Dec. 19, 1933. C. W. KUHN ET AL 1,940,422

ELECTRIC SNAP SWITCH

Filed June 11, 1930 2 Sheets-Sheet 1

Fig. 1

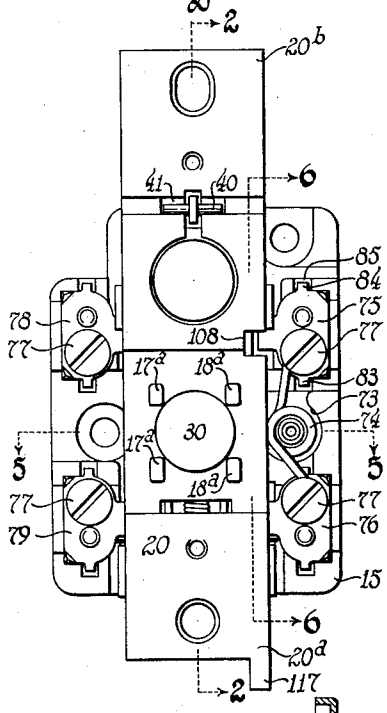


Fig. 2

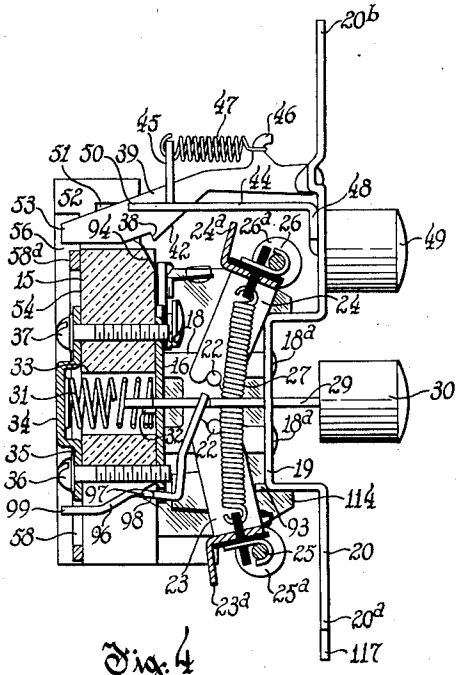


Fig. 3

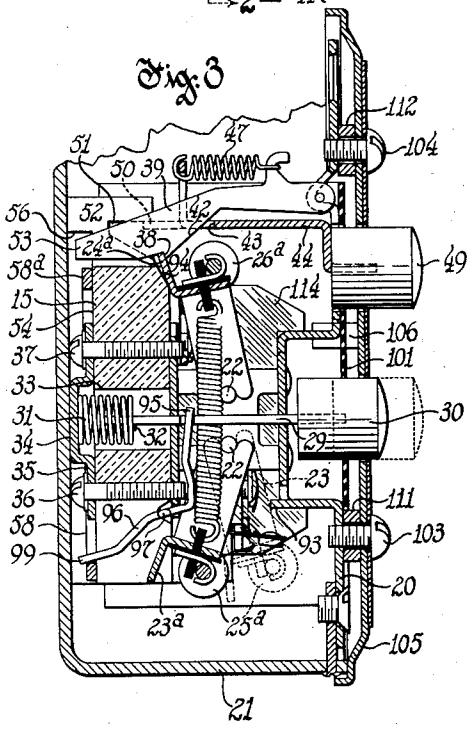
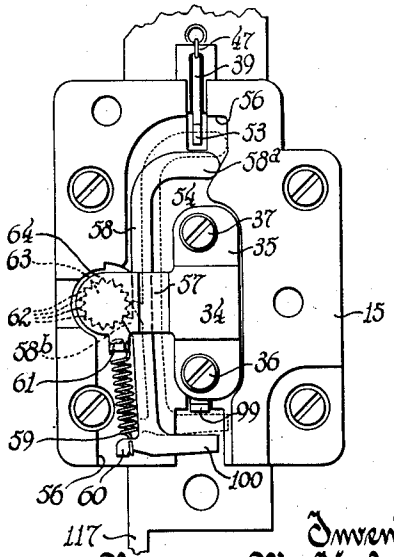


