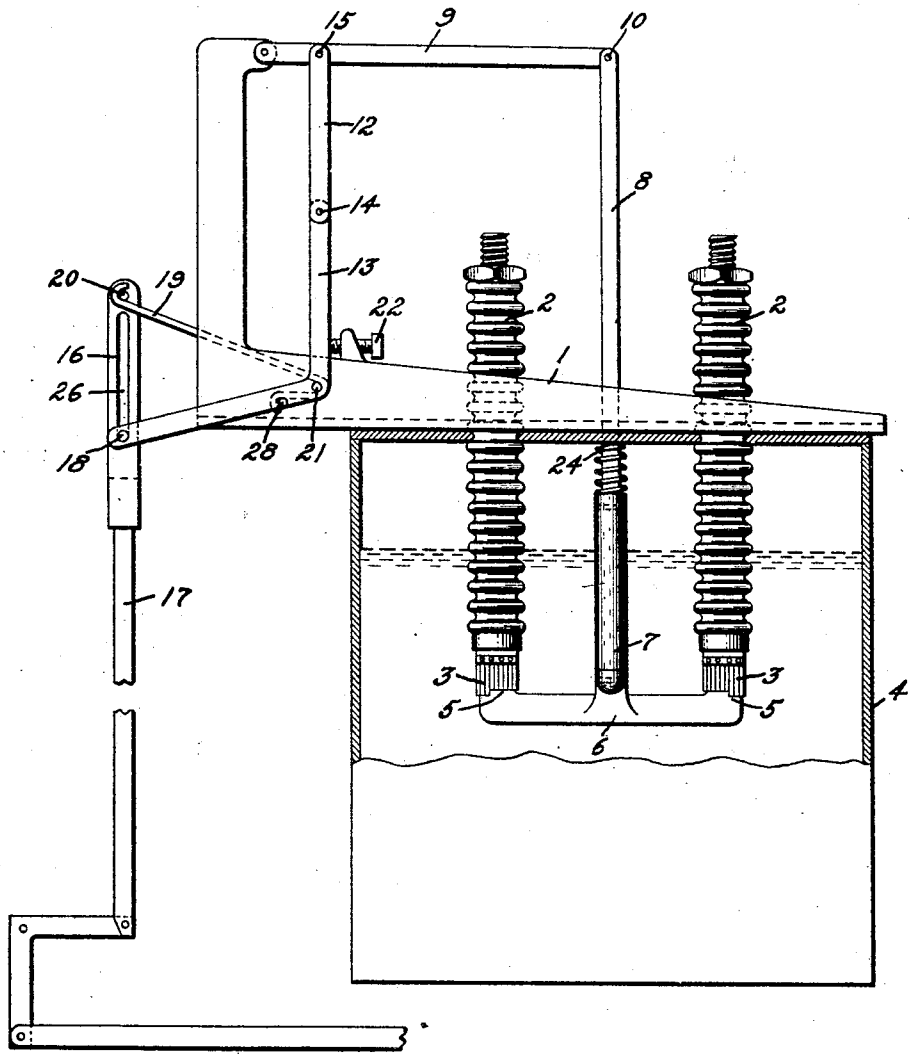
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J. D. HILLIARD

SWITCH OPERATING MECHANISM

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Inventor:
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SWITCH-OPERATING MECHANISM.

Application filed June 1, 1922. Serial No. 565,198.

My invention relates to electric switches and in the embodiment herein illustrated I show the same as applicable to switches having contacts adapted to be separated beneath the surface of a liquid. When so separated to break the circuit an arc is formed which results in the formation of gaseous material depending in quantity upon the duration of the arc. As experience has demonstrated that for certain given conditions such as line potential, current frequency and power factor, the distance required to separate the contacts to interrupt the current is constant within fairly narrow limits and as the quantity of gas formed is an important factor in limiting the capacity of switches of this type it becomes imperative that some means be employed to cause a rapid separation of the contacts to the required distance.

One object of the present invention is to provide a switch with an improved mechanism for causing a rapid separation of the contacts.

A further object is to provide a mechanism of this character which can readily be incorporated in switches of the types now manufactured.

In a large number of switches at present on the market separation of the contacts is effected either wholly or partially by a spring, acting upon the contact mechanism. This spring is called upon to move not only the switch contacts themselves but a considerable portion of the opening and tripping mechanism. This necessarily limits the speed which the spring can impart to the contacts themselves, particularly in the case of remote mechanically controlled switches. To increase the strength of the spring will increase the speed of opening but it will cause the closing operation which must take place against the force of the spring to become correspondingly difficult.

A further object of my invention is to avoid this disadvantage by providing means through which the contact mechanism at the opening of the switch may be released from the greater part of the closing and tripping mechanism, and thus become free to move independently thereof under the influence of the opening force.

