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VALVE FOR MANUAL CONTROL OF HYDRAULIC CYLINDERS

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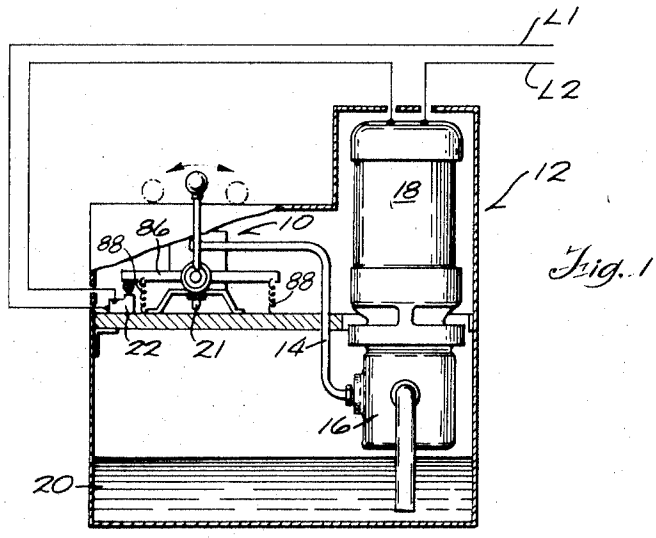


