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PRESSURE ACTUATED SWITCH HAVING ONE CUP-SHAPED CONTACT

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Fig. 1.

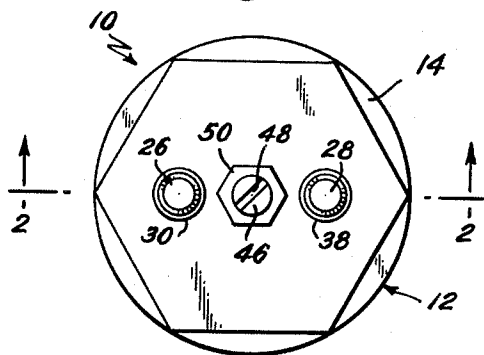


Fig. 2.

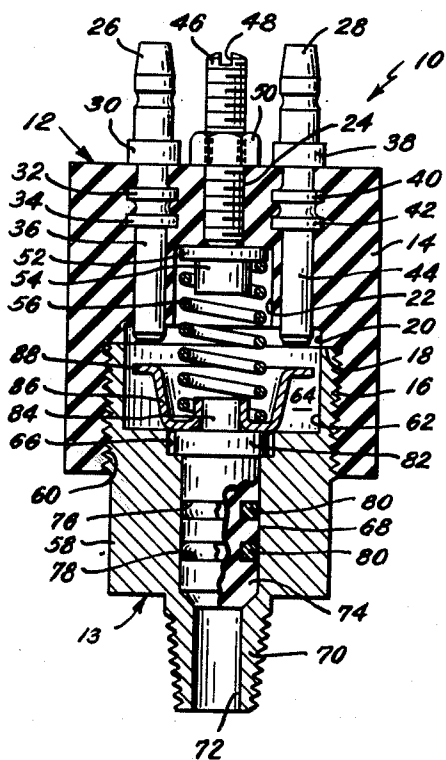
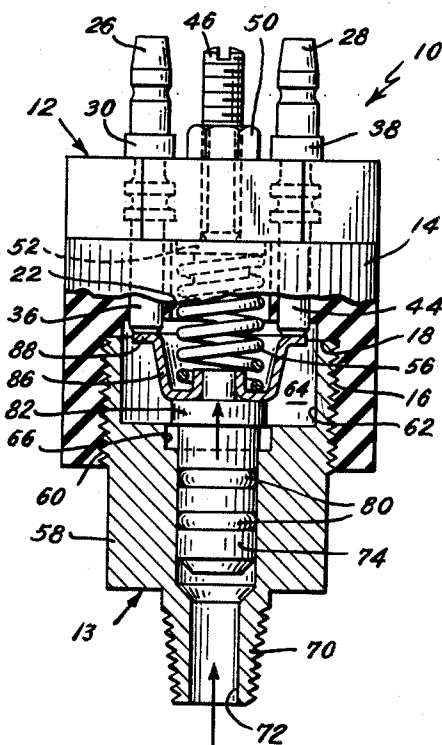


Fig. 3.



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PRESSURE ACTUATED SWITCH HAVING ONE CUP-SHAPED CONTACT

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1 Claim. (Cl. 200—82)

The present invention relates to a pressure switch. More particularly, the present invention relates to a pressure switch that is adapted to control operation of an electrical circuit in response to the establishment of a predetermined fluid pressure in a remote system.

The pressure switch embodied in the present invention is of that type which includes a fluid operated piston that communicates with a source of fluid pressure from hydraulic or fluid system. Located within the housing of the pressure switch embodied herein are spaced contacts that are adapted to be moved into electrical communication with each other when the pressure in the hydraulic system reaches a predetermined value. Pressure switches of this type described are generally well known in the art and prior to the instant invention have been fairly complex in construction and have required relatively large housings or casings that necessarily increased the cost of the switch. The pressure switch of the present invention is relatively compact in construction and includes few moving parts so that the accuracy of the switch is maintained. This type of switch is particularly desirable for use on hydraulic starters for diesel engines, aircraft hydraulic systems, or any hydraulic system where the circuit must be closed at a predetermined pressure. Notwithstanding the compact construction of the pressure switch embodied herein, the pressure range is adjustable and may be set in a matter of seconds to operate in any required range from zero to approximately 3000 p.s.i.

