

PATENT SPECIFICATION (11)

1 522 946

1 522 946

- (21) Application No. 15323/77 (22) Filed 13 April 1977 (19)
(31) Convention Application No. 720 860 (32) Filed 7 Sept. 1976 in
(33) United States of America (US)
(44) Complete Specification published 31 Aug. 1978
(51) INT. CL.⁸ F15B 20/00
(52) Index at acceptance
F1P 11X 4
F2G 9A 9F
(72) Inventor DUANE ROBERT SMITH



(54) ACCUMULATOR DRAIN

(71) We, CATERPILLAR TRACTOR Co., a corporation organised and existing under the laws of the State of California, United States of America, of 100 N.E. Adams Street, Peoria, Illinois 61629, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates generally to hydraulic systems and pertains particularly to a safety connector for use for example for connecting an accumulator to control means in such system.

Many hydraulic systems may utilize accumulators for accumulating and maintaining a supply of pressurized fluid for ensuring a supply of pressurized fluid for certain functions within the system. Such accumulators may be employed in intermittently operated hydraulic systems or may be employed as a back-up system in other hydraulic systems. Such accumulators are also frequently employed as a safety means in hydraulic systems should the prime mover supplying the system with fluid under pressure fail so that brakes, clutches and the like can be either set or released and loads which are suspended may be lowered for safety reasons.

Such hydraulic systems occasionally need maintenance or repair of a nature which requires the removal of one or more components from the system. Under such conditions it is desirable that fluid under pressure be bled from the system to reduce waste of fluid, or the danger of fluid leaking or being sprayed on to an engine exhaust manifold or the like with the resultant danger of fire. Such systems are frequently such as to maintain fluid pressure within the accumulator until the accumulator is deliberately bled by an operator or maintenance crew. It is desirable, however, that automatic means be provided for bleeding the accumulator in case this is overlooked by the operator or maintenance crew. Failure to bleed

the system can result in conduits, hoses and the like being propelled at high velocity through the air by means of the high pressure fluid when these components are disconnected from the system.

Also, it is advantageous to have automatic bleed means available to vent and drain any hydraulic line, regardless of pressure, prior to complete disconnection to prevent spillage, loss of fluid and hazardous conditions caused by fluid on the floor upon which maintenance personnel or operators could slip.

It is a primary object of the present invention to provide for such automatic bleeding of hydraulic systems.

According to this invention, we provide a hydraulic system having fluid control means, a fluid sump communicating with the control means, a source of fluid under pressure, and conduit means connecting the source to the control means, the conduit means including disconnectable connecting means to enable the source to be disconnected from the control means, wherein the connecting means includes vent means which automatically vents the source to the sump as soon as the connecting means is partially disconnected.

Preferably, the connecting means includes a bore defining an outlet port communicating with a passage in communication with the control means and an annular member engaged in the bore and connecting one end of the conduit means to the port to establish communication between the conduit and the passage, and a vent passage communicates with the bore between the ends thereof so that partial removal of the annular member from the bore brings the conduit and the bore into communication with the vent passage.

Two examples of hydraulic systems in accordance with the invention will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a layout diagram of one hydraulic system;

Figure 2 is a sectional view to a larger

8

scale of the connecting means in the example of Figure 1; and,

Figure 3 is a sectional view similar to Figure 2, but of an alternative embodiment of the connecting means.

Turning now to Fig. 1 of the drawing there is illustrated a hydraulic system indicated generally by the numeral 10 comprising a pump 11 supplying pressurized fluid by way of a conduit 12 including a check valve 13 to a control system including a housing 14. The housing 14 defines a chamber 15 in which a valve assembly 16 is mounted for controlling one or more motors, brakes and clutches or the like for a system. The valve 16 is supplied with fluid by way of an inlet conduit or passageway 17 which is in communication with the supply conduit 12. A branch passage 18 is connected by way of detachable conduit means 19 with an accumulator 20. The pump 11 and the accumulator 20 may both be generally referred to as sources of pressurized fluid. The detachable conduit 19 is connected to the passage 18 by way of a port and by means of a safety connecting means indicated generally at 21. The safety connecting means may be utilized between any source of pressurized fluid and the system or components within the system, and is not intended to be utilized solely between an accumulator, as illustrated. The pump 11 draws fluid by way of a conduit 22 from a sump 23 within the housing 14.

The valve assembly 16 can include one or more valves and is operative to communicate by means of a plurality of control lines 24, 25 and 26 for controlling one or more motors, brakes or the like.

Turning now to Fig. 2 there is illustrated in detail the construction of the safety connector assembly 21. The connector includes an enlarged bore coaxially with passage 17 defining a port 27 having internal threads formed therein. A shoulder 28 is formed at the juncture of the enlarger bore 27 and the passage 18.

