HYDRECO™

SERVICE INSTRUCTIONS
V37-V38-V39-V46-MVT150
CONTROL VALVES

wagner
a division of allied systems company

INTENTIONALLY BLANK

7. This illustrates the serial numbering system used for Hydreco components which identifies the date of manufacture.

HYDRECO SERIAL NUMBER CODE

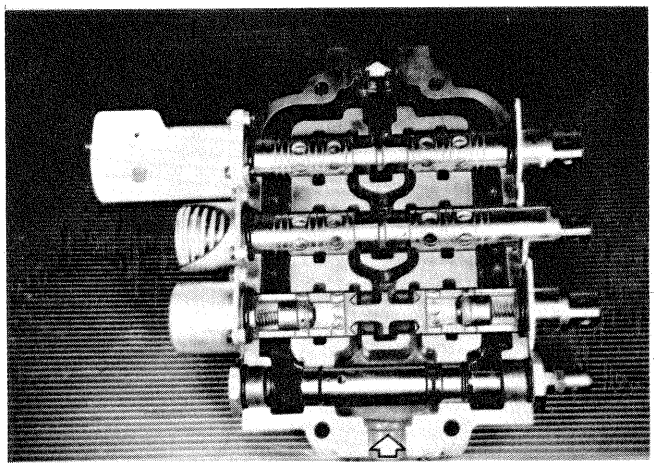
EXAMPLE: C A 02 123

- 123 — Number assigned in sequence to each unit of a production run.
- 02 — DAY (2nd.)
- A — MONTH (JANUARY)
- C — YEAR (1967)

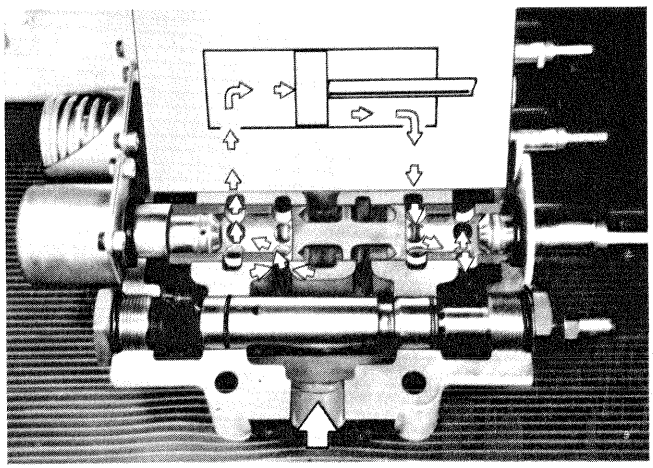
CODE:

YEAR		MONTH	
S - 1961	B - 1966	A - JANUARY	G - JULY
T - 1962	C - 1967	B - FEBRUARY	H - AUGUST
U - 1963	D - 1968	C - MARCH	J - SEPTEMBER
X - 1964	E - 1969	D - APRIL	K - OCTOBER
A - 1965	F - 1970	E - MAY	L - NOVEMBER
		F - JUNE	M - DECEMBER

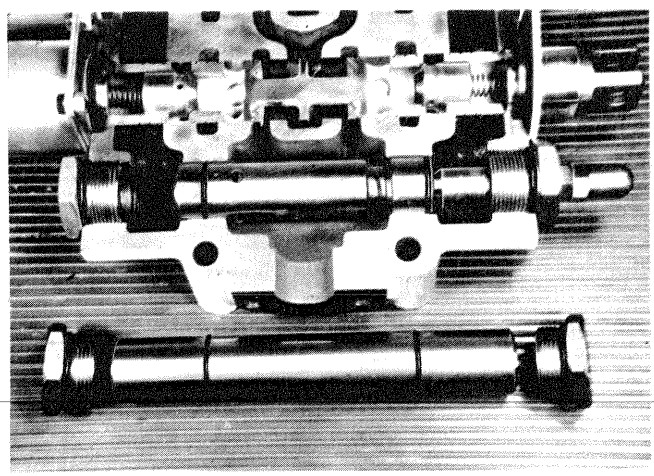
8. The purpose of a control valve is to direct pump flow to the work function. In the cut-a-way model the relief valve is located at the inlet cavity and there are three operating plungers shown in the assembly. When no work function is being performed the plungers are held in a neutral position by a return spring or a mechanical detent that will be discussed later. With the plungers in this position oil is free to pass from inlet to outlet through the center bypass.

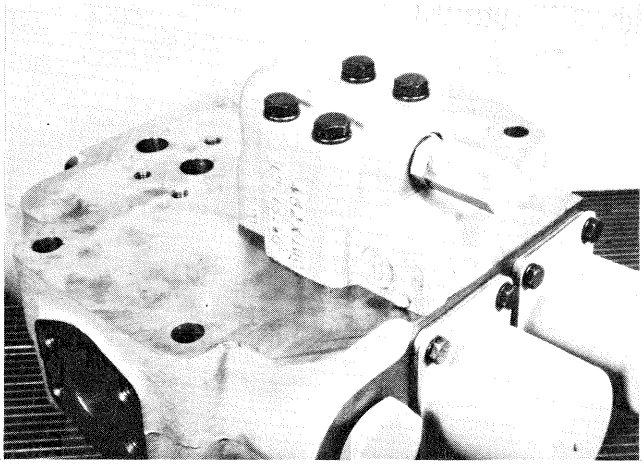


9. Actuating a plunger closes off the center bypass and directs the pump flow to a valve cylinder port. Internally, oil travels through the hollow plunger actuating a "load drop" check. At the opposite end of the plunger the same operation occurs except the valve cylinder port is in connection with the valve low pressure tank core and the valve outlet. Load drop checks allow pump operating pressure to build up to the work load pressure before opening which prevents oil reversal or the load being dropped. This is a double acting valve plunger, other plunger designs are used to satisfy the demands of particular machine functions.

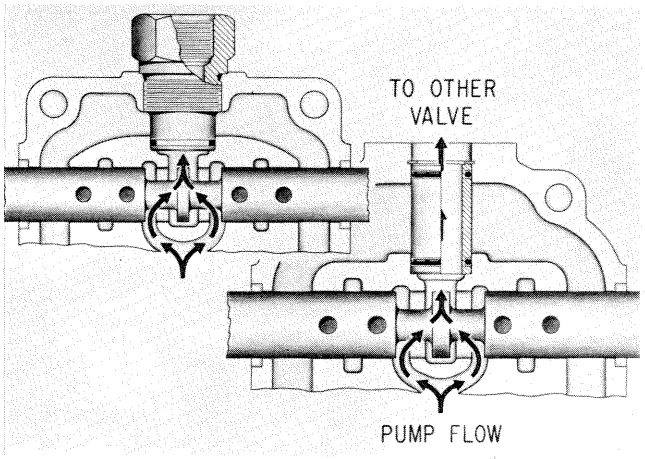


10. All valves can incorporate an adjustable pilot operated relief valve that is factory preset. The relief valve limits the maximum operating pressure of the system and, therefore, should never be tampered with or adjusted unless recommended by the Original Equipment Manufacturer. The pilot operated type functions by a small pilot poppet which signals the main cartridge to open allowing the pump flow to go to the tank core. Control valves not incorporating a relief valve have a cylindrical plug in place of the cartridge, to seal the high pressure core from the low pressure core.





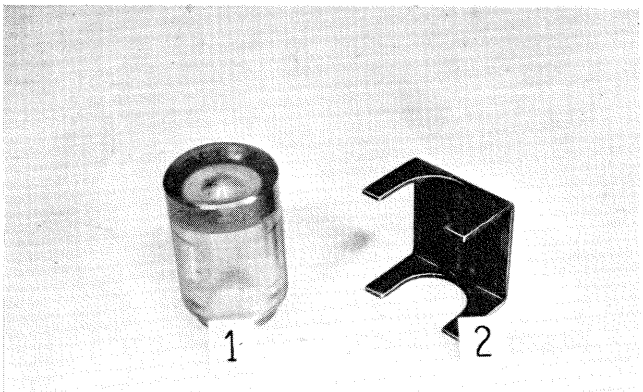
11. Overload relief valves are installed on some valves to prevent damaging shock pressures or to limit operating pressure in some circuits. The overload relief valve relieves oil directly from the valve cylinder port to the valve low pressure tank core.



12. On applications with operating functions downstream from the main control valve a "high pressure carryover" fitting is used in the control valve. When this feature is used the low pressure outlet is located either on the top or bottom of the control valve.
A V36 series valve uses a threaded type fitting and the V37, V38 and V39 valves have a sleeve type fitting using a snap ring retainer. If fittings are removed, new "O" ring seals should be used and greased when fittings are replaced.

Clean Valve.... and work area.

13. Dirt, metal particles and other contaminents are harmful to all precision built hydraulic components. Servicing of these control valves should start by cleaning the exterior of the unit with solvent and suitable brushing. Work should be done in a clean area where new or reusable parts can be kept clean.

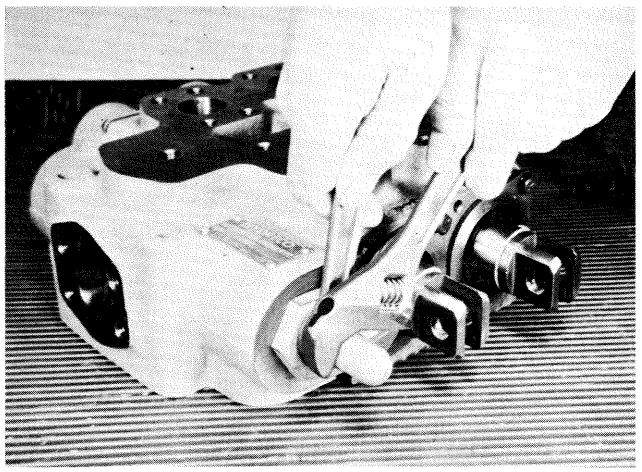


14. These convenient tools may be obtained from the Kent-Moore Organization, Inc. of Warren, Michigan. Each valve series require similar tools but of appropriate size.