Fig. 4



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ELECTRIC SNAP SWITCH

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Fig. 5

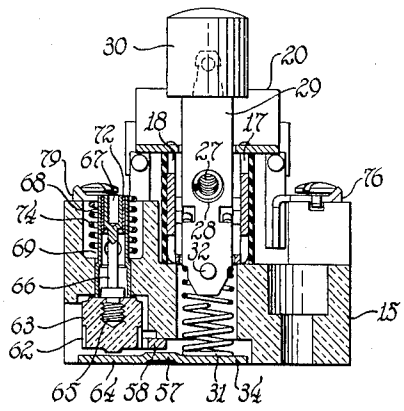


Fig. 6

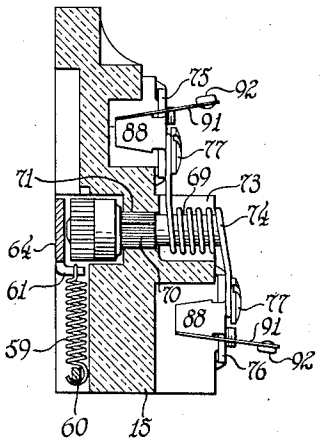


Fig. 7

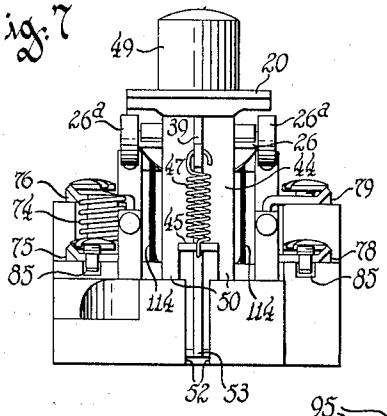


Fig. 8

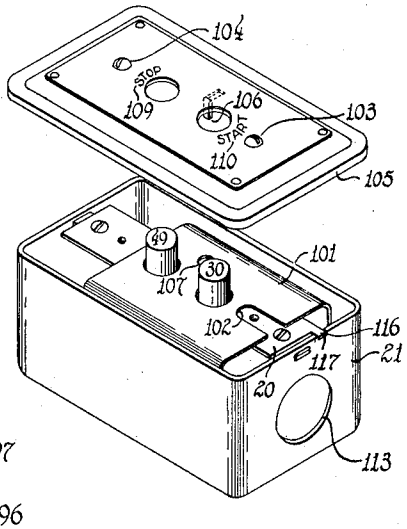


Fig. 9

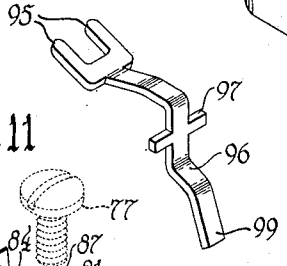


Fig. 10

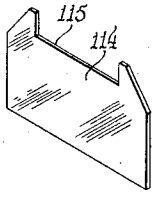
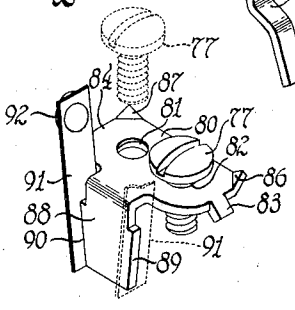


Fig. 11



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UNITED STATES PATENT OFFICE

1,940,422

ELECTRIC SNAP SWITCH

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Application June 11, 1930. Serial No. 460,461

29 Claims. (Cl. 200—124)

This invention relates to improvements in electric snap switches, and more particularly to snap switches of the free-tripping thermal overload type.

An object of the invention is to generally improve the details of construction and operation of switches of the aforementioned character.

Another object is to provide a switch of the aforementioned character which may be accurately calibrated for response under given overload conditions.

Another object is to provide such a switch which may be substantially instantaneously reset for further operation after overload.

Another object is to provide a free-tripping electrothermally responsive overload switch the parts of which are of rugged and durable construction and which may be readily and inexpensively assembled.

Other objects and advantages of the invention will hereinafter appear.

The accompanying drawings illustrate an embodiment of the invention which will now be described, it being understood that the embodiment illustrated is susceptible of modification without departing from the scope of the appended claims.

In the drawings, Figure 1 is a top plan view of a free-tripping electro-thermally responsive overload switch constructed in accordance with our invention.

Fig. 2 is a view partly in vertical section and partly in elevation, on the line 2—2 of Fig. 1,—the movable switch parts being shown in one inoperative position.

Fig. 3 is a view similar to Fig. 2 showing the movable switch parts in a second or transiently inoperative position,—the dotted lines illustrating the operative position assumed by one of the bridging contactors upon release of the actuating push buttom.

Fig. 4 is a bottom plan view of the switch.

Fig. 5 is a vertical sectional view, on the line 5—5 of Fig. 1.

Fig. 6 is a vertical sectional view, substantially on the line 6—6 of Fig. 1.

Fig. 7 is an elevational view of the latch end of the switch.

Fig. 8 is a perspective view of the switch and the enclosing casing therefor.

Fig. 9 is a perspective view of the crank or lever for effecting resetting of the latch tripping lever.

Fig. 10 is a perspective view of one of the punched plates of insulation for the switch mechanism, and

Fig. 11 is a perspective view of one of the stationary switch contact and terminal assemblies.

The switch mechanism herein disclosed is in certain respects similar to that described and claimed in the patent of William C. Stevens and George J. Meuer, No. 1,784,207, dated December 9, 1930.