A fitting 29 is connected to the end of hose or conduit 19 and defines a shoulder 30 which is engaged by a shoulder 31 of a threaded collar 32. The threaded collar 32 engages the abutting shoulder 31 of the fitting 29 and includes external threads co-operatively engaging the threads of the bore 27 for securing the fitting 29 within the bore 27. The fitting 29 includes an annular seal lip or ring 33 which engages an annular disc-like seal 34 against shoulder 28. A vent passage 35 communicates with the bore 25 outward from the seal 34 and the seal face 33.

It will be appreciated that in the position as shown in Fig. 2 the fluid communicates by way of conduit 19 with passageway 17 as long as the members 33 and 34 are in engagement and effective. However, once the seal

is broken between the member 29 and the seal faces 33, and 34 by partial disengagement of the connecting means fluid within the conduit 19 can immediately begin communicating with the vent passage 35 which communicates with the interior 15 of housing 14 and the sump 23. Thus, the accumulator 20 will be vented automatically upon partial disengagement or the beginning of removal of the fitting or connecting means 21.

Turning now to the embodiment of Fig. 3 an alternative embodiment is illustrated wherein equivalent or identical elements as in the previous embodiment are identified by the same reference numerals. In this embodiment, the conduit 19¹ is connected for supplying high pressure fluid from an accumulator (not shown) with a passage 18¹ in a housing 14¹ having a vent passage 35¹. In the embodiment a bore 36 concentric with bore 18¹ includes a tapered shoulder 37 and a radial shoulder 38 formed between the bore 36 and the passage 18¹. A seal member 39 fits within the end of the bore 36 at the juncture thereof with passage 18 and includes a substantially conical shaped seal face 40. A fixture 41 connected to the end of conduit 19 includes a seal face 42 engaging conical seal face 40 of the seal member 39. This fixture 41 is biased into place within the bore 36 by means of threaded collar 43 including external threads thereon threadably engaging internal threads within bore 36 and including a substantially conical forward shoulder 44 engaging an abutting shoulder 45 on the fixture member or fitting member 41.

As in the previous embodiment it will be appreciated that when the threaded member 43 is backed off from its position within bore 36 such that the seal faces 40 and 42 disengage and separate, then fluid within conduit 19 will flow outward through vent passage 35¹ into the sump of the system.

With this arrangement the accumulator of the system will be automatically vented as soon as an operator or other person begins disconnecting the connection thereof to the remainder of the system.

WHAT WE CLAIM IS:—

1. A hydraulic system having fluid control means, a fluid sump communicating with the control means, a source of fluid under pressure, and conduit means connecting the source to the control means, the conduit means including disconnectable connecting means to enable the source to be disconnected from the control means, wherein the connecting means includes vent means which automatically vents the source to the sump as soon as the connecting means is partially disconnected.

2. A hydraulic system according to claim 1, in which the connecting means includes a



scale of the connecting means in the example of Figure 1; and,

Figure 3 is a sectional view similar to Figure 2, but of an alternative embodiment of the connecting means.

Turning now to Fig. 1 of the drawing there is illustrated a hydraulic system indicated generally by the numeral 10 comprising a pump 11 supplying pressurized fluid by way of a conduit 12 including a check valve 13 to a control system including a housing 14. The housing 14 defines a chamber 15 in which a valve assembly 16 is mounted for controlling one or more motors, brakes and clutches or the like for a system. The valve 16 is supplied with fluid by way of an inlet conduit or passageway 17 which is in communication with the supply conduit 12. A branch passage 18 is connected by way of detachable conduit means 19 with an accumulator 20. The pump 11 and the accumulator 20 may both be generally referred to as sources of pressurized fluid. The detachable conduit 19 is connected to the passage 18 by way of a port and by means of a safety connecting means indicated generally at 21. The safety connecting means may be utilized between any source of pressurized fluid and the system or components within the system, and is not intended to be utilized solely between an accumulator, as illustrated. The pump 11 draws fluid by way of a conduit 22 from a sump 23 within the housing 14.

The valve assembly 16 can include one or more valves and is operative to communicate by means of a plurality of control lines 24, 25 and 26 for controlling one or more motors, brakes or the like.

Turning now to Fig. 2 there is illustrated in detail the construction of the safety connector assembly 21. The connector includes an enlarged bore coaxially with passage 17 defining a port 27 having internal threads formed therein. A shoulder 28 is formed at the juncture of the enlarger bore 27 and the passage 18.

