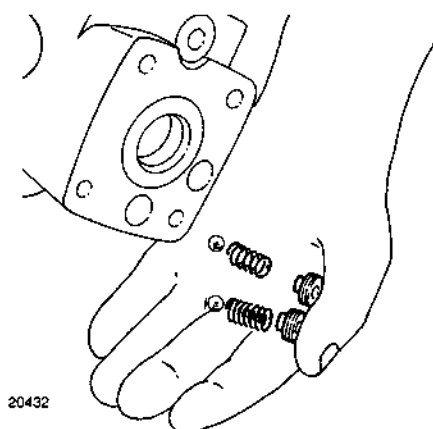
18. Remove seal washers.



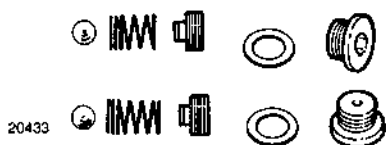
16. Remove dust shield and O-ring from their respective seats in control valve body.



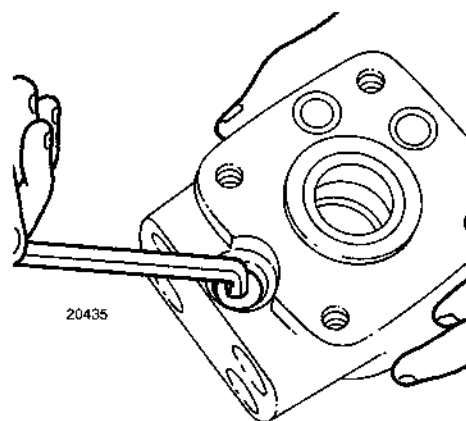
19. Remove the cylinder safety valve pressure set screws using a 6 mm Allen wrench.



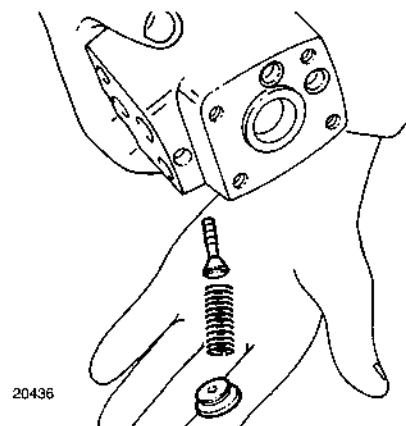
20. Turn control valve upside down, extract the balls, springs and spring guides from the two cylinder safety valves.



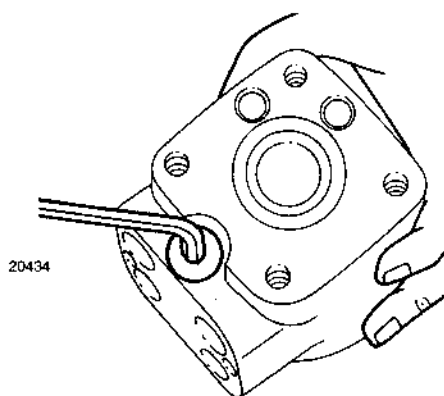
Exploded view of the cylinder safety valves (disassembly-assembly sequence).



22. Remove the pressure relief valve adjustment screw.



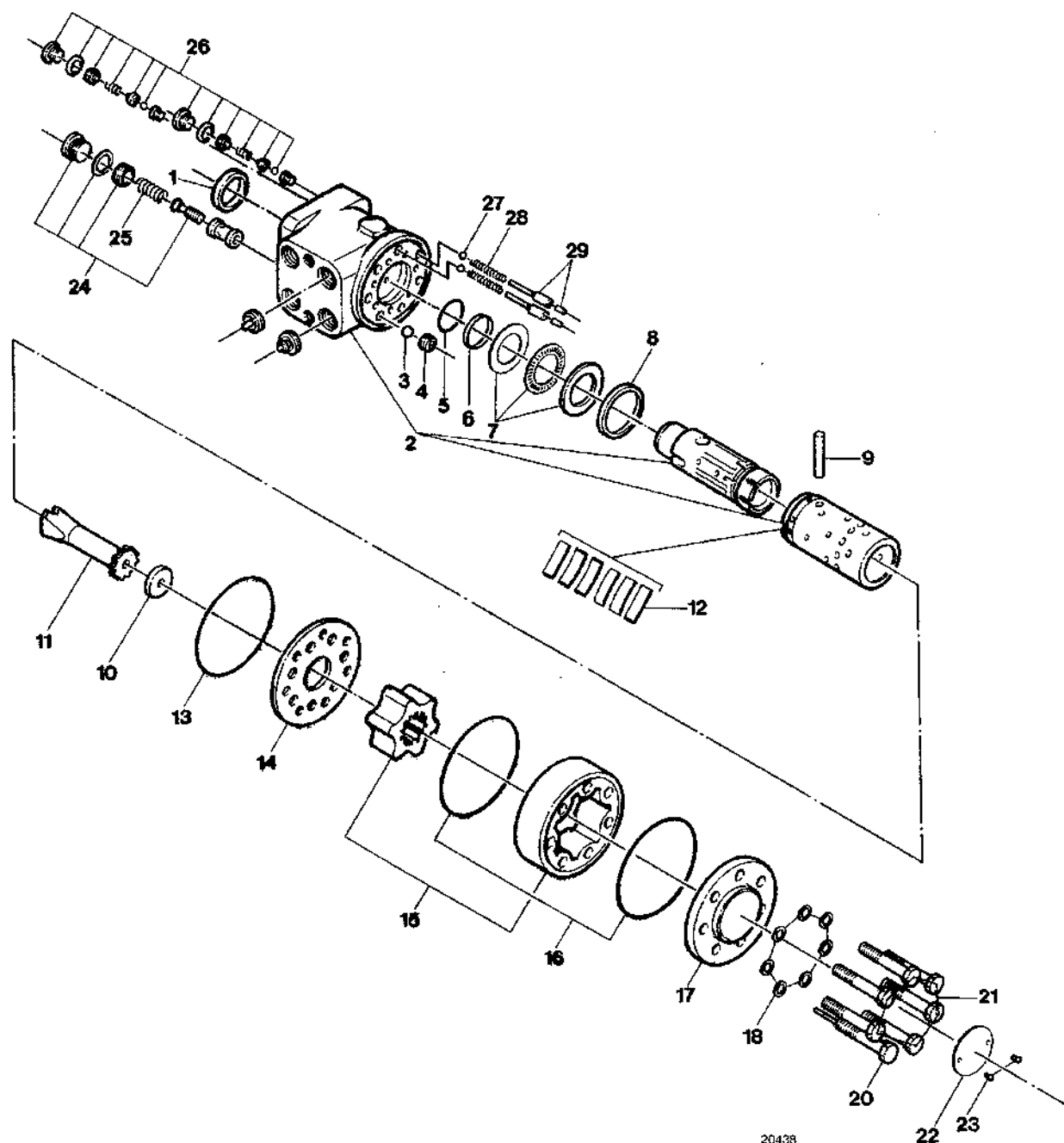
23. Turn control valve upside down and complete disassembly by extracting the spring and the pressure relief valve piston.



