

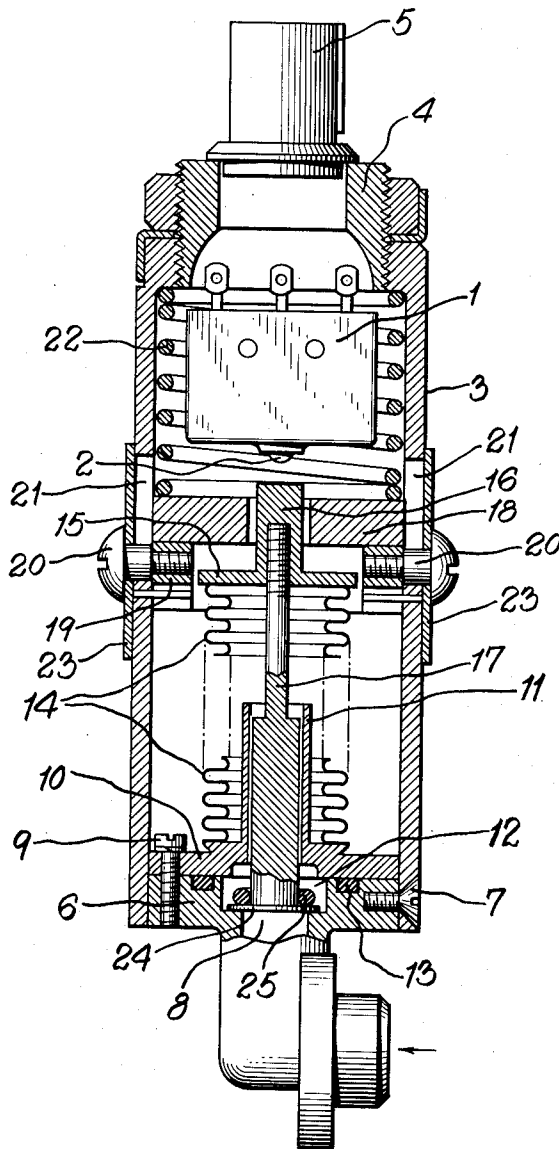
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PRESSURE SWITCH

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PRESSURE SWITCH

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8 Claims. (Cl. 200-83)

My present invention relates to a pressure switch device in which a switch is actuated by pressure applied to an operating element of the switch as, for example, by a bellows that expands under fluid pressure.

Switches of the above type may be subjected occasionally to excess pressure or overpressure, that is, to pressure above or beyond that required to actuate the switch. My present invention provides means by which the operating element and the switch element actuated by it are held in the position they attain when subjected by overpressure until reset manually. In this way a warning that the system has been subjected to overpressure is obtained and retained until the system has been reset.

Pressure switches of this type are made sensitive to variations in pressure and this sensitivity might be impaired by mechanical latching means actuated by moving with or engaging any moving parts of the system.

My invention provides a magnetic latch which imposes no force or restraint on the movement of any of the switch actuating elements during the normal actuation of the switch but which holds a movable switch actuating element when the switch is subjected to a pressure above that required to actuate it. The moving element may be released from the magnetic latch by manually moving the magnetic latching element until its effective magnetic field is beyond the movable element.

The various features of my invention are illustrated by way of example in the accompanying drawing which shows a longitudinal section of a pressure switch mechanism embodying the invention.

In the embodiment shown in the drawing a switch 1, having a projecting actuating stem 2 is mounted in a tubular housing 3. The switch is supported near one end of the housing from a closure element 4 having an outlet tube 5 for the leads of the switch. The stem 2 extends substantially co-axially of the housing toward the opposite end.

The opposite end of the housing is closed by a plug 6 secured to the housing by screws 7 and having an inlet passage 8 for pressure fluid. Fixed to the inner face of the plug 6 by screws 9 is a plate 10 having a tube 11 open at each end and communicating with the passage 8 through a recess 12 formed in the plug 6 and plate 10. The plate 10 is sealed air-tightly to the plug 6 by an annular gasket 13 encircling the recess 12 between the plug and plate.

Air-tightly secured to the inner face of the plate 10 is a bellows 14 co-axial with and enclosing the tube 11 and extending toward the switch 1.

The upper end of the bellows is closed fluid-tightly by a closure plate 15 of magnetic material and has a stem 16 extending toward the stem 2 of the switch 1 in such manner that extension of the bellows under the pressure admitted through the passage 8 will move the stem 16 into contact with the stem 2 and move the latter to actuate the switch. The closure plate 15 has a guide stem 17 extending downwardly into the tube 11 to the recess 12 and is enlarged within the tube to slide freely and be guided therein.