Accordingly, it is an object of the present invention to provide a pressure switch that is adapted to control operation of an electrical circuit where the circuit must be closed at a predetermined fluid pressure that occurs in a remote fluid system.

Another object of the present invention is to provide a pressure switch for use in hydraulic controls that is relatively compact in design and is capable of withstanding pressures far in excess of the operating range thereof.

Still another object is to provide a pressure switch for use in hydraulic systems where the circuit in the switch is adapted to be closed at a predetermined pressure that occurs in the system.

Still another object is to provide a pressure switch for use in a hydraulic system that is adjustable in the operating range thereof and that includes a unique contact member that is adapted to establish contact within the switch when a predetermined pressure is reached in a remote hydraulic system.

Other objects, features and advantages of the invention will become apparent as the description thereof proceeds when considered in connection with the accompanying illustrative drawings.

In the drawings which illustrate the best mode presently contemplated by me for carrying out my invention:

FIG. 1 is a top plan view of the pressure switch embodied in the present invention;

FIG. 2 is a sectional view taken along lines 2—2 in FIG. 1 and showing the contact components in the normally open position; and

FIG. 3 is a sectional view similar to FIG. 2 showing the contact components after electrical communication has been established therebetween.

Referring now to the drawings and particularly to

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FIGS. 2 and 3, the pressure switch embodied herein is generally indicated at 10 and includes a housing that comprises a block generally indicated at 12 and a plug generally indicated at 13. The block 12 includes a body portion 14 that is formed of a plastic material having insulating properties. Formed in one end of the body portion 14 is a threaded opening 16 that terminates interiorly of the body portion 14 at a shoulder 18. Communicating with the central opening 16 in the body portion 14 is a shallow recess 20, the diameter of which is slightly reduced with respect to the diameter of the opening 16 so as to define the shoulder 18. Formed interiorly of the body portion 14 and communicating with the shallow recess 20 is an inner chamber 22. An axial opening 24 extends through the body portion 14 from the end opposite that in which the opening 16 is formed and is threaded, the purpose of which will hereinafter be described.

Molded in the body portion 14 and formed as an integral part thereof are spaced contact elements 26 and 28. Both the contact elements 26 and 28 project outwardly of the body portion 14 of the block 12. The contact element 26 includes an outer flange 30 that abuts an end wall of the block 12 and inner spaced flanges 32 and 34 that are adapted to promote the securement of the contact element 26 within the block 12 in the molding operation thereof. A contact bar 36 is joined to the flange 34 and projects through the body portion 14 and into the recess 20. The contact element 28 is formed similarly to contact element 26 and includes an outer flange 38, inner flanges 40 and 42, and a bar 44 that projects through the body portion 14 into the recess 20 of the block 12. An adjustment screw 46 threadably engages the threaded opening 24 in the body portion 14 of the block 12 and is provided with a slot 48 for receiving an adjusting tool, such as a screwdriver, for adjusting the position of the adjusting screw 46. A lock nut 50 threadably engages the exposed portion of the adjusting screw 46 and is adapted to lock the adjusting screw in the adjusted position thereof. It is understood that when the adjusting screw is to be rotated for adjusting the pressure switch as will be described hereinafter, the lock nut 50 will be loosened with respect to the end wall of the block 12 that it engages. The inner end of the adjusting screw 46 engages a flanged head 52 of a plug 54 that extends interiorly of a spring member 56, the purpose of which will be described.

The plug 13 is preferably formed of a metal material in order to withstand the high pressures of the operating fluid and includes a body 58 that is provided with an outer threaded portion 60 that threadably engages the threaded opening 16 of the block 12. Formed centrally in the body 58 of the plug 13 adjacent the innermost end thereof is a central opening 62 that cooperates with the recess 20 in the block 12 to define a central chamber 64. Communicating with the central opening 62 is a coaxially formed recess 66. Extending through the body 58 is a chamber 68 that is coaxial with respect to the opening 62 and recess 66 and communicates with the recess 66. Integrally joined to the body 58 of the plug 13 at the outermost end thereof is a reduced neck section 70, the outermost surface of which is threaded for being received in any suitable hydraulic or fluid apparatus. Extending through the reduced neck section 70 is a central passage 72 that communicates with the chamber 68 on the inner side thereof and with a source of fluid pressure on the outer side thereof when the pressure switch is located in communication with a fluid pressure system.