21. Using a 6 mm Allen screw, remove the pressure relief valve threaded plug and extract the seal washer.



Exploded view of the pressure relief valve (disassembly-assembly sequence).



Exploded view of the hydrostatic steering control valve

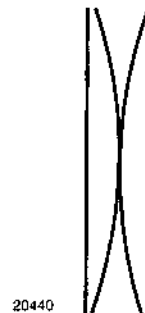
1. Dust shield - 2. Control valve body, rotary valve and rotary valve housing sleeve - 3. Check valve ball - 4. Check valve threaded plug - 5. O-ring seal - 6. O-ring (5) back-up ring - 7. Thrust bearing parts - 8. Spring (12) retaining ring - 9. Rotor drive sleeve-shaft drag pin - 10. Spacer - 11. Rotor drive shaft - 12. Sleeve return springs to **neutral** - 13. O-ring seal - 14. Back-up ring - 15. Rotor and stationary ring - 16. O-ring seals - 17. Cover - 18. Washers - 20. Check valve seat set screw - 21. Cover screws - 22. Plate - 23. Plate screw - 24 and 25. Pressure relief valve and spring - 26. Cylinder safety valves - 27. Return valve balls - 28. Return valve springs - 29. Return valve pins.

24. Clean all control valve parts thoroughly.

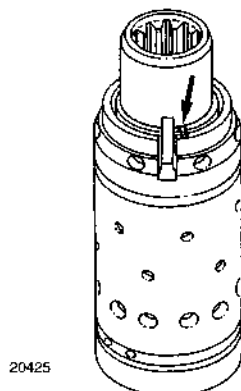
25. Replace washers and seals.

26. Check mechanical parts accurately and replace those showing signs of significative wear.

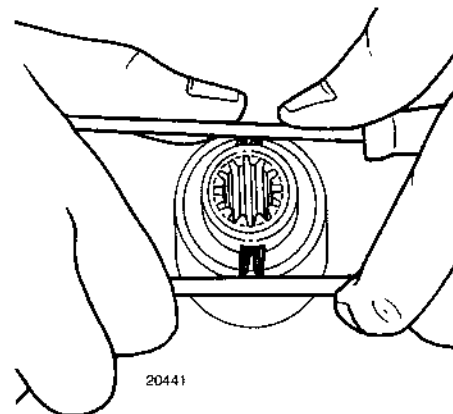
27. Prior to re-assembly, lubricate parts in hydraulic oil.



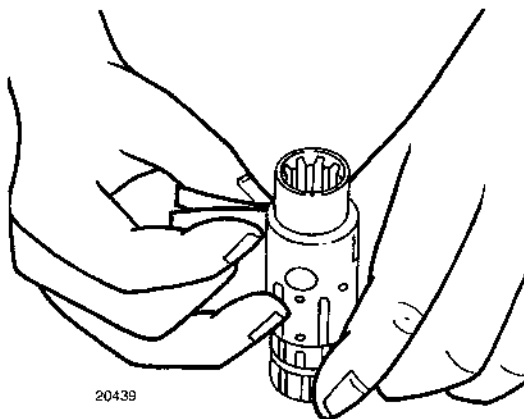
Assembling scheme of springs in **neutral**.



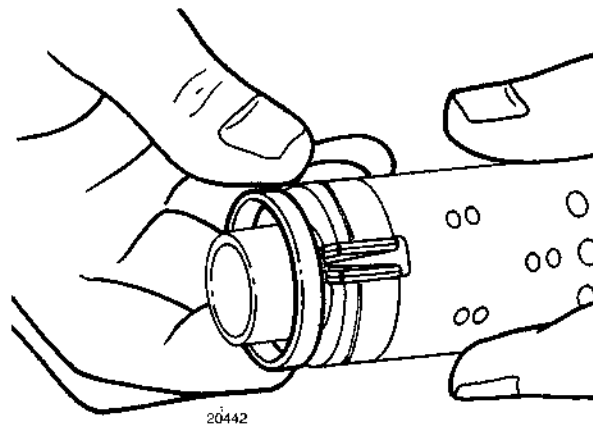
28. Re-install the rotary valve on sleeve, verifying correct alignment of reference marks shown in the figure.



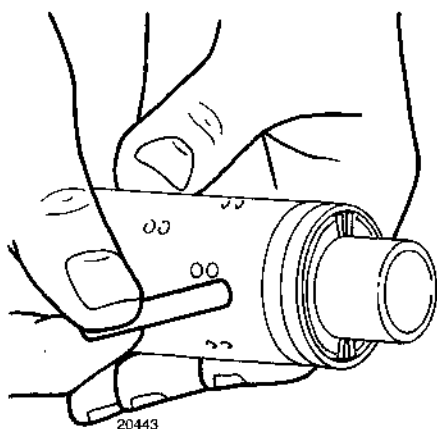
30. Line up and center the spring set of the **neutral** position.



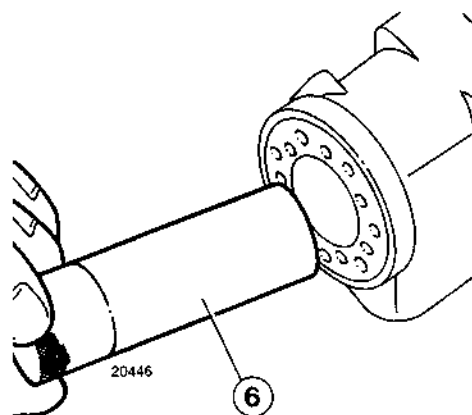
29. Introduce the two flat and the two shaped springs, pressing them by hand into their respective seats as evidenced in the assembling scheme shown at the top of the right column on this page.



