March 10, 1942. O. RASMUSSEN 2,275,556

SWITCH

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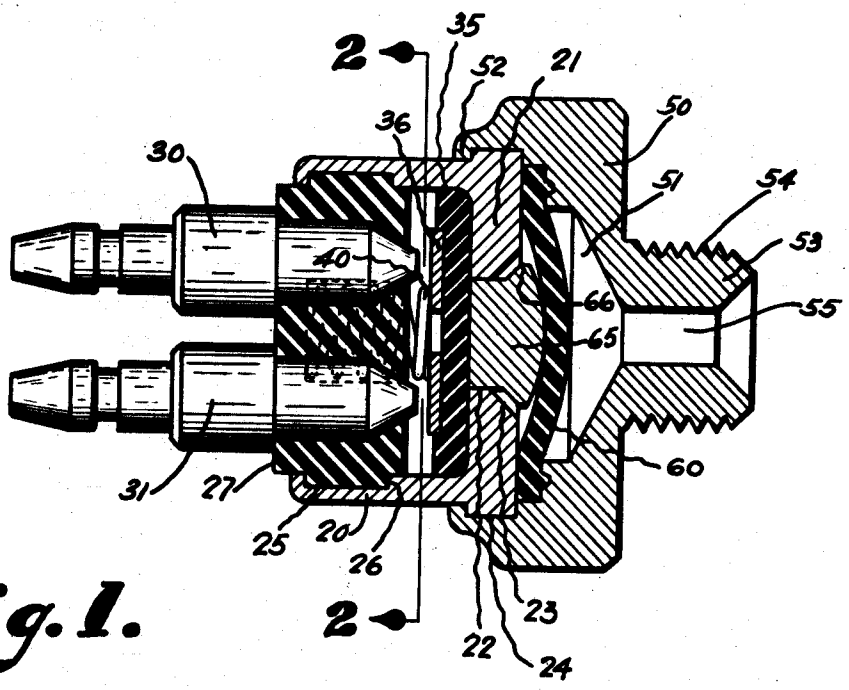


Fig. 1.

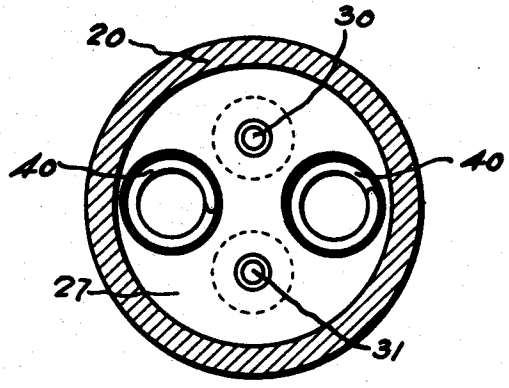


Fig. 2.

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SWITCH

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8 Claims. (Cl. 200—83)

This invention relates to improvements in electric switches and particularly to switches adapted to be actuated by fluid pressure.

It is among the objects of the present invention to provide a pressure actuated electric switch in which the loss of applied pressure, in the event of a switch failure such as a fracture in the insulating material or its disintegration by heat due to a prolonged short circuit, is substantially eliminated.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred embodiment of the present invention is clearly shown.

In the drawing:

Fig. 1 is a longitudinal sectional view of the invention, certain parts being shown in elevation for the sake of simplicity.

Fig. 2 is a cross sectional view taken along the line 2—2 of Fig. 1.

The present invention comprises an electric switch particularly adapted to be used in conjunction with a hydraulic brake system of an automobile for controlling a signal device such as a stop-light.

The switch comprises a cup-shaped housing having an annular wall 20 and a bottom wall 21. This bottom wall 21 has a central aperture 22 counterbored at its outer end as at 23, thus providing a tapering, annular seat. An outer, annular flange 24 is provided on the housing at its bottom end. The annular wall is recessed as at 25, providing an annular shoulder 26. An insulating block 27 has an outer annular flange, the one edge of which seats upon the annular shoulder 26 when the insulating block 27 is placed in the housing 20. The outer edge of the annular wall of the housing is spun over and engages the other annular edge of the flange on the insulating block 27, thus securely holding said insulating block in position within the housing, as shown.

This insulating block carries two terminal posts 30 and 31 properly spaced, the inner ends of said terminal posts extending beyond the inner surface of the block 27.

