United States Patent [19]

Zelenka

[11] **3,718,790**

[45] **Feb. 27, 1973**

[54] PRESSURE RESPONSIVE SWITCH

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[22] Filed: **Oct. 4, 1971**

[21] Appl. No.: **186,024**

[52] **U.S. Cl.**.....**200/83 V**, 200/83 R, 200/166 BH

[51] **Int. Cl.**.....**H01h 35/34**

[58] **Field of Search**.....200/83 V, 83 N, 83 P, 83 R, 200/67 DA, 166 BH, 166 J

[56] **References Cited**

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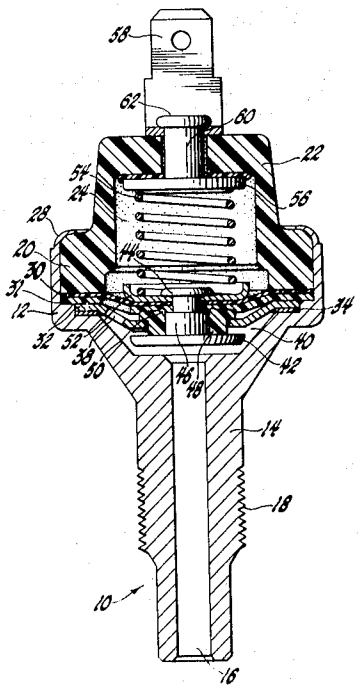
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[57] **ABSTRACT**

This invention relates to a normally open pressure responsive electrical switch. Such a switch can be used in an automobile transmission as part of the transmission control spark advance systems presently found on automobiles.

