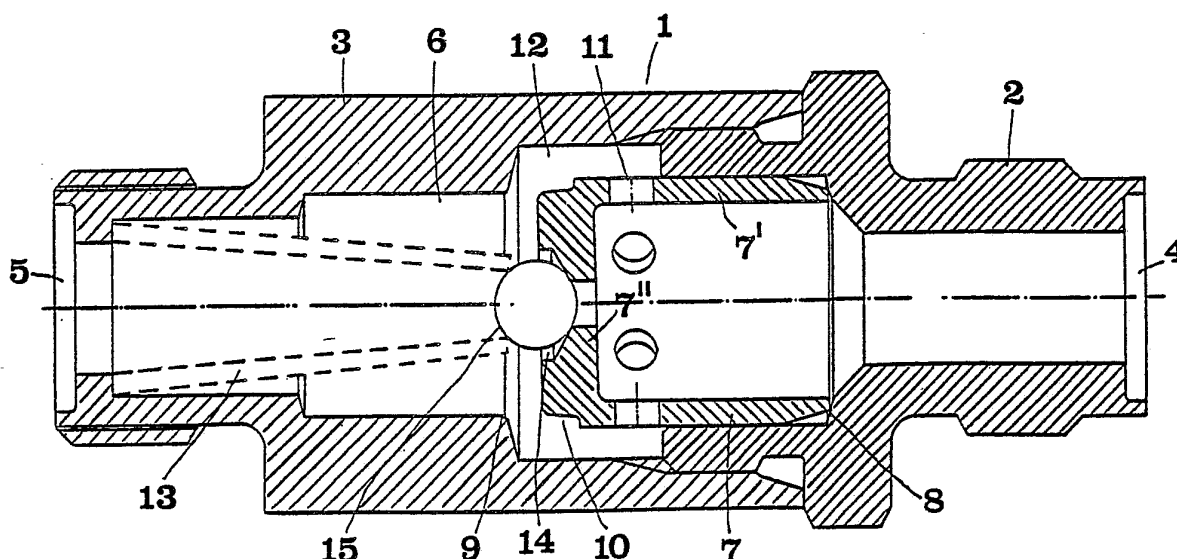




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(54) Title: PRESSURE DROP HOSE VALVE



(57) Abstract

A pressure drop hose valve comprises a valve body (1) having an inlet (4) and an outlet (5) as well as a throughflow passageway (6) which connects the inlet and the outlet and in which a valve cone (7) is axially movable. The portion of the valve cone (7) facing the outlet (5) is formed with a seat surface (10) for cooperation with a seat (9) provided in the passage of the valve body and normally located at a distance from said valve cone seat surface (10). A spring (13) strives to displace the valve cone (7) towards the inlet (4), the seat surface of the valve cone and the valve seat of the body being designed such that the valve cone, during its displacement towards the outlet (5) after activation of the valve following a pressure drop in the hose, is constantly held or wedged in the seat.

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PRESSURE DROP HOSE VALVE

The present invention relates to a pressure drop hose valve comprising a valve body having an inlet and an outlet as well as a throughflow passage which connects the inlet and the outlet and in which a valve cone is axially movable.

It is already known to mount pressure drop hose valves in hydraulic or pressure fluid systems of different types, for cutting off the supply of pressure fluid in case a pressure drop or damage occurs in some part of the system downstream of the valve. A common type of pressure drop hose valve is provided with a valve member that is urged towards the open position by a compression spring and has a restriction where the pressure fluid is subjected to a pressure drop. An increased flow due to e.g. a pressure drop in the hose results in an increase of the pressure drop across the valve member which thus is urged against a valve seat, thereby to close the communication between the inlet and the outlet of the valve. However, efficacious prior art pressure drop hose valves are of complicated construction, and the design of the restrictions such that the valves will depend heavily on viscosity, which implies that the valves operate at different activating flows under varying working conditions.

Another disadvantage of the known pressure drop hose valves is that the force exerted by the compression spring on the valve member tends to reopen the valve, despite a pressure drop having occurred. If the valve is mounted in e.g. the boom of a construction machine, the dynamics in the boom might temporarily decrease or eliminate the fluid pressure urging the valve towards the closed position. The compression spring may then reopen the valve, which restarts the closing operation

and lowers the boom in an oscillating movement, with the ensuing risk of damage to the construction machine and its implements and injury to the workmen standing round.

