Oct. 5, 1937. G. O. WILMS 2,095,222

ELECTRIC SWITCH

Filed Nov. 26, 1934 4 Sheets-Sheet 1

Fig. 1.

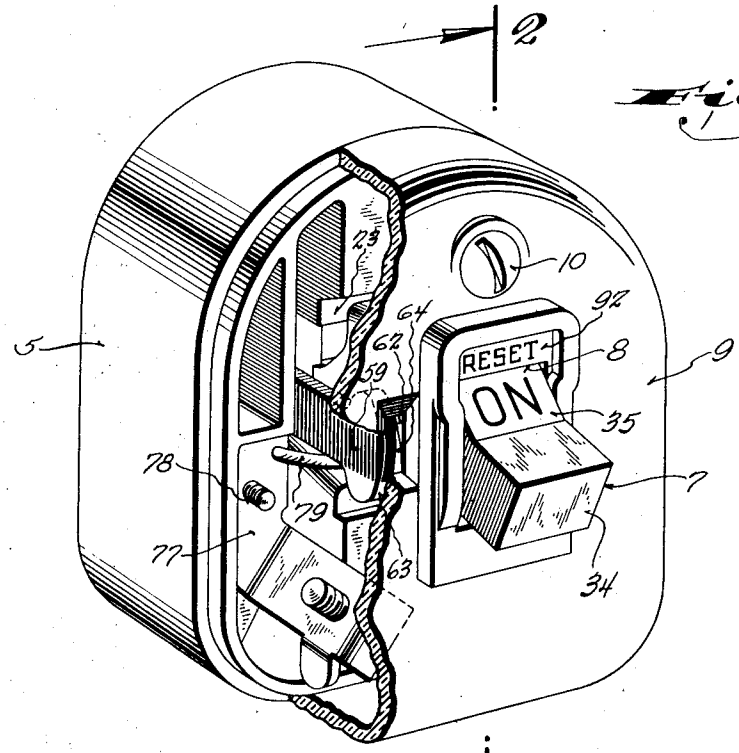
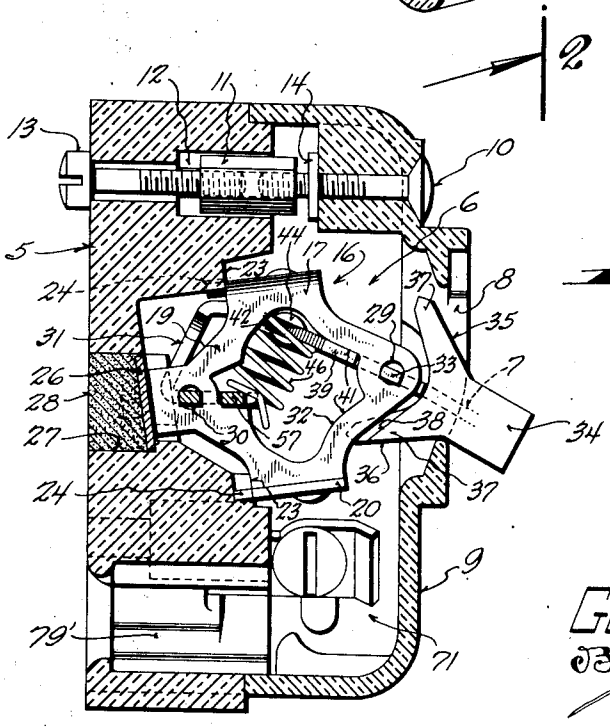


Fig. 2.



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Oct. 5, 1937. G. O. WILMS 2,095,222

ELECTRIC SWITCH

Filed Nov. 26, 1934 4 Sheets-Sheet 2

Fig. 3.