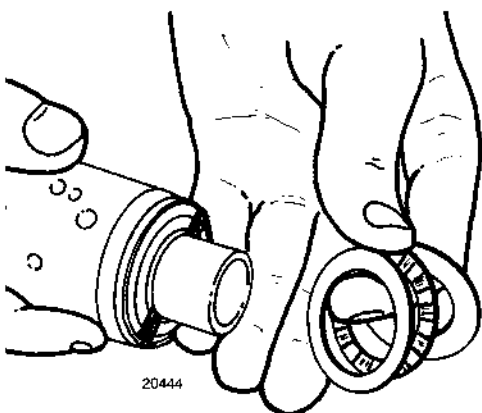
31. Install the **neutral** position spring retaining ring on the valve housing sleeve, keeping in mind that the same ring must be free to rotate without any interference by the springs.



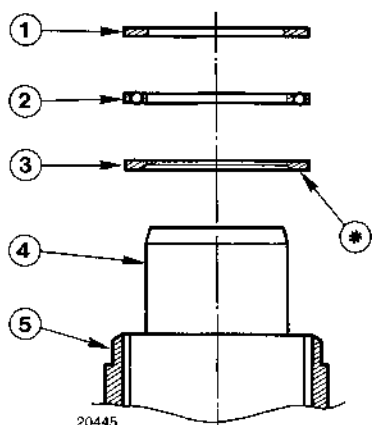
32. Introduce the drag pin in the rotor drive sleeve-shaft assy.



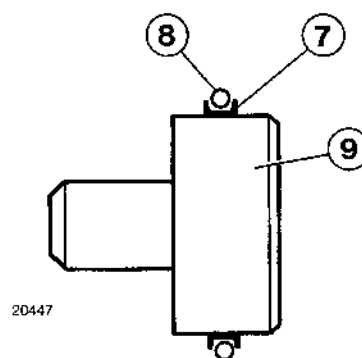
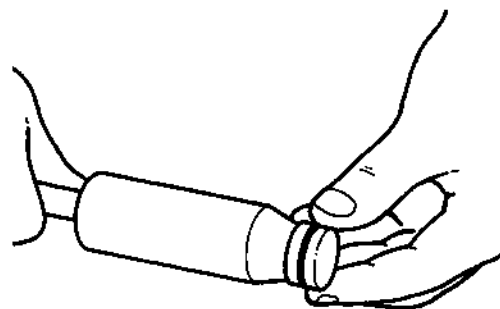
34. Place the control valve body so that the rotary valve sleeve housing is positioned horizontally, then introduce the pilot bushing (6) of tool no. 293955.



33. Fit the thrust bearing making sure to follow the sequence and notices reported in the figure below.

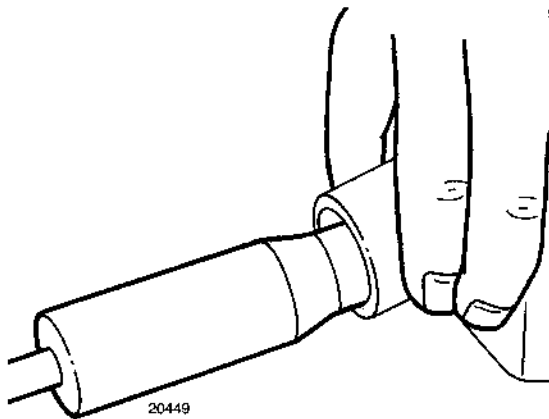


1. Bearing outer ring – 2. Thrust bearing – 3. Bearing race with chamfer* facing the shoulder of detail (5) – 4. Rotary valve – 5. Rotary valve seat sleeve.

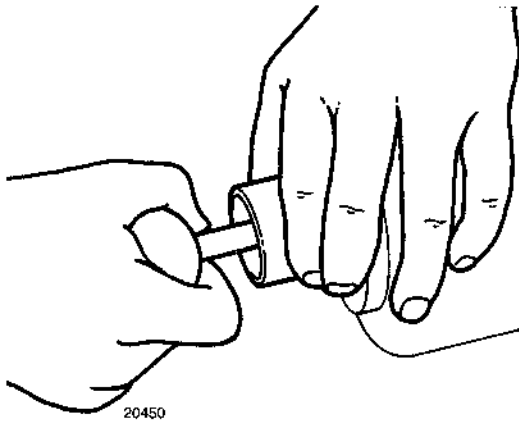


Supporting head for abutment and seal rings (part of special tool 293955)

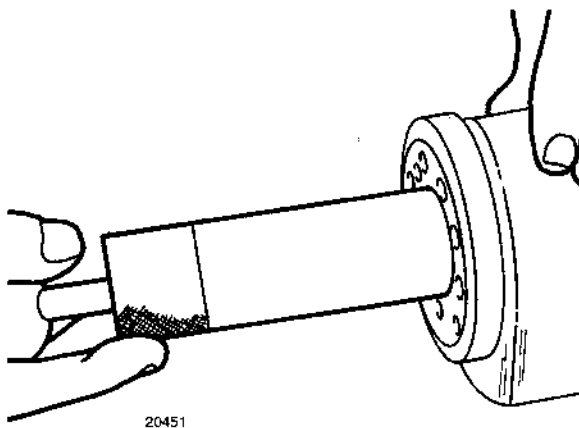
35. Lubricate with hydraulic oil the abutment ring (7), O-ring seal (8) and install them on head (9) of special tool 293955 as shown in the above figures.



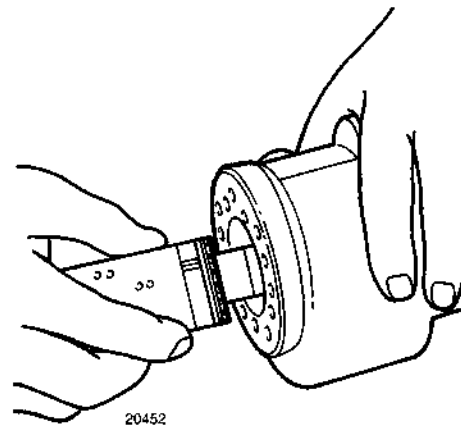
36. Introduce the complete drive punch inside the pilot bushing previously installed.