Under excess pressure the bellows 14 may move the closure plate 15 beyond the distance required to actuate the switch 1. Upon such movement the closure plate is held magnetically to the under surface of a magnetized ring 18 supported on a supporting ring 19. The support-

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ing ring 19 is slidably secured by screws 20 in longitudinal slots 21 in the wall of the housing 3 and is normally pressed by a coil spring 22 confined between the ring 18 and the end of the housing about the switch to press the supporting ring 19 toward the bellows end of the housing to the limit permitted by the slots 21. The magnetized ring 18 is in this position when it engages the closure plate 15 as the latter is moved to the limit of its movement by pressure in the bellows 14 beyond that required to actuate the switch 1. When the pressure in the bellows is reduced the closure plate is prevented by the magnetic ring 18 from returning to its original position under the spring tension of the bellows walls.

To free the closure plate 15 the supporting ring 19 and the magnetized ring 18 may be moved manually away from the closure plate 15, which is restrained from moving because of the abutment of its stem 16 against the switch 1. As the magnetic field of the ring 18 is thus removed from the closure plate 15 the latter is drawn by the tension of the bellows walls away from its extended position and out of the magnetic attraction of the ring 18. The bellows may thereupon function normally under normal operating pressures. Plates 23 may be slidably mounted on the outside of the housing and secured by the screws 20 to move as a unit with the supporting ring 19. These plates serve to cover the slots 21 thus protecting the working parts from dust and also serving to provide convenient means to move the rings 18 and 19 manually.

The latching of the closure plate 15 to the magnetized ring 18 occurs only on contact, the magnetic effect being insufficient to attract the plate when separated but sufficient to hold the plate against the tension of the bellows wall when the closure plate is in actual contact with the ring. As there are no mechanical connections to the latching means, the elements of the switch system move with complete freedom.

To the lower enlarged end of the stem 17 within the recess 12 is a plate 24 having on its upper face about the stem a resilient O-ring 25. When the bellows expands to its maximum permissible extent the O-ring 25 seals against the upper face of the recess 12 and seals the tube 11 against the flow of pressure fluid into the bellows. This limits the pressure that may be admitted to the interior of the bellows and prevents bursting of the bellows by excess pressure.

Having described my invention, what I claim is:

1. A pressure switch which comprises a housing, a switch mounted in said housing and having an actuating element, an expansible bellows mounted at one end in said housing, the other end of said bellows being movable by the expansion of said bellows to contact said actuating element of said switch to operate said switch, said movable end of said bellows comprising magnetic material, a magnetic holding element positioned to be contacted by the magnetic material of said movable end to hold said end upon movement of said end beyond the distance required to operate said switch, said housing having a stop to limit the movement of said magnetic holding element toward said bellows, and means biasing said magnetic holding element to said stop, said magnetic holding element being displaceable from said movable end of said bellows to release said end, said housing having an inlet to said bellows.

2. The pressure switch of claim 1 in which said magnetic holding element comprises a magnetized ring and in which said stop comprises a slot in said housing, said magnetic holding element having a projection through said housing to enable said holding element to be moved from outside said housing.

3. A pressure switch device which comprises a cylindrical housing, a switch mounted in said housing, an

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expansible bellows mounted in said housing to expand axially of said housing toward said switch under fluid pressure to actuate said switch, a magnetic element mounted on the movable end of said bellows and movable axially toward said switch by the expansion of said bellows, and a magnet mounted in said housing in position to be contacted by said magnetic element and to hold said element magnetically when said bellows expands beyond the distance required to actuate said switch, said magnet being movable out of contact with said magnetic element to release said element and said bellows.

4. The pressure switch of claim 3 in which said housing has a recess at the fixed end of said bellows, an inlet to said recess and an opening from said recess co-axially into said bellows, said recess having a valve seat about said opening, a valve in said recess to seat on said valve seat and a valve stem extending from said valve through said bellows to and secured to the movable end of said bellows to close said opening from said recess into said bellows when said movable end of said bellows moves beyond its switch operating position.

5. The pressure switch device of claim 3 in which said switch and bellows are aligned longitudinally in said housing and in which said actuating element of said switch is a slidable stem extending toward said bellows.

6. The pressure switch device of claim 5 in which the magnetic element of said bellows is a closure element having a stem projecting toward said actuating element and

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engages and is stopped by said switch upon moving said actuating element past its actuating range of movement.

7. The pressure switch device of claim 6 in which said magnet is a ring magnet slidably engaging the wall of said housing and in which said housing has longitudinal guide slots, said switch device comprising a mounting ring movable longitudinally in said housing and having projections through said slots, and a spring confined between said ring magnet and the end of said housing to press said ring magnet onto said mounting ring, said mounting ring holding said magnetic ring in advance of the magnetic element of said bellows.

8. The pressure switch device of claim 7 having a sliding element on the outer surface of said housing closing said slots and secured to the projections of said mounting ring.

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