Fig. 1

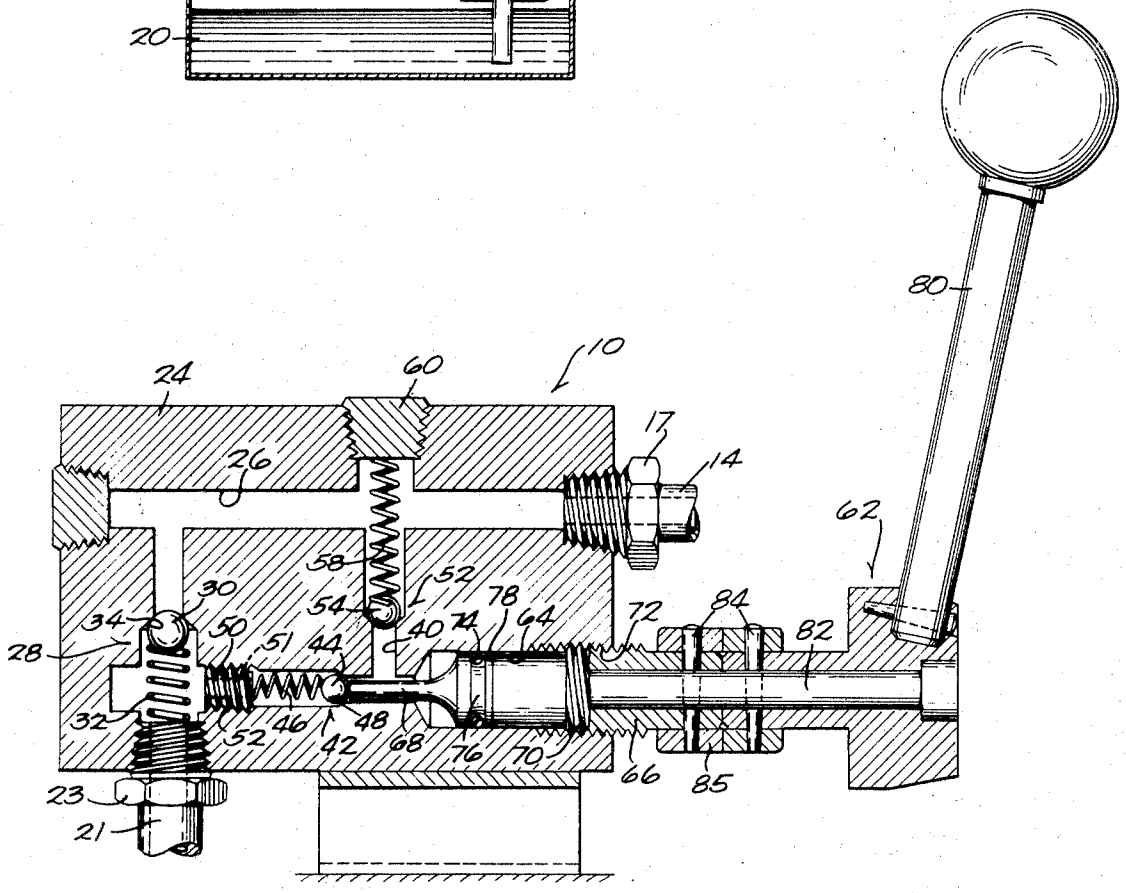


Fig. 2

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VALVE FOR MANUAL CONTROL OF HYDRAULIC CYLINDERS

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ABSTRACT OF THE DISCLOSURE

Disclosed herein is a hydraulic fluid control valve including a housing having a main flow path with a one-way check valve positioned in the flow path, a return flow path connected to bypass the one-way valve in the main flow path with a pair of check valves in the return flow path to isolate a section of the return flow path and a valve actuating device in the isolated section to open one of the check valves in the return path.

BACKGROUND OF THE INVENTION

This invention relates to a control valve for a portable hydraulic pump wherein the control valve is used to control the buildup of pressure to a hydraulic device, to maintain the pressure in the hydraulic device and to relieve the pressure in the hydraulic device. The control functions in a valve of the type contemplated herein are normally accomplished by a valve actuating device including a threaded spool which is subjected to the force of the high pressure hydraulic fluid flowing through the housing. At high operating pressures the force acting on the spool increases the friction on the threads of the spool to such an extent that the spool sticks in the housing.

SUMMARY OF THE INVENTION

The invention disclosed herein provides a control valve for a portable hydraulic pump having the functions of the valve controlled by an actuating device which requires substantially the same actuating force or torque regardless of the pressure of the hydraulic fluid in the control valve. More specifically, the control valve according to the invention comprises a housing having a main flow passage and a return flow passage connected to bypass a check valve in the main flow passage with a pair of check valves in the return passage to isolate a section of the return passage from the pressure of the hydraulic fluid in the main flow passages. An actuating device is mounted in the housing for movement into the isolated section of the return passage to open one of the pair of check valves in the return passage to relieve the pressure in the main passage. This arrangement of the actuating device in the section isolated by the pair of check valves prevents the force of the high pressure hydraulic fluid from acting on the actuating device so that it can be rotated easily regardless of the operating pressure in the main passage.

Other objects and advantages of the present invention will become more readily apparent when read in connection with the accompanying drawings in which:

FIG. 1 is a schematic view of the portable hydraulic pump.

FIG. 2 is a section view in elevation of the control valve.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Although the disclosure hereof is detailed and exact to enable those skilled in the art to practice the invention, the physical embodiments herein disclosed merely exemplify the invention which is defined in the claims appended hereto.

Referring to FIG. 1, the control valve **10** is shown mounted within a housing **12** and connected by a pipeline **14** to a hydraulic pump **16** which is driven by an electric motor **18** to pump hydraulic fluid from a reservoir **20** through the control valve to a hydraulic device (not shown) through a pipeline **21**. The motor **18** is connected to an electrical power source (not shown) by electric lines L_1–L_2 through a normally open switch **22**. The control valve **10** is used to control the operation of the motor **18**, to maintain pressure in the outlet line **21**, and to relieve the hydraulic pressure in pipeline **21** to the hydraulic device.

More particularly, the control valve **10**, as seen in FIG. 2, includes a housing or body **24** having a main flow passage **26** connected at the inlet end to the pipeline **14** by a threaded nipple **17** and at the outlet end to the pipeline **21** by a threaded nipple **23**. Return flow of fluid through the passage **26** is prevented by means of a main check valve **28** having a ball **30** biased into engagement with a valve seat **34** in the passage **26** by a spring **32** positioned between the ball **30** and the nipple **23**. Hydraulic fluid is returned to the reservoir by means of a return or secondary passage **40** connected to bypass the main check valve **28** in the main passage **26**. The flow of fluid through passage **40** is controlled by means of a first return check valve **42** having a ball **44** biased into engagement with a valve seat **48** provided in the return passage **40** by a spring **46** positioned between the ball **44** and a threaded plug or retainer **50** having an aperture **51**. Hydraulic fluid in the main passage **26** is prevented from flowing through the return passage **40** by means of a second return check valve **52** having a ball **54** biased into engagement with a valve seat **56** provided in the return passage **40** by a spring **58** positioned between the ball **52** and a threaded plug **60**. Valves **42** and **52** are oppositely biased and seated in passage **40** in a space relation.