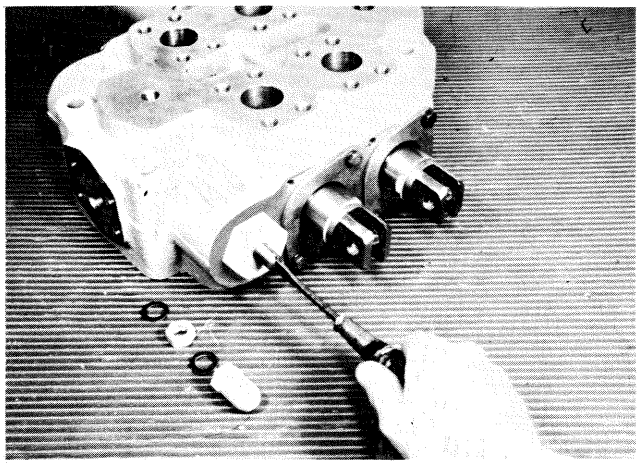
Valve Series	Tool No. 1 Seal Installer	Tool No. 2 Spring Compressor
V36	J9319-2	J22233
V37	J9320-2	J9323
V38	J9321-2	J9322
V39	J22990	J22991

Tool No. 1 is used to install plunger seals without damage. The spring Tool No. 2 will hold a spring in a compressed state affording ease in disassembly and assembly.

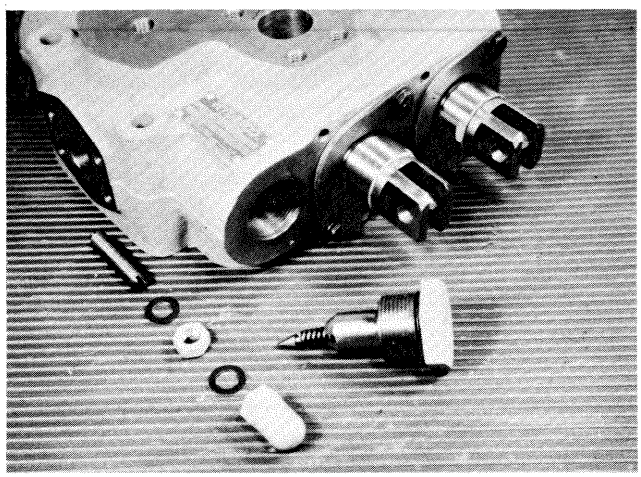
15. The relief valve can be installed in either side of the valve housing. Mark the valve to indicate the adjustment side to aid in reassembly. Disassembly can be started by removing the acorn nut, jam nut and two washers from the adjusting screw.



16. Remove the adjusting screw from the hex headed relief cap. This will release the tension of the relief spring.

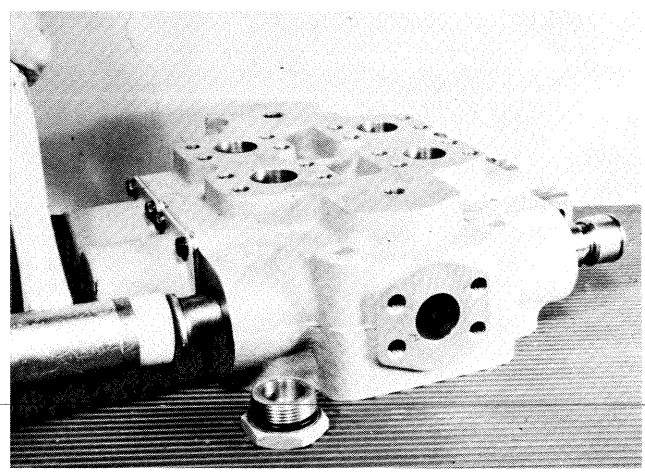


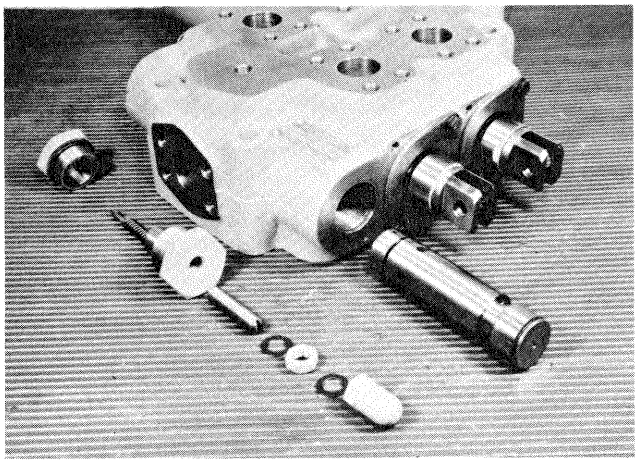
17. Remove the relief cap, the poppet and spring from the valve housing.



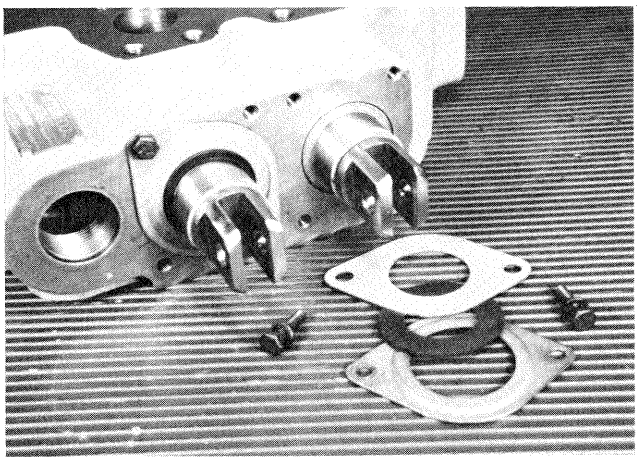
18. Remove the hex cap and "O" ring and drive the relief cartridge out the adjustment side of the valve. To ensure against damage to the cartridge and cartridge bore, a soft rod of the following diameter should be used for each valve series.

V36		7/8	to		15/16"	diameter
V37		15/16	to	1 &	1/16"	diameter
V38	1 &	3/16	to	1 &	5/16"	diameter
V39	1 &	1/2	to	1 &	5/8"	diameter

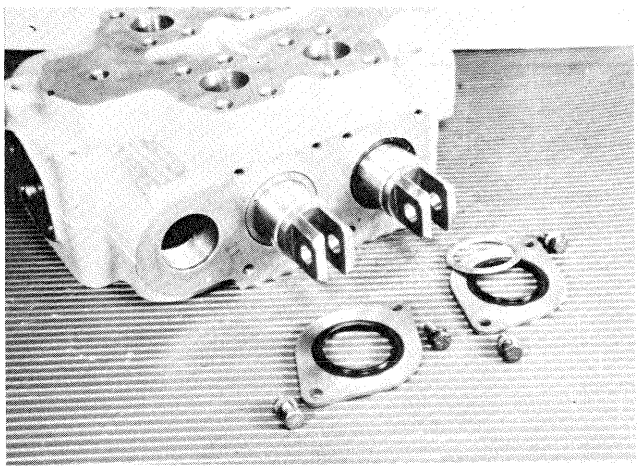




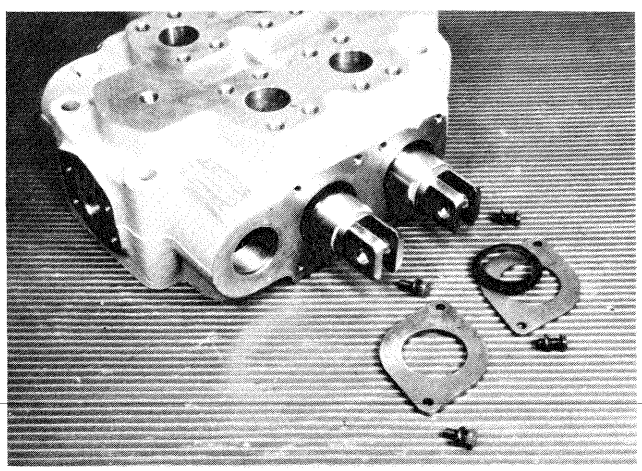
19. These are all of the relief valve parts when disassembled. The small snap ring installed on the cartridge positions the cartridge in the valve housing while the relief cap holds it in place.



20. Removal of the operating plungers from the valve housing is accomplished by first removing the cap screws and lock washers holding the plate retaining the plunger dirt wiper. Removal of the retainer plate reveals the type of wiper configuration in use. This type is a flat wiper which is sandwiched between the retainer plate and an inner plate retaining a fiber back-up ring and plunger seal.

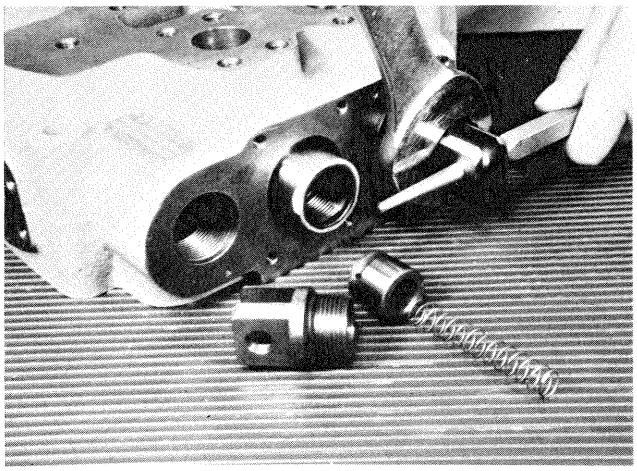


21. This second wiper configuration consists of a wiper bonded to the plate and retains the fiber back-up ring and plunger seal. A second type of bonded wiper not shown also serves as a back-up ring to the plunger seal, thereby eliminating a fiber ring.