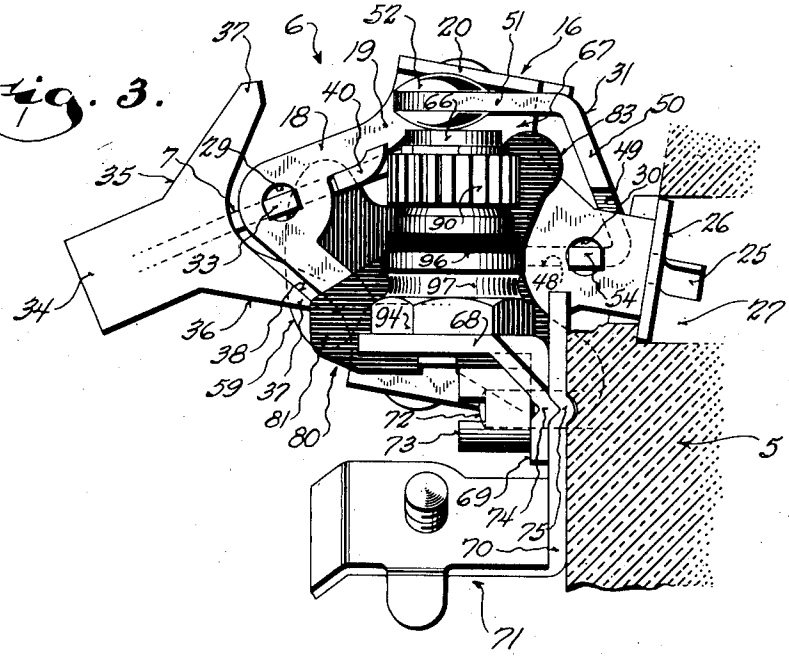
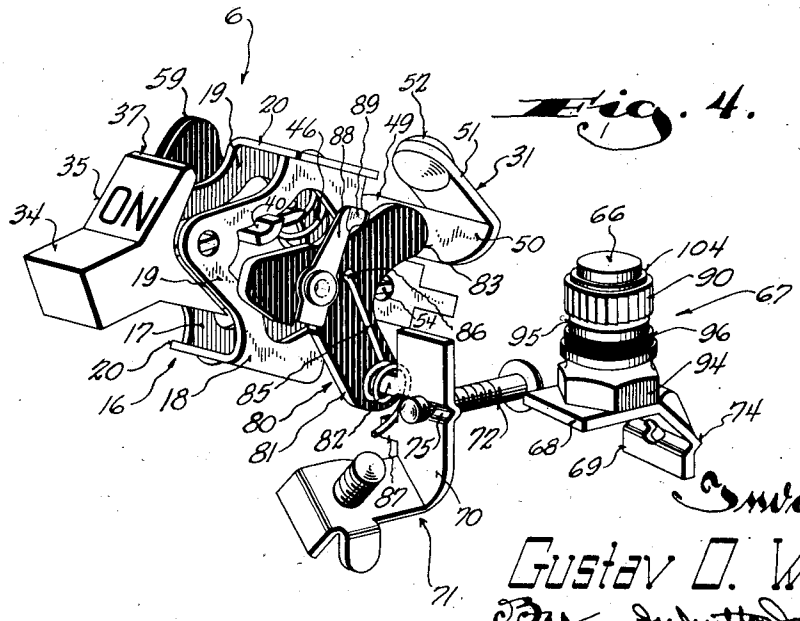


Fig. 4.



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Oct. 5, 1937. G. O. WILMS 2,095,222

ELECTRIC SWITCH

Filed Nov. 26, 1934 4 Sheets-Sheet 3

Fig. 5.

