Aug. 10, 1943. J. W. OVERBEKE 2,326,487

VALVE

Filed Aug. 20, 1941

Fig. 1.

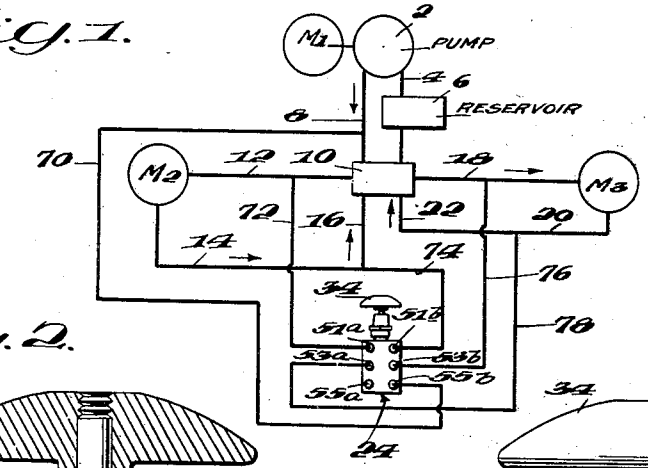


Fig. 2.

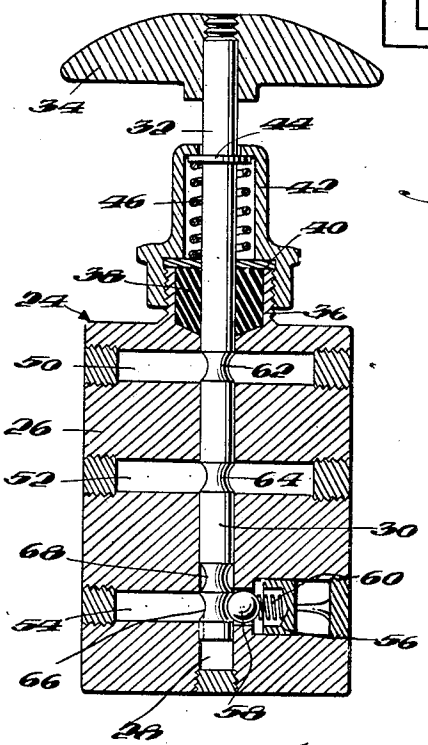


Fig. 3.

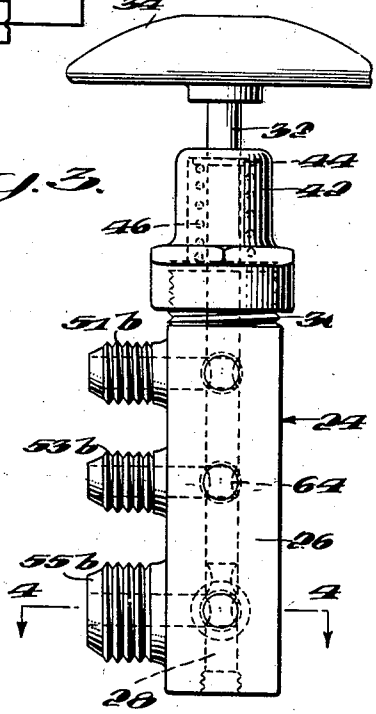
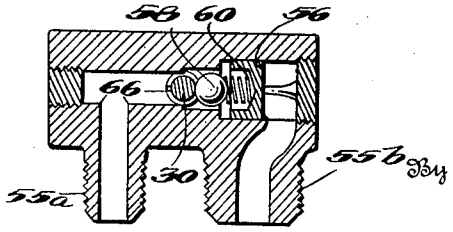


Fig. 4.



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2,326,487

VALVE

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3 Claims. (Cl. 121—38)

This invention is directed to an automatic pressure valve for a hydraulic system. More particularly the invention is directed to the construction of a valve which will prevent operating units of a hydraulic system from being locked in place by hydraulic pressure.

In hydraulically operated mechanisms in aircraft, for example, a movable gun turret, the source of hydraulic pressure as, for example, a pump, is located outside the turret, while within the turret are motors for turning and elevating the turret, which motors are actuated by a control valve within the turret. A closed pressure circuit is thus established between the control valve and the motors. Should the gunner in the turret become injured or otherwise incapable of action it is impossible to turn the turret externally in order to remove the gunner because of the pressure lock which is established by the control valve and the motors. In other words, the closed hydraulic system prevents the motors from being operated. In such instances it is necessary to dismantle the turret in order to remove the gunner.