A further object is to provide a switch with a trip release mechanism which in the train of operating mechanism is located as near as possible to the contacts themselves.

Another object is to provide a switch having an improved trip free release mechanism.

A further object is to provide a switch which may be installed with any one of a variety of operating mechanisms but wherein means is provided which will insure upon opening of the switch a uniformly rapid separation of the contacts.

Other objects and advantages will appear from the description taken in connection with the accompanying drawing which shows in section partly in elevation a portion of the switch embodying my invention.

The switch shown is of the single pole type and comprises a frame member 1 which supports insulators 2 for the stationary terminals 3, and also supports and forms a cover member for the liquid containing tank 4. Resilient contacts 5 are secured to the terminals 3 and are adapted to engage a conducting bridging member 6 which is fastened to insulated rod 7, an extension 8 of which protrudes through the cover 1 and is pivotally connected with the contact lever 9 at 10. The toggle link 12 is pivoted to the upper end of the bell crank 13 by a pin 14, and to the contact lever 9 by a pin 15. A clevis 16 formed with a slot 26 is attached to an operating rod 17 and furnishes means for operating the switch through the pin 18 in the end of the bell crank 13, which pin is adapted to move in the slot 26. The bell crank 13 is pivoted at 21 to the frame 1. A spring 19 is wound about the pivot 21 and bears at one end against a pin 28 formed on the bell crank 13, and at its other end bears upwardly against a pin 20 on the clevis 16. An adjustable stop 22 is provided to limit the travel of the bell crank 13 in a clockwise direction, the preferred position of the toggle when the switch is closed, being slightly beyond the center line formed by joining the centers of the pins 15 and 21.

To furnish the necessary force for separating the contacts I provide a spring 24 interposed between the rod 7 and the cover 1. Contacts 5 likewise assist the opening operation by reason of the pressure which they exert upwardly against the contacts 3.

In operation, let it be assumed that the switch is in closed position as shown in the drawing. To open, the operating rod 17 and clevis 16 are moved quickly downward, thereby storing energy in the spring 19 and

causing the slot 26 to move until the pin 18 is struck a hammer blow by impact with the upper end of the slot. This causes the bell crank 13 to turn quickly about the pivot which breaks the toggle formed by the bell crank and link 12. The contact mechanism is then free to fall assisted by the action of spring 24 and pressure of the contacts 5 as above described. The stored energy of the spring 19 is utilized to accelerate the movement of the bell crank 13 and except for the lateral friction of the pin 18 against the side of the slot 26, the pin 18 may freely traverse this slot until it reaches its lower end. In this position the pin 18 is ready to receive an upward impulse from the rod 17 to reclose the switch. I term the means by which the contacts are released to permit them to open a trip release mechanism.

It is clear that the rod 17 may be operated from a point adjacent the contacts or from a more remote point by a suitable actuating mechanism, and that regardless of what mechanism is used to actuate the rod 17 when the switch is tripped open, the opening forces are not required to move any of the operating mechanism farther from the contacts than the bell crank 13. While the toggle shown furnishes a means whereby the closing pressure exerted by the rod 17 may be utilized at a considerable mechanical advantage to force the contacts closed, it is to be noted that no mechanism is moved by the toggle in the opening operation, and thus the necessity of moving portions of the operating mechanism at a correpsonding mechanical disadvantage which would be the case were the clevis 16 movable with the bell crank 13 during the opening operation does not exist.

By causing the circuit through the tripping coil of this trip free release device (not shown) located at the point of control to be broken except when the switch is in the position shown, it will be impossible for the switch to be tripped open while being moved toward circuit closing position.

While I have shown and described my invention as applicable to a switch of the fluid type, it is clear that the same is equally applicable to air brake switches.

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

1. The combination of contacts separable to break a circuit, a toggle releasable to permit the separation of the contacts, means for moving said toggle to close said contacts, said means acting upon said toggle through a lost motion connection and a spring interposed at said lost motion connection for assisting the separation of said contacts upon their release and for causing said means to assume a position in which said lost motion is taken up at the start of the closing operation, whereby the force of the spring does not oppose said closing operation.

2. In a switch operating mechanism, a contact operating member, a toggle connected therewith, an operating rod for said toggle having a pin and slot connection therewith, and a spring arranged between the rod and the toggle tending to move said pin to one end of said slot whereby the contact opening movement of said operating member is accelerated and the lost motion of said pin and slot connection is taken up preparatory to the switch closing movement of said operating rod, the arrangement being such that the spring is compressed by the opening movement of the operating rod.

In witness whereof, I have hereunto set my hand this 31st day of May, 1922.

JOHN D. HILLIARD.