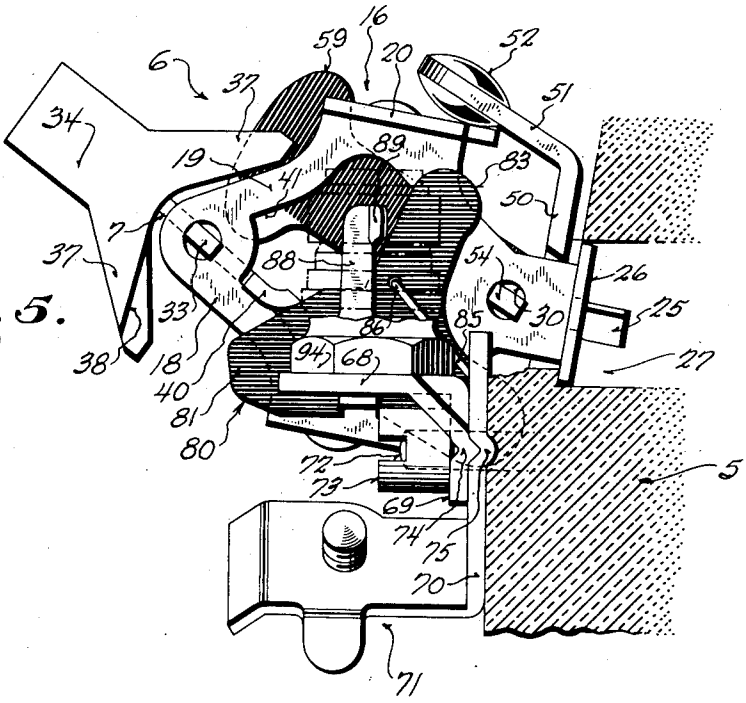


Fig. 6.

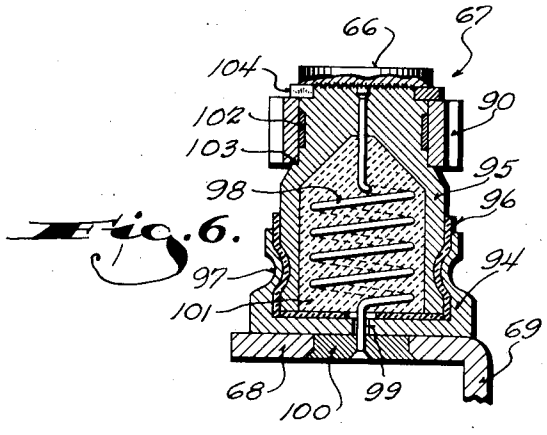
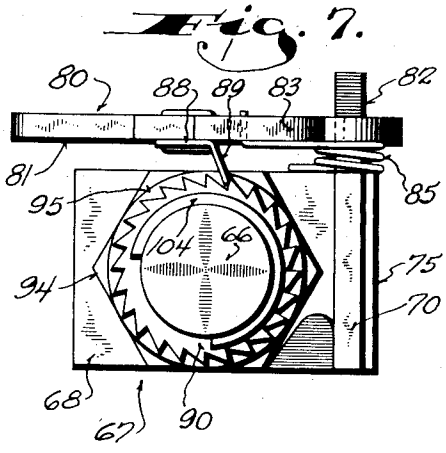


Fig. 7.



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Oct. 5, 1937. G. O. WILMS 2,095,222

ELECTRIC SWITCH

Filed Nov. 26, 1934 4 Sheets-Sheet 4

Fig. 8.

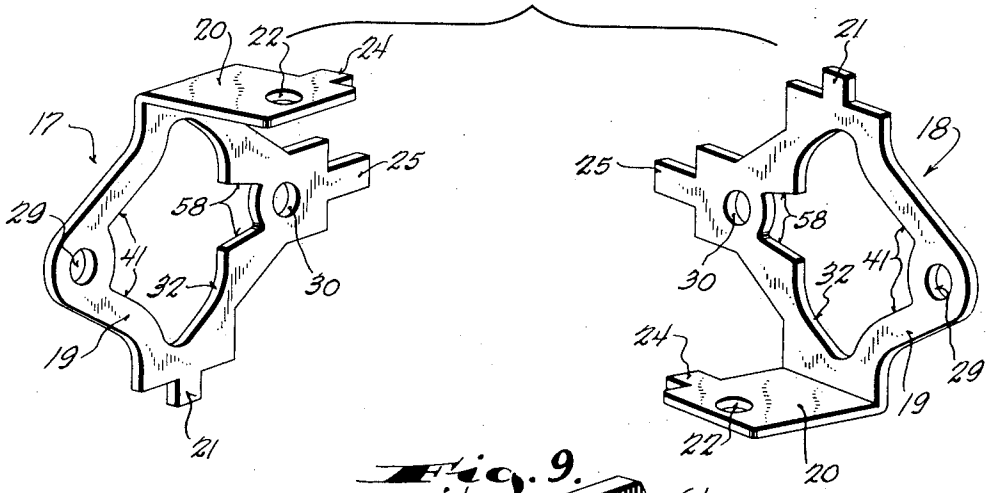

Fig. 9.