An object of the instant invention is to provide a valve which will automatically release the pressure lock in a system such as previously described.

Another object of the invention is to produce a valve which can be actuated by a gunner within a turret in order to establish pressure for the motors for operating the turret, which valve will be automatically released when the pressure for operating the motors is cut off from outside the turret.

Generally these and other objects of the invention are obtained by providing a valve which includes a spring pressed member and a detent. When the member is pressed downwardly against the spring, pressure from a source outside the turret will force the detent to hold the member in a position where it establishes a pressure system between the control valve in the turret and the motors for operating the turret. When the pressure source from the outside of the turret is cut off, the detent is released and the spring actuates the member so that the pressure lock on the motors is released and the turret can be moved from the outside.

The means by which the objects of the invention are obtained are more fully described with reference to the accompanying drawing in which:

Fig. 1 is a diagrammatical view of a pressure system in which the novel valve is inserted;

Fig. 2 is a cross-sectional view of the novel valve;

Fig. 3 is a side elevational view of the valve; and

Fig. 4 is a cross-sectional view of the valve on the line 4—4, Fig. 3.

In Fig. 1 a pressure system for operating a motor driven turret is shown which consists of a motor M1 connected to a pump 2 which is joined by conduit 4 to a fluid reservoir 6, all of these elements being located outside the turret. From pump 2 an oil pressure line 8 extends into the turret to a control valve 10. This valve communicates with motor M2 through conduit 12, with return lines 14 and 16 leading from motor M2 to valve 10. Valve 10 further communicates with motor M3 through conduit 18 and return lines 20 and 22. Control valve 10 is of a known construction and is for the purpose of either separately or simultaneously actuating motors M2 and M3 which may, for example, be for the purpose of rotating and elevating the turret, respectively. Reference is made to U. S. Patent No. 2,204,048 for the detail construction of a valve serving the purposes of control valve 10.

It is apparent that valve 10 forms a lock in the pressure line from the valve to each of the motors and return. Consequently, if the gunner is incapable of operating the valve 10 to bring the turret to a position where he can leave the turret, the turret cannot be turned externally by hand because the motors are locked against turning by the pressure in the lines connecting the valve with the motors. In order to avoid this difficulty the automatic release valve of the instant invention is added to the above described system.

As more fully shown in Figs. 2 to 4, this release valve 24 consists of a housing 26 vertically cored to form a cylinder 28 in which is mounted a piston 30. This piston is extended outwardly of the housing by a stem 32 upon which is placed a handle 34. On the upper side of the housing 26 is a threaded annular flange 36 within which is placed packing 38 through which the piston stem passes. This packing is held in place by a plate 40 which in turn is held in position by a fitting 42 threaded to flange 36. An annular collar 44 on stem 32 abuts the inwardly flanged upper portion of fitting 42 and limits the upward motion of piston 30. Between collar 44 and plate 40 is a coil spring 46 which urges the piston upwardly.

The housing 26 is transversely bored to form

passageways 50, 52 and 54. Threaded fittings 51a and 51b, note Figs. 1 and 3, provide entrances into bore 50 and means for attaching conduits to valve 24. Fittings 53a and 53b are similarly provided for bore 52, while fittings 55a and 55b serve the same purpose for bore 54. Bore 54 is further provided on the side of cylinder 28 communicating with fitting 55b with an enlarged portion in which is mounted a piston 56. This piston is adapted to operate against a ball 58 through the intermediary of a spring 60.

Piston 30 has a neck or groove 62 which has a length equal to the diameter of bore 50 so that when the piston is in the position shown in Fig. 2, communication is established through bore 50 past piston 30. A similar neck or groove 64 is provided on piston 30 for establishing communication by bore 52. At the lower end of the piston two adjacent necks or grooves are formed, the lower one 66 being engaged by the ball detent 58 when the piston is in its upper position, note Fig. 2, while the second groove 68 is engaged by the ball detent when the piston is moved downwardly.

Valve 24 is mounted in the circuit of Fig. 1 as follows:

A branch pressure line leads from the conduit 8 to fitting 55b, thus providing a source of pressure from the pump 2 to piston 56 within valve 24.