Referring to the drawings, the numeral 15 designates a base of suitable molded insulating material. Seated upon the upper face of base 15 is a metallic switch frame preferably comprising a punched and stamped metal piece of substantially U-shape in cross section, having a horizontal base portion 16 and a pair of upstanding parallel arms 17 and 18. Each of said arms is provided with a pair of shouldered upper end portions adapted to penetrate correspondingly shaped openings in the downwardly offset portion 19 of a supporting top plate 20,—said end portions being upset, as indicated at 17^a and 18^a (Figs. 1 and 2) to secure said frame parts to each other. The outwardly extending lugs 20^a and 20^b of the top plate are perforated as shown to provide for attachment thereof to a suitable box or casing 21 (Fig. 3).

The metal of each arm 17 and 18 of the frame piece is pressed or extruded inwardly at two points to provide two sets of pivot studs 22 (Figs. 2 and 3), said studs being located in a common plane substantially midway between the portions 16 and 19 of the frame. Pivotally engaging the respective endwise alined pairs of studs 22 are a pair of substantially U-shaped contact carriers 23 and 24, which are respectively adapted to rotatably support the shafts 25 and 26 in insulated relation thereto,—said shafts carrying the pairs of cylindrical or roller contactors 25^a and 26^a.

Attached to but insulated from the free ends of the carriers 23 and 24 in the manner illustrated is a coiled tension spring 27 which acts to retain the carriers in pivotal engagement with the studs 22 and to bias said carriers jointly to their upper or lower extreme positions. Spring 27 is adapted to be engaged, at substantially the mid-point of its length, by the walls of an opening 28 in a flat punched sheet metal actuating element 29, said element being adapted to slidably engage correspondingly shaped openings in frame portions 16 and 19, to be guided thereby, and the same having a knob or push-button 30 cemented or otherwise secured to the upper end

thereof. Element 29 is biased to its upper extreme position (Fig. 2) as by means of a coiled compression spring 31 engaging the lower reduced end portion thereof, upward movement of said element being limited by engagement of a boss or projection 32 thereon with the lower face of portion 16 of the frame.

Spring 31 is located within a passage or opening 33 in base 15, and the lower end of said spring is adapted to rest upon the downwardly offset portion 34 of a plate 35,—screws 36 and 37 being adapted to penetrate registering openings in plate 35 and base 15 and taking into tapped openings in portion 16 of the frame to rigidly secure said frame and said plate to base 15.

Carriers 23 and 24, which may be of identical construction, are respectively provided with outwardly projecting lugs 23^a and 24^a,—the lug 24^a being adapted for engagement by the shoulder 38 formed upon the latch member 39. Latch member 39 is pivotally connected to the top plate 20 of the frame, as by means of a pin 40 located within a depression or recess 41 in said plate. Latch member 39 is provided above the shoulder 38 with an inclined edge 42 with which the end wall 43 of a slot within a latch releasing push button element 44 is adapted to engage,—said element 44 having a portion containing said slot bent outwardly at right angles thereto, as shown at 45.

Attached at one end to said portion 45 and attached at its other end to a hook or lug 46 on latch member 39 is a coiled tension spring 47,—said spring acting to bias latch member 39 into the path of lug 24^a. Spring 47 also acts to retain the pin 40 in pivotal engagement with the depression 41 in top plate 20, while at the same time biasing element 44 to its upper extreme position wherein the offset or shoulder 48 formed on the latter engages the lower surface of plate 20. A push button 49 is attached to the upper end of element 44 and is slidable within a circular opening in plate 20,—the lower forked end 50 of said element being accommodated within a suitably shaped recess 51 in base 15.

Base 15 is provided with a slot 52 within which the lower end 53 of element 39 is adapted to oscillate—said end 53 extending beyond the wall 54 of a recess 56 in the bottom face of base 15. Slidable between said wall 54 of recess 56 and the offset portion 57 of plate 35 is a latch tripping lever 58 consisting of a flat sheet metal punching, said lever having an end portion 58^a movable to the dotted line position (Fig. 4) to trip the latch,—said lever being biased to said dotted line position by means of a coiled tension spring 59 attached at one end to a hook 60 formed on member 58 and at its other end to a hook 61 formed on plate 35.

Lever 58 is provided intermediate its ends with a pawl or projection 58^b which is engageable with any one of the teeth 62 formed on the periphery of a molded insulating element 63. An extension 64 of plate 35 underlies said element 63 to prevent downward displacement of the latter. Embedded in or otherwise attached to element 63 is one end 65 of a spindle 66,—the other end 67 of said spindle being in the form of a hollow cylindrical enlargement which is rotatable within the upper end 68 of a hollow cylindrical member 69, the enlarged lower end 70 of which is externally milled or grooved longitudinally to provide for a drive fit thereof within a passage 71 formed in base 15. Interposed between the adjacent ends 67 and 68 of spindle 66 and cylindrical member 69 is a layer or film of a suitable eutectic alloy or solder 72. Located within a recess 73 in base 15 and surrounding member 69 for the major portion of its length is a coiled resistance wire or heater 74.

Heater coil 74 is electrically connected at its respective ends to the terminal plates 75 and 76 of the switch mechanism, as by means of the usual binding screws 77. Terminal plates 78 and 79 are located at the opposite side of the switch mechanism.

