

Aug. 22, 1933.

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1,923,092

ELECTRIC SWITCH

Filed May 8, 1930

Fig. 1

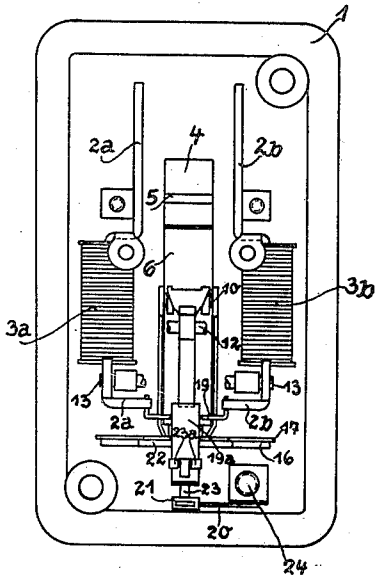


Fig. 2.

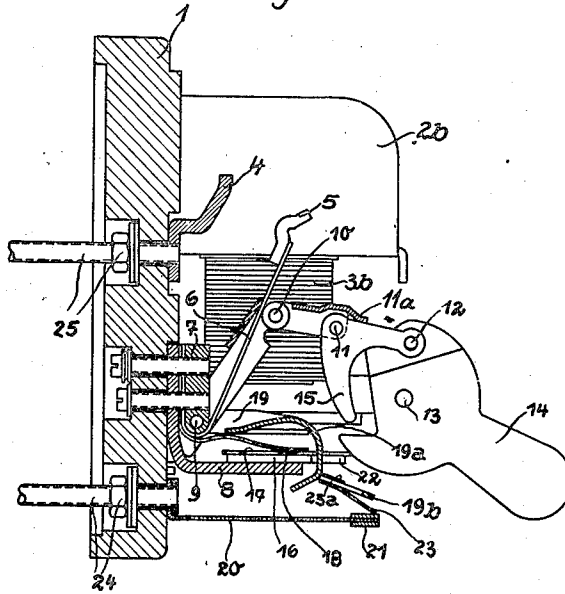
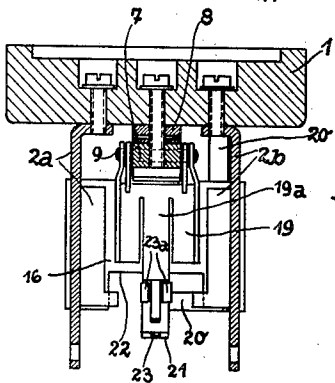


Fig. 3.



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1,923,092

ELECTRIC SWITCH

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Application May 8, 1930. Serial No. 450,737

8 Claims. (Cl. 200—88)

In switches with overload cut out arrangements there has been a tendency to substitute separate electromagnetic and thermal release devices for the combined electromagnetic-thermal releases formerly more usual. By combined electromagnetic-thermal release is meant a release device in which the release armature of the overload magnet effects release not only when short circuits or like overloads occur but also in the case of relatively small but protracted overloads, but is hindered from moving by a thermal relay as long as the relatively low overload has not exceeded an unpermissible period. In separate electromagnetic and thermal releases the armature of the overload magnet remains still as long as short circuit or like overload currents do not occur. It only moves on the occurrence of such overloads. With relatively low but unpermissibly protracted overloads, the release action is effected solely by a thermal release.

The present invention relates to an overload switch with two magnet windings for actuating the release armature, between which the moving switch contact, and the switch locking and actuating mechanism with the operating handle are located. Such switches are characterized by a very compact construction, so that they are suitable for replacing the still very usual cartridge fuses. Owing to the shielding of the actuating and locking mechanism on both sides due to the magnet windings, it has not been possible hitherto to provide such a switch with separate electromagnetic and thermal releases. The actuating and locking mechanism is only free at its lower end for the action of the armature. Accordingly a combined electromagnetic-thermal release device has been used. Beneath the armature a current traversed and therefore current heated bimetallic strip has been provided, to one end of which a helical spring was attached, of which the other end is attached to the armature. Upon a short circuit occurring, with this arrangement the armature is attracted in spite of the spring tension so that the locking mechanism is released. If a relatively small overload current flows, the bimetallic strip slowly bends upwards so that after a certain time the spring is slackened to such an extent that the weak magnetic force developed by the overload suffices to attract the armature which releases the locking mechanism by its movement.

The present invention solves the problem of providing a switch of this kind with an electro-

magnetic and thermal release in such a manner that both releases act entirely independently. According to the invention a movable member is provided over the release armature which is movable both by the armature and independently thereof, and which passes through the plane of the armature and has an abutment which is movable by a thermal release below the armature.

The accompanying drawing illustrates an example of the invention.

Figure 1 is an elevation in which the operating handle has been omitted to render the parts more visible.

Figure 2 is a longitudinal section, and

Figure 3 is a cross section.

