Aug. 4, 1925. 1,548,800

J. D. HILLIARD

ELECTRIC SWITCH

Filed April 27, 1923

Fig. 1.

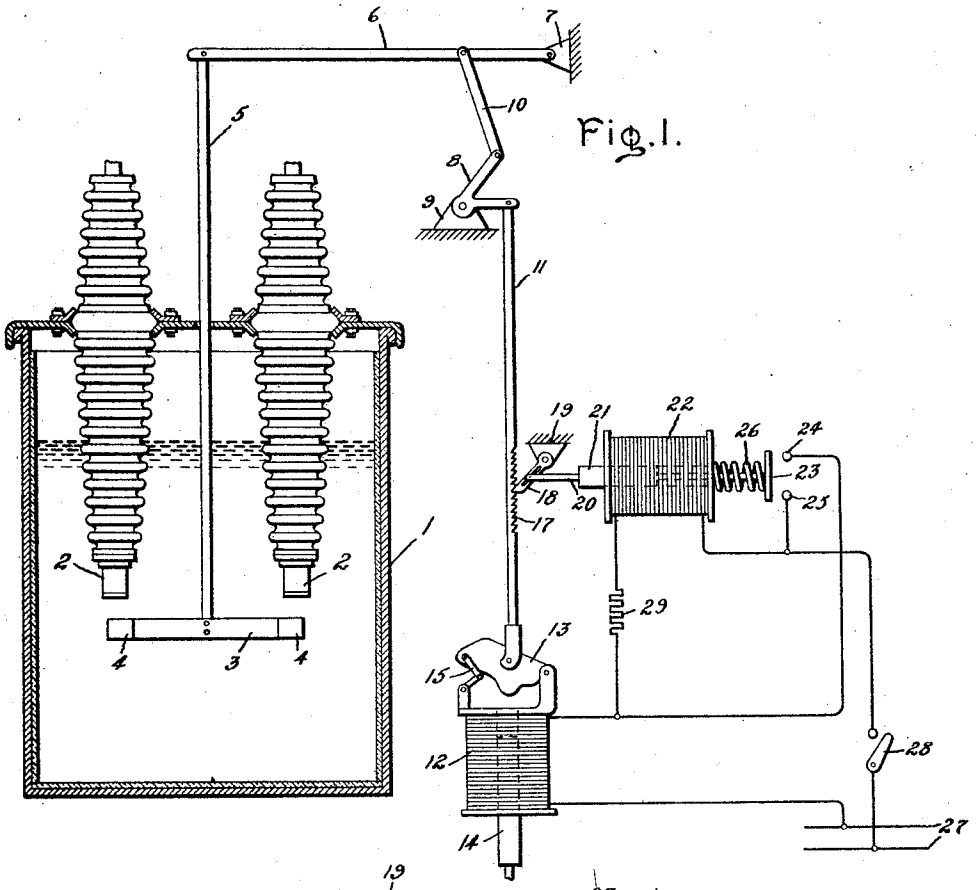
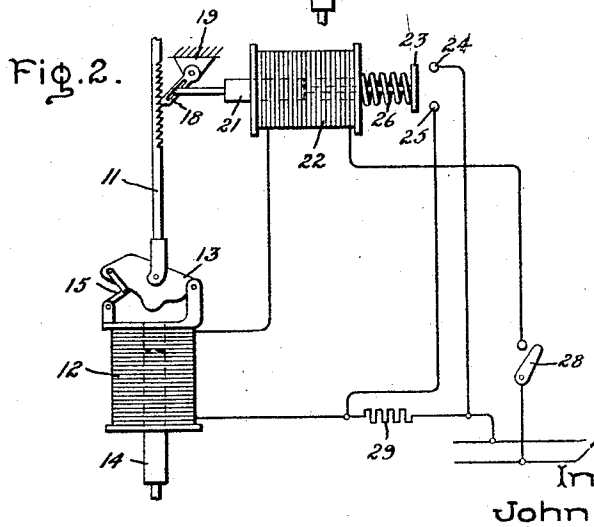


Fig. 2.