The check valve **42** is opened to allow hydraulic fluid to bypass check valve **28** and return to the reservoir **20** by means of an actuating device **62** mounted in a recess **64** connected to the section of return passage **40** isolated by the check valves **42** and **52**. More particularly, the actuating device **62** includes a spool **66** having a needle **68** which projects into return passage **40** in a position for engagement with the ball **44**. The check valve **42** is opened by moving the spool **66** axially into engagement with ball **44** to move the ball **44** off of the valve seat **48**. This is accomplished by providing a threaded section **70** on the spool **66** which engages a threaded section **72** in the recess **64**. Rotation of the spool **66** in the recess **64** will move the needle **68** either toward or away from the ball **44**. The spool **66** is sealed in the recess **64** by means of an O-ring seal **74** provided in a groove **76** in the spool **66** with a plastic backup ring **78** provided in the groove **76** to prevent extrusion of the O-ring. The spool is rotated by means of a handle **80** secured to a stem **82** on the end of the spool **66** by means of a pair of pins **84** passing through a pair of sleeves **85** connected to an actuating lever **86**. The actuating lever **86** is positioned to engage switch **22** to control the operation of the motor **18** and pump **16**. A pair of springs **88** are attached to the ends of the lever **86** to hold the lever in a neutral position with the switch **22** open and the return check valve **42** closed.

In operation, the handle **80** is rotated counterclockwise in FIG. 1, to move the actuating lever **86** into engagement with the switch **22**. This will start the motor **18** and pump **16** to force hydraulic fluid through line **14** and passage **26** in housing **10**. The pressure of the hydraulic fluid will open check valve **28**. The hydraulic fluid is prevented from entering the return passage **40** by check valves **42** and

52. The handle **86** is held in this position until the pressure in the outlet pipeline **21** reaches the desired level. When the handle is released, springs **88** rotate the actuating device **62** clockwise to a neutral position. Check valves **28** and **42** will both be closed and the pressure of the hydraulic fluid in the outlet line **21** will be maintained at the desired level. Rotation of the handle **80** clockwise will move the spool **66** into the housing **10** and the needle **68** will engage and unseat the ball **44** from the valve seat **48** against the bias of spring **46**. The hydraulic fluid in the line **26** will flow past check valve **42** and will open the check valve **52** allowing the hydraulic fluid to flow back to the reservoir through the pipeline **14** and pump **16**.

With this arrangement, the spool **66** is never subjected to the pressure of the hydraulic fluid in passage **26** while hydraulic fluid is being pumped through the control valve or while the pressure of the hydraulic fluid is being maintained in the outlet line **21**. In the absence of any hydraulic pressure on the spool, it can be rotated freely and will never lock in the housing.

What is claimed is:

1. A control valve for a hydraulic pump, said valve comprising a housing, a main flow passage through said housing, a main valve in said main flow passage, a return flow passage connected to said main flow passage to bypass said main valve, a first return valve in said return passage, a second return valve in said return passage, and a threaded spool having a needle positioned in said return passage for engagement with one of said return valves, said one of said return valves being resiliently biased toward a closed position and arranged to relieve pressure in said main flow passage when engaged and opened by the rotary motion of said threaded spool in one direction.

2. A control valve according to claim **1** wherein said one of said return valves comprises a one-way check valve positioned to prevent the return flow of fluid through said return passage and said other of said return valves comprises a one-way check valve positioned to prevent the flow of hydraulic fluid in a forward direction through said return flow path.

3. A control valve according to claim **2** wherein said needle is positioned for movement in said return passage between said first and second return valves.

4. A control valve according to claim **1** including a hydraulic pump connected to said main flow passage, a normally opened switch connected to control said pump, and an actuating lever connected to said spool and positioned to engage and close said switch when said spool is in the other direction.

5. A control valve according to claim **4** including a spring positioned to bias said actuating lever and spool to a neutral position with said switch open and said first return valve closed.

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60—52; 137—493.8, 522, 599