The terminal plates 75, 76, 78 and 79 are all of identical form, and, as shown for example in Fig. 11, each consists of a substantially T-shaped punched metal blank 80 the head portion of which is provided with two symmetrically located tapped openings 81 and 82 of equal size, either of which openings is adapted for cooperative engagement by a suitable securing screw (as shown) and the other of which is adapted to receive the shank of a binding screw 77. Said head portion is provided at opposite ends with downwardly struck lugs 83 and 84 which are adapted for engagement with suitable shoulders or notches 85 formed on base 15. Said head portion is further provided at its two outside corners with bent-up lugs 86 and 87 which respectively cooperate with the head of the binding screw 77 in its alternative locations.

The shank 88 of said T-shaped terminal member is bent downwardly at substantially right angles thereto, said shank having downwardly convergent side edges 89 and 90 to either of which edges a resilient strip metal contact element 91 is adapted to be rigidly secured flatwise, as by spot welding the latter to the former. Rigidly secured to element 91, as by riveting or the like, is a contact tip or button 92 which is preferably formed of silver. Two left-hand assemblies (as illustrated in Fig. 11) and two right-hand assemblies are provided for the complete switch. The right-hand assembly is made by attaching the strip 91 to the edge 89 of the shank 88 and by threading the binding screw 77 into tapped opening 81, as indicated in dotted lines in Fig. 11.

The respective pairs of stationary contact and terminal members are located in different planes upon the base 15, so that one pair of contacts will be bridged by the contactor supported by carrier 24 in the lower extreme position of the latter, and the other pair of contacts will be bridged by the contactor supported by carrier 23 in the upper extreme position of the latter.

While the arrangement is such that carriers 23 and 24 have substantially equal arcs of movement, it will be noted that carrier 24 is permitted to move upwardly to a slightly greater extent than carrier 23,—movement of the latter being limited by engagement thereof with the lug 93 which is struck downwardly from portion 19 of top plate 20. Conversely, the carrier 23 is permitted to move downwardly into engagement with the portion 16 of the frame, whereas downward movement of carrier 24 is limited by engagement of its lug 24^a with the angular surface 94 on base 15 (see Figs. 2 and 3). In the manner aforedescribed we insure downward snap movement of carrier 23 ever so slightly in advance of the corresponding movement of carrier 24, whereby disengagement of the contactor supported by carrier 23 is effected prior to en-

gagement of the contactor supported by carrier 24. The similar lead of carrier 24 in the bias of both carriers to their upper extreme positions is only important in that it tends to equalize the tension of spring 27 with respect to said carriers.

Operation of our electro-thermally responsive switch may best be explained by assuming connection of a line wire to the terminal plate 78 (Fig. 1), the other line wire being connected to one terminal of a motor (not shown) which motor has its other terminal connected to terminal plate 79. Then upon depression of push button 30 to its lower extreme position the contactor supported by carrier 23 is first moved out of bridging engagement with its cooperative stationary contacts and immediately thereafter the contactor supported by carrier 24 is moved into bridging engagement with its cooperative stationary contacts. The circuit through the switch contacts as a group thus remains broken.

It will be noted that the forked end 95 of a crank or lever 96, (Fig. 9) is in cooperative engagement with the notched edges of push button actuating element 29, crank 96 having pivot projections 97 formed thereon which are received within suitable bearing notches 98 in base 15,—one forked end of portion 16 of the frame being adapted to overlie said projections 97 to retain the latter in pivotal engagement with said notches 98. The end 99 of crank 96 extends into the recess 56 in base 15, and is adapted, upon downward movement of element 29, to engage the arm 100 of lever 58 to automatically effect resetting of the latter to its full line position illustrated in Figs. 2, 3 and 4. This permits the latch 39 to become effective for retaining the carrier 24 in its lower extreme position.

Upon release of push button 30 the same moves to its upper extreme position under the bias of spring 31, with consequent snap movement of carrier 23 to its upper extreme position (as shown in dotted lines in Fig. 3). This completes circuit through all of the switch contacts,—said circuit including in series therewith the heating coil 74. Under given overload conditions the heating effect of coil 74 will be sufficient to cause fusion of the eutectic alloy 72 aforementioned with consequent release of spindle 66 and its associated element or wheel 63. Lever 58 is thus freed to move under the bias of spring 59, and the end 58a thereof effects tripping of latch 39 (as shown in dotted lines in Fig. 4). Carrier 24 then moves with a snap action to its upper extreme position to interrupt the controlled circuit.

The alloy 72 thereupon cools immediately to lock the wheel 63 against rotation, and the switch may be reset for further operation by merely depressing and then releasing the button 30,—which causes resetting of lever 58 in the manner aforedescribed.

Also, assuming circuit making positioning of the several switch parts, latch 39 may be tripped at any time to effect interruption of the circuit by merely depressing the push button 49,—such operation in nowise affecting the setting of lever 58.