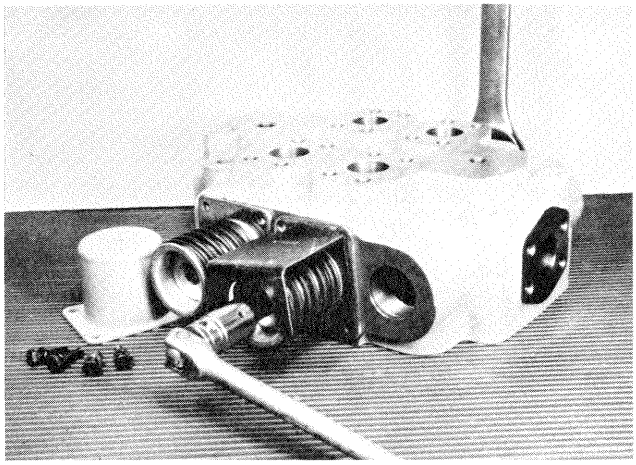


22. This type of wiper also is in direct contact with the plunger seal and both seals are retained by the plate.

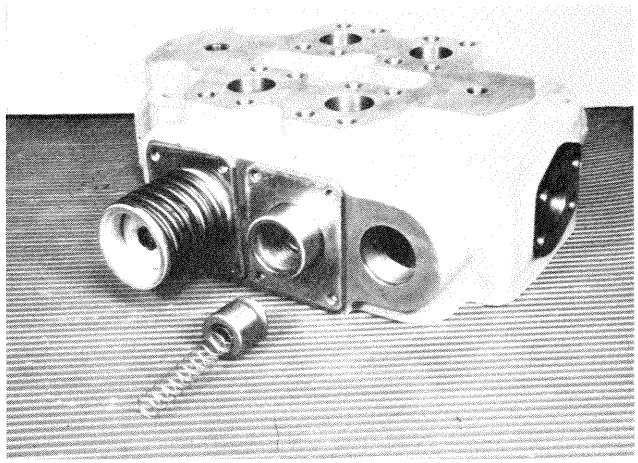
23. Remove the plunger eye and "O" ring seal. Use the wrench flats provided on the plunger end and a suitable rod or tool in the plunger eye clevis hole. Remove the internal spring and load check from each plunger and mark or tag each check for reassembly to their respective plunger and plunger end.



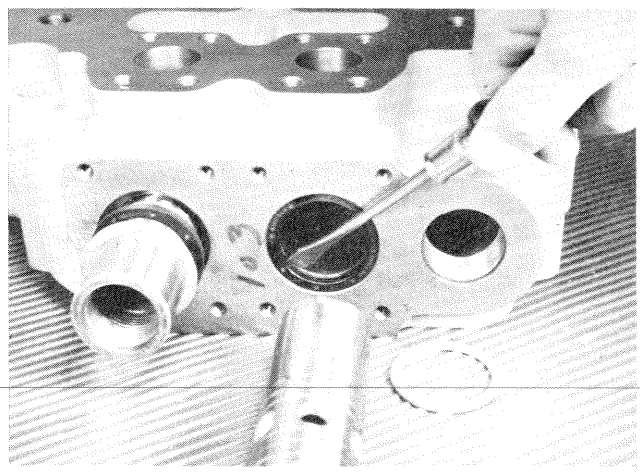
24. This photo illustrates removal of the spring return. Reference should be made to photos commencing with No. 61 before any other type covers are removed. Remove the spring by using the spring tool shown in photo 14. Push the plunger slightly outward and install tool leg between the spring guide and seal retainer plate. Remove the plunger end cap and "O" ring seal using a socket wrench in the cap while holding the plunger by the two wrench flats.

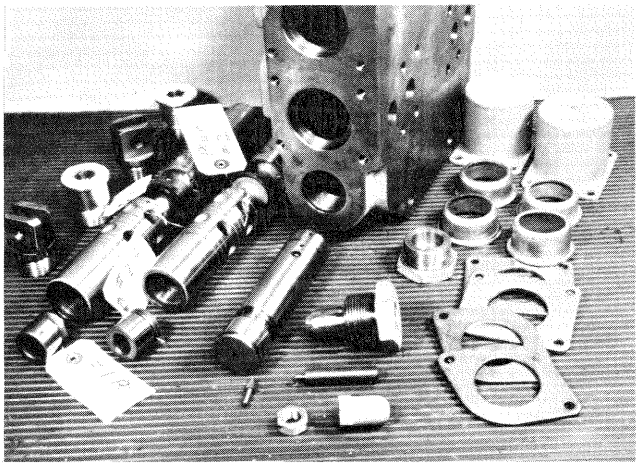


25. Remove the check spring and check from the plunger and match mark the check and plunger as before, for later reassembly. Remove the seal retaining plate from the plunger end.

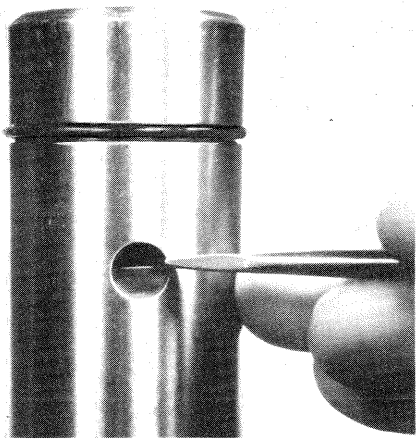


26. Remove disassembled plungers from the valve housing and mark or tag plungers for reassembly. Remove the fiber back-up rings and pry seals, if necessary, from both sides of the housing bore. This completes disassembly of the control valve.

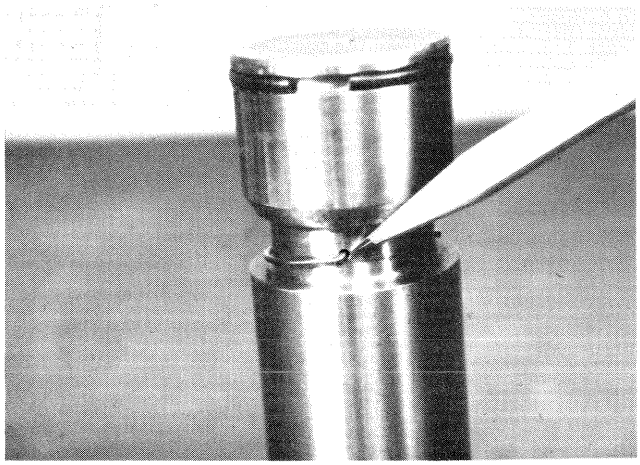




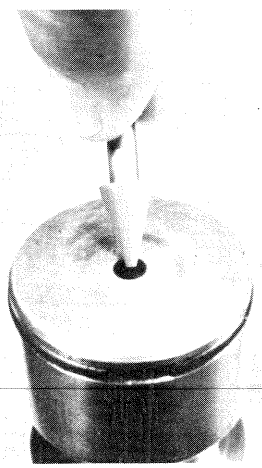
27. Wash parts in solvent and dry with lint-free cloth. Replace all rubber "O" ring seals, plunger seals, fiber back-up rings and springs.



28. Check the operation of the internal piston of the relief cartridge by actuating it against the spring. The piston should travel freely and return to the original position without binding or hanging up—if faulty, replace the cartridge.



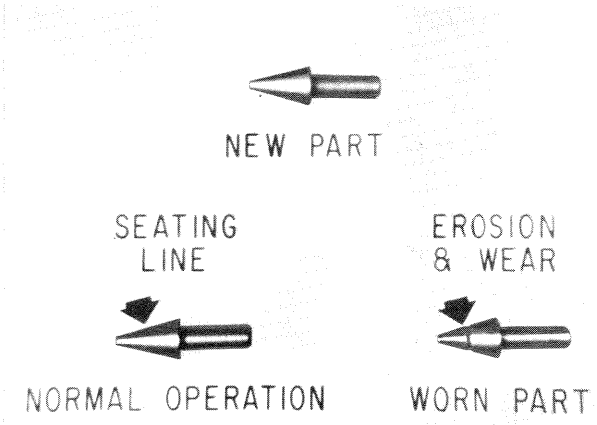
29. Check the small wire retained around the cartridge to see that it can move freely in the hole. This wire controls proper operation of the relief valve and keeps the orifice hole clean by its free movement.



30. Check the poppet seat in the cartridge and replace the cartridge if the hole is hammered out, eroded or out of round.

Relief cartridges are factory assembled and tested and are serviced as assemblies only.

31. The inspection of the pilot poppet will help determine the degree of contamination in the hydraulic system. The condition of the poppet in a clean system during normal operation will show only an acceptable light line at the point of contact with the cartridge hole. A highly contaminated system will cause erosion of the poppet and other critical parts of a hydraulic system. An eroded poppet should be replaced and the reason for contamination corrected.

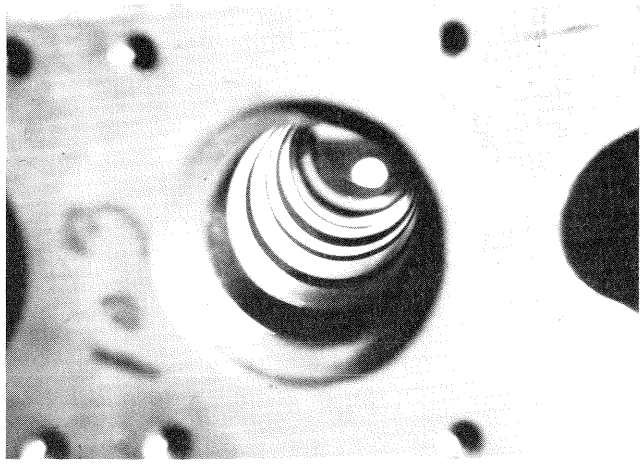


32. Plungers should be inspected closely for obvious damage such as flaking of the chrome plating, excessive wear, cracking and damage caused by foreign objects passing through the system.

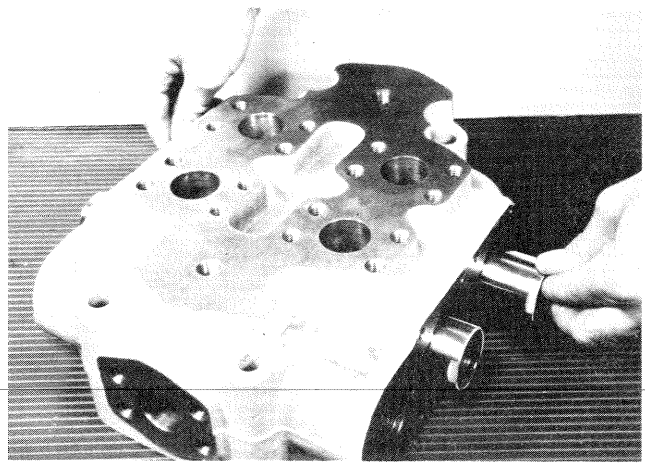
For example, continued flaking will contaminate a system and can cause binding of the plungers in the plunger bore. Wear patterns on the closely fitted plungers can be normal in some instances and increased plunger leakage will not arversely affect some machine functions.

