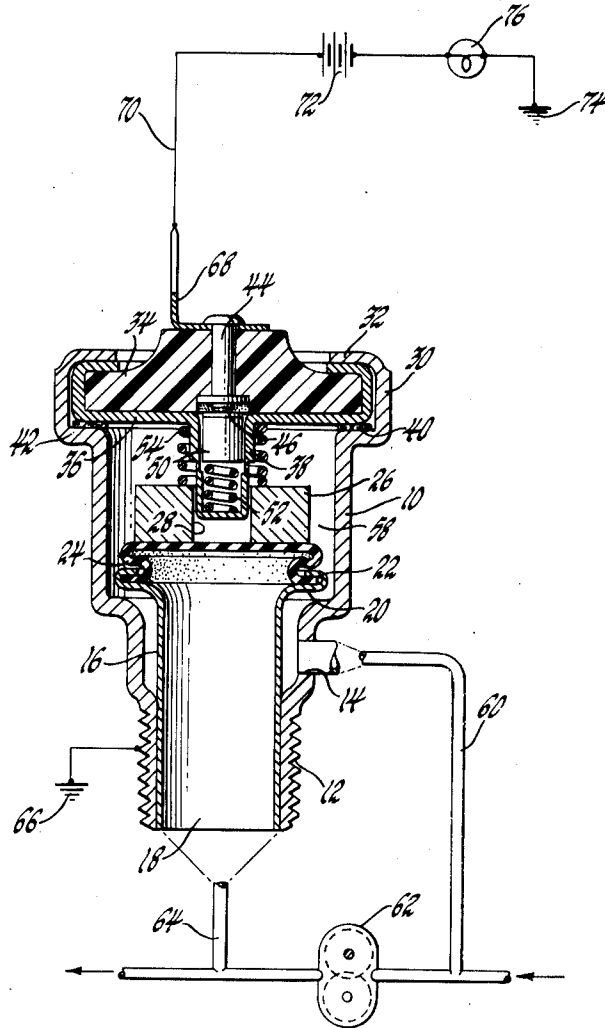


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FLUID DIFFERENTIAL PRESSURE AND MAGNETICALLY
OPERATED ELECTRIC SWITCH
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FLUID DIFFERENTIAL PRESSURE AND MAGNETICALLY OPERATED ELECTRIC SWITCH

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2 Claims. (Cl. 200—83)

This invention relates to switches and more particularly to switches suitable for presenting warning signals and operated by differential fluid pressures.

An object of the present invention is to provide an improved pressure differential switch of compact design. Another object of the invention is to provide a pressure differential switch having a casing of plug-in form suitable for connection to the inlet and outlet sides of a pump.

A feature of the present invention is a switch including a casing with a differential pressure actuated member therein and controlling the operation of contacts by means of a magnet and an armature. Another feature is a plug-in type of casing enclosing a differential pressure actuated mechanism for making and breaking an electrical contact through the use of spring means and a permanent magnet.

These and other important features of the invention will now be described in detail in the specification and then pointed out more particularly in the appended claims.

A pressure differential switch is illustrated in the drawing comprising a plug-in type of casing 10 having a threaded and open end 12 and a side port 14. The threaded end of the casing is somewhat reduced tightly to receive a tubular element 16 therein and which defines a passage 18. The top of the tubular element 16 flares outwardly as at 20 and is reversely bent as at 22 firmly to clasp the lower flange end of a bellows or pressure actuated member 24. The latter is made of rubber or some flexible material giving the member sufficient latitude of movement as will further appear. The member 24 is located in an intermediate portion of the casing 10 and resting on a flat side of the member 24 is an annular permanent magnet 26 having a central opening 28. The top end of the casing 10 is enlarged as at 30 and inwardly turned as at 32 tightly to retain an insulator disk 34 and a retainer 36. The latter is provided with a central and downwardly extending tubular portion 38 which serves as an armature guide element. This latter portion extends downwardly into the opening 28 of the permanent magnet. A gasket 40 is interposed between a shoulder 42 of the casing and the retainer 36 making the casing leak proof. The insulator 34 is exposed to the atmosphere and a terminal rivet 44 penetrates the insulator member and retains an electrical contact 46 in a position coaxial with that of the magnet 26 and the tubular portion 38. An armature or cylinder 50 of magnetic material is slidable within the projection 38 and is adapted to make contact with the contact 46 when urged so to do by a coil spring 52 located within the portion 38. A coil spring 54 surrounds the portion 38 and urges the permanent magnet 26 toward and into contact with the pressure actuated member or bellows 24.