After mounting the switch mechanism in box 21 in the manner indicated in Fig. 8 we preferably apply thereto a loose-fitting insulating and enclosing member 101 which is perforated to accommodate the push buttons 30 and 49. Member 101 is likewise notched or perforated as indicated at 102 to provide clearance for the shank of one of the cover attaching screws 103, the other of said screws being shown at 104. Cover 105 is likewise perforated to accommodate push buttons 30 and 49, and said cover is provided with a downwardly struck lug 106 which registers with an opening 107 in member 101 and with a notch 108 (Fig. 1) in top plate 20 to insure proper location of the legends 109 and 110 which are preferably applied to said cover.

As shown in Fig. 3 cover 105 may have spot-welded or otherwise rigidly secured to its lower face a pair of washers 111 and 112 to insure proper attachment and spacing of said cover with respect to top plate 20 of the switch frame. A suitable opening 113 may be provided to permit entrance of the circuit wires to box 21.

Two punched plates 114 of mica or other suitable insulating material may be interposed between the respective longitudinally spaced pairs of stationary contacts and the switch frame,—said plates having cut-out portions 115 to accommodate the aforementioned downwardly offset portion 19 of the top plate 20.

Also as shown in Fig. 8 the box 21 is provided at one end with a notch 116 to accommodate the extension or lug 117 provided at one end of the top plate 20 of the switch frame. This means insures mounting of the switch mechanism only in one position with respect to the box 20, and as aforestated the parts 106, 107 and 108 insure mounting of cover 105 only in one position with respect to the switch mechanism. The advantages of this arrangement are obvious since it minimizes the amount of care and skill required for installation of the switch mechanism.

What we claim as new and desire to secure by Letters Patent is:

1. In a free-tripping overload switch, in combination, stationary and movable switch contacts, means normally biasing said contacts toward open position, manually operable means for effecting closure of said contacts with a snap action, a latch operable automatically to retain said contacts in closed position against said bias, a thermally responsive device having a part releasable automatically under given overload conditions for tripping engagement with said latch, and means adapted upon each operation of said manually operable means after release of said part to simultaneously effect resetting of the latter.

2. In a free-tripping overload switch, in combination, a plurality of sets of stationary and movable contacts requiring joint closure thereof for completion of an electric circuit, means for normally biasing one set of contacts to closed position and for simultaneously biasing the other set of contacts to open position, means for effecting closure of said last mentioned set of contacts, a latch operable automatically to retain the latter in closed position, a member spring-biased into tripping engagement with said latch, electro-thermally controlled means for withholding said member from engagement with said latch pending given overload conditions, and means to insure resetting of said tripping member upon each closing operation of said normally open set of contacts.

3. In an electric snap switch, in combination, an insulating base, a metallic switch frame, a push button member interposed between and slidably engaging said base and said frame, a latch member pivotally supported by said frame and depending therefrom, said push but-

ton member having a slot and said latch member having a cam surface, and spring means interposed between said push button member and said latch member to bias said cam surface into the path of an end wall of said slot and to retain said members in assembled relation to said base and said frame.

4. In an electric snap switch, in combination, an insulating base, a metallic switch frame, a push button member interposed between and slidably engaging said base and said frame, a latch member pivotally supported by said frame and depending therefrom, said push button member having a slot and said latch member having a cam surface, spring means interposed between said push button member and said latch member to bias said cam surface into the path of an end wall of said slot and to retain said members in assembled relation to said base and said frame, a switching member pivotally supported by said frame and normally biased to one extreme position and movable to the opposite extreme position against said bias, said latch member being adapted to retain said switching member in the position last mentioned, and means other than said push button member for effecting release of said switching member by said latch member.

5. In an electric snap switch, in combination, an insulating base, a metallic switch frame, a push button member interposed between and slidably engaging said base and said frame, a latch member pivotally supported by said frame and depending therefrom, said push button member having a slot and said latch member having a cam surface, spring means interposed between said push button member and said latch member to bias said cam surface into the path of an end wall of said slot and to retain said members in assembled relation to said base and said frame, a switching member pivotally supported by said frame and normally biased to one extreme position and movable to the opposite extreme position against said bias, said latch member being adapted to retain said switching member in the position last mentioned, means other than said push button member for effecting release of said switching member by said latch member, said means comprising a lever slidable upon the lower surface of said base and spring biased into engagement with said latch member, and means comprising an electro-thermally responsive element to normally retain said lever out of engagement with said latch member.

6. In an electric snap switch, in combination, an insulating base, a metallic switch frame, a push button member interposed between and slidably engaging said base and said frame, a latch member pivotally supported by said frame and depending therefrom, said push button member having a slot and said latch member having a cam surface, spring means interposed between said push button member and said latch member to bias said cam surface into the path of an end wall of said slot and to retain said members in assembled relation to said base and said frame, a switching member pivotally supported by said frame and normally biased to one extreme position and movable to the opposite extreme position against said bias, said latch member being adapted to retain said switching member in the position last mentioned, means other than said push button member for effecting release of said switching member by said latch member, said means comprising a lever slidable upon the lower surface of said base and spring biased into engagement with said latch member, means comprising an electro-thermally fusible element to retain said lever out of engagement with said latch member and to permit release of said lever for tripping said latch under given electrical conditions, and means adapted upon movement of said switching member to its last mentioned extreme position to simultaneously effect resetting of said lever.

