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PRESSURE ACTUATED SWITCH

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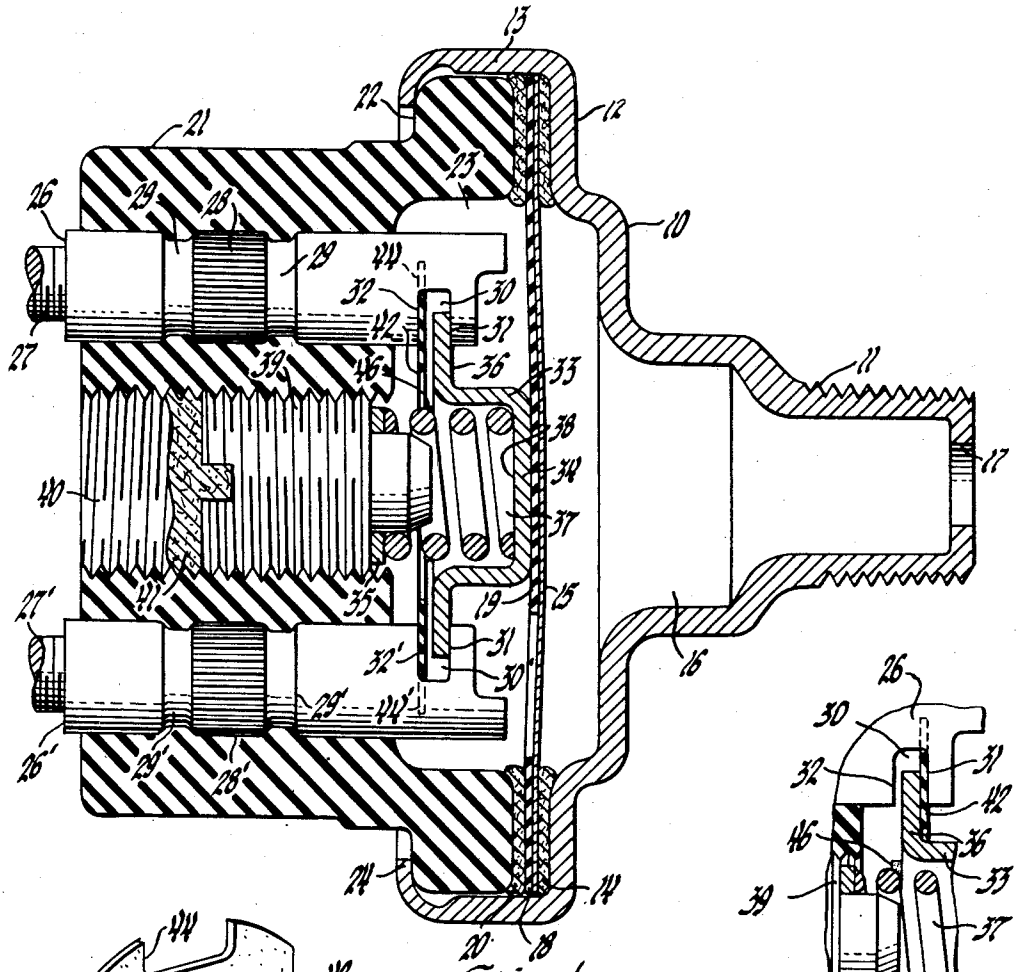


Fig. 1.

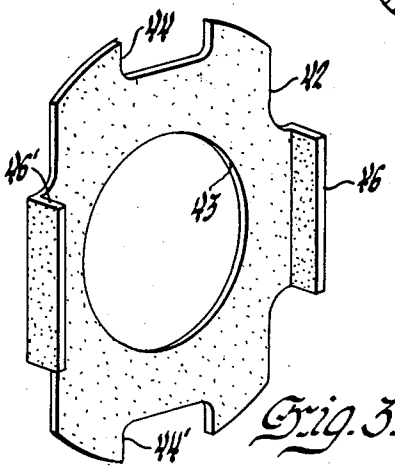


Fig. 3.

Fig. 2.

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PRESSURE ACTUATED SWITCH

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This invention relates to pressure actuated switches and more particularly that type which utilizes a diaphragm for actuating bridging contacts to control an electrical circuit.

Switches of this type find numerous applications in control and indicating devices for fluid pressure systems. Such switches are commonly used in automotive vehicles and must therefore be of rugged construction, reliable in operation, and economical to manufacture. In certain applications, it is required that the switch operate to complete the circuit, upon actuation in one sense, while in other applications the switch must operate to interrupt the circuit, upon actuation in the same sense. Thus, it is desirable that the operating function of the switch may be changed from "make" to "break" by a simple operation without the necessity of complex or special parts.

Accordingly, it is an object of this invention to provide a switch structure adapted to selectively "make" or "break" an associated circuit in response to the same actuation.