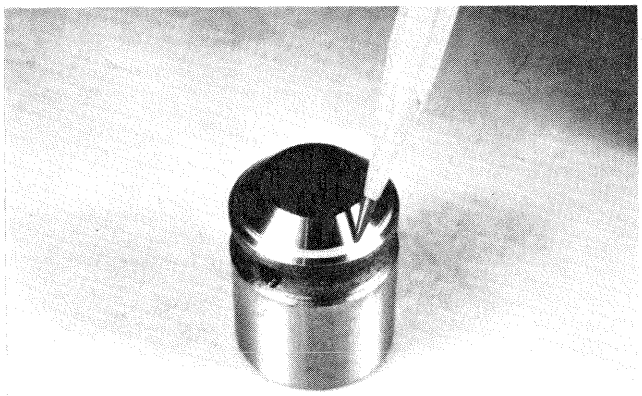
The inspector must judge the extent of damage and decide upon the reusability of each plunger—or return the valve to the factory for evaluation.

33. With a light, inspect each plunger bore of the valve housing for scratches, burrs, and gouges. Check for loose particles or dirt accumulation on the bore surfaces.



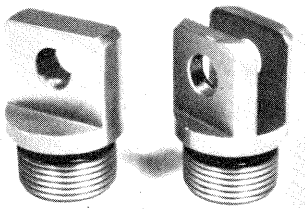
34. For inspection purposes coat plungers with clean oil and install them in their respective bores as marked or tagged. Work each plunger as in actual operation and rotate plunger a complete revolution to determine if plungers fit without binding. Remove plungers for later re-assembly. If it is decided to return the valve to the factory for select fitting of new plungers, reassemble all parts before shipping.

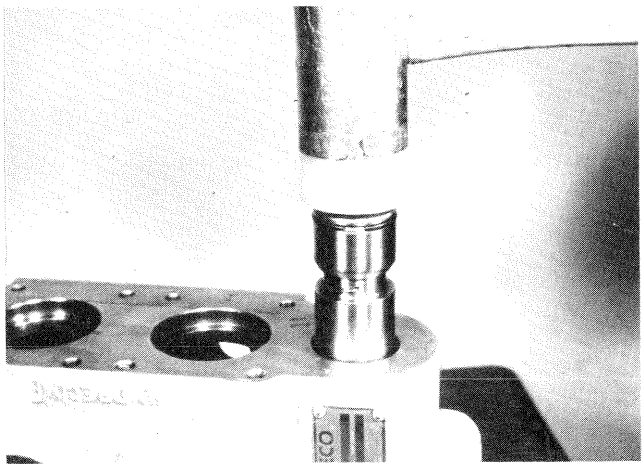




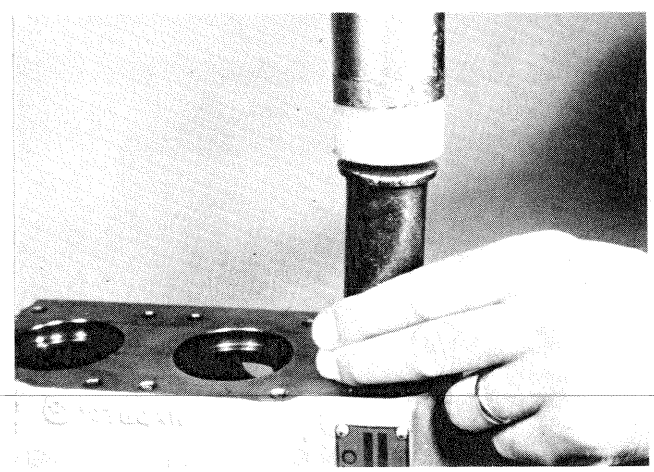
35. The load drop check should be replaced if machine performance indicates improper operation. Replacement should also be made if the conical surface has a deep groove worn by contacting the seat in the operating plunger. The plunger seat should be lapped slightly to conform to the new check. If the original square edge of the plunger seat is worn excessively, replacement of the plunger is necessary. Return the valve to the factory for select fitting of the new plunger.

36. Replace the plunger eye if the clevis pin hole is worn or is out of round.



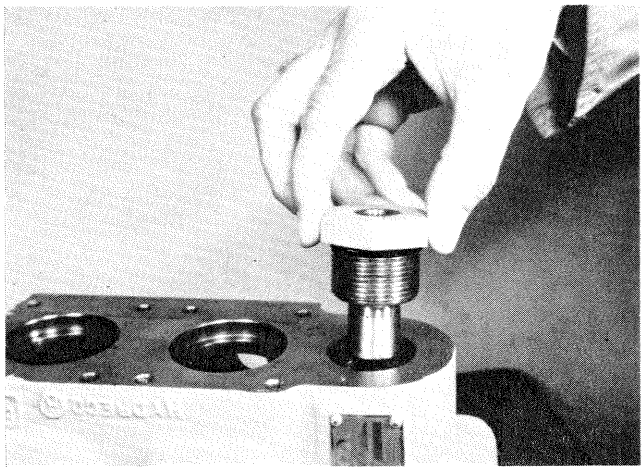


37. Place the valve housing in an erect position with the relief adjustment side up. Grease the new "O" ring seal on the relief cartridge and install this end into the valve body. Tap lightly with a soft hammer until the cartridge falls of its own weight into the housing.

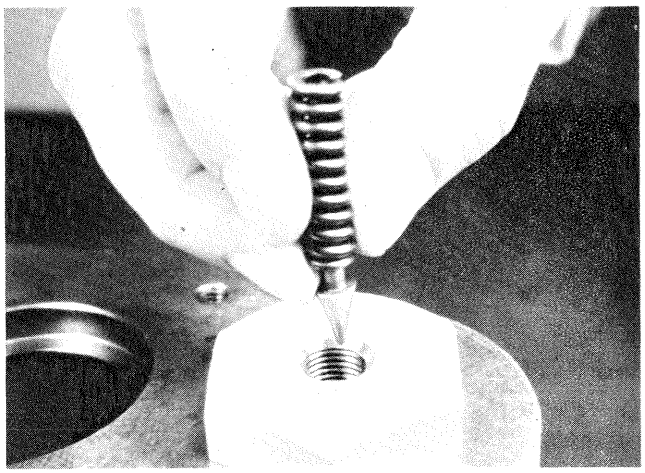


38. Continue installing the cartridge with a soft rod until it bottoms. Do not damage the relief poppet hole in the end of the cartridge.

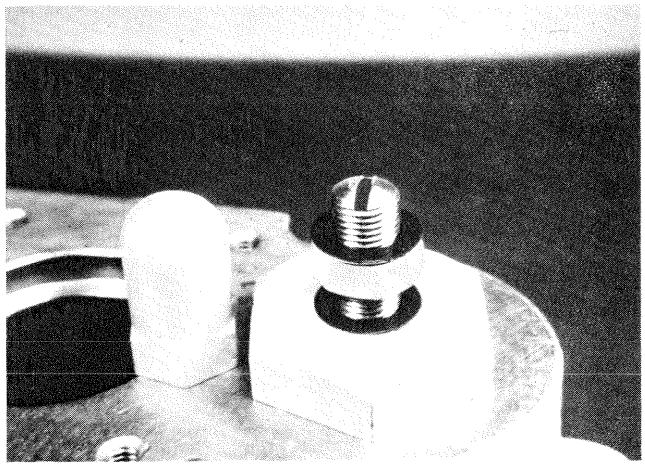
39. Install a new "O" ring seal on the relief cap and install the cap. Torque to 45 foot pounds.



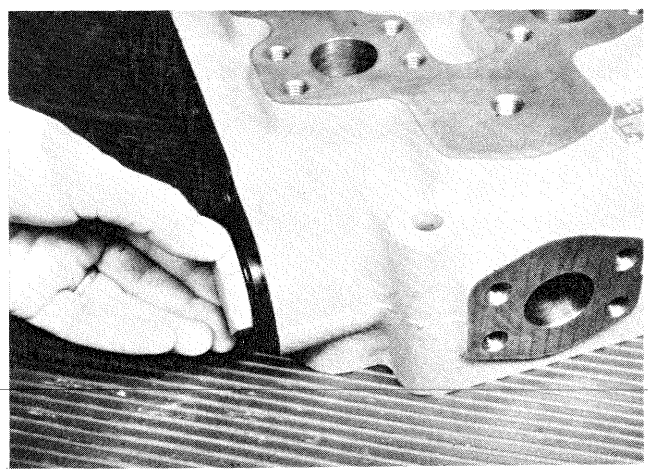
40. Place the relief poppet and the spring in the relief cap. Be sure the poppet is seated in the cartridge hole.

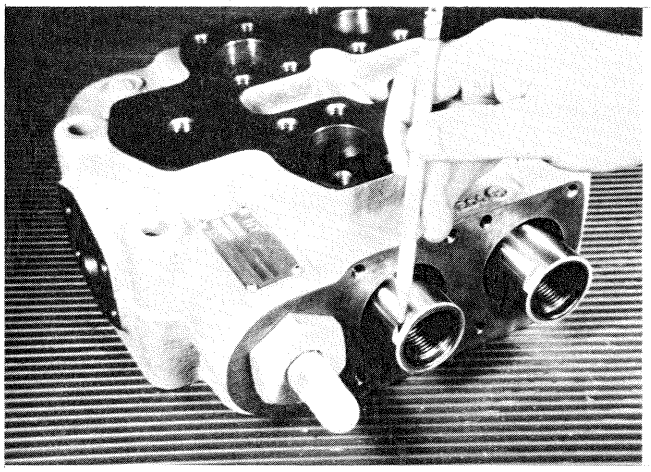


41. Thread the adjusting screw in by hand until the spring tension is felt. Install the jam nut with a seal washer on each side. The acorn nut is added and left loose until the relief valve is set.