On the base 1 of insulating material are secured two iron plates 2a and 2b both bent up at right angles at the bottom, on which are carried the two magnet windings 3a and 3b serving to actuate the release armature. Between the plates 2a and 2b is the stationary switch contact 4. The moving switch contact 5 is secured to a blade spring 6, the opposite end of which is gripped between clamping members 7 and 8. The spring 6 tends to move the contact 5 away from the contact 4. The field between the plates 2a and 2b serves to blow out the arc formed when the switch is opened.

Between the two coils 3a and 3b on the plates 2a and 2b is the actuating and locking mechanism and the operating handle. The actuating and locking mechanism is formed by a double toggle. Its first link lies between the pivots 9 and 10, its second link between the pivots 10 and 11, its third link between pivots 11 and 12, and its fourth link between pivots 12 and 13. The link 10, 11 has a projection 11a coacting with the link 11, 12 so that these two links can only bend downwardly just beyond the dead centre position. The link between the pivots 12 and 13 is formed by the operating handle 14. The link 9, 10 is coupled for common movement with the spring 6 and moving contact 5 so that when this link turns about the pivot 9 these two parts move with it. The link 11, 12 is provided with a horn 15.

The plate form armature 16 on which lies a similarly shaped plate 17 of insulating material, is secured to a blade spring 18 which is gripped between the clamping members 7 and 8. It is pressed by the spring 18 against one limb of the right angle member 8.

Above the armature 16 is a member 19 rotatable on the pivot 9. The central part 19a of the mem-

ber 19 is bent upwardly, this part cooperating with the horn 15.

Beneath the armature 16 is the current heated bimetallic strip 20 which carries a small insulating piece 21. The part 19a of the member 19 passes through a cut out portion 22 in the armature 16 and is provided with an abutment 19b which is movable by the bimetallic strip 20 serving as the thermal release. A weak blade spring 23 is secured to the abutment 19b of the member 19 by lapped over ears 23a. The member 19 rests with the spring 23 on the bimetallic strip 20.

The connections within the switch are arranged as usual. The switch is connected in circuit by the terminals 24 and 25.

In the position of the parts shown in Figure 2, the contacts 4 and 5 are apart and the circuit through the switch open. When the handle 14 is moved upwards about the pivot 13, the toggle links 10, 11 and 11, 12 remain unchanged in their positions relative to one another. The link 9, 10 swings about the pivot 9 and with it the spring 6 until the contact 5 bears on the contact 4 thus closing the circuit through the switch. During the closing movement the horn 15 moves over the part 19a of the release member 19.

Upon a short circuit occurring, or similar overload, the armature 16 is suddenly lifted by the action of the magnet windings 3a and 3b. In its upward movement it lifts the member 19 which swings about the pivot 9. The mid part 19a over which the horn 15 is situated causes the toggle formed by the links 10, 11 and 11, 12 to collapse upwards. Accordingly the links 9, 10 can swing around the pivot 9 under the action of the spring 6 and the contact 5 leaves the contact 4. Clearly, this action will take place even if the handle 14 is held by hand in the "on" position during a short circuit. The switch therefore is of the trip-free-from-the-release handle type. When the toggle 10, 11, 12 has been caused to collapse by the member 19 through the horn 15, the handle 14 falls owing to its weight into the "off" position, so that the position of handle immediately indicates whether the circuit through the switch is open or closed.

With the switch "on", the bimetallic strip 20 is traversed by current and therefore heated. Owing to its rise in temperature it bends upward somewhat and presses the weak spring 23 slightly upwards. Owing to the weakness of the spring 23 however at first no movement of the member 19 occurs, the spring merely being slightly loaded. If an overload of unpermissible amount occurs, the bimetallic strip 20 bends further upwards and if this current continues the spring 23 is finally pressed against the abutment 19b and the insulator 21 on the strip 20 swings the member 19 upwards about the pivot 9. Accordingly the horn 15 located over the part 19a of member 19 is moved upwards so that the toggle 10, 11, 12 is caused to collapse upwardly and the cut out spring 6 comes into action. Releasing therefore takes place with relatively small but protracted overloads by purely thermal action; the short circuit or rapid release armature 16 remains entirely at rest.

What I claim is:—

1. In an electric switch having an overload release device the combination of a plate form release armature, a pair of magnet coils arranged side by side above said armature for actuating said armature on the occurrence of short circuits and like overloads, a moving contact

member, a switch actuating and locking mechanism and an operating handle mounted between said coils, an upwardly moving plane bimetallic strip traversed by current mounted below and parallel to said armature, and a release member pivoted above said armature in the path of movement thereof and passing through the plane thereof into the path of said bimetallic strip, adapted to release said actuating and locking mechanism.