Within the housing there is provided a flexible disc 35, preferably of rubber or the like, this disc fitting snugly against the inner surface of the bottom wall 21 of the housing and the inner surface of its annular wall 20. The flexible disc carries the bridging contact 36 which is adapted to be moved into bridging engagement with the inner ends of the terminal posts 30 and 31. Springs 40 are interposed between the block 27 and the bridging contact 36, these springs normally urging said bridging member out of engagement with the cooperating terminal posts, maintaining the flexible disc 35 substantially flat against the inner wall of the housing, as shown in Fig. 1. The disc 35 completely covers the central opening 22 in the bottom wall of the housing.

A cap 50, recessed to provide the pressure receiving chamber 51 fits over the annular flange 24 of the housing, the inner edge 52 of said cap being spun over and engaging the housing so that the cap 50 is securely attached to the housing of the switch. An extension 53 with outer threads 54 thereon, provides a nipple which may be screwed into any suitable pressure line as for instance the pressure cylinder of the hydraulic brake system with which this switch may be used. This nipple has a passage 55 leading into the pressure receiving chamber 51. In the pressure receiving chamber 51 there is provided a flexible diaphragm 60 which extends across the entire chamber, thus shutting off its communication with the passage or central opening 22 in the housing wall 21. This diaphragm 60 has its outer peripheral portion tightly clamped between the cap 50 and the housing 21, thus sealing the pressure receiving chamber 51 against leaks at this point.

A plunger 65 is slidably carried in the opening 22 of housing wall 21, this plunger having an enlarged head portion 66, one surface of which is tapered so as to coincide with the tapered counterbore forming the seat 23 about the central opening 22. This plunger head extends beyond the outer surface of the housing 21, engaging the diaphragm 60 as shown. The spring 40, holding the bridging member 36 and its resilient disc 35 in normal position, will hold the plunger 65 in the position shown in Fig. 1, for, the one end of the plunger engages the one side of the disc 35 while the opposite end engages the diaphragm 60 and consequently in this normal position the diaphragm 60 is bulged outwardly into the pressure receiving chamber 51. In this normal position the inner sloping surface of the head 66 of the plunger 65 is spaced from the seat 23, this spacing being of slightly greater dimension than the normal spacing between the bridging member 36 and the ends of its cooperating terminal posts 30 so that normally bridging member 36 engages its terminal posts before the head 66 of the plunger will engage the seat 23.

When pressure is applied in the pressure receiving chamber 51, the diaphragm 60 will be urged toward the wall 21 of the housing, thus

moving the plunger 65 to the left in the said wall. This will distort the flexible disc 35, moving the bridging member 36 into electrical engagement with the inner adjacent ends of the terminal posts 30 and 31, completing a circuit from one of said posts to the other. Normally the head 66 of the plunger 65 does not engage the seat 23; however, if increased pressures are applied within the chamber 51, the plunger 65 will be moved so that its head will engage the seat 23 in the wall 21 of the housing, the inner end of the plunger thus compressing the resilient and flexible disc 35 without putting any undue pressure upon the bridging member 36 and its terminals.

When a contact is moved into and out of engagement with other contacts, arcing will take place. Such arcing will, after a time, cause a burning or pitting which sometimes results in the sticking or freezing, as it is called, of the contacts. When this happens the flow of current will be maintained, resulting in the heating up and eventual burning of the insulation block supporting the terminals. If such condition exists for an undue lengthy time, the insulation block will become charred and weakened, after which fluid pressure, exerted through the diaphragm 60 and the plunger 65, disc 35 and bridging contact 36 against the terminals supported in said weakened block, will result in what may be termed a "blow-out," or more specifically a fracture. If a straight plunger 65 were provided between the two diaphragms 60 and 35 it could pass through its supporting wall and thus the high fluid pressure would burst the diaphragms, resulting in a loss of fluid pressure within the chamber 51. When used in connection with a hydraulic braking system such a loss of fluid pressure would be disastrous, for under these circumstances no fluid pressure could be retained for brake application. However, the present invention provides a plunger 65 with a head 66 adapted to engage a seat 23 in the housing wall 21 so that in case a blow-out of the switch portion of the device occurs, fluid pressure will merely urge the head 66 of the plunger into engagement with the seat 23, thereby completely shutting off communication between the fluid pressure chamber 51 and the opening or passage 22 leading from it, consequently no loss of fluid pressure in the system would result.

