M. H. SHOENBERG.

OVERLOAD SWITCH.

APPLICATION FILED DEC. 27, 1919.

1,378,730. Patented May 17, 1921.

2 SHEETS—SHEET 1.

Fig. 1.

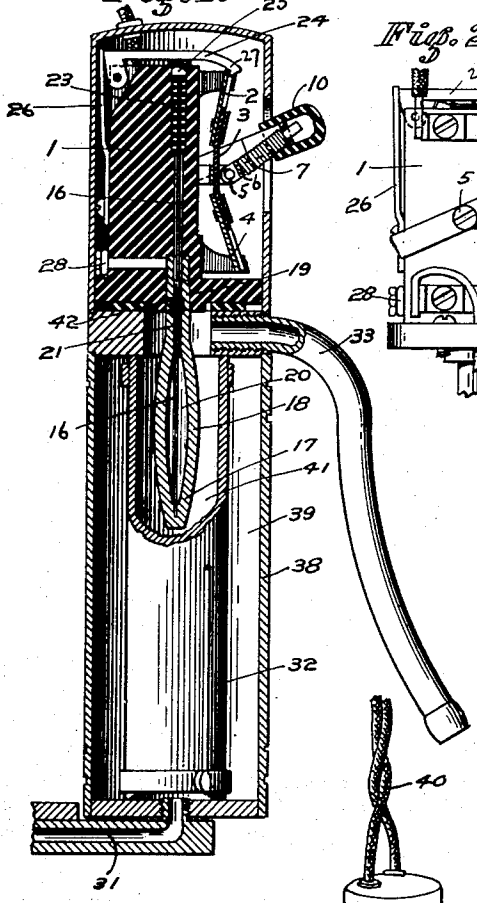


Fig. 2.

Fig. 3.

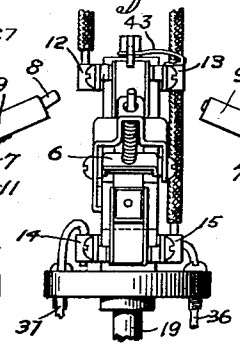


Fig. 4.

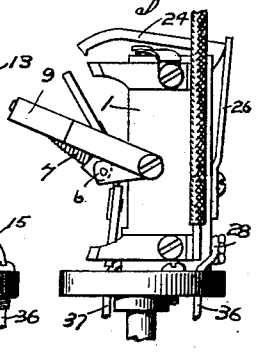


Fig. 5.

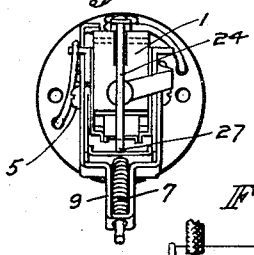


Fig. 6.

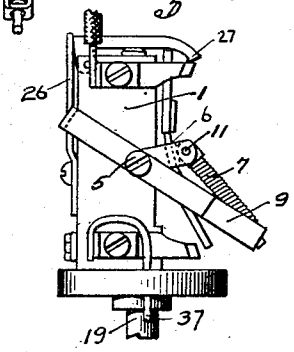


Fig. 7.

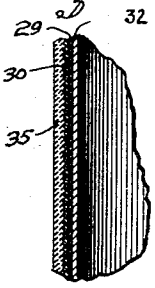
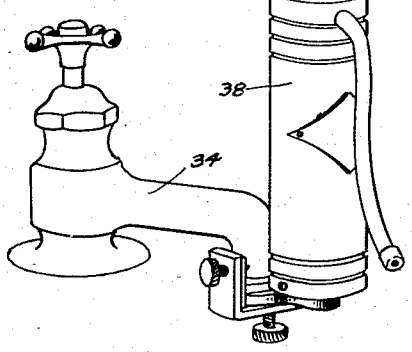


Fig. 8.