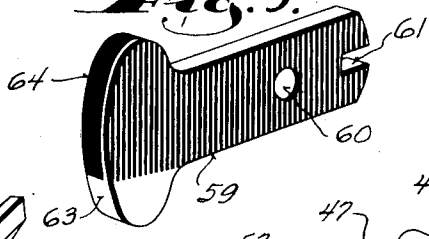

Fig. 11.

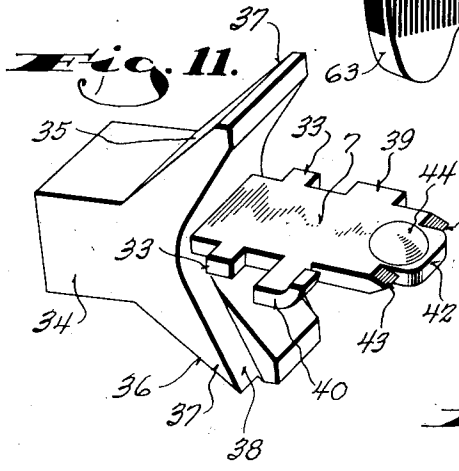

Fig. 10.

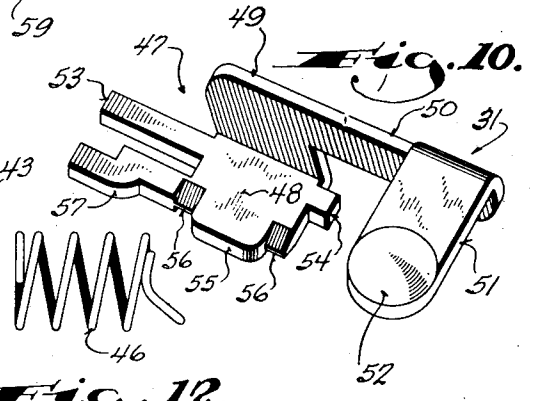

Fig. 12.

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Patented Oct. 5, 1937 2,095,222

UNITED STATES PATENT OFFICE

2,095,222

ELECTRIC SWITCH

Gustav O. Wilms, Milwaukee, Wis., assignor to Allen-Bradley Company, Milwaukee, Wis., a corporation of Wisconsin

Application November 26, 1934, Serial No. 754,737

27 Claims. (Cl. 200—116)

This invention relates to electric switches and refers more particularly to manually operable snap switches especially adapted for connecting small motors directly across the line.

The severe competition to which the manufacturer of devices using small electric motors, usually of fractional horsepower capacity, is subjected has compelled the use of cheaper motors which are incapable of withstanding large overloads. Consequently, the provision of reliable quick acting overload protection is of utmost importance, but again the necessity for low cost requires that the overload protective device employed should be inexpensive. Likewise, the switch for turning the motor on and off must be reliable, but inexpensive.

To meet this demand for low cost, the overload release and the on and off switch are usually combined in a single unit, which to be at all practical and commercially successful must have the following qualifications:

In the first instance, the unit must be inexpensive; it must be compact and mechanically strong throughout; its overload responsive feature must be reliable and accurate; its switch must be snap acting; it must trip free upon an overload so that under no circumstances can the switch be held closed under sustained motor overload conditions; it should have an indicator to show whether or not the switch is closed and also whether or not it has been tripped in response to an overload condition; and, for the sake of simplicity, a single operating member must provide for opening and closing the switch and also for resetting the overload release.

It is therefore a general object of this invention to provide a combined manually operable and overload responsive switch which has all of the foregoing qualifications.

Heretofore, all overload release mechanisms were of such construction and design that a unit having all of the desirable qualifications mentioned could not be built as compactly and cheaply as was desired.

It is therefore another object of this invention to provide an improved overload responsive mechanism which is so constructed that it allows unprecedented compactness of design.

Inasmuch as the fusible alloy type of overload release permits considerable strain to be placed directly on the fusible alloy held latch itself, and because of its comparatively high accuracy, this type of overload release is employed in this invention.