7. In an electric snap switch, in combination, an insulating base, a metal frame, a switching member pivotally supported by said frame, a push button actuator slidably engaging said frame, spring means interposed between said actuator and said switching member to effect snap movements of the latter to opposite extreme positions respectively upon corresponding movements of said actuator, means to bias said actuator and said switching member to one extreme position, means to retain said switching member in its opposite extreme position against the action of said bias, said means comprising a pivoted latch spring biased into the path of said switching member, means comprising a lever slidably mounted upon the bottom face of said base and spring biased into tripping engagement with said latch, a toothed wheel normally adapted to withhold said lever from engagement with said latch, and means comprising a fusible support for said wheel and adapted under given thermal conditions to effect release of the latter with consequent movement of said lever for tripping said latch.

8. In an electric snap switch, in combination, an insulating base, a metallic switch frame, a pair of substantially U-shaped contact carriers pivotally supported by said frame, the open ends of said carriers being oppositely arranged in spaced relation and the pivotal centers thereof being in horizontal alinement with each other, a coiled tension spring having the opposite ends thereof attached to said carriers respectively and adapted to bias said carriers jointly to their upper or lower extreme positions, two pairs of stationary contacts, said pairs of contacts being supported on said base in different horizontal planes respectively, bridging contactors on the respective carriers, one of said contactors being adapted to bridge one pair of contacts in the upper extreme position of its carrier and the other contactor being adapted to bridge the other pair of contacts in the lower extreme position of its carrier, and means for insuring movement of said first mentioned carrier and said last mentioned carrier from their upper extreme positions in the sequence just mentioned, whereby disengagement of one contactor from its cooperating contacts is effected prior to engagement of the other contactor with its cooperating contacts, said means comprising means for maintaining said first mentioned carrier at a lesser angle than the angle of said second mentioned carrier with respect to the horizontal line of said pivotal centers in the upper extreme positions of said carriers respectively.

9. In a free-tripping overload switch, in combination, an insulating base, a metallic switch frame, two sets of stationary contacts carried by said base, two oscillatable bridging contactors pivotally supported by said frame and adapted for cooperation with said contacts, a coiled tension spring interposed between the free ends of said contactors, a push button actuating ele-

ment operatively engaging said tension spring and biased to its upper extreme position to effect a corresponding bias of said contactors, a latch pivotally supported by said frame and located in the path of one of said contactors to retain the latter in its lower extreme position against the action of said bias, means comprising a lever slidable upon the bottom surface of said base and spring biased into engagement with said latch for releasing the latter, a pawl or projection on said lever and a toothed wheel to be engaged by said pawl, means including a fusible alloy for retaining said wheel in a relatively fixed position, and means comprising a heating coil electrically connected to one contact of each set for effecting fusion of said alloy under given current conditions.

10. In a free-tripping overload switch, in combination, an insulating base, a metallic switch frame, two sets of stationary contacts carried by said base, two oscillatable bridging contactors pivotally supported by said frame and adapted for cooperation with said contacts, a coiled tension spring interposed between the free ends of said contactors, a push button actuating element operatively engaging said tension spring and biased to its upper extreme position to effect a corresponding bias of said contactors, a latch pivotally supported by said frame and located in the path of one of said contactors to retain the latter in its lower extreme position against the action of said bias, means comprising a lever slidable upon the bottom surface of said base and spring biased into engagement with said latch for releasing the latter, a pawl or projection on said lever and a toothed wheel to be engaged by said pawl, means including a fusible alloy for retaining said wheel in a relatively fixed position, means comprising a heating coil electrically connected to one contact of each set for effecting fusion of said alloy under given current conditions, and means comprising a member pivotally supported by said base and operatively engaged by said push button actuating element to effect resetting of said lever upon each movement of said element to its lower extreme position.

11. As an article of manufacture, a wiring terminal member comprising a substantially T-shaped punched metal plate, the head portion of said T-shaped plate having a pair of tapped openings of equal size, either of said tapped openings being adapted for cooperative engagement with the shank of a securing screw and the other of said openings being adapted to accommodate the shank of a binding screw, said head portion having lugs at opposite ends thereof for interlocking engagement with a suitably shouldered support, and the shank of said T-shaped plate being bent downwardly at substantially right angles to the head portion thereof.