It is another object of this invention to provide a change-function switch of simple rugged construction requiring few parts and permitting selection of operating function by a simple rearrangement.

It is a more specific object of this invention to provide an electrical switch of the contact bridging type which utilizes the terminal posts as fixed contacts and which operates to selectively close or open the circuit in response to the same actuation.

These and other objects and the manner in which they are achieved will become apparent from the description which follows, taken with the accompanying drawing in which:

Figure 1 is an elevational view in section of the switch.

Figure 2 is a fragmentary view showing a rearrangement of certain switch parts.

Figure 3 is a perspective view of the contact insulating member.

The inventive switch comprises a pair of laterally spaced terminal posts provided with axially spaced contact elements and a bridging contact member having a portion movable between the spaced contact elements. An insulating member is disposed between the spaced contact elements and may be positioned on either side of the contact member to provide the desired function of interruption or completion of the circuit upon actuation of the contact member in a given direction.

Referring now to the drawings, an exemplary embodiment is shown in which the switch is actuated in response to fluid pressure and is adapted to control the electrical continuity of an associated circuit. The switch structure comprises a metal shell **10**, generally cylindrical in cross section, which has a threaded nipple portion **11** adapted to be connected to an associated fluid pressure system. The shell is provided with a radial shoulder portion **12** and an adjacent axial flange **13**. An annular

gasket **14** is seated against shoulder **12** forming a fluid tight seal therewith.

A distendable diaphragm **15**, which may be suitably constructed of metal such as stainless steel, is disposed within the shell **10** against gasket **14**. The diaphragm **15** and the shell **10** define a pressure chamber **16** having a passage **17** through the nipple portion of shell **10** for the admission of fluid pressure. Disposed adjacent one face of the diaphragm **15** is a bearing plate **18** of insulating material in the form of an annular disk having an inwardly extending tongue portion **19**. A gasket **20** is fitted tightly against the bearing plate **18** and the flange **13** to provide a fluid tight seal.

An insulating support member **21**, which is is suitably a molded body of a thermosetting phenolic plastic, is provided with an annular flange **22** which is seated against gasket **20**. The insulating support member **21** is formed with a hollow end portion or recess **23** to accommodate certain members of the switch will be described subsequently. The shell **10** has a radial flange **24** crimped over flange **22** of the insulating support member to compress the gaskets **14** and **20** and to secure the parts together. The shell **10** and insulating support member **21** form a two-part housing for the entire switch structure.

A terminal member or post **26** extends axially through the insulating support member **21** into the recess **23**. The outer end **27** of terminal post **26** is adapted to be connected to an electrical circuit while its intermediate portion is formed with a knurled section **28** and undercut portions **29** to securely retain the post in the insulating support member. The inner end of the post **26** is provided with a lateral recess or notch **30** which is bounded by axially spaced contact elements or walls **31** and **32**. Similarly, terminal member or post **26'** extends axially through the insulating support member **21** into the recess **23** with its outer end **27'** adapted to be connected to an electrical circuit and with its intermediate portion formed with knurled section **28'** and undercut portions **29'**. The inner end of the post **26'** is provided with a lateral recess or notch **30'** which is bounded by axially spaced contact elements or walls **31'** and **32'**. The recesses **30** and **30'** are disposed oppositely and open inwardly or towards each other.

A contact member or cup **33** is disposed generally between the terminal posts **26** and **26'** and is movable axially thereof to serve as an electrical bridge across the terminals. The contact member is provided with a base or bearing portion **34** engaging the tongue portion **19** of bearing plate **18** and an annular rim or projecting contact portion **36** which extends partially into each of the recesses **30** and **30'**. Resilient means such as coil spring **37** is interposed between the depressed portion **38** in contact cup **33** and the spacer ring **35** seated against adjustable set screw **39**. The set screw is disposed in axial opening **40** and threadedly engages the walls thereof to permit axial positioning of the screw and adjustment of the force exerted by the spring. This permits variation of the bias force exerted on the diaphragm **15** for effecting calibration. Once the bias force has been established the set screw may be secured in position by a suitable sealing compound **41** deposited within the opening **40**.

An insulating member or plate **42** having a central opening **43** is positioned coaxially of the contact cup **33**. The insulating plate **42** is provided with notches **44** and **44'** at opposite sides thereof which are interlocked with notches **30** and **30'** in the terminal posts and retain the insulating plate **42** in position. The insulating plate **42** is at least coextensive with the rim portion **36** of contact member and is provided with apron portions **46** and **46'** to retain the insulating plate **42** in position with respect to the contact member **33**. The diameter

of the central opening 43 in the insulating member 42 is somewhat greater than the outer diameter of bearing portion 34 of contact member 33. This permits the parts to be assembled with the insulating member 42 selectively positioned on either side of rim portion 36 in accordance with the desired function of the switch, as will be described subsequently. The thickness of rim portion 36 and insulating member 42 and the axial length of notches 30 and 30' are so proportioned that the contact member 33 is permitted limited axial movement. Thus, rim portion 36 may be displaced from engagement with contact elements 31 and 31' to control the electrical continuity between the terminal posts 26 and 26'.