From the aforegoing it may therefore be clearly seen that applicant has provided an electrical switch of simple structure and design, capable of avoiding fluid pressure loss in the event of switch failure such as a fracture or blow-out of the insulating block caused by disintegration of the block due to heat or an imperfection.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A pressure actuated switch comprising, in combination, a housing; cooperating contacts in said housing, one of which is movable and yieldably held out of engagement with the other; a plunger slidably supported in a wall of the housing for actuating the movable contact, a compressible, insulating pad interposed between the plunger and movable contact, said pad supporting said contact, a cap secured to the housing and providing a pressure receiving chamber; and a diaphragm clamped between the cap and said wall of the housing and engaging the plunger.

2. A pressure actuated switch comprising, in combination, a housing having a wall thereof provided with a single opening; cooperating stationary and movable contacts in said housing; means yieldably holding the movable contact spaced from its cooperating contacts; a plunger slidably carried in the single opening of one wall of the housing, said plunger being adapted to actuate the movable contact into engagement with the others; a rubber pad interposed between the plunger and movable contact and in which said contact is embedded; a cap secured to the housing and providing a pressure receiving chamber; and a flexible disc clamped at its peripheral edge between the plunger supporting wall of the housing and the cap and engaging the plunger.

3. A pressure actuated switch comprising, in combination, a cup-shaped housing, the bottom wall of which has a central aperture; cooperating contacts in said housing, one of which is movable and yieldably held out of engagement with the others; a resilient pad covering the inner surface of the bottom wall of the housing, said pad covering the central aperture in said wall and supporting the movable contact; a plunger slidably supported in said central aperture and extending beyond the outer surface of said bottom wall; a cap rigidly secured to the housing and providing a pressure receiving chamber; and a flexible diaphragm tightly clamped between the housing and cap, completely separating the pressure receiving chamber from the said central aperture and engaging the end of the plunger.

4. A pressure actuated switch comprising in combination, a cup-shaped housing, the bottom wall of which has an opening, counterbored at its outer end to provide an annular seat; an insulating block secured in the housing; terminals carried by the block; a flexible disc fitting in the housing against the inner surface of its bottom wall; a bridging contact carried by the disc; a spring yieldably urging the bridging contact away from the ends of the terminals; a plunger slidably carried in the opening of the wall, one end engaging the flexible disc, the other having a head portion normally spaced from the annular seat; a flexible diaphragm on the outer surface of the housing wall, completely covering the plunger, and a cup-shaped cap rigidly secured to the housing and arranged to clamp the diaphragm securely to the housing, said cap providing a pressure receiving chamber on the side of the diaphragm opposite the plunger.

5. A switch in accordance with claim 4 characterized, however, by the fact that the normal space between the head of the plunger and the annular seat in the opening in which said plunger is slidably supported is comparatively greater in length than the space normally provided between the terminals and the movable bridging member.

6. A pressure actuated switch comprising in combination, stationary terminals; a cooperating movable contact; resilient means yieldably holding the contact spaced from said terminals; pressure actuated means; and a resilient disc providing the sole support of the movable contact and interposed between the movable contact and said pressure actuated means, adapted to transmit movement of the pressure actuated means to the contact to cause said contact to engage the terminals, and adapted to yield upon

further movement of the pressure actuated means after such contact engagement.

7. A pressure actuated switch comprising in combination, stationary terminals; a cooperating movable contact; resilient means yieldably holding the contact spaced from said terminals; a pressure actuated member having a predetermined range of movement toward the contact; and a resilient disc solely supporting the movable contact and interposed between the pressure actuated member and the contact, adapted to urge said contact into engagement with the terminals in response to movement of the pressure actuated member through a certain portion of its range of movement and adapted to yield and be distorted in response to movement of said member throughout the remaining portion of its range of movement.

8. A pressure actuated switch comprising in combination, a pressure receiving chamber; a switch containing chamber; an apertured rigid disc between said chambers; a flexible diaphragm in the pressure receiving chamber; a compressible diaphragm in the switch containing chamber; and motion transmitting means movably carried in the aperture of the rigid disc, the respective ends of said means engaging the flexible diaphragm and compressible diaphragm, said means being adapted in response to pressure in the pressure receiving chamber first to deform the compressible diaphragm in the switch containing chamber to close the switch therein and then to compress said diaphragm and concurrently close the aperture in the rigid disc thereby limiting the movement of said means.

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