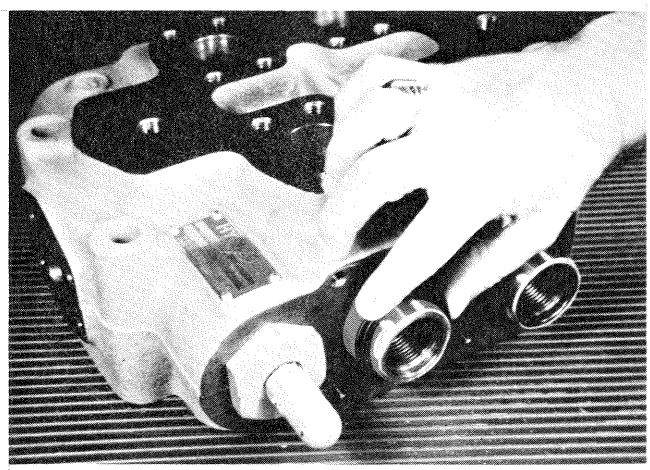


42. Place the valve in a position so the plain hex headed relief cap can be installed. Grease and install a new "O" ring seal and torque the cap to 45 foot pounds.

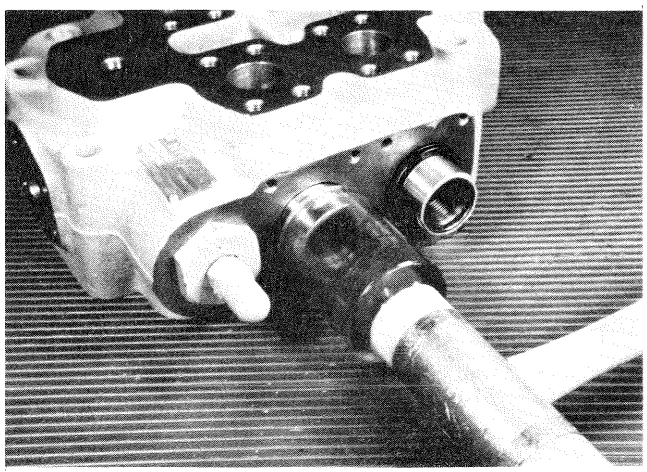




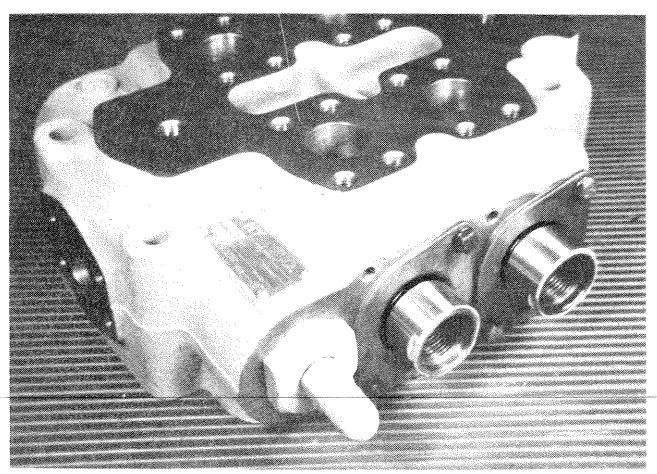
43. Install each operating plunger in their respective bores as marked when disassembled and center each plunger equal distance from each side of the valve housing. Be sure plunger wrench flats are on the operating side of the valve.



44. Coat the new plunger seal with grease and slip into place on the plunger with the proper side out as marked. Seals not marked are earlier types and should be replaced with the newer seals.

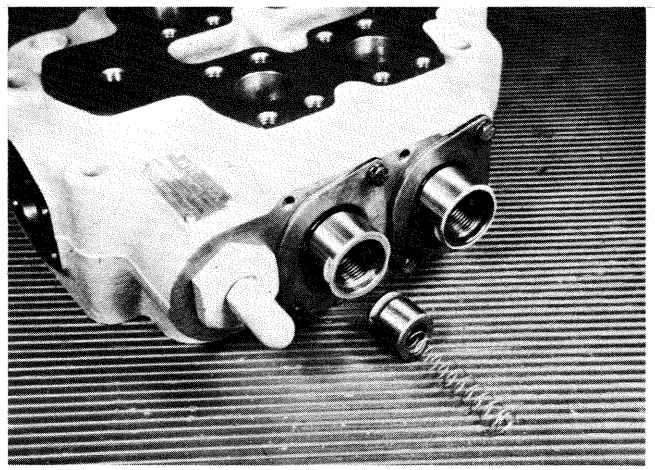


45. Bottom the plunger seal in the seal bore by using the seal installing tool of Photo 14. Light tapping on the tool may be required and absolute flatness of the seal is essential. Do not distort the seal or damage it in any manner.

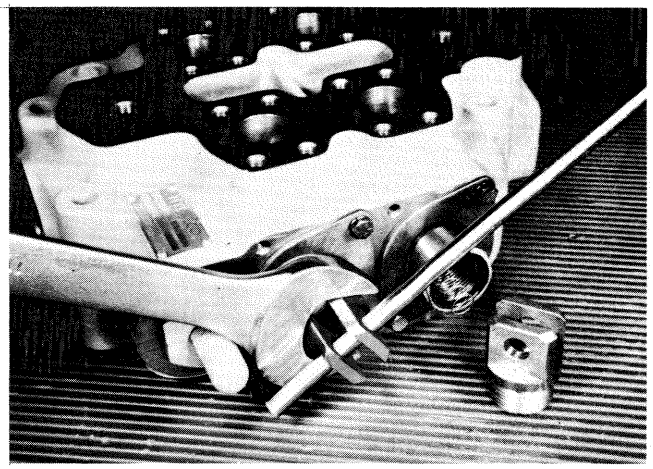


46. Add a new outer dirt wiper and the retainer plate to the plunger end and install the cap screws with lock washers. Torque to 15 to 20 foot pounds.

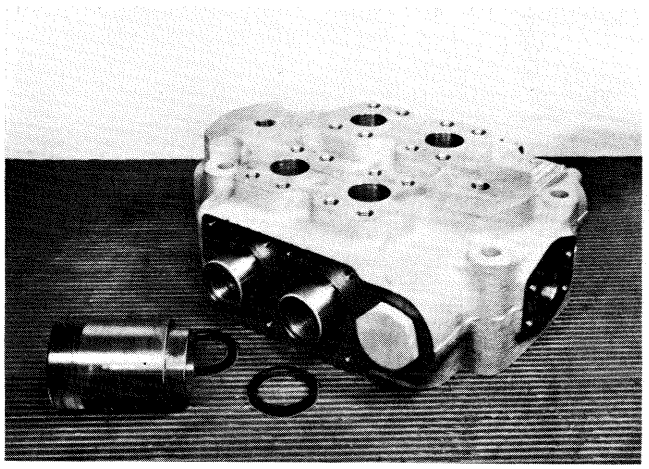
47. Add the internal plunger check and spring to the correct plunger end as previously marked at disassembly.



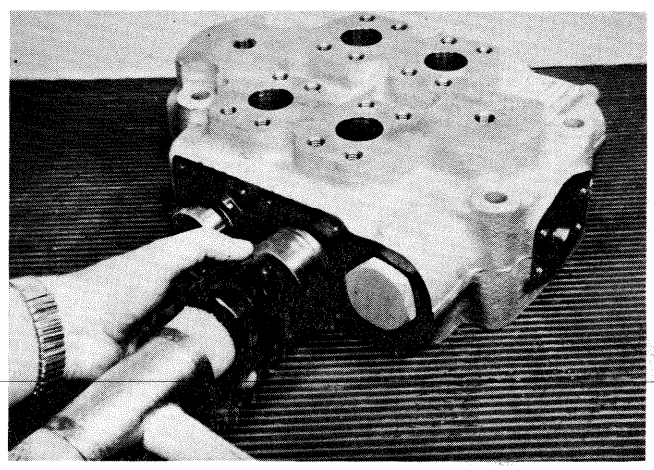
48. Place a new "O" ring seal on the plunger eye and install the eye in the plunger with the check spring end centered in the recess of the eye. Tighten snug by using the wrench flats on the plunger and a suitable rod or tool in the plunger eye. The plunger eye will be torqued later when torquing the cap on the other end of the plunger.

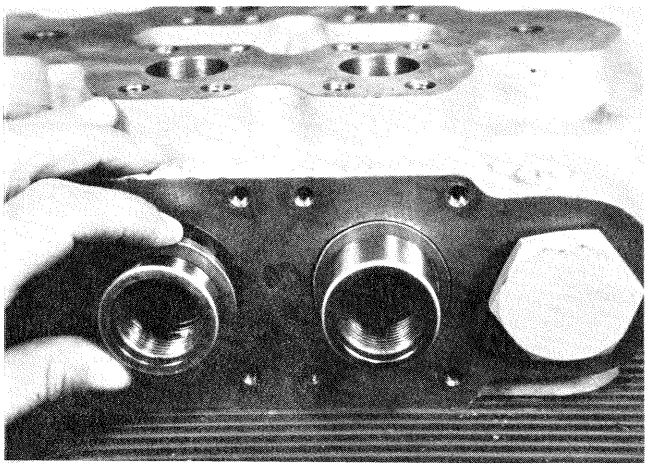


49. Grease and install new seals with the correct side out as marked on the seal. Seals not marked are earlier types.

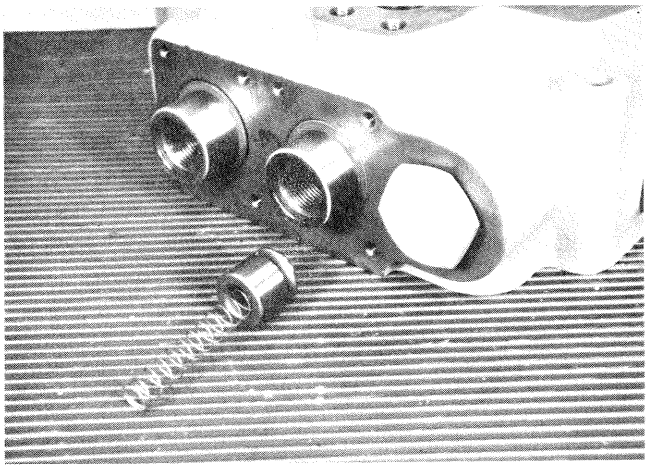


50. Use the same tool and care to avoid seal damage as previously explained for other side of valve. Bottom seal in place.