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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.

ELECTRIC SWITCH.

Application filed April 27, 1923. Serial No. 635,128.

To all whom it may concern:

Be it known that I, JOHN D. HILLIARD, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Electric Switches, of which the following is a specification.

My invention relates to electric switches of the fluid break type wherein the pressure of the gas generated upon opening the switch tends to cause a reclosing of the same and the object of my invention is to provide against such a reclosing of the switch. It is well known that at each opening of a fluid break switch under load an arc is drawn at the switch contacts which, by the disassociation of the insulating fluid, suddenly forms a considerable volume of gas. Where the construction of the switch operating mechanism includes an operating rod which slides through an opening in the cover of the vessel enclosing the insulating fluid and the switch contacts and is moved outwardly to close the switch, the pressure of gas formed when the switch opens the circuit under heavy load, and particularly during the existence of a short circuit on the line controlled by the switch, may be sufficient to cause the switch to reclose. Such a reclosing of the switch which has previously opened in response to a short circuit frequently has been followed up by disastrous results. To prevent such reclosing of the switch under the conditions mentioned without interfering with the operating movement of the switch, I have provided a detent which normally engages a portion of the switch operating mechanism to prevent its movement in a direction corresponding to the closing movement of the switch but which is disengaged by an electromagnet from such operating mechanism prior to the operation of the switch actuating means.

My invention will be better understood from the following description and accompanying drawing, in which Figure 1 is a diagrammatic view of a fluid break switch and operating mechanism therefor illustrating a preferred form of my invention; Fig. 2 is a diagrammatic view illustrating a modification.

Referring now to Fig. 1 of the drawing, 1 represents the enclosing vessel or tank of a fluid break switch of which 2 are the stationary contacts and 3 is the bar carrying the movable cooperating contacts 4. The operating rod 5 extends up through the cover of the tank and at its upper end is pivoted to one end of the lever 6. The opposite end of this lever is fulcrumed to a support 7. A bell crank lever 8 fulcrumed to a support 9 has one arm connected to the lever 6 by a link 10 while its other arm is pivoted to the rod 11. For actuating the switch I have shown an electro-magnet comprising a solenoid 12 which has fulcrumed to its upper portion a lever 13 to which the rod 11 is pivoted. When the solenoid is energized the plunger 14 is lifted to engage and operate the lever 13 to close the switch. Toggle links 15 serve to retain the lever 13 in its raised position corresponding to the closed position of the switch.

In order that the pressure of gas generated within the tank upon the opening of the switch under load or when a short circuit occurs on the line may not cause the switch to reclose, I have provided a ratchet mechanism comprising a series of teeth 17 formed upon the rod 11 which are normally engaged by a spring pressed pawl 18. This pawl is pivoted to a support 19 and has a pin and slot connection as shown with an actuating rod 20, which rod extends from opposite ends of a core 21 of the solenoid 22. The rod 20 carries a bridging member 23 at the end opposite the pawl which is adapted to electrically connect contacts 24 and 25, and arranged between and secured to the solenoid and the bridging member is a tension spring 26. Circuit connections are provided between the two solenoids 12 and 22 and the mains 27 to be controlled by a switch 28. A resistance 29 is included in the connection between the two solenoids, and the contacts 24 and 25 are connected in the manner shown so that when they are engaged by the bridging member 23 the solenoid 22 and the resistance 29 will be short circuited. The value of the resistance 29 is so chosen that when this resistance is added to the resistance of the solenoid 22, the current will be insufficient to cause the solenoid 12 to actuate the switch.