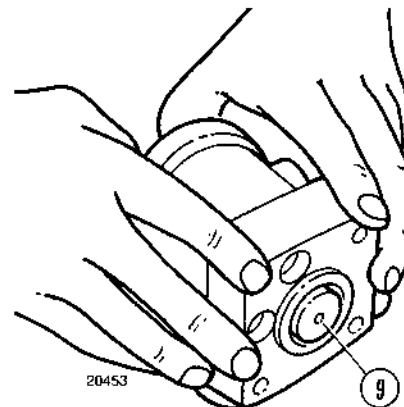
37. Holding the outer bushing with your hands, press down and simultaneously turn the drive punch to ease the ingress of the seal ring into its seat on the control valve body.



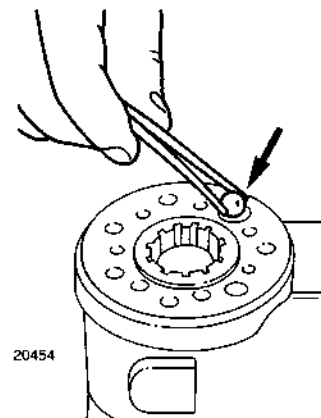
38. Pull out the special tool **293955** parts (outer bushing and drive punch). **Note:** the supporting head for abutment and seal rings (see page 41-16) will remain on the control valve body.



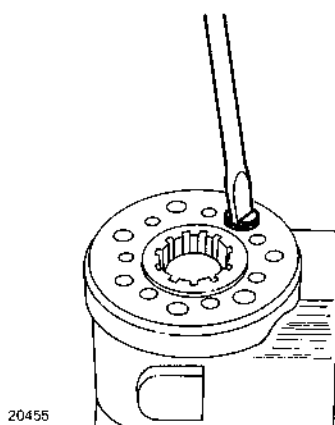
39. Introduce inside the control valve body the parts previously fitted conforming to operations 28 thru 33 and hold the rotor drive sleeve-shaft assy. drag pin on a horizontal position to prevent it from sliding out and accidentally insert itself in the grooves existing inside the control valve body.



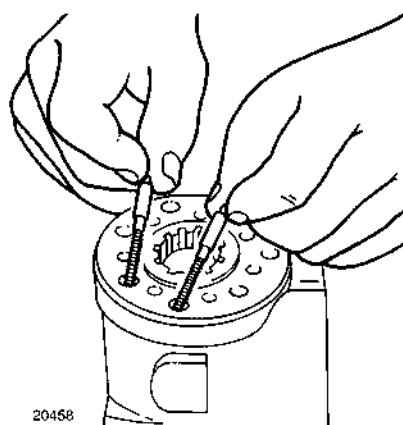
40. Press on the rotary valve to bring the thrust bearing against the control valve; scope of this operation is to simultaneously expel the head (9) of the special tool **293955** (see pages 41-16) and the entry of rings (7) and (8) in their seats on the control valve body.



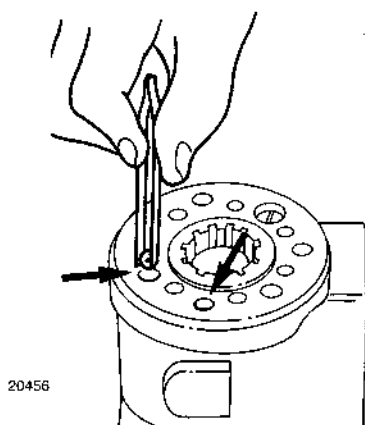
41. Turn the control valve and fit the check valve ball in the seat shown by the arrow.



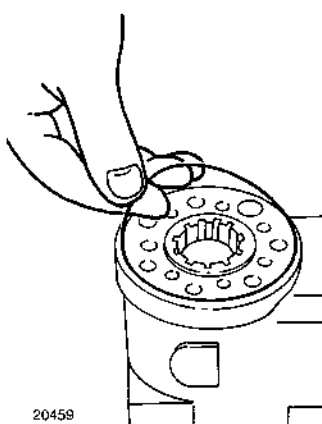
42. Screw the threaded plug in the check valve seat until its top surface is below the control valve body mating surface.



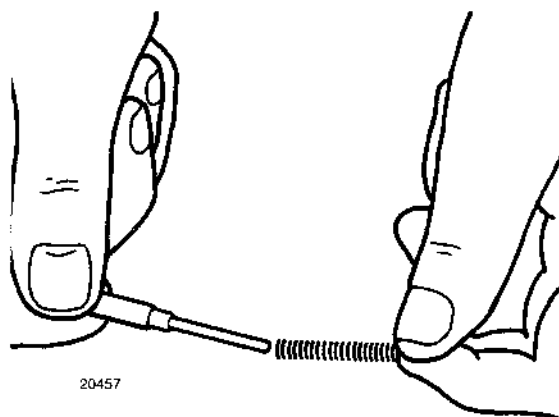
45. Fit the pins with springs in the return valve arrowed seats (see op.43).



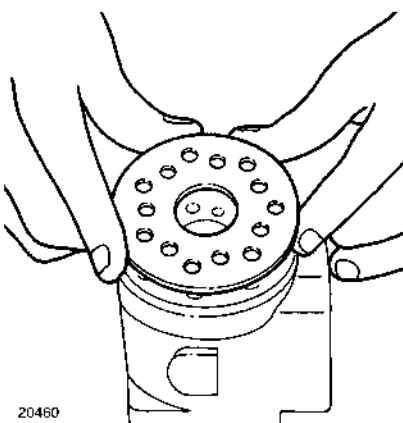
43. Fit the return valve balls in the two arrowed seats.



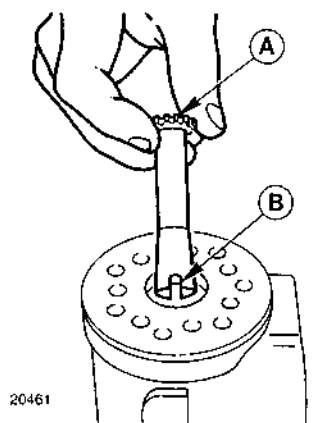
46. Lubricate the O-ring seal and fit it in its seat on control valve.