2. In an electric switch having an overload release device the combination of a pair of magnet coils arranged side by side and energized by the circuit controlled by the switch, a plate form release armature suspended on a spring beneath said coils in the field thereof, a double toggle between said coils, a moving contact member coupled to one end link of said double toggle, spring means tending to move said moving contact member away from the stationary contact member, an operating handle forming the other end link of said double toggle, an upwardly moving plane bimetallic strip heated by the current in the circuit controlled by the switch mounted beneath said armature parallel thereto, and a rotatable release member pivoted above said armature in the path thereof and having a projection passing down through a cut out part of said armature into the path of said bimetallic strip, adapted to cause said toggle to collapse when lifted.

3. In an electric switch having an overload release device the combination of a pair of magnet coils arranged side by side and energized by the circuit controlled by the switch, a plate form release armature beneath said coils in the field thereof and attached to one end of a blade spring, a double toggle between said coils, another blade spring carrying the moving contact and tending to move away from the stationary contact, coupled to one end link of said double toggle, an operating handle forming the other end link of said double toggle, an upwardly moving plane bimetallic strip heated by the current in the circuit controlled by the switch mounted beneath said armature parallel thereto, and a rotatable release member above said armature in the path thereof and having a projection passing down through a cut out part of said armature into the path of said bimetallic strip, adapted to cause said toggle to collapse when lifted.

4. In an electric switch having an overload release device the combination of a pair of magnet coils arranged side by side and energized by the circuit controlled by the switch, a blade spring, a plate form release armature carried by said blade spring and disposed beneath said coils in the field thereof, a double toggle between said coils, a moving contact member coupled to one end link of said double toggle, spring means tending to move said moving contact member away from the stationary contact, an operating handle forming the other end link of said double toggle, an upwardly moving bimetallic strip heated by the current in the circuit controlled by the switch mounted beneath said armature parallel thereto, a rotatable release member pivoted above said armature in the path of movement thereof and passing through the plane thereof into the path of said bimetallic strip, a horn on one link of said double toggle projecting into the path of movement of said release member and a curved part on said release member cooperating with said horn.

5. In an electric switch having an overload release device the combination of a pair of magnet coils arranged side by side and energized by the circuit controlled by the switch, a plate form release armature disposed beneath said coils in the field thereof, a blade spring carrying said release armature, a double toggle between said coils, a second blade spring carrying the moving switch contact and tending to move away from the stationary switch contact coupled to one end link of said double toggle, an operating handle forming the other end link of said double toggle, an upwardly moving plane bimetallic strip heated by the current in the circuit controlled by the switch mounted beneath said armature parallel thereto, a rotatable release member pivoted above said armature in the path of movement thereof and passing through the plane thereof into the path of said bimetallic strip, a horn on one link of said toggle projecting into the path of movement of said release member and a curved part on said release member cooperating with said horn.

6. In an electric switch having an overload release device the combination of a plate form release armature, a pair of magnet coils arranged side by side above said armature for actuating said armature on the occurrence of short circuits and like overloads, a blade spring carrying said armature, a moving contact member, a switch actuating and locking mechanism and an operating handle mounted between said coils, an upwardly moving plane bimetallic strip traversed by current mounted below said armature parallel thereto, a release member pivoted above said armature in the path of movement thereof and passing through the plane thereof into the path of movement of said bimetallic strip adapted to release said actuating and locking mechanism, and a weak spring secured to said release member with its free end resting on said bimetallic strip.

7. In an electric switch having an overload release device the combination of a pair of magnet coils arranged side by side and energized by the circuit controlled by the switch, a plate form

release armature pivoted beneath said coils in the field thereof, a double toggle between said coils, a blade spring carrying the moving contact and tending to move away from the stationary contact coupled to one end link of said double toggle, an operating handle forming the other end link of said double toggle, a plane bimetallic strip traversed by the current in the circuit of the switch mounted beneath said armature so that it bends upwardly when its temperature rises, a rotatable release member pivoted above said armature in the path of movement thereof and having a projection passing down through a cut out part of said armature into the path of said bimetallic strip, a weak spring secured to said release member with its free end resting on said bimetallic strip, a horn on the toggle link pivoted to said handle projecting into the path of movement of said release member, and a curved part on the upper side of said release member cooperating with said horn.

8. In an electric switch with independently operating electro-magnet and thermal release, the combination of a rotatable release member convex on its upper side, a plate form armature mounted upon a spring and located beneath said release member and having a cut out portion through which said release member passes downwardly, a plane bimetallic strip mounted beneath and parallel to said armature, said strip being heated by the current and then bending upwardly so as to raise said release member, a pair of coils arranged side by side above said armature and excited by the current and having their magnetic circuit passing on the lower side through said armature, cores in said coils extending in plate form above said coils, a pair of respectively fixed and moving coacting contacts between said plate form parts of said cores, a double toggle between said coils adapted to actuate said movement contact, and a horn on one of the mid members of said toggle cooperating with the said curved part of said release member.

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