Conduit 12 extending between control valve 10 and motor M2 is branched by conduit 72 to fitting 51a and bore 50, while conduit 74 extends from fitting 51b to conduit 16.

The circuit between control valve 10 and motor M3 is also joined to release valve 24 by a conduit 76 branched from conduit 18 to fitting 53b, and a conduit 78 branched from conduit 20 to fitting 53a, communication thus being established through bore 52 in valve 24.

From fitting 55a a short length of conduit (not shown) extends which serves merely as a leakage discharge conduit for any fluid which may seep past piston 56 in bore 54.

The operation of the release valve is as follows:

When the gunner takes his position in the turret, motor M1 is started to provide pressure for operating motors M2 and M3 through control valve 10. The gunner then presses down on handle 34 of release valve 24. Thus in valve 24, piston 30 is urged downwardly against the pressure of spring 46 and ball 58 engages the detent groove 68. As fluid pressure is conveyed to one side of piston 56 through conduits 8 and 70, ball 58 is held tightly in groove 68 so that the piston 30 can not rise in spite of spring 46. At the same time piston 30 has been moved so that bores 50 and 52, respectively, are closed by piston 30 and no fluid can pass through the circuits in which these bores are included. A groove in the bottom edge of piston 30 forms a relief passage for oil trapped in the bottom of cylinder 28 to escape, and thus ensuring that piston 30 can be pressed downwardly.

If the gunner should become incapable of operating control valve 10 and it is desired to move the turret by manually turning it from the outside, all that needs to be done is to stop motor M1. As pump 2 ceases to operate, a pressure drop takes place in conduit 70, thus relieving the hydraulic pressure on piston 56. The force of spring 46 is then greater than the pressure upon ball 58 so that the piston 30 is automatically moved upward into the position shown in Fig. 2, and communication is established through bores 50 and 52, respectively. Motor M2 is then placed in an open circuit through conduits 12, 72, bore 50, conduits 74 and 14 and as no pressure lock exists this motor can be turned by externally moving the turret. Motor M3 is free to move, as an open circuit is established through conduits 20, 78, bore 52, conduits 76 and 18, so motor M3 can be turned by externally moving the turret.

The invention thus achieves the objects of the invention by providing a release valve connected into auxiliary circuits with the motors for operating the turret, and connected with the source of fluid pressure so that upon stopping the pressure from the source of fluid pressure the valve automatically opens the auxiliary pressure lines and removes any pressure lock which might have occurred by reason of the control valve for operating the motors. The novel valve can be employed in any hydraulic system where it is desired to move machinery by by-passing a control valve. The novel valve is of simple, lightweight and compact construction and easily operable by a quick single motion.

Having now described the means by which the objects of the invention are obtained, I claim:

1. In a hydraulic system including a source of fluid pressure, a plurality of fluid motors and a control valve therefor, duct means interconnecting the pressure source and said motors including return ducts, a normally closed valve in a duct means between the pressure and return ducts of said motors said valve having a spring urging the valve to the open position, pressure actuated detent means for holding the valve in the closed position during the entire operation of said motor, whereby, upon a drop in fluid pressure, the valve will open a fluid passage around the motors to relieve the pressure lock.

2. A pressure release valve for an emergency by-pass line of a pressure system comprising a housing, a fluid passage in said housing to which said line is connected, a cylinder bore extending across said passage, a piston movably mounted in said bore to open or close said passage, a spring adjacent one end of said piston urging said piston to open said passage, a detent adjacent the other end of said piston, and a hydraulically operable means actuated by the pressure in said system cooperating with said detent for holding said piston to close said passage as long as the hydraulic pressure is maintained.

3. A pressure release valve for an emergency by-pass line of a pressure system comprising a housing, a fluid passage in said housing to which said line is connected, a cylinder bore extending across said passage, a piston movably mounted in said bore to open or close said passage, a spring adjacent one end of said piston urging said piston to open said passage, a detent groove in said piston adjacent the opposite end of said piston, a second passage in said housing adjacent said opposite piston end, and a detent in said second passage movable into engagement with the detent groove in the piston by hydraulic pressure of the system to prevent said piston from being moved by said spring while the hydraulic pressure of the system is maintained.

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