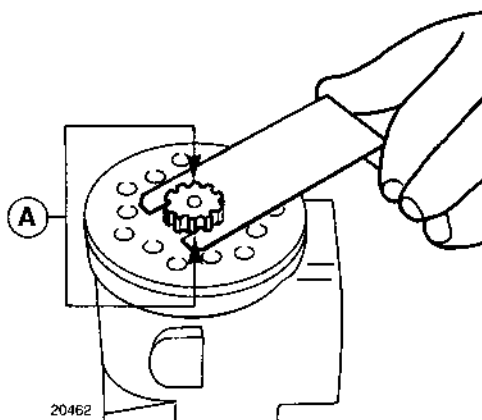
44. Fit springs on return valve pins.



47. Install the end washer aligning its holes with those on the control valve.



- 48.** Make a reference mark on the upper part of teeth (A), in correspondance of seat (B), to show the exact position of the valve-sleeve drag pin.

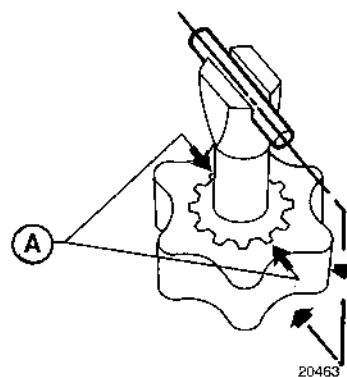


- 49.** Introduce the drive shaft inside the control valve housing, fit the rotor drive shaft retaining-centering tool **293390** in between rotor drive shaft and end washer, as shown in the figure, and turn the shaft in order to favour the correct mating of seat (B) with the drag pin fitted on the sleeve.

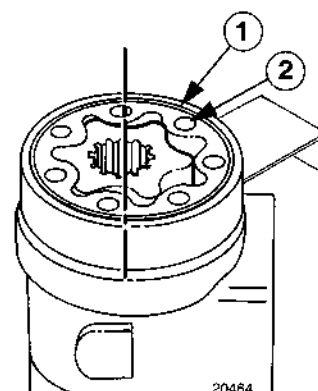
- 50.** Proceed with rotor installation keeping the following notices in mind:

a) every time the hydrostatic steering is dismantled, turn rotor upside down in order to limit the wear process of the splined coupling;

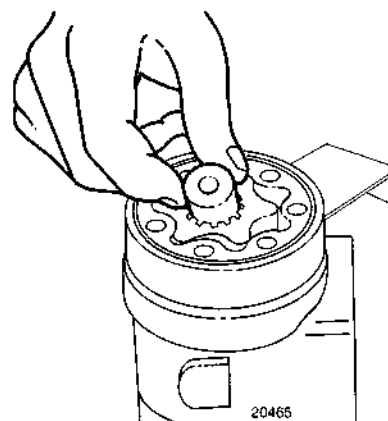
b) The following figure has been drawn with rotor drive shaft removed in order to show correct phasing among rotor, rotor drive shaft and drag pin;



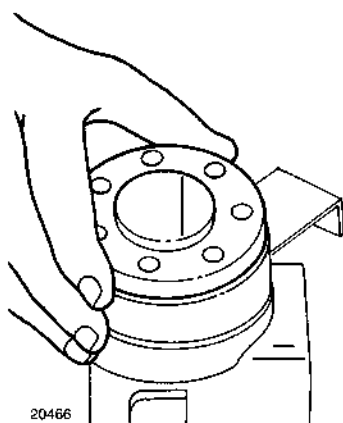
- c)** Install rotor on drive shaft, keeping in mind that phasing requires the alignment of teeth (A) on the drag pin axial plane, as evidenced in operation **48**, with the center line of a rotor vane.



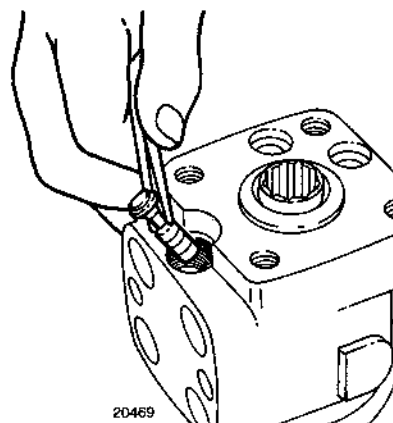
- 51.** Lubricate the two O-ring seals (1) with hydraulic oil and fit them in their seats on the rotor stationary ring and, finally, install the rotor making sure that fitting holes (2) are aligned with the corresponding ones on the end washer.



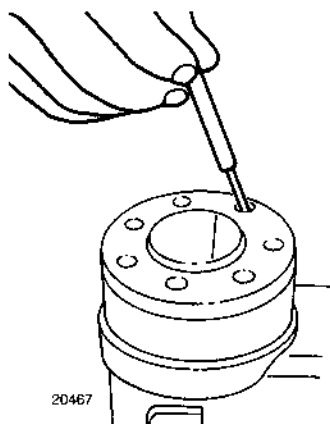
- 52.** Fit inside spacer.



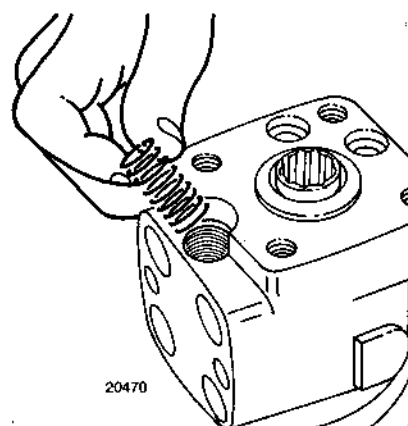
53. Fit cover lining up its holes with the corresponding ones present on the rotor stationary ring.



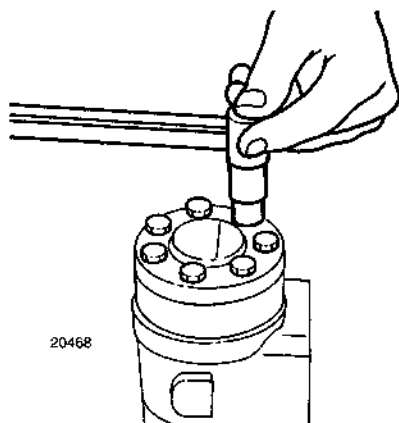
56. Turn control valve body upside down and insert the pressure relief valve piston in its seat as shown in the figure (see page 13 for parts detail).