5 It is the object of the present invention to obviate the above-mentioned drawbacks and to provide a pressure drop hose valve which is simple and reliable and affords a distinct shut-off of the conduit system. According to the principal characteristic feature
10 of the invention, this object is achieved in that the portion of the valve cone facing the outlet is formed with a seat surface for cooperation with a seat provided in the passage of the valve body and normally located at a distance from said valve cone seat surface,
15 and that a spring strives to displace the valve cone towards the inlet, the seat surface of the valve cone and the seat of the body being designed such that the valve cone, during its displacement towards the outlet after activation of the valve following a pres-
20 sure drop in the hose, is constantly held or wedged in the seat.

The valve cone is preferably in the form of a hollow cylinder or receptacle which is open in the direction of the inlet and has one or more radial
25 holes to permit fluid to flow from the inside of the valve cone to a by-pass in the passage.

In the accompanying drawing

Fig. 1 is a longitudinal section through a pressure drop hose valve according to the invention in the open
30 position, and

Fig. 2 is a section through the same valve in the closed position.

The valve shown in the drawing comprises a body 1 consisting of two parts 2 and 3 screwed together
35 by means of an inner and an outer thread, respectively. The body part 2 is provided with an inlet 4 and the body part 3 with an outlet 5, which can be connected

to the other components of the conduit system in some suitable manner. The inlet 4 and outlet 5 communicate with one another via a throughflow passage or bore 6 extending through the body 1. In this passage 6, a valve cone 7 is reciprocable between a stop 8 in the body part 2 and a seat 9 in the body part 3.

In the described, preferred embodiment, the valve cone 7 is composed of a hollow cylinder or receptacle which is open towards the inlet 4 and has a shell-shaped wall 7' and an end wall 7". Said end wall 7" seals the cylinder body at the end facing the outlet. The outside of the end portion of the valve cone 7 facing the outlet is formed as a seat surface 10. Furthermore, the valve cone is provided with a suitable number of circumferential, radial holes 11 through which fluid can pass from within the cavity in the valve cone. In the described embodiment, the cylinder wall 7' is adapted to seal against the inside of the passage portion provided in the body part 2. In order to permit pressure fluid to flow through the valve, the passage 6 of the valve body is enlarged to form a by-pass 12 in the area outside the throughflow holes 11. The axial extension of this passage is at least of the same length as the path of movement of the holes 11 when the valve cone 7 is displaced between the front and back extreme positions of the holes.

Positioned between the outlet 5 and the valve cone 7 is a compression spring 13 which constantly strives to urge the valve cone towards the inlet 4, i.e. towards the open position of the valve. The valve seat 9 and the seat surface 10 of the valve cone are mutually adapted in such a way that they are constantly held or wedged to one another when, after a pressure drop, the valve cone is moved into engagement with the seat. In practice, this characteristic wedging effect of the invention can be achieved in different ways. For example, both the seat 9 and the seat surface

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10 on the valve cone can be cylindrical and fit into one another by press fitting. Furthermore, the seat surface can be slightly conical or tapering to render the wedging of the seat surface to the valve seat more secure. Also the seat surface 10 can be partially conical or partially cylindrical, i.e. it can have a conical portion merging into a cylindrical portion. The seat 9 can also be slightly conical to provide the said wedging action either in cooperation with a conical seat surface 10 or in cooperation with a cylindrical seat surface.

In the normal condition where the valve cone 7 is in the open position shown, hydraulic oil or other fluid flows in the direction from the inlet 4 towards the outlet 5 via the holes 11 and the by-pass 12. Should a pressure drop occur downstream of the valve, the oil is evacuated on the exit side of the valve cone, resulting in an increased flow through the holes 11, which in turn causes to the counteracting force of the compression spring 13 to be overcome so that the valve cone is urged into engagement with the seat 9, shutting off the passage. Since the seat surface 10 is distinctly wedged in the seat 9, the risk of an unintentional reopening of the valve is eliminated.