Positioned within the chamber 68 is a piston 74 that is provided with annular spaced grooves 76 and 78 in which O rings 80 are disposed. The innermost end of the piston 74 has a flange 82 joined thereto that is received with-

in the central recess 66. Joined to the exposed end of the flange 82 is a projection 84 that extends through a central opening in a cup-shaped contact member 86. The central opening in the cup-shaped contact member 86 receives the projection 84 therein, thereby positively locating the contact member 86 in position. The outermost end of the wall of the contact member 86 terminates in an annular flange 88 which as shown in FIGS. 2 and 3 has a diameter that provides for establishing simultaneous contact with the inner ends of the contact elements 26 and 28. Both the contact elements 26 and 28 and the contact member 86 are formed of a material such as silver that enables the contact components to carry high electrical loads with a minimum of arcing therebetween. It will be noted that the spring member 56 extends over the projecting portion of the contact member 86, and extends around and receives the projection 84 of the piston 74. The piston 74 is preferably formed of an insulating plastic material such as "Delrin" in order to prevent grounding of the contact member 86 which the piston engages. The plastic piston 74 is also preferred for use, since it is strong and will not absorb moisture of the operating fluid.

In use, the pressure switch 10 is inserted into a wall of fluid pressure apparatus such as a hydraulic system with the passage 72 communicating with the interior of the fluid pressure system so that the pressure exerted on the outer end of the piston 74 is the same as the pressure within the system. In normal operation, the contact member 86 is located within the chamber 64 in the position illustrated in FIG. 2, that is, spaced from the contact elements 26 and 28. With the spring member 56 adjusted to a predetermined position by the adjusting screw 46 so as to require a predetermined pressure for moving the piston 74 and consequently the contact element 86, the pressure switch is set for operation for establishing electrical communication between the contact elements 26 and 28.

When the pressure within the remote system exceeds a predetermined value, the piston 74 is moved in the direction of the arrow as illustrated in FIG. 3. Since the spring member 56 will resist movement of the piston 74 to only a predetermined pressure, movement of the piston 74 in response to the pressure in the system exceeding this value will cause the spring member 56 to be compressed. As the spring member 56 is compressed in response to movement of the piston 74, contact element 86 is moved toward the contact elements 26 and 28 until engagement of the annular flange 88 is made with the innermost ends of the contact elements. Electrical communication is thereby established between the contact elements 26 and 28 for completing an electrical circuit. Although not specifically disclosed herein, the electrical circuit as utilized may be employed in connection with hydraulic starters for diesel engines or in any electrical circuit where the circuit must be closed at a predetermined pressure in a remote fluid system.

When the pressure in the remote system falls below

the predetermined value, the spring 56 will urge the piston 74 outwardly and break electrical communication between the contact elements 26 and 28. The circuit is then open and the switch returns to the normal position thereof.

While there is shown and described herein certain specific structure embodying the invention, it will be manifest to those skilled in the art that various modifications and rearrangements of the parts may be made without departing from the spirit and scope of the underlying inventive concept and that the same is not limited to the particular forms herein shown and described except insofar as indicated by the scope of the appended claim.

What is claimed is:

In a pressure switch that is adapted to control operation of a device in response to the establishment of a predetermined fluid pressure in a remote system, a housing including a plug member and a contact block secured to said plug member, said plug member having a central recess formed therein and a first chamber communicating with said central recess and with a source of external pressure, a piston located in said first chamber and being responsive to the external source of pressure for movement in an axial direction in said first chamber, said contact block having a central recess formed therein that communicates with a central recess in said plug member and that defines a central chamber therewith, said piston including an upper flange portion on which a projection is formed, said projection extending into said central chamber, spaced contact bars embedded in said contact block, each of said contact bars having a portion exposed in said central chamber, the opposite end of each contact bar extending outwardly of said contact block, a cup-shaped contact member located in said central chamber having an inner wall and an outer peripheral flange, an opening being formed in said inner wall through which said projection extends and the underside of said inner wall engaging the upper flange portion of said piston, so that upper movement of said piston results in a corresponding movement of said contact member, and means for normally retaining said contact member out of engagement with said contact bars, said contact member being movable by said piston against the action of said retaining means and in response to a predetermined pressure from said source on said piston, wherein said peripheral flange is moved into engagement with said contact bars to establish electrical communication therebetween.

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