Feb. 10, 1931. J. D. HILLIARD 1,792,302

SAFETY VALVE FOR ELECTRIC SWITCHES

Filed Oct. 1, 1926

Fig. 1.

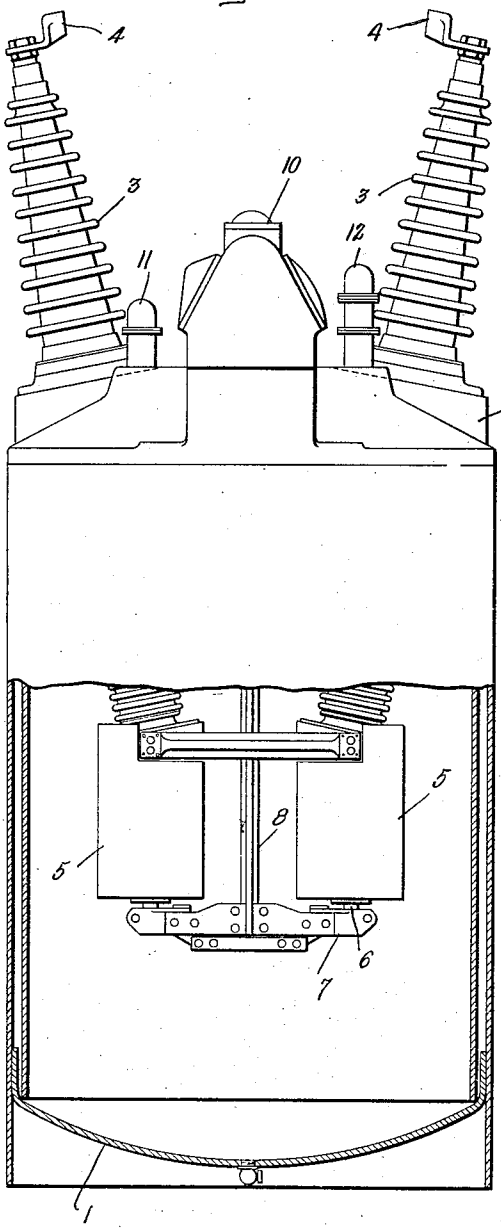


Fig. 2.

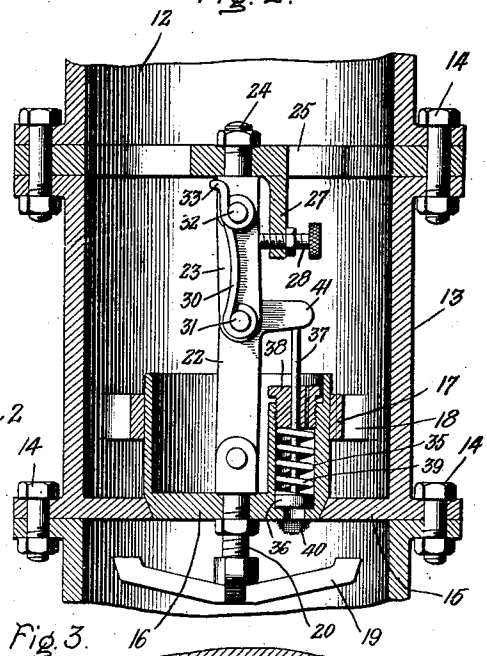
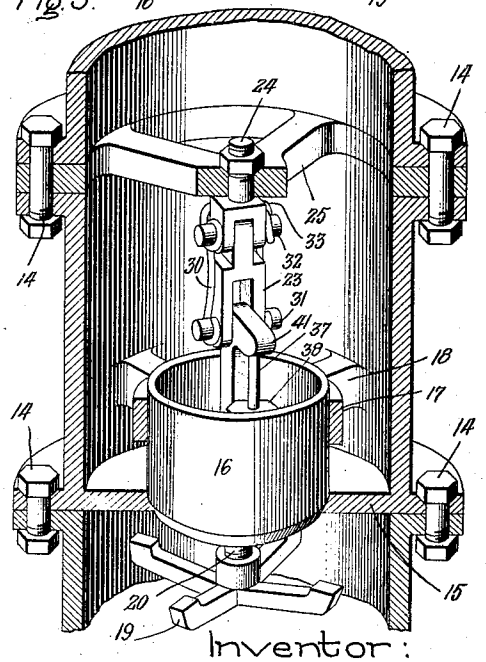


Fig. 3.



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UNITED STATES PATENT OFFICE

JOHN D. HILLIARD, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

SAFETY VALVE FOR ELECTRIC SWITCHES

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My invention relates to electric switches and particularly to switches of the fluid break type wherein the contacts separate beneath the surface of an insulating fluid. When an arc is drawn in insulating fluids commonly used in such switches a certain amount of gas is formed due principally to the decomposition of the liquid, the amount depending upon the value of the current and voltage interrupted and the length of time that the arc continues. In ordinary use the amount of gas pressure generated in the switch is not excessive, the gas being commonly vented through a relatively small orifice and may be conducted away where it can do no harm. If, however, an accidental breakdown should occur in the switch such as to cause a continuous arcing under short circuit conditions the gas would be generated at such a rapid rate that the venting orifice might not be sufficient to allow its escape and eventually a pressure might be built up sufficient to rupture the switch tank.