INVENTOR

BY Milton H. Shoenberg

Miller & Henry

ATTORNEYS

M. H. SHOENBERG.

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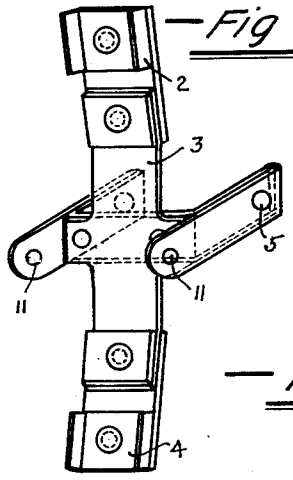
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1,378,730.

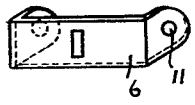
Patented May 17, 1921.

2 SHEETS—SHEET 2.

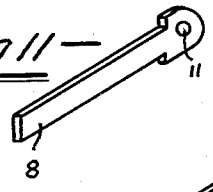
— Fig 9 —



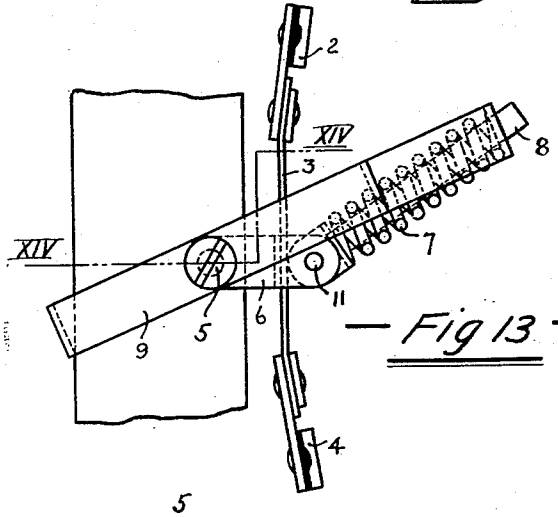
— Fig 10 —



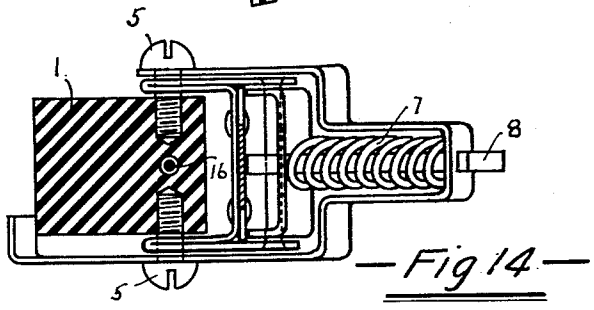
— Fig 11 —



— Fig 12 —



— Fig 13 —



— Fig 14 —

INVENTOR
Milton H Shoenberg
BY
Miller & Henry
ATTORNEYS

UNITED STATES PATENT OFFICE.

MILTON H. SHOENBERG, OF SAN FRANCISCO, CALIFORNIA.

OVERLOAD-SWITCH.

1,378,730. Specification of Letters Patent. Patented May 17, 1921.

Application filed December 27, 1919. Serial No. 347,734.

To all whom it may concern:

Be it known that I, MILTON H. SHOENBERG, a citizen of the United States, and a resident of the city and county of San Francisco, State of California, have invented new and useful Improvements in Overload-Switches, of which the following is a specification.

My invention has for its object the opening of an electric circuit by automatically operating a switch from its closed circuit position into its open circuit position, and also the provision of manually operating means whereby the switch may be thrown from its open position into its closed position as required. The switch is particularly applicable to the control of heating apparatus and provides means whereby in the event of over-heating, from whatever cause, the switch automatically opens the circuit preventing damage to the apparatus or other deleterious effects.

The switch is preferably of the double pole type thereby entirely interrupting both legs of the circuit of the switch.