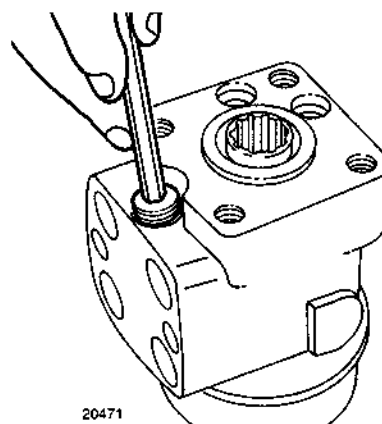
54. Remove retractor tool **293390** and fit on the check valve, shown in the figure, the special screw and washer.



57. Fit the pressure relief valve spring.

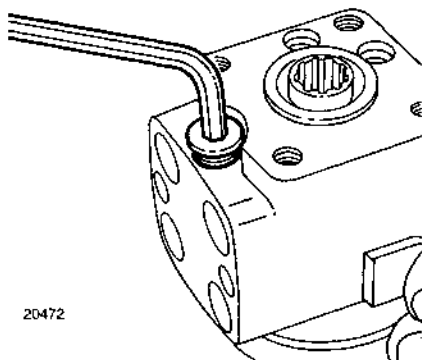


55. Fit the remaining six cover screws complete with their respective washers and tighten them in crossed sequence to a torque of 24 to 36 Nm (2.5 to 3.7 kgm or 18 to 26.7 ft.lb).

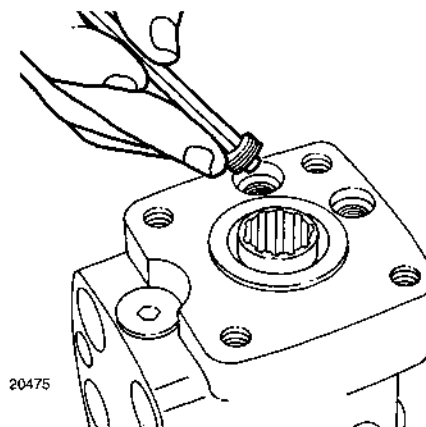


58. Fit the pressure relief valve setting screw using a 8 mm Allen screw.

Note: pressure setting will be subsequently carried on on bench or on tractor in accordance to the values given in the data chart of page 41-1.

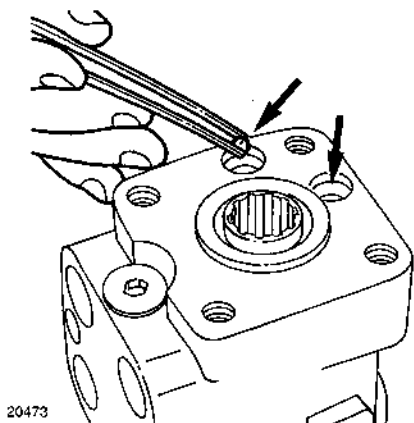


- 59.** Screw on the plug complete with associated seal using a 8 mm Allen wrench and, after pressure setting on bench or on tractor, torque tighten at 40 to 60 Nm (4.1 to 6.1 Kgm or 30 to 44 ft.lb)

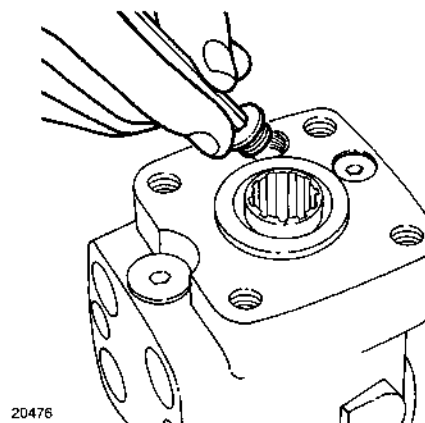


- 62.** Screw on the two cylinder safety valve pressure setting screws using a 6 mm Allen wrench.

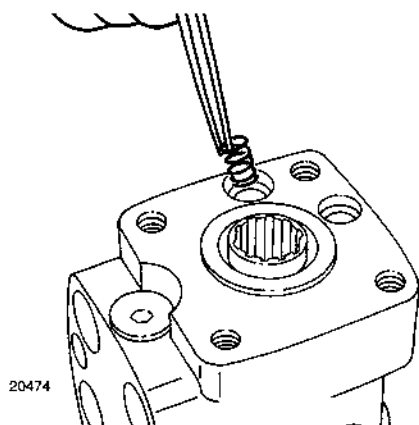
Note: pressure setting will be subsequently carried on bench or on tractor in accordance with the values given in the data chart of page 41-1.



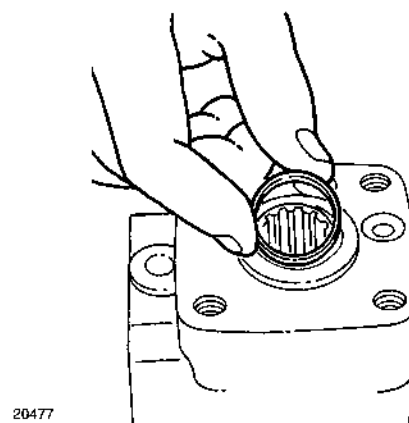
- 60.** Introduce the two balls inside their cylinder safety valve seats shown by the arrows (see parts detail on page 13).



- 63.** Screw on the two plugs and associated oil seals using a 6 mm Allen wrench, perform pressure setting, torque tighten at 30 Nm (3 Kgm or 21 ft.lb).



- 61.** Introduce spring guides and springs into their cylinder safety valve seats.



- 64.** After completion of assembly, fit the dust shield ring on control valve body.