With the parts arranged as shown in Figure 1 in which insulating member 42 is adjacent contact elements 32 and 32' of recesses 30 and 30', the switch functions to interrupt the circuit in response to increasing pressure. Upon the admission of a predetermined value of fluid pressure the diaphragm exerts sufficient force against bearing member 18, contact member 33 and spring 37 to displace the rim portion 36 from engagement with the contact elements 31 and 31' on the terminal posts. This interrupts the electrical circuit between the terminal 26 and the terminal 26'. Upon further increase of fluid pressure, the rim portion 36 is moved into engagement with the insulating plate 42. The insulating plate prevents the electrical circuit from being completed between the contact elements 32 and 32'. In this condition the contact member 33 is firmly seated against the insulating plate 42 which is supported by the terminal posts and an increase of pressure is ineffective to cause further displacement. By reason of the bearing area afforded the diaphragm by the bearing portion of the contact member and the bearing plate, the diaphragm is protected from damage by excess pressures. When the fluid pressure is decreased below the predetermined value, the contact member 33 is moved under the influence of the spring 37 against the bearing plate and the diaphragm until the rim portion 36 of the cup engages walls 31 and 31'. At this point the continuity of the electrical circuit is restored.

By a simple rearrangement, as shown in Figure 2, the operating function of the switch is changed by positioning the insulating plate 42 on the opposite side of rim portion 36 against contact elements 31 and 31'. In this assembled relation the operation is similar to that described above except that the circuit is normally interrupted because the bias force of spring 37 urges the rim portion 36 into engagement with insulating member 42. An increase of fluid pressure causes the diaphragm to displace the rim portion 36 into engagement with contact elements 32 and 32' to complete the circuit. The insulating member 42 prevents the circuit from being completed upon a decrease of pressure when the contact cup 33 is returned by the spring 37.

It will now be apparent that the insulating member 42 may be positioned with respect to contact cup 33 in accordance with the desired operating function of the switch. In applications where the circuit between terminal posts 26 and 26' is to be interrupted in response to increasing pressure, the insulating member 42 is positioned adjacent contact elements 32 and 32' of recesses 30 and 30'. Where the circuit is to be completed in response to increasing pressure, the insulating member 42 is positioned adjacent contact elements 31 and 31' of recesses 30 and 30'. Calibration to cause switch operation at a desired value may be readily accomplished by adjustment of set screw 39.

Although this invention has been described in detail with respect to a particular embodiment, such embodiment is illustrative only and is not to be construed in a limiting sense. Numerous modifications and variations within the spirit and scope of the invention will now occur to those skilled in the art. For a definition of the invention, reference is made to the appended claims.

I claim:

1. A pressure actuated switch comprising a casing and an axially distendable diaphragm defining a pressure chamber, means for admitting fluid pressure to said chamber against one side of said diaphragm, a pair of spaced electrical terminal members supported by said casing on the other side of said diaphragm, said terminal members defining oppositely disposed notches and providing a pair of front and an axially spaced pair of back fixed contacts, a movable contact member having a bearing portion adjacent said diaphragm and a rim portion extending into said notches whereby transverse motion of the contact member is limited in one direction by said terminal members, an insulating plate interposed between said rim portion and one pair of fixed contacts, said insulating plate defining oppositely disposed notches interlocked with said terminal members and having axially extending portions whereby transverse motion of the contact member is limited in the other direction, and resilient means for urging said contact member toward said diaphragm whereby the electrical continuity between said terminal members is affected by the position of the said diaphragm.

2. An electrical switch comprising a housing including an insulating body, a pair of terminals supported by said body, each of said terminals being provided with a pair of axially spaced rigid contact elements, an insulating member extending between both pairs of spaced contact elements, a bridging contact member having a bearing portion and being movably disposed between both pairs of spaced contact elements, said insulating member being positionally interlocked with said terminals and said contact member and disposed on one side of the latter for retaining the latter against lateral movement, said insulating member being alternately disposable on the other side of said contact member and positionally interlocked with said terminals and said contact member, resilient means normally urging said contact member toward engagement with one of said contact elements of both terminal members, a distendable diaphragm engaging said bearing portion for moving said contact member against said resilient means toward engagement with the other of said spaced contact elements of both contact elements whereby the movement of said contact member and the distension of said diaphragm are limited by the spacing of said contact elements, and means supported by the insulating body for adjusting the force exerted by the resilient means.

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