The space 58 surrounding the magnet 26 and the bellows 24 is connected through the port 14 by a line 60 leading to the inlet side of a liquid pump 62. The passage 18 leading to the interior of the bellows 24 is connected by means of a line 64 to the discharge side of the pump 62. The showing of lines 60 and 64 and the pump 62 is merely for purposes of illustration. Actually such devices could be so used with the switch but the switch is specially designed to be screwed into a block having two chambers therein so that one chamber at low pressure will be connected to the port 14 and the other at higher

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pressure will be connected to the passage 18. A block with such passages is not illustrated as it forms no part of the present invention.

The casing 10 may be connected as a plug to a source of pump discharge pressure or with a line 64 and in either event the casing 10 would be grounded as diagrammatically represented at 66. The rivet 44 is utilized to retain a terminal indicated at 68 and this may be connected by a line 70 to a source of electrical power such as the battery 72. The latter is connected to the ground as at 74 by way of a signal lamp 76.

When the fluid pressure in the system served by the pump 62 is normal, the bellows 24 will have moved the magnet 26 upwardly against the spring 54 to become effective in pulling the armature 50 downwardly and breaking contact of the latter with the contact 46. In such an event, therefore, normal conditions of the fluid system would result in the lamp 76 being unilluminated. If the pressure on the discharge side of the pump 62 falls with relation to the pump intake pressure, the magnet 26 will lower because of the spring 54. The armature 50 would, therefore, be released from the field of the magnet 26 and the spring 52 would cause the armature to raise and effect an electrical signal by causing the lamp 76 to illuminate. It will be noted that operation of the switch is not affected by any variation in the over-all pressure of the fluid system served by the pump 62. It is effected only by the differential pressure actuating the bellows 24.

I claim:

1. In a differential fluid pressure actuated switch, a metallic casing including two fluid pressure inlets and an insulated electrical terminal being mounted on the casing exterior, a movable diaphragm being positioned intermediate said inlets, means for applying fluid from each of said inlets to opposite sides of said diaphragm, a contact element being insulated from said casing and extending from said terminal into the interior of said casing, relatively movable magnet and armature members, one of said members being connected to said diaphragm and movable in response to a pressure differential across the diaphragm, a guide element extending between said one member and said contact element to receive the other of said members, said other member being slidable within said guide element and said guide element providing an electrical connection between said casing and said other member, spring biasing means urging said other member away from said one member into engagement with said contact element, whereby said engagement provides an electrical conductive path between said terminal and said casing, said diaphragm moving said one member toward and away from the contact engaging position of said other member to magnetically attract or release said other member, thereby interrupting or closing said electrical path.

2. In a differential fluid pressure actuated switch, a metallic casing including upper and lower fluid pressure inlet openings, a flat movable diaphragm being positioned across the interior of said casing between said upper and lower inlets; means for applying fluid from each of the inlets respectively to the top and bottom of said diaphragm; an electrical terminal having a contact element insulated from said casing and extending into said casing toward said diaphragm along the central perpendicular axis thereof, an armature guide element connected to the top of said casing and extending along said diaphragm axis between the contact element and the upper diaphragm surface, an annular magnet member being supported by said diaphragm and coaxially aligned with said guide to receive one end thereof, said magnet member being movable in response to differential fluid pressure across said

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diaphragm, a conductive armature member slidable within said guide element, an armature biasing spring urging said armature member away from said one guide end and toward the other end of said guide into an engaging position with said contact element whereby said engagement provides an electrical conductive path between said terminal and said casing, said diaphragm moving said magnet member along said armature guide to magnetically attract or release said armature member, thereby interrupting or closing said electrical path.

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References Cited by the Examiner

UNITED STATES PATENTS

2,283,340	5/42	Ray	200—87
2,628,296	2/53	Dillman	200—81.9
2,892,051	6/59	Moore	200—81.9
3,005,887	10/61	Robson	200—83
3,042,771	7/62	Oliveau	200—83
3,109,908	11/63	Clason	200—83

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