An object of my invention is to provide improved means controlled by a predetermined pressure in the switch tank for quickly relieving the pressure.

My invention will be better understood from the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

Referring to the drawing, Fig. 1 is an elevation with parts broken away of a switch involving my invention; Figs. 2 and 3 are enlarged detail cross-sectional views of the discharge pipe of the switch showing the relief valve and operating mechanism therefor.

The switch shown in Fig. 1 comprises a closed receptacle formed by a tank 1 and a cover 2 through which extend the insulator bushings 3 carrying the terminals 4 and the contact operating mechanism, not shown. For illustrative purposes only, I have chosen to show the switch as of the explosion chamber down-break type, the explosion chambers containing the fixed contacts being arranged at 5 and the movable contact rods 6 being connected by a bridging member 7 to which is connected the operating rod 8. At one side of casing 10 containing the switch operating mechanism I have shown the vent pipe 11 which preferably extends from the switch to a point outside of the building in which the switch is housed. The venting orifice communicating with this pipe is preferably made relatively small.

At the other side of the casing 10 I have shown the vent pipe 12 which also preferably is arranged to discharge gas and liquid at a point where it can do no damage such as outside of the building which houses the switch. The orifice by which this pipe communicates with the interior of the switch is not restricted but the passageway is normally closed by a valve of relatively large size so that when it opens due to excessive pressure within the switch tank, for example, due to a break-down or a failure of the switch, the pressure may be quickly relieved or at least prevented from building up to a dangerous value. I have shown the discharge pipe 12 provided with an intermediate flanged section 13 to which it is secured as for example by bolts 14. Section 13 is shown having an inwardly extending flange 15 in which is formed the seat for the valve 16. The valve is guided by the ring 17 connected to the section 13 by suitable struts 18 and is limited in its opening movement by the spider 19 which is secured to the valve by the screw stud 20. The valve is normally held or thrust against the seat by toggle mechanism comprising the links 22 and 23. Link 22 pivotally connects with the aforementioned stud 20 and link 23 is connected by pin 31 with link 22 and by pin 32 with the stud 24 which stud is held by the spider 25 which is bolted to the upper end of the section 13. The spider has a downward

extension 27 which supports a screw stop 28 which by engagement with the upper link 23 limits the amount of overset that the toggle may take. To insure proper resetting of the valve after an opening movement and the desired oversetting of the toggle, I have shown the spring 30 attached to pivot pins 31 and 32 and having the bent end 33 arranged to engage the stud 24. It will be seen that the toggle automatically resets itself and firmly holds the valve closed until the pivot pin 31 is pushed past center to allow the toggle to buckle. Formed in the valve 16 is the small cylinder 35 in which slides the piston 36 having the rod 37 passing through the vented screw plug 38 in the upper end of the cylinder. Spring 39 normally holds the piston down against a shoulder on the cylinder wall forming its seat. The opening leading to the piston valve 36 is covered by the screen 40 to protect the valve from a projected mass of insulating liquid which might cause it to operate at a point below the required static pressure at which it was set. The pressure at which the piston valve will operate may be varied by adjustment of the screw plug 38. The lower link 22 of the toggle is shown provided with a lateral extension 41 which when pressed with sufficient force by the rod 37 moves the toggle pin 31 over center and allows it to buckle. The adjustment is such that the pressures produced in the tank by the normal operation of the switch will not be sufficient to cause the large valve 16 to open, the gas formed at such operations escaping through the restricted orifice in vent pipe 11. In the event of a break-down in the switch or other cause of abnormal pressure therein, the piston valve 36 in responding to such abnormal pressure will trip the toggle and allow the large valve to release the gas and liquid, thereby preventing a further rise in pressure.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. A valve structure adapted for the quick relief of excessive pressure in a tank comprising means forming a valve seat, a valve therefor, a toggle for normally holding the valve on the seat, and means carried by the valve and subject to the pressure within the tank for releasing the toggle.

2. Apparatus adapted for the quick relief of excessive pressure in an enclosed fluid break switch comprising a valve seat, a valve, a toggle for retaining the valve on the seat, pressure responsive means for tripping the toggle thereby to allow the valve to open under the influence of and to relieve the pressure, and a spring arranged to effect the subsequent restoration of the toggle to the position retaining the valve on its seat.

3. Apparatus adapted for the quick relief of excess pressure in an enclosed fluid break switch comprising a valve seat, a valve for providing relief of said pressure, a toggle adapted to thrust said valve into seating engagement, pressure responsive means for causing collapse of said toggle whereby the pressure within said switch is effective immediately to move the valve from its seat, and a spring for effecting resetting of said toggle and consequent reseating of the valve upon predetermined decrease of said pressure.

In witness whereof, I have hereunto set my hand this 30th day of September, 1926.

JOHN D. HILLIARD.