In the embodiment shown, there is provided, in the end wall 7" of the valve cone, an opening 14 forming a seat for a valve member 15 disposed between the compression spring 13 and the valve cone 7 and having the form of ball, a cone or the like. In this way, a pressure limiting valve is obtained as an integrated part of the pressure drop hose valve. The pressure limiting valve functions of course only when the pressure drop hose valve is closed, and its characteristic depends on the compression spring 13.

It will be appreciated that the invention is not limited only to the embodiment described above and shown in the drawing. Thus, the valve cone need

not be in the form of a hollow cylinder. For example, the cone may consist of a substantially solid body around which flows the fluid in question when passing from the inlet to the outlet. Although it is preferred to dispose a compression spring between the outlet and the valve cone, it is also possible to position a tension spring in the area between the inlet and the valve cone to urge the valve cone towards the open position and to retain the ball or the valve member 15 in the closed position. Although it is preferred to give both the valve cone and its associated seat a rotationally symmetric form, it is possible to design these components with an optional non-circular cross-section. Finally, it should be mentioned that the valve according to the invention naturally can be used in conduits other than hose conduits.

CLAIMS

1. Pressure drop hose valve comprising a valve body (1) having an inlet (4) and an outlet (5) as well as a throughflow passageway (6) which connects the inlet and the outlet and in which a valve cone (7) is axially movable, characterised in that the portion of the valve cone (7) facing the outlet (5) is formed with a seat surface (10) for cooperation with a seat (9) provided in the passage of the valve body (1) and normally located at a distance from said valve cone seat surface (10), and that a spring (13) strives to displace the valve cone (7) towards the inlet (4), the seat surface (10) of the valve cone and the seat (9) of the body being designed such that the valve cone (7), during its displacement towards the outlet (5) after activation of the valve following a pressure drop in the hose, is constantly held or wedged in the seat.

2. Valve as claimed in claim 1, characterised in that the valve cone is in the form of a hollow cylinder or receptacle (7) which opens in the direction of the inlet (4) and has one or more radial holes (11) to permit a fluid to flow from the inside of the valve cone to a by-pass (12) in the passage (6).

3. Valve as claimed in claim 1 or 2, characterised in that the valve seat (9) and the seat surface (10) are cylindrical and formed to establish a press fit with one another.

4. Valve as claimed in claim 1 or 2, characterised in that the valve seat (9) is cylindrical, and that the seat surface (10) is slightly conical.

5. Valve as claimed in claim 4, characterised in that the conical seat surface (10)

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merges into a cylindrical portion insertable in the valve seat to establish a press fit.

6. Valve as claimed in any one of the preceding claims, characterised in that the valve cone (7), in its end facing the outlet (5), is provided with an opening (14) forming a valve seat for a spring-loaded second valve member (15), e.g. a ball, the spring (13), the valve member (15) and said opening (14) forming a pressure limiting valve in the actuated condition of the pressure drop hose valve.

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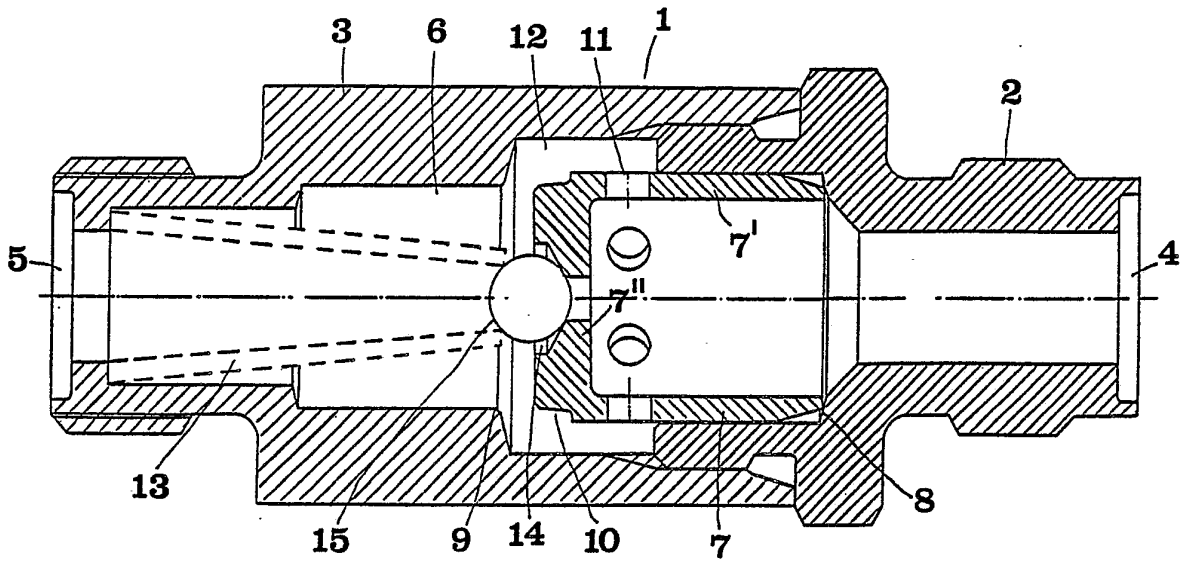