Other objects will appear from the drawings, description and claims. These objects I attain by providing a pair of swinging contact members adapted to spring on each side of their corresponding stationary contact blades, and while in its central position providing a closure in each of a plurality of circuit legs. Also, when the heat from current flowing is not in excess of normal, the switch may be retained in its position of closure, but if for any reason the current flowing exceeds the predetermined amount, the means for retaining the switch element in its closed position is displaced outside of the contact range therewith resulting in a clearance or movement in either or both directions of the contact blade, and making it impossible to retain the contact blade in the position of closure. The contact blade, or blades, may be swung in either or both directions by a projecting arm or finger piece having connections such that a considerable finger movement initiates pressure against the blade and movement of the blade then takes place, and when this occurs the blade "snaps" quickly into the new position. If the current then flowing due to the closure of the circuit is in excess of a predetermined amount the switch blade is instantly released and continues its movement into a neutral or open position. If while the switch is closed it is desired at any time to open it, this may also be accomplished by reversal of movement of the finger member.

In combination with the retaining member for holding the blade in a position of closure, I arrange an expansion element interposed in the circuit so that current flowing through the switch when in its closed position also flows through the expansion element and heats the same. This expansion element or thermostat wire is to be placed within the device connected to the circuit controlled by the switch, as for example—a water heater, in which case the expansion element is preferably immersed in the water, and as stated above, in series with the coils adapted to heat the said water. The current flowing through the thermostat element will generate heat therein, which heat will be rapidly abstracted by the flowing water, and the temperature of the said element will therefore be retained sufficiently cool to prevent its expansion beyond a predetermined point.

If now for any reason the water is removed, as for example—boiling away, the heat generated in the said expansion element due to its electrical resistance will not be abstracted as rapidly as before, and therefore the temperature of the said element will be raised. The raising of its temperature causes expansion, which in turn is utilized to operate the trip or latch that has heretofore held the switch in its closed position, and the removal of the latch permits the spring against the switch blade, to force the said blade out of contact and into an open position.

By referring to the accompanying drawings my invention will be made clear,

Figure 1 is a cross section of my switch in combination with a water heater with the switch parts partly in section.

Fig. 2 is a side view of the switch element with the switch blades in closed position and a thermostat link engaged with the switch blade.

Fig. 3 is a side view similar to Fig. 2 but moved through an angle of 90°.

Fig. 4 is a side view opposite to Fig. 2

and showing the thermostat latch open due to the automatic operation of the thermostat.

Fig. 5 is a plan view of Fig. 3.

Fig. 6 is a side view similar to Fig. 2 but with the switch blade in one of its inoperative positions.

Fig. 7 is a cross section of a portion of the heating element in the water heater.

Fig. 8 is an assembly of the heater and switch as located on a well known form of faucet.

Figs. 9 to 14 inclusive illustrate in detail certain parts and their association.

Throughout the figures the same numerals refer to similar parts.

The insulating base on which the switch parts are mounted is indicated by the numeral 1.

Numerals 2 and 4 are metallic bridges on the insulated switch plate 3, they being insulated from each other as by the body portion of the blade 3. The entire assembled blade 2, 3, 4 is pivotally mounted at 5, which pivot also carries a U shaped arm 6, under the control of the spring 7, carried on the arm 8, and passing through a suitable hole carried in the second U piece 9. Mounted on the end of the second U piece 9 is the finger member 10, by which the piece 9 may be raised or lowered over a wider range than the movement provided for the U piece 6, such that the plane of the arm 9 may pass in either direction beyond the plane of the spring pivot 11 carried on the U piece 6. It will thus be seen that the compression spring 7 will tend to force the U piece 6 in a downward direction, and the finger piece 10 of the arm 9 in an upward direction when the parts are as indicated in Figs. 2 and 4, and when the finger piece 10 is depressed forcing the arm 9 down into the position shown in Fig. 6, the spring 7 will tend to retain it in its down position, and will force the pivot 11 upwardly swinging the member 6 about its support 5 and carrying with it the switch blades 2 and 4 of the insulated member 3 into the inoperative position.