3 Claims, 3 Drawing Figures



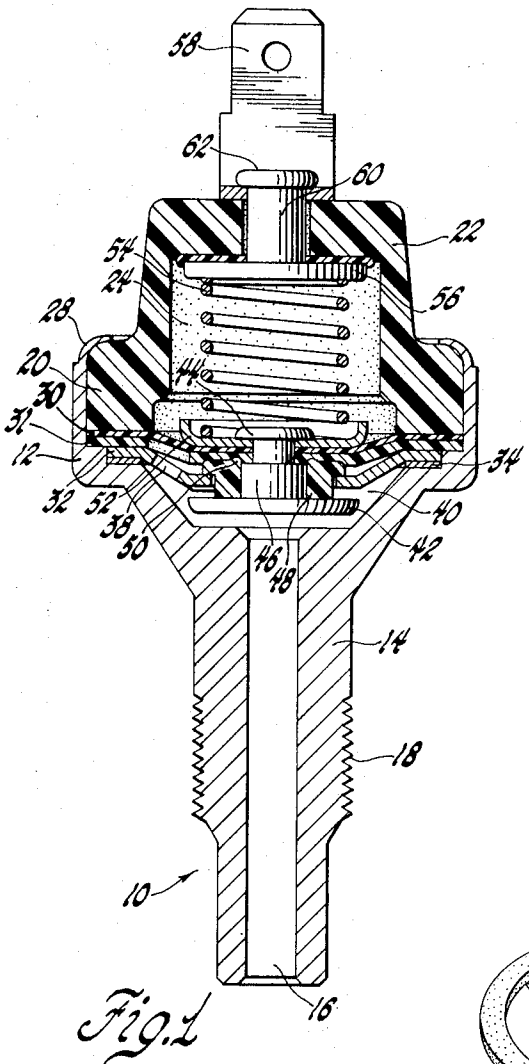


Fig. 1

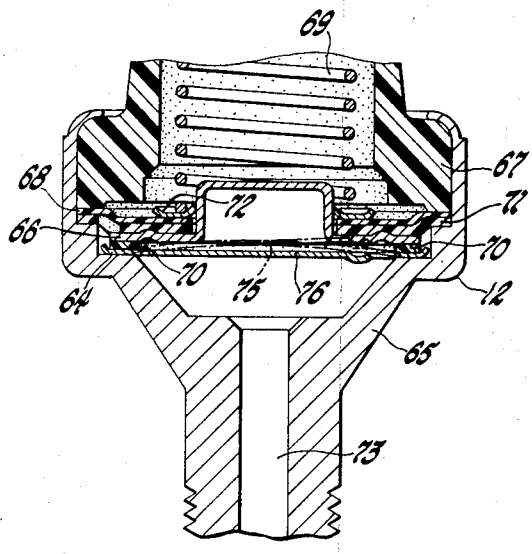


Fig. 2

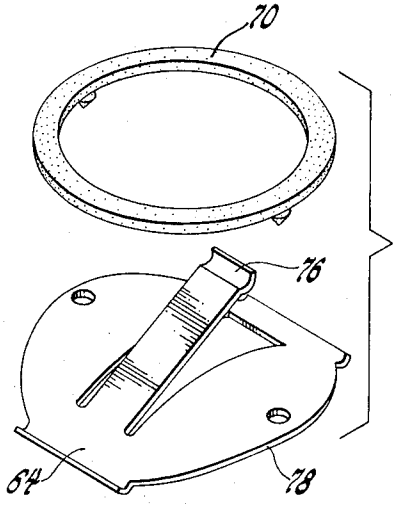


Fig. 3

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PRESSURE RESPONSIVE SWITCH

The prior art switches such as that shown in the U.S. Pat. to Clason No. 2,816,189, assigned to the same assignee, are of the normally closed type switches which cannot be used in the transmission control spark system application without an additional relay.

By use of my invention I provide a simple-to-manufacture switch that is normally open and which has a minimum number of parts.

It is an object of my invention to provide a simple, normally open pressure responsive switch. Other objects and advantages of the present invention will be apparent from the drawings in which:

FIG. 1 shows a cut-away view of one embodiment of my invention;

FIG. 2 shows a similar view of a second embodiment; and

FIG. 3 shows the contact assembly as used in the FIG. 2 embodiment.

Referring to FIG. 1, body member **10** is formed as two members or in two parts or sections. The first section is a cup-shaped member **12** made of a conductive material and having an integral tubular boss or neck portion **14** formed thereon with the neck portion **14** having a fluid passage **16** therein. Neck **14** has threads **18** thereon for easy attachment. Cup-shaped member **12** has an external hexagonal shape so that it may be readily engaged by a spanner wrench or similar tool. However, it is understood that the shape is immaterial and therefore the body may be made in any convenient shape or form.

The second section of body member **10** is similarly formed as a cup-shaped member **20** as is the first section **12** of body member **10** and likewise has a tubular boss or neck member **22** integrally formed thereon and having a bore **24** therethrough. Second section **20** of body member **10** is made of an insulator material, such as rubber, plastic or the like. Cup member **20** fits into cup member **12** with the two members **12** and **20** held in an assembled position by a crimped or rolled-over edge **28** formed on member **12**. It is understood that any convenient means, such as bolts, screws, epoxy or the like, may be used to hold the two members together.

A flexible diaphragm **30** made of any known diaphragm material is held between the two cup-shaped members **12** and **20** by conductive discs **32**, **34** respectively, as well as the force of the crimp acting to hold the two members together. The first disc **38** has holes therethrough to allow fluid to move through the disc and impinge on the diaphragm to aid the diaphragm in its movement. As is readily apparent, conductive disc **32** is the stationary contact.

Centrally located within a cut-out or stepped-out portion **40** in the conductive cup member **12** is a movable contact **42**. Contact **42** is inserted through disc **32** and the diaphragm **30** where it is held in this position by a peened or rolled-over edge **44** on the contact body **46**. An insulator member **48** is located between contact body **46** and the conductive disc or stationary contact **32** and is held in position on diaphragm **30** by means of protrusions **50**. Below diaphragm **30** and between disc **32** is a sealing gasket **31** that acts as a seal between members **12** and **20**. The peened-over edge **44** on contact body **46** in addition to holding the contact **42** in place also holds a third conductive disc **52** in a fluid tight manner beneath diaphragm **30**. Disc **52** reinforces diaphragm **30** and acts or serves as a seat for the conductive spring **54** and also makes up part of the electrical path through the switch. Spring **54** is attached to a fourth conductive disc or plate **56** that is in turn attached to a terminal **58** through a body **60**. Body **60** has rolled-over or peened edges **62** to hold the fourth conductive disc to the terminal **58**.

A modification of the pressure responsive switch is shown in FIG. 2. The switch is constructed in the same manner and operates in the same way as the switch shown in FIG. 1. The difference, however, is in the movable contact member or contact plate **64**. Contact member **64** is positioned in a cut-out or stripped-out portion in a conductive member **65** and is held in that position by a first conductive disc **66**, which we will also call the stationary contact, diaphragm **68**, insulator **70**, **71**, the force of the crimp holding the two body sections **65**, **67** together, as well as the force of the spring **69** acting against the diaphragm and the first conductive disc **66**. Contact member **64** is insulated from the conductive disc **66** by insulator member **70**. Diaphragm **68** is reinforced by means of the clips **72** and is held in position by spring **69** and conductive member **66**. Clips **72** also act as a seat or means of holding spring **69** in place. Disc **66**, clips **72**, spring **69** and a terminal member (not shown) serve as the electrical path from contact **64** to ground.