A fitting 29 is connected to the end of hose or conduit 19 and defines a shoulder 30 which is engaged by a shoulder 31 of a threaded collar 32. The threaded collar 32 engages the abutting shoulder 31 of the fitting 29 and includes external threads co-operatively engaging the threads of the bore 27 for securing the fitting 29 within the bore 27. The fitting 29 includes an annular seal lip or ring 33 which engages an annular disc-like seal 34 against shoulder 28. A vent passage 35 communicates with the bore 25 outward from the seal 34 and the seal face 33.

It will be appreciated that in the position as shown in Fig. 2 the fluid communicates by way of conduit 19 with passageway 17 as long as the members 33 and 34 are in engagement and effective. However, once the seal

is broken between the member 29 and the seal faces 33, and 34 by partial disengagement of the connecting means fluid within the conduit 19 can immediately begin communicating with the vent passage 35 which communicates with the interior 15 of housing 14 and the sump 23. Thus, the accumulator 20 will be vented automatically upon partial disengagement or the beginning of removal of the fitting or connecting means 21.

Turning now to the embodiment of Fig. 3 an alternative embodiment is illustrated wherein equivalent or identical elements as in the previous embodiment are identified by the same reference numerals. In this embodiment, the conduit 19¹ is connected for supplying high pressure fluid from an accumulator (not shown) with a passage 18¹ in a housing 14¹ having a vent passage 35¹. In the embodiment a bore 36 concentric with bore 18¹ includes a tapered shoulder 37 and a radial shoulder 38 formed between the bore 36 and the passage 18¹. A seal member 39 fits within the end of the bore 36 at the juncture thereof with passage 18 and includes a substantially conical shaped seal face 40. A fixture 41 connected to the end of conduit 19 includes a seal face 42 engaging conical seal face 40 of the seal member 39. This fixture 41 is biased into place within the bore 36 by means of threaded collar 43 including external threads thereon threadably engaging internal threads within bore 36 and including a substantially conical forward shoulder 44 engaging an abutting shoulder 45 on the fixture member or fitting member 41.

As in the previous embodiment it will be appreciated that when the threaded member 43 is backed off from its position within bore 36 such that the seal faces 40 and 42 disengage and separate, then fluid within conduit 19 will flow outward through vent passage 35¹ into the sump of the system.

With this arrangement the accumulator of the system will be automatically vented as soon as an operator or other person begins disconnecting the connection thereof to the remainder of the system.

WHAT WE CLAIM IS:—

1. A hydraulic system having fluid control means, a fluid sump communicating with the control means, a source of fluid under pressure, and conduit means connecting the source to the control means, the conduit means including disconnectable connecting means to enable the source to be disconnected from the control means, wherein the connecting means includes vent means which automatically vents the source to the sump as soon as the connecting means is partially disconnected.

2. A hydraulic system according to claim 1, in which the connecting means includes a



9

3

1,522,946

3

5 bore defining an outlet port communicating with a passage in communication with the control means and an annular member engaged in the bore and connecting one end of the conduit means to the port to establish communication between the conduit and the passage, and in which a vent passage communicates with the bore between the ends thereof so that partial removal of the annular member from the bore brings the conduit and the bore into communication with the vent passage.

10 3. A hydraulic system according to claim 1 or claim 2, wherein the source of pressurized fluid includes an accumulator.

15 4. A hydraulic system according to claim 2, or claim 3 when dependent on claim 2, wherein the bore is internally screw-threaded along its length and has an annular shoulder at one end thereof, the annular member is externally screw-threaded and screwed into the bore from the end of the bore remote from the shoulder and seal means is provided at a forward end of the annular member and is in engagement with the annular shoulder for sealing the conduit means to the passage, the conduit means and the passage being brought into communication with the vent passage as the annular member is unscrewed from the bore.

20 5. A hydraulic system according to claim

4, in which the vent passage communicates with the bore closely adjacent the shoulder so that the seal means is disengaged from the shoulder, and the conduit means and the passage are vented immediately unscrewing of the annular member is started.

35 6. A hydraulic system according to claim 4 or claim 5, in which the seal means comprises an annular disc-like seal and an annular seal lip, said annular disc-like seal being retained between said shoulder and said annular seal lip.

40 7. A hydraulic system according to claim 4 or claim 5, in which the seal means includes an annular seal having a substantially conical shaped seal face and an annular seal face on a part fixed to the end of the conduit means, the annular seal face engaging said conical shaped seal face, and said annular seal being retained between said shoulder and said annular seal face.

50 8. A hydraulic system according to claim 1, substantially as described with reference to Figures 1 and 2, or Figure 3, of the accompanying drawings.

55
For the Applicants:—
GILL, JENNINGS & EVERY,
Chartered Patent Agents,
53/64 Chancery Lane,
London, WC2A 1HN.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1978.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY
from which copies may be obtained.