The bridge 2 is adapted to close contact between the side blades 12 and 13 when the switch is closed, and the bridge 4 is adapted to close contact between the said blades 14, 15 when the switch is in its closed position.

The finger piece 10 through the action of the spring 7 on U piece 6, as above described, causes the switch blade 3 and its bridge members 2 and 4 to swing from one extreme position to the other, both extreme positions corresponding with neutral or open circuit. The down position of the finger piece 10 corresponds with the open position of the switch as indicated in Fig. 6. The upper position of the finger piece 10 corresponds with either the closed position, as indicated in Fig. 2, or the open position as indicated in Fig. 4, depending upon the condition of the thermostat or expansion element 16. This element 16 I prefer to construct of a non-corrosive wire, insulated, enameled, or otherwise treated, and one end of the said wire is secured as at 17, in an open frame 18, which is preferably of metal, or other suitable conductor, and which at its opposite end 19, is fixed in the insulating base 1 of the switch.

The open frame 19 may advantageously be constructed of a metallic tube cut away in its lower portion as at 20, and threaded into the insulating base as at 19. The thermostat, or wire element 16 is assembled with a rod of larger cross section, or higher conductivity at 21, which latter rod passes through a rubber gasket 42, the latter being for the purpose of preventing water from the heater getting into the mechanism of the switch. The rod passes upward and through the spring 23, normally under compression so that the said rod 21 and the wire 16 together are in tension due to the compression of the spring 23.

At 24 is provided a latch member normally resting against the button 25 formed with the end of the rod 21, which latch 24 is retained against the said button by the light spring 26, the latter normally forcing the latching end 27 of said latch into the positions shown in Figs. 1, 2, 6, and which latch is adapted to engage the extended end of the switch blade 3 and hold it in the position indicated in Figs. 1 and 2 when the finger member 10 is in the up position.

At 28 is provided a contact adapted to complete the circuit through the tube 19, frame 18, connections 17, wire 16, rod 21 and button 25, the latter being electrically connected at 43, to the contact piece 13, which latter when the switch is closed connects with one leg of the circuit through the metallic bridge 2 and piece 12. From the contact piece 28 one of the wires adapted to energize the heating device is connected to the water heater. (see Figs. 4, 3) which heater is provided with a tube 32 around which is a suitable insulating sheet 29 as of mica, on which is wound a resistance coil 30, which is preferably to be embedded in cement, or otherwise permanently fixed thereon.

The tube 32 and insulation 29 are preferably made very thin to readily enable the heat to be transmitted therethrough to the circulating water. The water to be heated enters through the passageway 31 and passes upward through the heating element 32 (formed as indicated in Fig. 7) during which time it is heated by contact with the wall of the said tube and its coil 30 and resistance wire 16. The heat of the resistance wire 16 being given up to the circulating water so that the said wire is retained at a

relatively low temperature during the period of water passage. The heated water now passes out through the tube 33, and as long as the circulation of the water through the opening 20 is maintained around the wire 16, it is prevented from attaining a high or unsafe temperature. If the water flow be closed off as by the faucet 34, or if the water has not previously been turned on, or if for any reason the wire 16 is not maintained cool while the current is flowing through the said wire, the heat generated by the said current due to the resistance of the wire is retained therein, and the temperature of the wire is immediately raised and the spring 23 forces the rod 21 and button 25 to raise the latch member 24 causing a release of the switch member 3 from the latch end 27, and by the action of the spring 7 to immediately "snap" into the position shown in Fig. 4, thereby opening the circuit and interrupting the flow of current through the heater and thermostat wire. It will be impossible to maintain the switch closed without cooling the wire 16 by the circulation of water, as in the case of the water heater shown in Figs. 1 and 8, or maintaining it cool by other device which may be substituted therefor.

In order to establish and maintain closure of the switch it is necessary to create and maintain a flow of water, or other heat abstracting means about the wire 16 at any time that the finger piece 10 is operated to close the switch.