As shown in FIG. 3, contact plate **64** is made in a generally circular shape having a cut-out finger **76**. Plate **64** is made of a conductive material preferably of spring steel and is bowed at the mid-point **78** toward the edges. As readily seen in FIG. 3, in a relaxed state, with no pressure on the outside of the contact plate, the finger **76** generally protrudes or projects out of the plane of the contact plate. Insulator **70** is assembled to the contact. In the assembled position and when pressure is applied through the assembly of the parts of the diaphragm **68**, conductive disc **66**, etc., contact plate **64** is bent or assumes a flat configuration as shown in FIG. 2, causing finger **76** to also move into a flat or planar position or configuration.

In use, the boss or neck **14** having threads **18** thereon is screwed into an opening generally in communication with a source of fluid under pressure — in this case, in the transmission — and the terminal **58** is connected to the battery. This will provide a signal to the distributor to advance or retard the spark. In the operation of the switch shown in FIG. 1, when fluid pressure on the diaphragm **30** entering through passage **16** exceeds the pressure applied by spring **56**, the diaphragm moves towards terminal **58** thereby moving contact **42** in engagement with the conductive disc **32** to provide the signal required.

In the operator of the second embodiment switch shown in FIG. 2, as fluid pressure on the conductive disc **66** and diaphragm **68** exceeds spring pressure, they move toward the spring and away from the fluid passage **73**. This action takes pressure off of the outside edges of contact plate **64** causing or allowing the plate to relax as shown in FIG. 3, whereby the finger **76** moves upwardly to the dotted line position **75** shown in FIG. 2, to make contact with conductive disc **66** to close the circuit and provide the signal desired. As is readily apparent, conductive disc **66** is a second contact.

I have provided a simple normally open pressure responsive switch that has a minimum number of parts that can be readily and easily assembled.

While my invention has been described in terms of certain specific embodiments thereof, it should be appreciated that other forms might be adapted by one skilled in the art; and, therefore, the scope of my invention is not to be considered limited by the specific embodiments disclosed.

I claim:

1. A pressure responsive electrical switch that makes electrical contact in response to a change of fluid pressure comprising a conductive body member, an insulator body member integrally attached to said conductive body member, a diaphragm secured between said conductive body member and said insulator body member by a first and second conductive disc, said first and second conductive discs being the stationary contact, a movable contact, said movable contact being inserted through said stationary contact and said diaphragm with said movable contact secured in a fluid tight relationship to said diaphragm by means of a third conductive disc on the side of said diaphragm opposite said stationary contact and being located in said insulator body member, insulator means between said movable contact and said stationary contact, a fourth conductive disc opposite said third conductive disc in said insulator body member having a terminal thereon, a spring between said third and fourth conductive discs that provides an electrical path from said movable contact to said terminal, said conductive body member having a fluid passage therein whereby fluid forced into the passage will act on said diaphragm to move said diaphragm and therefore said movable contact into engagement with said stationary contact whereby the switch electrically goes from a normally open to a normally closed position, said conductive body member having means of securing said pressure responsive switch to a fluid source.

2. A pressure responsive electrical switch that makes electrical contact in response to a change of fluid pressure comprising a conductive body member, an insulator body member integrally attached to said conductive body member, a diaphragm secured between said conductive body member and said insulator body member, a first conductive disc secured to said diaphragm and also secured between said conductive body member and said insulator body member, a contact member secured on a ledge and in contacting relationship with said conductive body member and being insulated from said first conductive disc by an insulator means, said conductive disc, spring insulator means, the conductive body and insulator body members providing a means of pressure on the edges of said contact member to change the shape of said contact from an initial generally curved position to a generally planar position, a second conductive disc on the opposite side of said diaphragm from said first conductive disc having a terminal thereon, a spring between said first and second discs that provides an electrical path between said conductive discs to said terminal, said conductive body member having means of securing said pressure responsive switch to a fluid source, a fluid passage in said conductive body member whereby fluid into the passage having enough pressure to overcome the spring pressure will impinge on said diaphragm to move said diaphragm against said spring thereby removing pressure from the edges of said contact member whereby said contact member returns to its initially curved position to make contact with said conductive disc to close the circuit and provide the desired signal.

3. In a switch as set forth in claim 2 wherein the contact has a struck-out center finger portion that moves in relationship to fluid pressure on said diaphragm whereby upon pressure that exceeds spring pressure being applied to said diaphragm said pressure on the outside edges of said contact relaxes whereupon said center finger portion moves out of the plane of said contact to engage said conductive disc.

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