HYDROSTATIC STEERING CONTROL VALVE

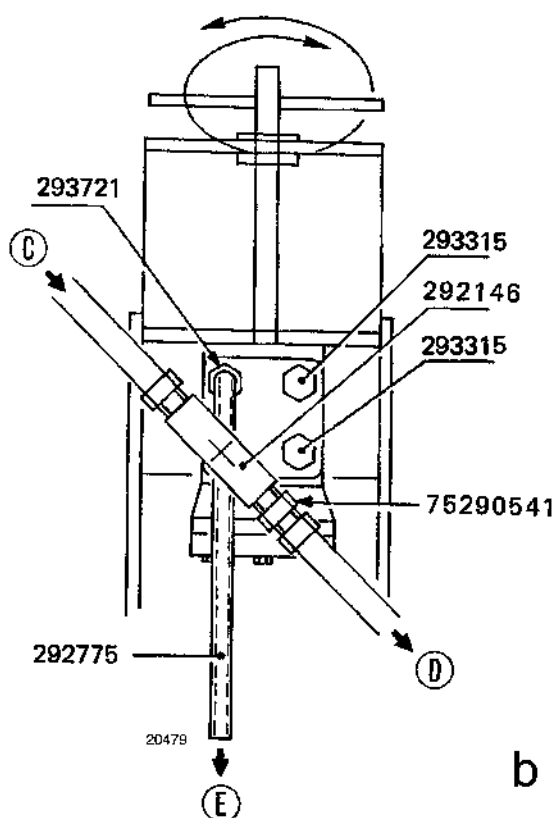
Test bench checks (Op. 41 204 38)

A – ROTARY VALVE WEAR TEST

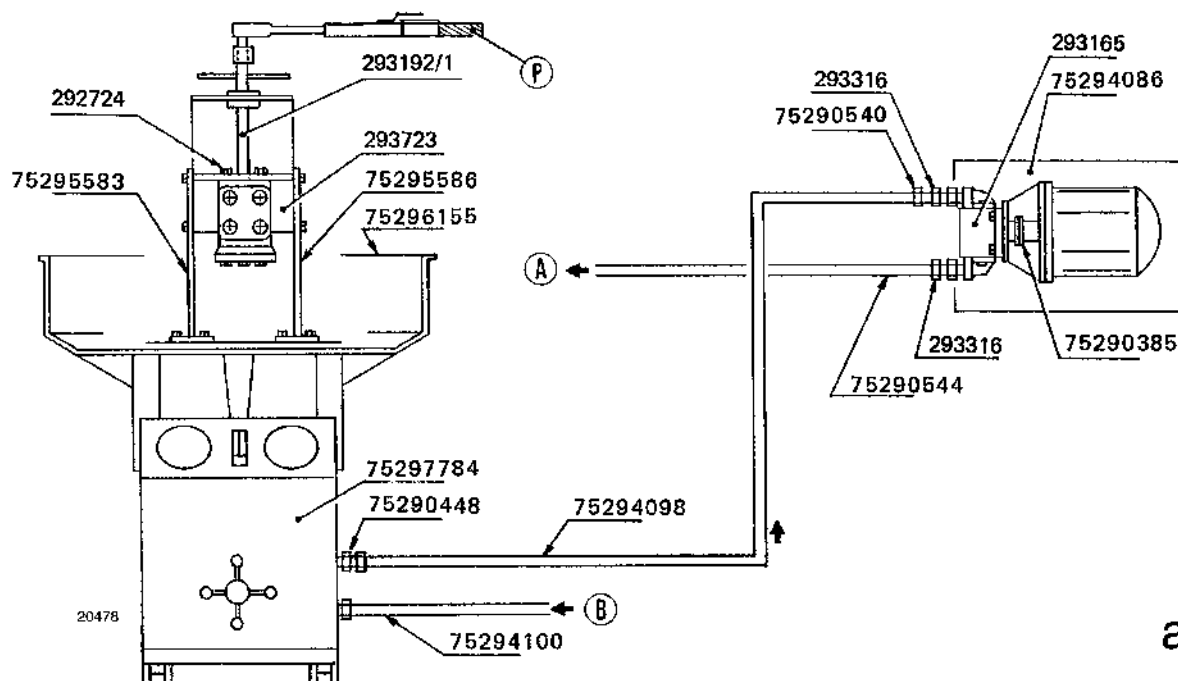
1. Make all necessary bench connections as shown on scheme of Fig. a and complete the circuit as per scheme b. Hold steering control on steering position (right or left) using special tool 293192/1.
2. Acting on the handwheel of device 75297784, increase pressure in the system until approaching the pressure relief valve setting without its cracking-off (24, page 41-1).
3. Fit a torque wrench to the tool 293192/1, apply a torque of about 34 Nm (3.5 Kgm or 25 ft.lb) and check that it takes more than ten seconds to the rotary valve (5, page 41-3) to make a full turn. If less, replace rotary valve and associated sleeve

Test specifications

Oil type IDRAULICAR AP51
 Oil viscosity SAE 20 W
 Oil temperature 60°C
 Capacity of oil pump idraulic 293165
 12 dm³ (l/1=2.64 UK or 3.17 US Gal)
 Speed of electric motor 75294086 1450 rpm