12. As an article of manufacture, a wiring terminal member comprising a substantially T-shaped punched metal plate, the head portion of said T-shaped plate having a pair of tapped openings of equal size, either of said tapped openings being adapted for cooperative engagement with the shank of a securing screw and the other of said openings being adapted to accommodate the shank of a binding screw, said head portion having downwardly projecting lugs at opposite ends thereof for interlocking engagement with a suitably shouldered support, the shank of said T-shaped plate being bent downwardly at substantially right angles to the head portion thereof and having downwardly convergent side edges, and a resilient strip metal contact element to be secured flatwise to either of said side edges whereby a right-hand or left-hand assembly may be provided.

13. In an electric snap switch, in combination, a molded insulating base, a metallic switch frame on the upper face of said base, an oscillatable switching member carried by said frame, a push button actuating element adapted upon movement thereof to one extreme position to effect corresponding movement of said switching member with a snap action, a compression spring for biasing said actuating element and said switching member jointly to their opposite extreme position, a latch pivotally supported by said frame and located in the bath of said switching member to retain the latter in its first mentioned extreme position against said bias, a lever slidable upon the lower face of said base and spring biased into engagement with said latch to release said switching member, electro-thermally responsive means of the solder type for normally withholding said lever from engagement with said latch, a metal plate underlying said lever to retain the latter in assembled relation to said base, and common means for securing said plate and said switch frame to said opposite faces of the base.

14. In a snap make and break switch, the combination with a plurality of pivoted contactors, of a common spring connection between said contactors for normally biasing the same jointly to one extreme position or the other, means utilizing said biasing connection for effecting movement of said contactors jointly to opposite extreme positions selectively, means biasing said last mentioned means to normally effect movement of said contactors jointly to one of said extreme positions, and associated means for insuring movement of one of said contactors in advance of the other contactor during movement of said contactors jointly toward their opposite extreme position.

15. In a snap make and break switch, the combination with a plurality of pivoted contactors, of a common spring connection between said contactors for normally biasing the same jointly to one extreme position or the other, means utilizing said biasing connection for effecting movement of said contactors jointly to opposite extreme positions selectively, means biasing said last mentioned means to normally effect movement of said contactors jointly to one of said extreme positions, and associated means for insuring movement of one of said contactors in advance of the other contactor during movement of said contactors jointly toward their opposite extreme position, said last mentioned means comprising means providing different throws of said contactors with respect to the pivotal centers thereof respectively.

16. In a free-tripping overload switch, in combination, stationary and movable contacts, means normally biasing said contacts toward open position, means including a depressible push button for effecting closure of said contacts, a latch operable automatically to retain said contacts in closed position against said bias, a member spring-biased into tripping engagement with said latch, electro-thermally controlled means for withholding said member from engagement with said latch pending given overload conditions, and means also operable auto-

matically upon depression of said push button to insure resetting of said latch-tripping member.

17. In a free tripping overload switch, in combination, a set of stationary contacts, a contactor movable into and out of bridging engagement with said contacts, means for effecting such movements of said contactor with a snap action, said means comprising a push button member having a spring connection with said contactor, means for biasing said push button member to a given extreme position and tending to effect disengagement of said contactor, a latch spring-biased into engagement with said contactor to retain the latter in engagement with said contacts, a member spring-biased into tripping engagement with said latch, electro-thermally controlled means including a fusible alloy for withholding said tripping member pending given overload conditions, and means including a lever interposed between said push button member and said tripping member to insure resetting of the latter upon each movement of said contactor into bridging engagement with said contacts.

18. In an electric switch, in combination, stationary and movable switch contacts, spring means normally biasing said contacts to open position, manually operable means comprising a depressible push button for effecting closure of said contacts, a latch spring-biased to retain said contacts in closed position, an electro-thermally controlled device of the solder type having a spring-biased part releasable automatically under given electrical conditions to trip said latch, and means adapted upon each depression of said push button after release of said part to effect resetting of the latter.

19. In an electric switch, in combination, stationary and movable switch contacts, spring means normally biasing said contacts to open position, manually operable means comprising a depressible push button for effecting closure of said contacts, a latch spring-biased to retain said contacts in closed position, an electro-thermally controlled device of the solder type having a spring-biased sliding part releasable automatically under given electrical conditions to trip said latch, and means adapted upon each depression of said push button after release of said part to effect resetting of the latter.

20. In an electric switch, in combination, stationary and movable switch contacts, spring means normally biasing said contacts to open position, manually operable control means comprising a push button depressible for effecting closure of said contacts, a latch spring-biased to retain said contacts in closed position, an electro-thermally controlled device of the solder type having a spring-biased part releasable automatically under given electrical conditions to trip said latch, means adapted upon each depression of said push button after release of said part to effect resetting of the latter, and means to subject said latch to operation by said manual control means to provide for tripping of said latch at will independently of said electro-thermally controlled device.

21. In a circuit controlling device, the combination with a plurality of cooperating contacts for controlling an electric circuit, of operating means for certain of said contacts including a plurality of operating parts, one of said parts being movable in opposite directions to open and close said circuit and another of said operating parts being movable out of a given normal position to open said circuit following closure thereof by said former operating part, and an electro-thermal device of the solder type responsive to control certain of said contacts to effect opening of said circuit, said device being resettable by one of said operating parts.