Considering the parts in the positions shown by Fig. 1, the main switch is moved to closed circuit position by closing the switch 28. This closes a series circuit

through both solenoids and the resistance, but for the reason stated above, only the electromagnet which is connected to the pawl will be actuated. The pawl is thereby withdrawn and the contacts 24 and 25 are bridged by the member 23. The resulting increase in energization of the solenoid 12 is sufficient to cause the main switch to be closed, it being understood that by reason of the inertia of the parts, the pawl is not returned into position to engage the ratchet teeth 17 before the main switch is fully closed. Since the pawl normally engages the ratchet, gas pressure within the tank cannot cause the switch to open.

In the modified form shown in Fig. 2 the construction is the same as shown in Fig. 1, the difference residing only in the circuit arrangement. The resistance 29 in this case, is placed between the solenoid 12 and one of the mains 27 and the contacts 24 and 25 are connected with opposite ends of the resistance so that when the electromagnet controlling the pawl is actuated the resistance 29 only is short circuited.

As the operation of the form illustrated by Fig. 2 is similar to that of Fig. 1 which has already been described, a description of its operation will be omitted.

While I have described a preferred embodiment of my invention together with a single modification thereof, I do not wish to be limited to the particular forms shown and described as it will be apparent that many modifications thereof may be made without departing from the scope of my invention as set forth in the appended claims.

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

1. In a fluid break switch wherein the pressure of gas evolved tends to move the switch mechanism to closed circuit position, means effective upon the initial movement of the switch mechanism to open circuit position for preventing the reclosing of the switch, means for rendering said means inoperative and means responsive to the operation of said second means for moving said switch mechanism to closed circuit position.

2. In a fluid break switch wherein the pressure of gas evolved tends to move the switch mechanism to closed circuit position, means for moving said mechanism to closed circuit position, means for controlling said first means, and means controlled by said controlling means for preventing movement of said mechanism to closed circuit position, said last means being effective after an initial movement of said mechanism to open circuit position.

3. In a fluid break switch mechanism wherein the pressure of gas evolved tends to move the mechanism to closed circuit position, means independent of the position of said mechanism for normally opposing movement of said mechanism to closed circuit position, electromagnetic means for rendering said means inoperative, means for moving said mechanism to closed circuit position, and means operated by said electromagnetic means for controlling the operation of said moving means.

4. In a fluid break switch mechanism wherein the pressure of gas evolved tends to move the mechanism to closed circuit position, an electromagnet for moving said mechanism to closed circuit position, means for preventing the reclosing of said switch due to gas pressure after an initial opening movement of the switch, electromagnetic means for rendering said means inoperative and a switch operated by said electromagnetic means for controlling said electromagnet.

5. In a fluid break switch mechanism wherein the pressure of gas evolved tends to move the mechanism to closed circuit position, an electromagnet for moving said mechanism to closed circuit position, means for preventing the reclosing of said switch due to gas pressure after an initial opening movement of the switch, means for rendering said means inoperative, a switch for controlling said last means, and a switch operated in response to movement of said first means for controlling the energization of said electromagnet.

6. In a fluid break switch mechanism wherein the pressure of gas evolved tends to move the mechanism to closed circuit position, an electromagnet for moving said mechanism to its closed circuit position, a detent normally engaging said mechanism to prevent said movement after the switch has begun to open, an electromagnet for withdrawing said detent, and a switch responsive to the position of said detent for controlling the operation of said electromagnet.

7. In a fluid break switch mechanism wherein the pressure of gas evolved tends to move the mechanism to closed circuit position, an electromagnet for moving said mechanism to its closed circuit position, a ratchet on said mechanism, a detent normally engaging said ratchet to hold said mechanism against movement to closed circuit position, an electromagnet for withdrawing said detent, a switch operated by the latter electromagnet, a source of current, a control switch, circuit connections between said source, said electromagnets, and said switches whereby when said control switch is closed, said detent is withdrawn and the switch controlled thereby is closed to cause the actuation of said first mentioned electromagnet.

In witness whereof, I have hereunto set my hand this 26th day of April, 1923.

JOHN D. HILLIARD.