With a view toward compactness, it is a more specific object of this invention to provide an overload responsive latch unit which embodies in a single small structure, a contact for the switch, a latch releasably held by a fusible alloy, a heater to melt the alloy, and an enclosure for the heater.

A further object of this invention resides in the provision of novel means for associating a snap switch with an overload tripping mechanism so that a single set of switch contacts opens and closes the motor circuit in response to manual operation of the switch and also opens the motor circuit in response to an overload condition.

Another object of this invention resides in the provision of resetting means for the overload release so associated with the snap switch that the operating member of the snap switch also provides means for resetting the overload release mechanism.

Another object of this invention is to provide an indicator which acts directly in conjunction with the opening and closing of the switch independently of the operating means therefor so that through a discrepancy between the indication of the indicator and the position of the operating member for the switch, the fact that the switch has been tripped in response to an overload is shown.

A further object of this invention is to provide a tripping mechanism operable in response to an overload condition which will trip the switch entirely free from and independently of the operating means for the switch so that in no event can the switch be held closed under sustained motor overload conditions.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a perspective view of the switch combination forming the subject matter of this invention, part of the cover being broken away;

Figure 2 is a longitudinal section view through Figure 1 on the plane of the line 2—2;

Figure 3 is an enlarged side view illustrating

the side of the switch opposite that shown in Figure 2;

Figure 4 is a perspective view of the switch and overload release mechanism removed from the supporting base;

Figure 5 is a view similar to Figure 3 but showing the switch open and with part of the latch unit and stationary contact broken away;

Figure 6 is an enlarged longitudinal section view through the latch unit and stationary contact;

Figure 7 is a top view of the latch unit and stationary contact showing particularly the ratchet wheel and the trip lever which is held in its potentially operative position by the ratchet wheel;

Figure 8 is a perspective view of the two halves of the switch frame;

Figure 9 is a perspective view of the indicator arm;

Figure 10 is a perspective view of the movable contactor;

Figure 11 is a perspective view of the operating lever; and

Figure 12 is a side view of the spring which provides contact pressure and holds the contactor in open or closed position.

Referring now more particularly to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral 5 represents a base of insulating material having its front face hollowed out for the reception of a snap switch unit indicated generally by the numeral 6. The switch is manually operable by a pivoted lever 7 projecting through an opening 8 in a cover 9 mounted on and closing the open front of the base.

The cover is held to the base by a screw 10, threaded in an elongated nut 11 received in a hexagonal pocket 12 in the base and held therein by a screw 13 which may be used in mounting the base on a suitable support. To preclude accidental detachment of the screw 10 from the cover a fiber washer 14 is frictionally engaged with the screw, as shown.

The switch 6 is assembled on a stamped metal frame 16 composed of two similar sections 17 and 18 (see Figure 8) each of which has a side wall 19 and an end wall 20. The side walls have tangs 21 projecting therefrom to be secured in holes 22 in the end walls 20 to secure the sections 17 and 18 together.

The frame is mounted on the base with the inner edges of its end walls 20 resting on shelves 23 formed by the configuration of the recess in the base into which the frame fits. To hold the frame against shifting laterally, tangs 24 project from its end walls 20 into recesses opening to the shelves 23. To secure the frame to the base, the inner ends of its side walls have tangs 25 which pass through an opening in the bottom of the base to project through and be secured to a plate 26 fixed in a cavity 27 at the back of the base.

The cavity 27 opens to the back of the base and communicates with the opening through which the tangs 25 pass. Its dimension transversely of the base is greater than the width of the opening so that the ends of the plate 26 are securely supported against forward movement. The attachment of the tangs 25 to the plate may be effected in any desired manner, but is conveniently accomplished by twisting their outer ends as illustrated. After the attachment has been made, the cavity 27 may be filled with a suitable sealing substance 28.

The side walls of the frame have aligned openings 29 and 30 located near the front and rear of the frame, respectively. The openings 29 provide bearings for pivotally mounting the lever 7, and the openings 30 provide bearings for pivotally mounting a movable contactor arm indicated generally by the numeral 31. Both the pivoted lever 7 and the contactor arm 31 have portions disposed between the sides of the frame and are mounted from the holes 29 and 30 in a manner to be hereinafter described.