22. A free-tripping overload switch comprising, in combination, stationary and movable switch contacts, manual control means normally operative for effecting relative movement of said contacts into and out of engagement with each other to control an electric circuit, and associated means operable automatically to render said contacts ineffective for closing said circuit, said means including an electro-thermally responsive device of the solder type, said device having a heating element to be energized upon closure of said circuit, a toothed wheel carried by said device, a member spring biased to a given extreme position wherein said contacts are rendered ineffective, said member having a catch engageable with said wheel to retain the former in its opposite extreme position pending a given degree of heating by said element, and means associated with said manual control means and adapted upon release of said member to provide for resetting thereof at will.

23. A free-tripping overload switch comprising, in combination, stationary and movable switch contacts, an electric circuit to be controlled thereby, manual control means normally operable to effect closing and opening of said contacts at will, an electro-thermally responsive device of the solder type having a toothed wheel, a member spring biased to a given extreme position wherein said contacts are rendered ineffective for completing said circuit, a catch carried by said member and engageable with said toothed wheel whereby said member is retained in its opposite extreme position, said electro-thermally responsive device having a heating element included in the controlled circuit and adapted upon a predetermined degree of energization thereof to automatically effect release of said member for movement thereof to its first-mentioned extreme position, and associated means for insuring resetting of said member in its second mentioned extreme position upon a given operation of said manual control means, said member being releasable only by operation of said electro-thermally responsive device.

24. In an overload circuit breaker, in combination, a self contained switch having manual operating means to effect circuit making and breaking operations thereof at will, said switch when operated to complete circuit being always operable to interrupt circuit free from interference by said manual means, of a self contained overload responsive unit comprising an electro-thermal device and a spring-biased element to latch with a part of said device subject to release therefrom for biased movement under given electrical conditions, and connections between said switch and said overload unit for effecting by the biased movement of said element circuit interruption by said switch and for resetting of said overload unit by said manual operating means of said switch.

25. A circuit breaker comprising a self-opening switch, a pivoted catch normally holding said switch closed and having a tripping arm, spring operated means to engage said arm and trip said catch to permit said switch to open, a ratchet

wheel held stationary by a fusible binder and engaged by said means to prevent the same from tripping said catch, an electric heater connected in circuit with said switch to generate heat to fuse said binder and permit said means to trip said catch, and manually operated means to engage said arm and trip said catch independently of said spring operated means.

26. A circuit breaker comprising a self-opening switch, a catch to hold said switch closed, spring operated means to trip said catch and permit said switch to open, a ratchet wheel held stationary by a fusible binder and engaged by said means to prevent the same from tripping said catch, an electric heater connected in circuit with said switch to generate heat to fuse said binder and permit said means to trip said catch, manually operated means to trip said catch independently of said spring operated means, and other manually operated means to close said switch and simultaneously bring said spring operated means into engagement with said ratchet wheel.

27. A circuit breaker comprising a self-opening switch, a pivoted catch normally holding said switch closed and having a tripping arm, spring operated means to engage said arm and trip said catch to permit said switch to open, a ratchet wheel held stationary by a fusible binder and engaged by said means to prevent the same from tripping said catch, an electric heater connected in circuit with said switch to generate heat to fuse said binder and permit said means to trip said catch, manually operated means to engage said arm and trip said catch independently of said spring operated means, and other manually operated means to close said switch and simultaneously bring said spring operated means into engagement with said ratchet wheel.

28. A circuit breaker, comprising a switch having its movable contact biased to an initial position, a latch to retain said movable contact in a predetermined position away from its initial position, means to actuate said latch at will to release said movable contact, other means to actuate said latch independent of the aforesaid means, another latch formed by a pawl and ratchet arranged to restrain said latter means from actuating said former latch, a fusible binder retaining said ratchet in a fixed position, means to heat said binder and thereby release said latter latch to enable said latter means to actuate said former latch and thereby allow said movable contact to return to its initial position, and means for moving said movable contact from its initial position and for reengaging said pawl and said ratchet to restrain said latch actuating means from actuating said former latch to enable said movable contact to be latched away from its initial position.

29. A circuit breaker, comprising a switch having its movable contact biased to an initial position, a switch latch to hold said movable contact in another position, a latch actuator tending to release said switch latch, a pawl and ratchet restraining means having a ratchet wheel retained in fixed position by a fusible binder and a pawl engaging said ratchet wheel and arranged to restrain said actuator from releasing said switch latch, means to heat said fusible binder and thereby permit said ratchet wheel to turn and enable said latch actuator to release said switch latch and allow said movable contact to return to its initial position, means independent of said latch actuator for releasing said switch latch at will, and means for moving said switch from its initial position and for reengaging said pawl and ratchet wheel to restrain said latch actuator from releasing said switch latch to enable said movable contact to be latched in its other position.

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