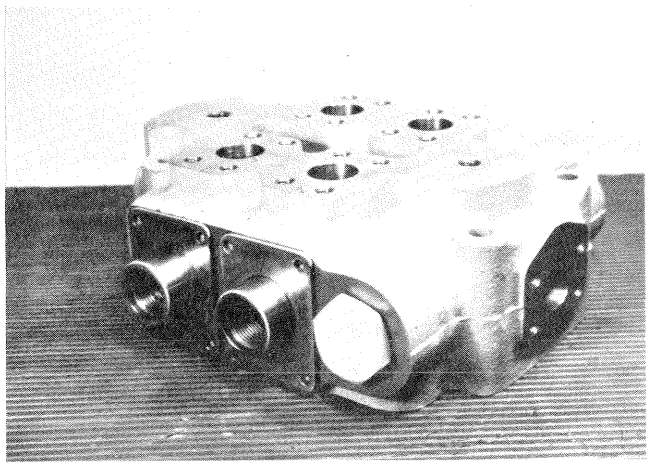




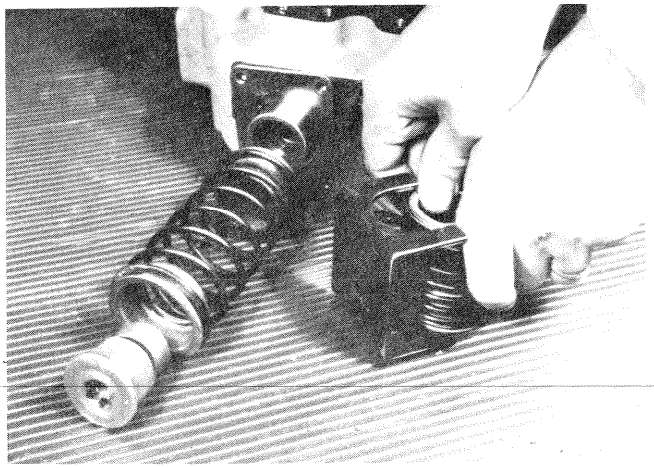
51. Add a new fiber back-up ring to each seal. If a seal is bottomed correctly, the back-up ring will be flush with the valve housing surface.



52. Install the plunger check and spring, if used, in the same plunger end as marked or tagged when disassembled.

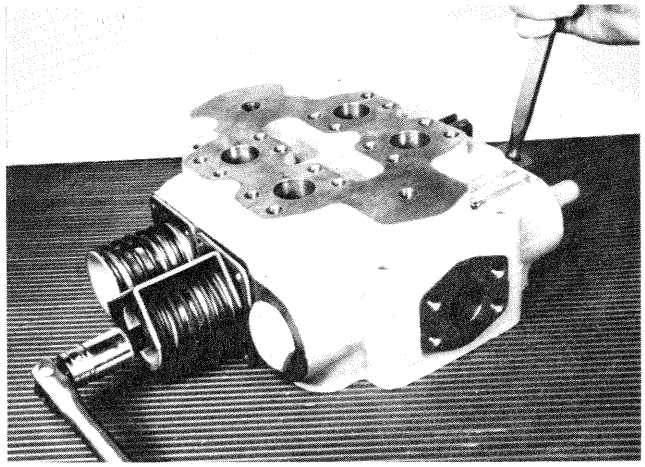


53. Place a seal retaining plate on each plunger end.

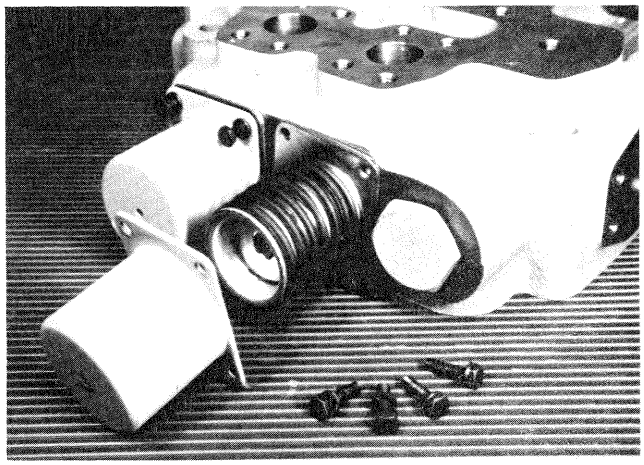


54. Place a cupped shaped spring guide in each end of the centering spring and compress the spring for use with the spring tool. Install a new "O" ring seal on the plunger end cap.

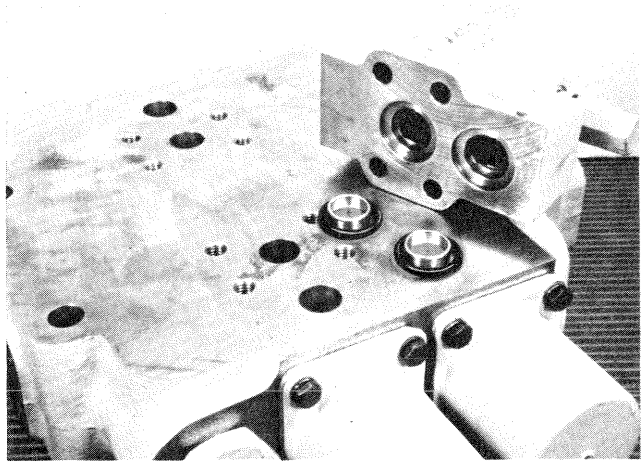
55. Place the plunger end cap into one end of the compressed spring assembly and engage the threads. Tighten and torque to 30 foot pounds by using the hex socket in the plunger cap and a suitable tool in the clevis hole of the plunger eye. This method will torque the plunger cap and the eye.



56. With the centering spring cover held in place, add the cap screws and lock washers. Torque cap screws 15 to 20 foot pounds. Installation of this cover places the plunger in its correct neutral position and completes its assembly.

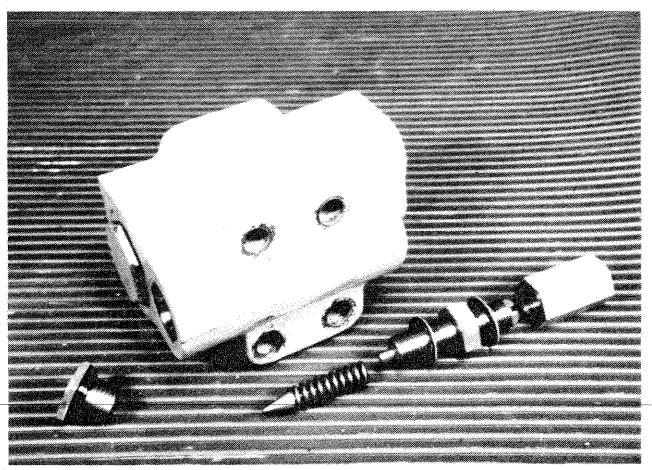


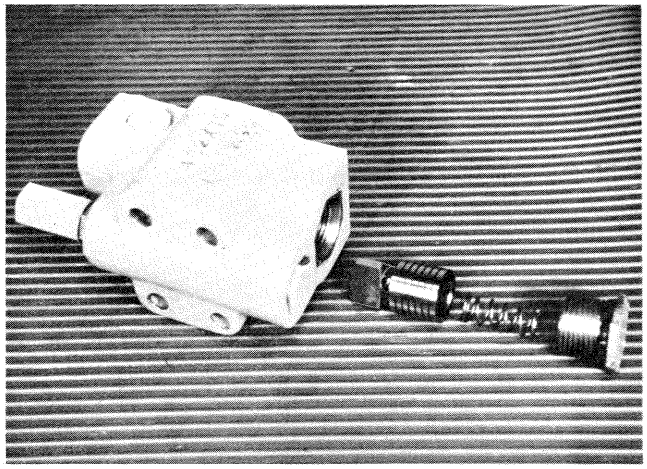
57. Remove the overload relief valve from the control valve by removing the four cap screws. Take notice of the O-ring seals and sleeves used in connecting the ports.



58. Remove the long hex cap from the adjusting screw having the jam nut and two seal washers. Remove the adjusting screw, spring and pilot poppet. Remove the hex headed cap from the other end of the valve only if the O-ring seal needs replacing. If poppet seat within the housing is damaged and does not have a sharp edge, the relief valve should be replaced. Inspect the poppet by reviewing Photo 31 of the main relief valve and replace if necessary.

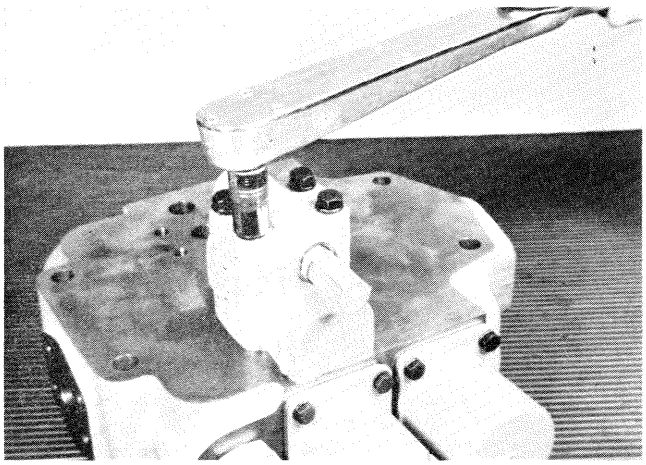
To assemble, place the poppet with its spring in the poppet seat hole. Thread the adjusting screw until spring tension is felt. Add the jam nut with a seal washer on each side and add the hex cap.



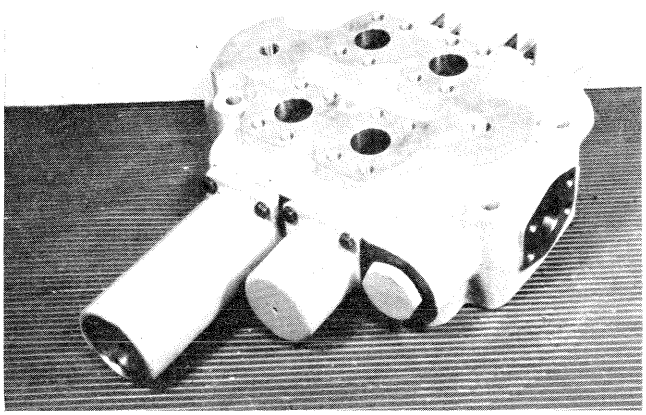


59. Remove the hex headed cap and "O" ring seal of the main relief section from the valve housing. Remove the spring and the main poppet. Replace the poppet if the conical surface is damaged at the point of contact with the seat. If the poppet seat within the housing does not have a sharp edge or is damaged, the complete relief valve should be replaced.