Besides the small bearing openings 29 and 30, the side walls of the frame also have large irregularly shaped openings 32, the edges at the front and rear ends of which provide stops for limiting the movement of the lever 7 and the contactor arm 31.

The lever 7 is stamped from sheet metal and has trunnions 33 projecting laterally from its side edges to engage in the openings 29 and pivotally mount the lever. Fixed to the outer end of the lever is a handle 34 molded of insulating material and of a size to substantially close the hole 8 in the cover.

Preferably, the handle 34 is slipped onto the lever 7 and is secured thereon either frictionally or by means of a suitable cement rather than by being molded directly onto the end of the lever.

As best illustrated in Figures 1 and 2, the position of the pivotal axis of the lever 7 is such that at its limits of movement, one or the other of two inclined faces 35 and 36 on the handle portion 34 is visible through the opening 8. The face 35 carries the designation "On", and the face 36 has the designation "Off" so as to visually indicate the position of the lever 7.

To insure proper assembly of the handle portion 34 with the lever 7, the lever is bent adjacent its pivotal axis so that its opposite end portions are disposed slightly angular to each other, and one of the two forks 37, into which the inner portion of the handle 34 is divided to provide the inclined faces 35 and 36, has its opposite edge portions cut away as at 38.

Consequently, it is possible to completely engage the handle portion 34 with the metal part of the lever only in one position, without having one of the forked inner portions 37 of the lever strike the adjacent front edges of the frame when the lever is in one of its two positions. When the handle portions 34 is properly assembled with the lever, neither of the two forks 37 strikes the front edges of the frame, the recesses 38 providing the clearance in one position of the lever.

To define the range of angular movement of the lever 7, lateral projections 39 and 40 on the sides of the lever engage with the stops provided by the front edges 41 of the openings 32 in the frame sides.

As best shown in Figure 11, the innermost extremity of the lever 7 has a central tongue 42 projecting from two knife edges 43 at opposite sides of the tongue, and a rivet 44 having rounded heads secured in the tongue adjacent its outer end portion so that the tongue has substantially a bulbous shape.

Engaged over the bulbous inner end of the lever 7 and bearing on the knife edges 43 is one end of a compression spring 46. The other end of the compression spring bears against part of the contactor arm 31. The distance between the portions of the lever 7 and the contactor arm against which the opposite ends of the spring bear

is less than the expanded length of the spring in any position of the parts so that the spring is at all times in compression, and as hereinafter described, snaps the contactor arm from one position to the other as the lever 7 is moved.

The contactor arm 31, as best illustrated in Figure 10, is stamped from sheet metal and has a flat mounting portion 48 provided with an angularly disposed flange 49 bent up from one edge thereof. The flange 49 has an overhanging projection 50 from the outer end of which a finger 51 projects laterally to be disposed in a plane substantially parallel with the plane of the mounting portion 48. The outer end of the finger 51 has a contact 52 fixed thereto, and projecting from the opposite side edges of the flat mounting portion 48 are aligned tangs 53 and 54, respectively. These tangs are received in the rear openings 30 in the side walls of the frame to pivotally mount the contactor arm.

The front edge of the flat mounting portion 48 has a tongue 55 to project into the adjacent end of the spring 46 and two knife edges 56 at opposite sides of the tongue to provide bearing surfaces for the spring. To assist the tongue 55 to maintain the spring properly engaged with the knife edges 56, the adjacent endmost coil of the spring instead of being flat and perpendicular to the axis of the spring as is ordinarily the case, is bent to lie in two angularly disposed planes as clearly shown in Figure 12.

The limits of swinging movement of the contactor arm 31 are defined by the engagement of a tang 57 projecting from the edge of the mounting portion 48 alongside the tang 53, with the inner or rear edges 58 of the openings 32 in the frame side walls.

It is to be noted that the arcuate distance of the permitted angular motion of the contactor arm is less than that of the lever 7. Consequently, when the lever 7 is actuated from one limit of movement to the other, the fulcrum provided by the knife edges 43 on the inner end of the lever 7 swings across dead center to shift the line of force of the spring so that the spring snaps the contactor arm to its opposite position.