One end of the heater coil 30 embedded in its heat insulating cement 35, is connected as at 36. Fig. 4, with the binding post 28, and the opposite end of the said coil is connected as at 37 with the side blade 14, which when the switch is closed completes the circuit through the knife blade, the bridge piece 4 and the binding post 15 and thus to the other leg of the energizing circuit.

The heater element 32, consisting of the tube 28, mica 29, wire coil 30, cement layer 35, is mounted within a protecting sheath or casing, or housing, 38, preferably arranged with an air space 39, serving as insulation and to prevent heat dissipation.

The operation is as follows:

Assuming an energization of the main circuit leads 40, water is turned on as through the faucet 34, which flows through the passageway 31, heat element passage 41, and out through the tube 33, being prevented from entering the passage 39, and prevented from entering the switch mechanism as by the rubber gaskets as at 42. Assuming the switch parts to now be as shown in Fig. 4, the finger piece 10 is first depressed, which throws the switch blade through its full stroke, as shown in Fig. 6, which is also an open position. During this stroke the switch blade has passed under the latch 27 which trips due to the sloping surface thereon. The finger piece 10 is now raised into the positions shown in Figs. 1 and 2, when the switch blade will start on its return stroke, and be caught by the latch 27 and held in position shown in the figures.

The bridge piece 2 will now bridge the contacts 12 and 13, completing the circuit therethrough, and permitting current to flow from 12 through to 13, 43, 25, 21, 16, 17, 18, 28, 36, thence around the coil 30 and out through the wire 37, side blade 14, switch bridge 4, and thence out through the binding post 15, thus completing the circuit.

During the period of normal water flow the wire 16 will be retained within its normal range of temperature by the circulating water or other fluid, and the switch will be retained closed. If the water now be shut off at the faucet 34, the body of water, or other fluid, remaining within the passageway 41 will become overheated, the wire or thermostat element member 16 will expand permitting the compression spring 23 to expand, forcing the button 25 to raise the latch 27, and releasing the switch blade from the positions of Figs. 1 and 2, when it will immediately "snap" into the position of Fig. 4, thus incidentally opening both legs of the circuit, the instantaneous movement preventing dangerous arcing or any circuit burn-out. If now the finger member 10 be operated in either direction, or any number of times, the position of closure of the switch will be instantaneously followed by an expansion of the wire 16 and the releasing of the latch 27, and the switch cannot be retained in its closed position without simultaneously maintaining a heat abstraction from the wire 16, which in the particular case herein illustrated is accomplished by the circulating water.

I claim:

1. In combination with an electric switch comprising an oscillating member adapted to snap into either extreme position about a pivot under the action of a spring, at which point the circuit is interrupted, and upon displacement of the opposite end of the spring with respect to said central pivot, and including latch means adapted to retain the member in an intermediate position and in contact with circuit terminals.

2. In combination with an electric switch comprising an oscillating member adapted to snap into either extreme position about a pivot under the action of a spring, at which point the circuit is interrupted, and upon displacement of the opposite end of the spring with respect to said central pivot, and including latch means adapted to retain the member in an intermediate position and in contact with circuit terminals, in combination with an expansible element constructed and adapted to permit said latch to arrest the member in closed circuit position

while said element is retained below a predetermined temperature, and to operate the latch to release the member upon a raise in temperature of the element, said element connected in series with said member and circuit terminals, and constructed and adapted to receive temperature variations from an electrically operated device in circuit with said switch.

3. A double pole, double throw, electric switch substantially as shown and described, in combination with an expansible wire, and associated therewith releasing means for said switch and an electrically operated device actuated by current controlled by said switch, said device embracing said wire and effecting temperature control thereof, as and for the purposes set forth.

In testimony whereof I have hereunto set my hand at the city and county of San Francisco, State of California.

MILTON H. SHOENBERG.