To assemble, install the poppet and spring. Use a new "O" ring seal on the cap and torque the cap to 20 foot pounds.



60. Mount the overload relief valve to the control valve using new "O" ring seals. Incorporate the sleeves which fit in the relief valve ports to retain the seal rings. Torque the cap screws to 20 foot pounds.



61. A detent is used to hold a plunger in an operating position. Detents are longer than spring return devices, as shown. They also vary in length depending on the type of detent and the positions detented.

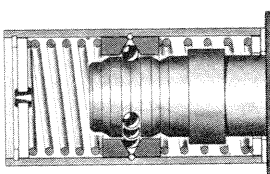


FIG. I
PLUNGER
DETENTED IN
NEUTRAL OR
HOLD POSITION

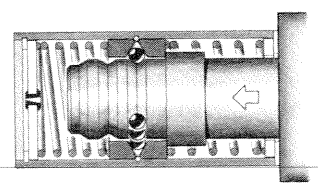
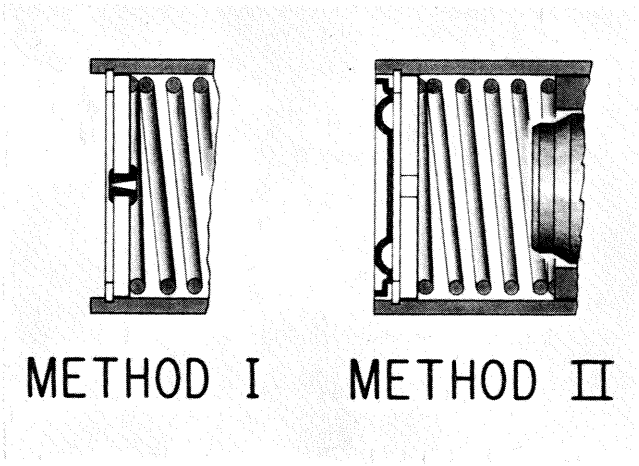


FIG. II
PLUNGER
DETENTED IN
"IN" POSITION

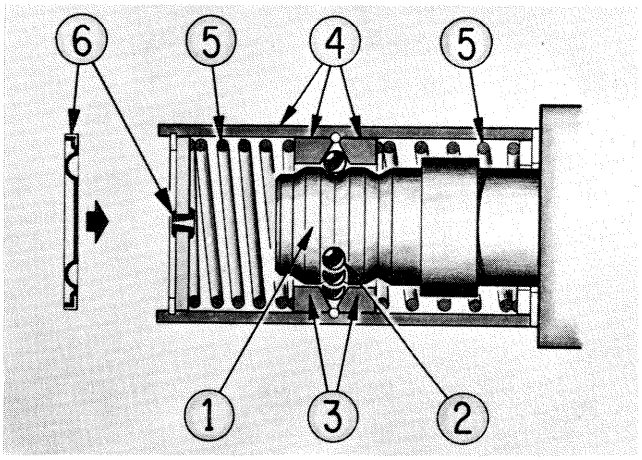
62. The detent functions by steel balls engaging a groove located in the detent cap where the plunger position is to be detented. The steel balls are held against the detent cap by ball retainers and spring tension.

63. Harmful contaminants such as dust, dirt and water are excluded from the detent by the two methods shown. The first type is a rubber breather plug with a through hole which opens and closes allowing the detent to "breathe" as air is expelled or drawn into the detent. Method II is a diaphragm which is pressed into place. Detent covers must extend at least 3/16" beyond the retaining ring to use this item—otherwise the plug in Method I is required.

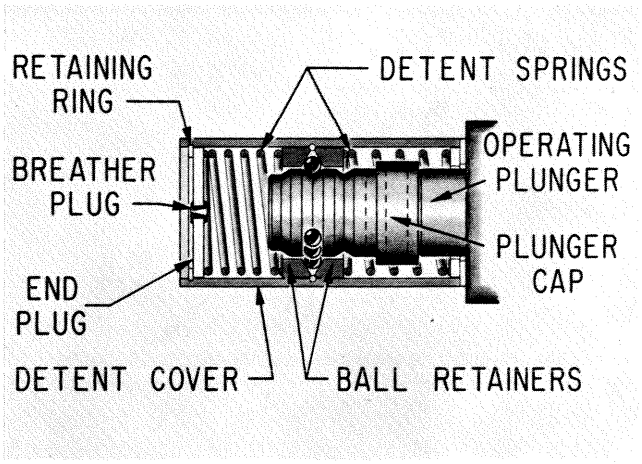


64. Detent parts should be replaced if inspection reveals any of the following:

1. Shoulders of detent cap grooves are worn with deep axial grooves.
2. Steel balls spalled, chipped or broken.
3. Ball retainers are worn or rusted—causing high operating effort or malfunction.
4. Rusty or worn bore in the detent cover.
5. Springs broken.
6. Breather plug or diaphragm damaged.



65. THREE AND FOUR POSITION DETENTS—A three position detent is used when a plunger is held in the NEUTRAL, IN and OUT positions. In a four position detent the "EXTREME IN" position is also held in place. Both detents allow a plunger to move freely between detented positions and no spring return of the plunger to neutral position is employed.

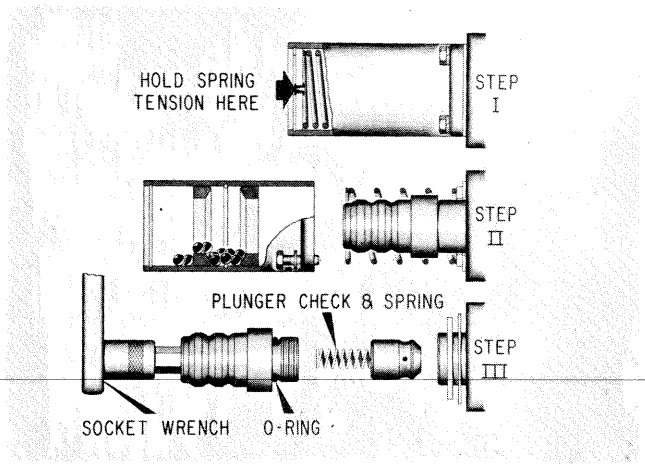


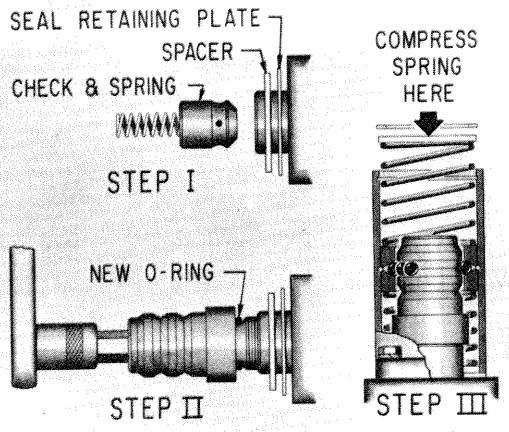
66. DISASSEMBLY OF THREE AND FOUR POSITION DETENTS.

STEP I—Remove the rubber breather plug or diaphragm from the end of the detent. Press the end plug against the spring and compress to remove the retainer ring. Release the spring tension with caution and remove the spring. Mark the spring location.

STEP II—Remove the four cap screws and cover. Collect all steel balls and count the number used for re-assembly. Remove the second spring.

STEP III—Remove the detent cap with its "O" ring seal from the plunger by using the hex socket in the cap and wrench flats on the plunger. Remove the internal spring and load drop check from the plunger. Remove and mark the spacer and seal retaining plate from the plunger end.



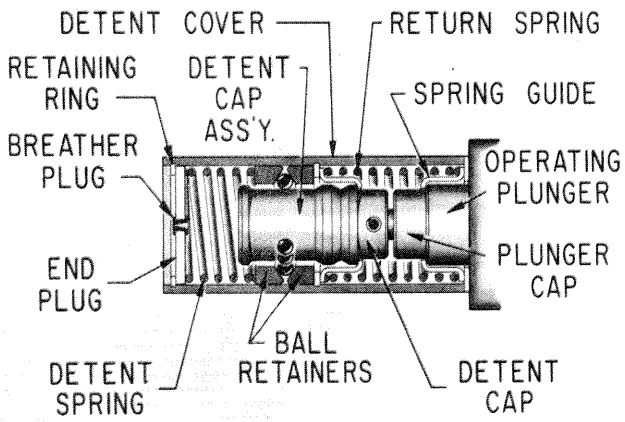


67. ASSEMBLY OF THREE AND FOUR POSITION DETENTS. Review Photo 64 for inspection of parts and clean all parts before reassembly.

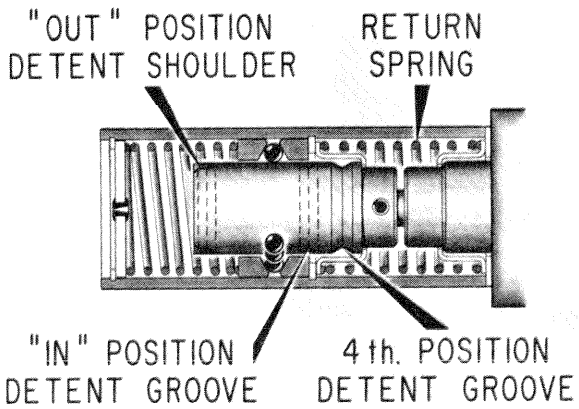
STEP I—Place the marked seal retaining plate and spacer on the plunger end. Install the load check and check spring in the plunger.

STEP II—Thread the detent cap with a new "O" ring seal into the plunger end. Torque the detent cap to 30 foot pounds while holding the plunger with a punch or rod in the clevis hole.

