July 20, 1937. J. P. RUTH 2,087,738

FLUID FLOW SWITCH

Filed June 3, 1936

Fig. 1

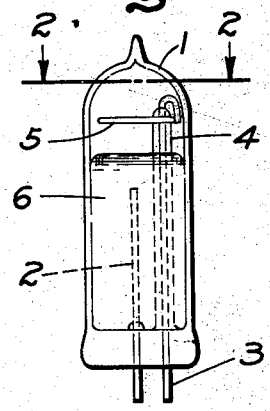


Fig. 2

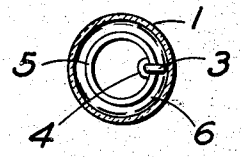
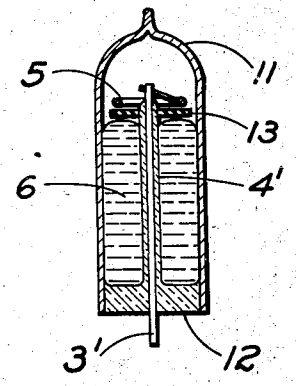


Fig. 3



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FLUID FLOW SWITCH

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1 Claim. (Cl. 200—152)

The present invention relates to fluid flow switches.

A particular object of the invention is to provide a novel fluid flow switch which will maintain a circuit closed therethrough in all positions thereof except for a small angle in any direction from a given axis. Other objects and advantages of my invention will appear from the following detailed description or from an inspection of the accompanying drawing.

The invention consists in the new and novel structure hereinafter set forth and claimed.

For various special applications it has been desired to produce a switch which will be open when within an angle of say 20° to 35° in any direction from a given axis, but which will be closed when in any other position. I have now discovered that this result is accomplished by means of a novel mercury switch of my invention. According to my invention a mercury switch of the tubular or bulbous type is provided with a quantity of mercury which is sufficient to extend above the center of the switch envelope in any position of the switch. Either an inlead or a metal shell is then provided to make contact with this mercury at all positions of the switch, while a ring-shaped contact concentric with the axis of the envelope and arranged toward one end of said envelope provides the second contact with the mercury when the switch is in the closed circuit positions. By adjusting the height of this contact above the mercury level when the axis of the switch is vertical the switch is arranged to close the circuit as soon as the switch is tilted from this position in any direction to any desired angle. The ring contact is preferably made as large as convenient in order to make the operation of the switch certain at the desired angle. In some cases, as where the switch is of especially small diameter, the action of the mercury tends to be slightly sluggish. I have found, however, that this tendency is overcome by introducing within the switch a small quantity of refractory dust, such as that of silica or magnesia, which results in the lively response of the mercury to any movement of the switch. I have further found that undesired operation of the switch to either open or close the circuit when the switch is subjected to violent agitation is avoided by use of a suitable surge impeding baffle in the path of the mercury.

For the purpose of illustrating my invention I have shown two preferred embodiments thereof in the accompanying drawing, in which

Fig. 1 is an elevational view of a mercury switch, shown in the open circuit position.

Fig. 2 is a cross sectional view of the same switch taken on the line 2—2 of Fig. 1, and

Fig. 3 is a sectional elevation of a modification of the switch of Fig. 1.

As shown in the drawing, with particular reference to Figs. 1 and 2, my novel switch has a tubular envelope 1 closed at the lower end by a pinch seal through which the inleads 2 and 3 are sealed in a conventional manner. The inlead 2 extends axially along the envelope 1 to a point a little more than half way toward the opposite end thereof, while the inlead 3, which is enclosed within an insulating sheath 4 of glass or the like, extends still nearer the opposite end of said envelope, where it carries the ring contact 5 of only slightly smaller diameter than said envelope. Said envelope 1 is provided with a pool of mercury 6 which extends to a point between the end of the inlead 2 and the ring contact 5, the exact level being determined by the angle at which it is desired that the switch should close. A small amount of silica or other refractory dust (not shown) is introduced into the envelope 1, particularly when said envelope is of fairly small diameter, of the order of ¼ inch, where it floats on the surface of the mercury 6, rendering the latter responsive to very slight movements of the envelope 1. The inlead 2 and the ring contact 5 are of any suitable material, such as tungsten or a chrome iron alloy, but where an especially low resistance is desired these elements are preferably formed with a platinum sheath which will be wetted by the mercury to form a low resistance contact. So far as the inlead 2 is concerned, this sheath may be limited to the tip thereof, which is always in contact with the mercury 6, and may consist of a small piece of platinum welded to said inlead, this construction having been found to produce excellent results. The envelope 1 preferably contains an atmosphere of hydrogen at any suitable pressure, and is sealed off at the tip in the usual manner.

The switch shown in Fig. 3 is similar in construction to that of Fig. 1, but in this instance the envelope 11 is made of a suitable metal such as a chrome iron alloy containing 26–30% chromium and 68–72% iron, and known as Allegheny 55. The lower end of said envelope is sealed with a disc 12 of a suitable glass, through which there extends an inlead 3'. Said inlead, which has an insulating sheath 4' of glass or the like, extends to a point well beyond the center of said envelope, and at its end supports the ring contact 5 of

tungsten, platinum sheath wire or the like. The mercury 6 fills said envelope to a point beyond the center of said envelope but below said contact. Hydrogen is also provided in this switch, as in Fig. 1. The envelope 11 is conveniently closed by drawing in the end and welding. Where desired a baffle 13 of insulating material is supported on the sheath 4' at a point just below the ring contact 5 to protect said ring from splashing contact when the switch is violently agitated.

In the operation of either of these switches when the switch is tilted in any direction from the position illustrated the mercury 6 flows toward the contact ring 5, making contact therewith at a definite angle, regardless of the direction of tilt. The circuit is thereupon closed through either switch in an obvious manner, and remains closed with any further tilting, even when the switch is the other end up, due to the fact that the switch is more than half filled with mercury.

While I have described my invention by reference to certain specific structures it is to be understood that it is not limited thereto, but that various changes omissions and substitutions, within the scope of the appended claim, may be made therein without departing from the spirit of the invention.

I claim as my invention:—

A fluid flow switch comprising a sealed envelope whose volume is more than half filled with a conducting fluid, means to make contact with said fluid at all positions of said switch, a ring contact coaxial with said envelope and disposed above the surface of said mercury in one position of said switch, whereby a limited tilting of said switch in any direction closes the circuit through said switch, said circuit remaining closed when the position of said switch is completely reversed, and a baffle between said mercury and said ring contact in the open circuit position of said switch to prevent a splashing contact of said mercury with said ring.

JOHN P. RUTH.