FIG 1

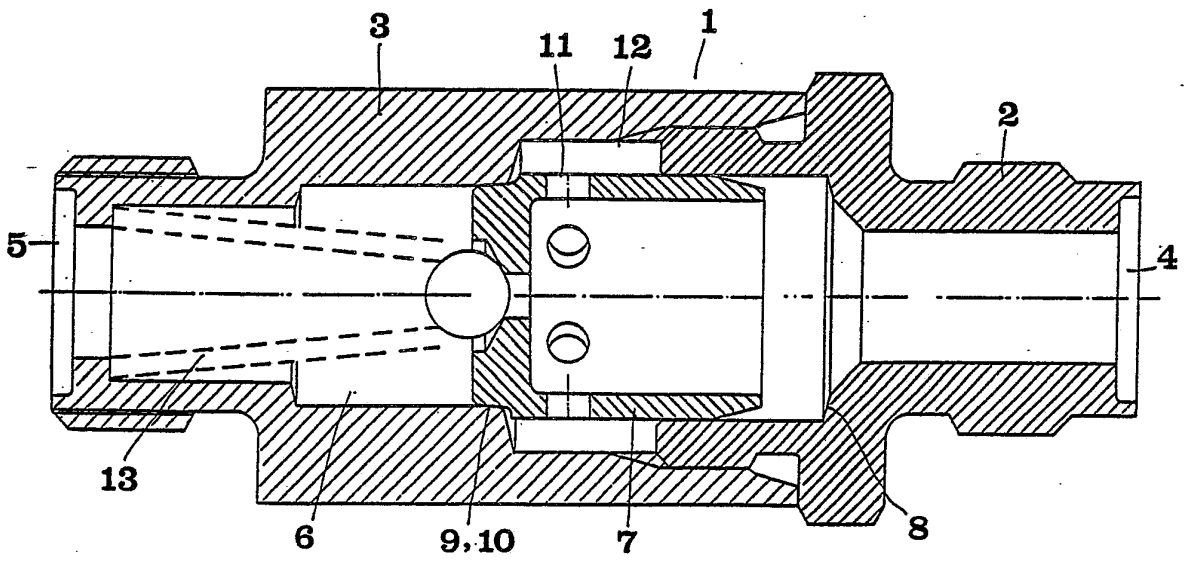
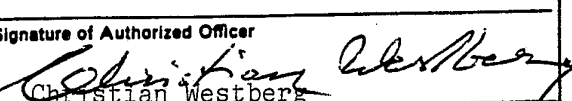


FIG 2

INTERNATIONAL SEARCH REPORT

International Application No PCT/SE88/00121

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC ⁴		
F 16 K 17/34		
II. FIELDS SEARCHED		
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IPC 4	F 16 K 17/20-/30	
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Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
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III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	US, A, 2 750 956 (R STEVENSON) 19 June 1956	
A	US, A, 2 439 116 (W WATERMAN) 6 April 1948	
A	DE, A1, 2 820 811 (GOK REGLER- UND ARMATUREN GMBH & CO KG) 15 November 1979	
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IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
1988-06-28	1988 -07- 01	
International Searching Authority	Signature of Authorized Officer	
Swedish Patent Office	 Christian Westberg	