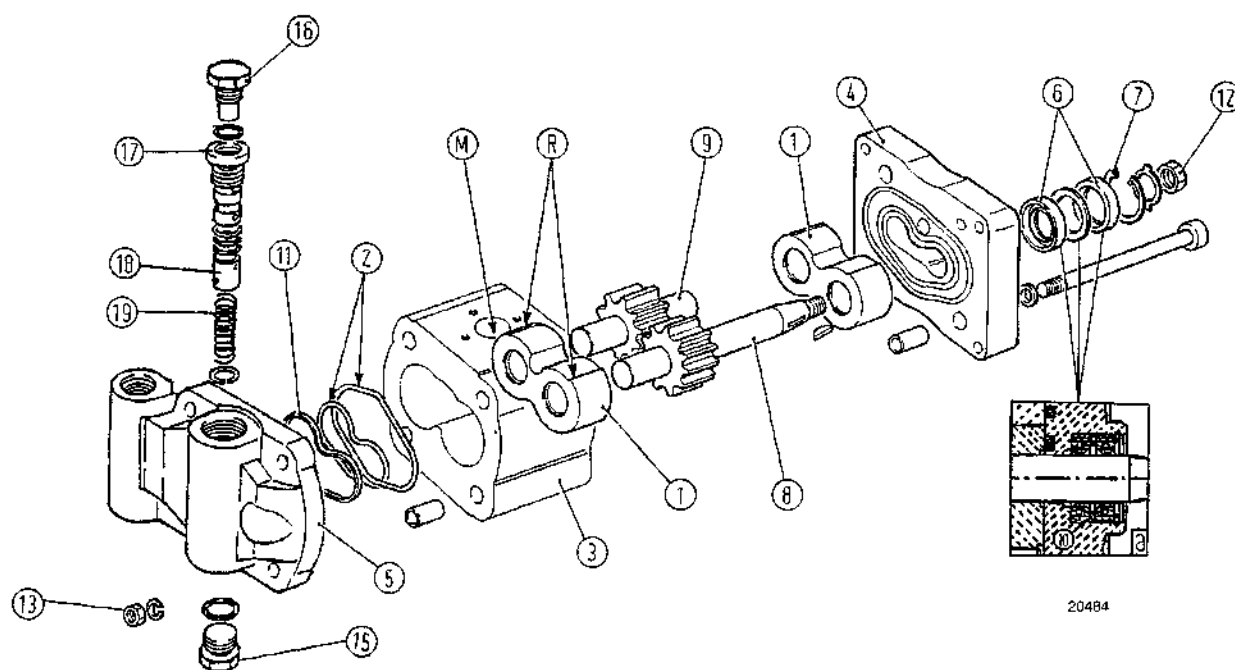


Rotary valve wear test
 C. From delivery – D. To throttle – E. Drain.



Test equipment and tool installation scheme for rotary valve check, oil seal tightness check, pressure relief valve and cylinder safety valve setting.

A. Delivery – B. Throttle – P. Torque wrench.



Oil pump exploded view

a. Detail of oil seal installation – M. Pump oil delivery duct – R. Gear bearing fillets – 1. Gear bearings – 2. Cover seals – 3. Pump case – 4. Rear end cover – 5. Flow regulator case – 6. Drive shaft oil seal – 7. Seal retainer ring – 8. Drive gear shaft – 9. Driven gear shaft – 10. Spacer – 11. Anti-extrusion ring – 12. Pump drive shaft and sleeve coupling nut and lockwasher – 13. Cover bolt nuts – 15 to 19. Flow regulator exploded view – 15 and 16. Plugs – 17. Cartridge – 18. Slider – 19. Spring

HYDROSTATIC STEERING OIL PUMP
Disassembly–Assembly of removed pump
(Op. 41 206 20)

Proceed as follows:

1. Remove cover nuts (13), bolts and lockwashers.
2. Remove nut (12) securing sleeve coupling to drive shaft and associated lockwasher.
3. Remove rear end cover (4), retaining ring (7) and oil seals (6).
4. Mark parts (1), (3), (4) and (9) to re-install them in the same original position if found efficient.
5. Remove bearings (1), gears (8) and (9) from rear cover (4) and pump case (3).
6. Retrieve oil seals (2) and anti-extrusion rings (11).
7. Remove plugs (15) and (16) and associated seals, remove from flow regulator case (5) all component parts and, precisely, the cartridge (17), slider (18) and spring (19).

With all parts loose, proceed as follows:

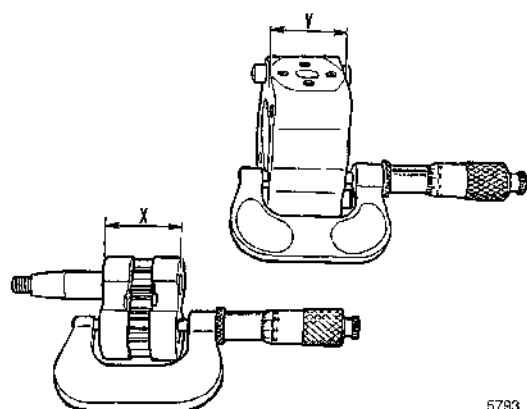
8. Check planarity and squareness of gears and bearings mating surfaces by interposing a thin film of carbon black powder; if very slight surface roughness is present, remove it with extra-fine grade, lubricated abrasive paper.
9. Check end play of the gear-bearing sub-assembly inside the pump against specifications (0.100 to 0.180 mm = .004 to .007 in).

If necessary, use lubricated abrasive paper to remove minimum quantities of materia.

10. Clean all parts thoroughly.

11. Replace oil seals (2), (6) and (11).

12. Lubricate loose parts with the same oil used for the hydrostatic steering plant operation and re-assemble the pump, referring to the exploded view shown on this page and paying attention to the following points:



Checking end play of gear-bearing unit inside oil pump case

Dimension X should be smaller than Y by 0.100 to 0.180 mm (.004 to .007 in)

a) re-assemble the pump by reversing the disassembly sequence of operations starting from 7 back to 1;

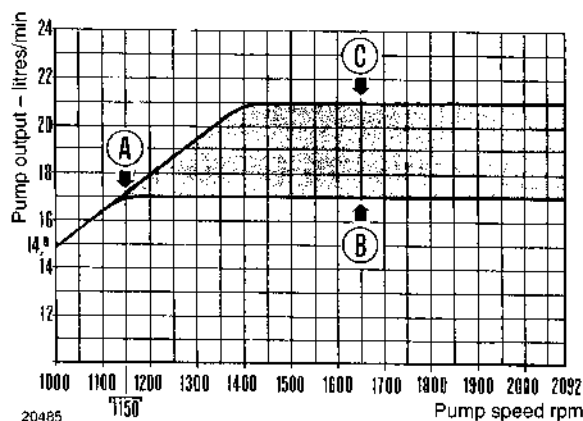
b) make sure to always work under top cleanliness conditions in order to avoid any ingress of foreign material which might damage the pump.

c) Interface parts (1), (3), (4) and (9) previously marked for this purpose and see description of operation 4, page 41–29 in order to re-fit them in their respective original positions.

d) install by hand the gear bearings (1) inside the pump, positioning them so the fillets (R) on circumference coincide with the oil delivery duct (M) and front surfaces provided with milled spiders for lubrication are brought to face the gears;

e) insert the plastic anti-extrusion ring (11) on the inside with respect to the central O-ring (2);

f) fit seals (6) on rear cover (4), complete with spacer (10), give orientation shown in detail a), page 41–29 and fill cavity between lips with grassofiat **TUTELA G9** grease.



Speed-output diagram of the hydrostatic steering drive pump

Test pressure 100 bar (102 kg/cm² or 1499 psi)

Oil temperature 55° to 65° C (131° to 149° F)

A. Commencement of metered output – B. Minimum limit for metered output – C. Maximum limit for metered output.

13. Re-install the pump on tractor, filling the suction line as well as the pump case with **TUTELA MULTI F** oil to facilitate priming and avoid any risk of seizure during the initial period of operation.