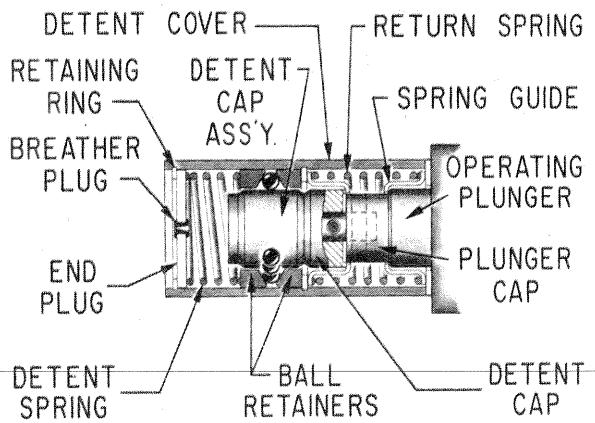
STEP III—Place the valve in a vertical position. Heavily coat the detent cap, ball retainer, inside of detent cover and internal snap ring with clean grease. Place the correct spring and the ball retainer in place and install the cover with cap screws and lock washers. Install the same number of steel balls as removed. Coat the second ball retainer with grease and slide into the cover. Add the other spring and place the end plug on this spring and compress until the retaining ring can be installed in the groove. Add a breather plug to the end plug or use a diaphragm as shown in Photo 63. With the cover cap screws loose, actuate the plunger to center the cover and torque the screws to 15 to 20 foot pounds.



68. FOURTH POSITION DETENT—This type of detent allows the plunger to return from two operating positions to neutral position by a spring. The fourth position, or "extreme in" position, is firmly held by the detent.



69. FOURTH POSITION WITH OTHER DETENTED POSITIONS—This detent holds an operating plunger in the "extreme in" position and one of the other positions. Neutral position is maintained by the "return to neutral" spring. Part names are the same as the previous detents.



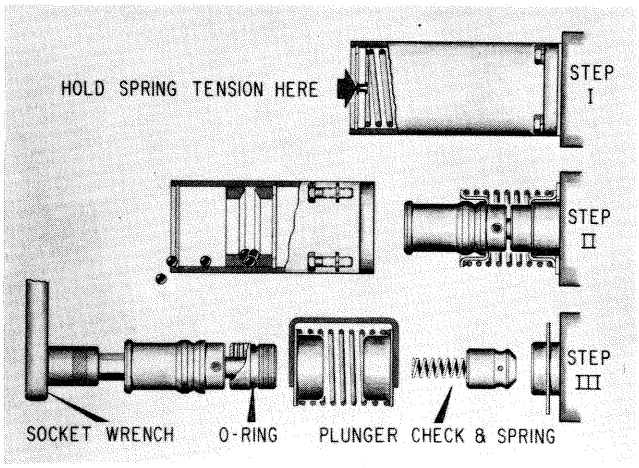
70. IN AND OUT POSITIONS DETENTED—A plunger detented in the IN position has a detent cap with one detent groove. For a detent in the OUT position a shoulder on the end of the detent cap holds the plunger. In both cases, neutral position is maintained by the centering spring which returns the plunger to the neutral position from either direction.

71. DISASSEMBLY OF THE THREE PRECEDING DETENTS.

STEP I—Remove the rubber breather plug or the diaphragm from the end of the detent. Press the end plug against the spring to remove the retaining ring and release the spring tension with caution. Remove the spring.

STEP II—Remove the four cap screws and the cover. Collect all steel balls and count the number used for re-assembly.

STEP III—With the spring compression tool, Photo 14, in place, remove the detent cap assembly and "O" ring seal from the plunger. Use the hex socket in the detent cap and the wrench flats on the far end of the plunger. Remove the internal check spring and check from the plunger. Remove and mark the seal retaining plate from the plunger end.

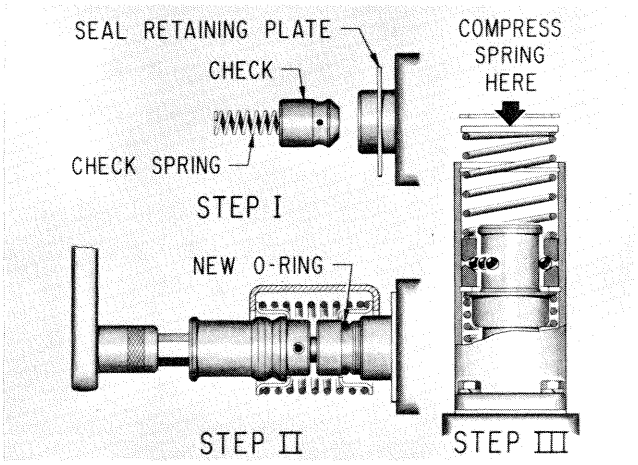


72. ASSEMBLY OF THE THREE PRECEDING DETENTS. Review Photo 64 for inspection of parts and clean all parts before assembly.

STEP I—Place the correct seal retaining plate on the plunger end. Some detents use two plates. Install the check and check spring in the plunger.

STEP II—Place a new "O" ring seal on the plunger cap and put the detent cap assembly through the spring and guides held by the spring tool. Thread the plunger cap into the plunger and torque to 30 foot pounds. Use the hex socket in the cap while holding the plunger with a punch or rod in the clevis hole when torquing.

STEP III—Place the valve in a vertical position and put the cover with an internal snap ring in place. Coat one ball retainer heavily with grease and install in the cover as shown. Place the correct number of steel balls around the detent cap and on the retainer. Heavily grease the second retainer and install. With second spring in place compress with the end plug until secured with the snap ring. Add a breather plug or diaphragm. Actuate the plunger while cover cap screws are loose, to center the cover, and torque the cap screws to 15 to 20 foot pounds.



73. Inquiries can be directed to:

HYDRECO
9000 E. MICHIGAN AVENUE, KALAMAZOO, MICHIGAN 49003 / PHONE (616) 349-1511

74. This presentation was produced to be of service to Hydreco customers and to help provide continued service life for Hydreco Control Valves.

Produced by

HYDRECO™ A UNIT OF GENERAL SIGNAL
9000 E. MICHIGAN AVENUE, KALAMAZOO, MICHIGAN 49003

RECOMMENDATIONS

1. **PAINTING THE CONTROL VALVE**
   Avoid plunger seal leakage by keeping the chrome plated plunger ends free of paint. Do not paint surfaces near ports where "O" ring seals are used.

2. **MOUNTING THE CONTROL VALVE**
   Mount the valve on a flat surface and use three or four mounting bolts. Tighten bolts evenly and avoid valve housing deflection which can cause plunger binding and excessive wear.

3. **HANDLE LINKAGE**
   Replace parts having worn clevis pin holes. Replace worn clevis pins and broken cotter keys. Adjust linkage for full stroke of plunger in both directions and take up unnecessary slack, avoid plunger binding from misaligned linkage.

4. **PRESSURE SETTINGS**
   Reliefs are factory set and if adjustment is necessary—follow the Original Manufacturers recommendations.

5. **SHIPPING INSTRUCTIONS**
   Control valves returned to the factory should be shipped prepaid and properly identified.
   Hydreco does not proceed with repair without written permission from the Original Equipment Manufacturer. Authorization should be obtained prior to the return of any material.

SLIDES AVAILABLE FROM HYDRECO

HYDRECO™ A UNIT OF GENERAL SIGNAL
9000 E. MICHIGAN AVENUE, KALAMAZOO, MICHIGAN 49003

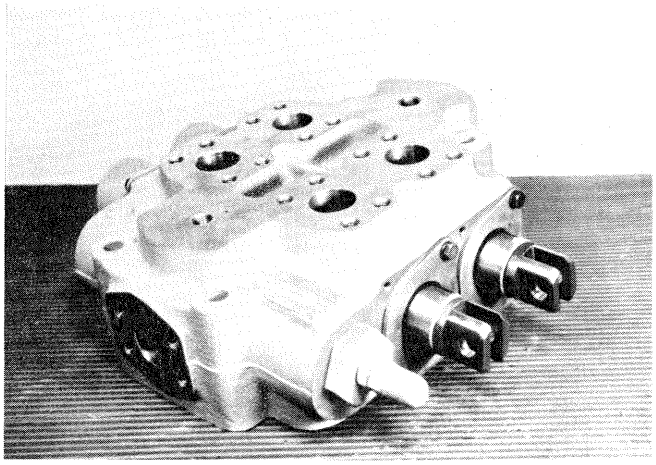
PRINTED IN U.S.A

Description

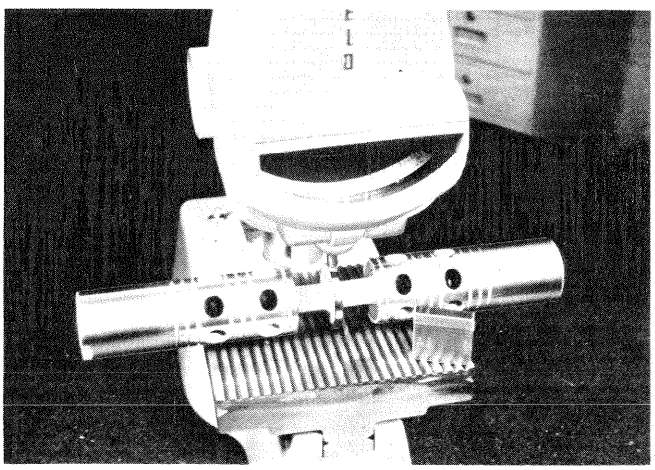
Servicing

Trouble Shooting

3. The four valve series covered by these service instructions are similar in design and operation but are of different capacities.



4. A Hydreco control valve is an important part of a hydraulic system and will provide many years of trouble-free life. This picture illustrates a V38 series valve with two operating plungers and an adjustable pilot operated relief valve that is preset at the factory.



5. Plunger and plunger bores are machined to extremely close tolerance for roundness, straightness, concentricity and surface finish. Each plunger bore is fitted with a plunger of a selected size and tested for a maximum leakage rate applicable to the machine's operation. Because of select fitted plungers, a control valve should be returned to the factory for servicing when the optimum machine performance is lost due to excessive plunger leakage. Determination of excessive plunger leakage should be made only after a thorough inspection of all other possible leakage points, such as cylinders, motors, fittings, etc.

MODEL NUMBERING SYSTEM

V38 SDD 12

VALVE SERIES

OPERATING PLUNGERS
(Type and number of plungers and their sequence — first letter denotes plunger nearest the valve inlet.)

VERSION NUMBER

6. Each valve is assigned a model number which denotes (1) valve series, (2) plungers, and (3) construction.

HYDRECO™

SERVICE INSTRUCTIONS
V37-V38-V39-V46-MVT150
CONTROL VALVES

HYDRECO™ A UNIT OF GENERAL SIGNAL
9000 E. MICHIGAN AVENUE, KALAMAZOO, MICHIGAN 49003