The tangs 53 and 57 extend a substantial distance beyond the side of the frame to mount an indicator 59. This indicator 59 may be formed of fiber and is attached to the arms 53 and 57 by having the outer shouldered portion of the tang 57 received in a hole 60 and the extremity of the tang 53 engaged in an open recess 61 in the inner end of the indicator. The outer end of the indicator is enlarged as shown in Figure 9 and is so positioned as to be visible through the hole 62 in the cover.

When the movable contactor is in its "off" position, the indicator is inclined upwardly with respect to the horizontal as shown in Figure 5 to bring its lower white or light colored portion 63 in line with the opening 62, while in the opposite or "on" position of the contactor, the black or dark colored upper portion 64 of the indicator only is visible through the opening 62. Hence the indicator shows white when the switch contacts are disengaged, and inasmuch as the indicator moves with the contactor arm independently of the actuating lever 7, it indicates when the switch has been tripped by the overload release to be later described.

The contact 66 is mounted on and forms part of a latch unit indicated generally by the numeral 67. This unit is mounted on the base alongside the switch mechanism by a bracket 68 which forms a permanent part of the unit. The attaching flange 69 of the bracket is clamped directly against one flange 70 of an angularly shaped terminal 71 which is fixed to the base by a screw 72 passing through a suitable hole in the base and threaded in the flange 70. The front of the base is recessed to snugly receive the flange 70 so that the single screw 72 firmly secures the terminal on the base against any movement whatsoever.

The screw 72 also passes through the flange 69 of the bracket and a nut 73 threaded on its outer end serves to readily detachably clamp the bracket to the flange 70 of the terminal. An interengaging tongue and groove connection 74 and 75 on the flanges 69 and 70, respectively, holds the bracket against turning about the axis of the screw.

As will be more at length described hereinafter, there is an electrical connection between the bracket 68 and the stationary contact 66 and inasmuch as the bracket 68 is directly engaged with the terminal 71 electrical connection from the terminal to the stationary contact 66 is afforded.

Electrical connection to the movable contactor is provided by a second terminal 77 fixed to the base by a screw 78 on the opposite side of the switch mechanism. This terminal 77 is connected through a flexible jumper 79 to the contactor arm, the ends of the flexible jumper being soldered directly to the terminal and the contactor arm.

Between the terminals 71 and 77 and beneath the switch mechanism, the base has an opening 79' through which conductor wires may be passed for attachment to the terminals in the conventional manner.

The mechanism described thus far comprises a complete manually operable snap switch particularly adapted for starting and stopping small electric motors. Combined therewith is an overload responsive tripping mechanism indicated generally by the numeral 80, to open the switch entirely independently of the manual control therefor in response to an overload condition so as to afford overload protection for the motor with which the switch is used. A novel feature of the combination resides in the fact that a single set of contacts is used for both the manual control of the motor circuit and also for the automatic opening of the circuit in the event of an overload.

The tripping mechanism comprises a substantially T shaped lever 81 preferably of insulating material, and pivotally mounted at the end of its stem on a trunnion 82 projecting from the side of the terminal flange 70. One end 83 of the head of the T shaped lever is arranged to engage the overhanging portion 50 of the movable contactor arm to swing the movable contactor about its pivotal mounting and disengage its contact 52 from the stationary contact 66. To effect this motion of the lever 81, a torsion spring 85 is provided. The spring 85 is coiled about the trunnion 82 and has one end hooked onto the lever as at 86 and its other end bearing against a lug 87 integral with the terminal flange 70 and disposed a short distance from the trunnion 82.

Fixed to the head of the lever 81 is a spring pawl 88, the outer end of which is bent to provide a spring finger 89 adapted for engagement with the teeth of a ratchet wheel 90 forming part of the latch unit 67. Normally, the ratchet wheel 90 is fixed against rotation so that with the spring finger of the pawl engaged therewith, as best shown in Figure 7, the lever 81 of the tripping mechanism is held against movement in a potentially operative position. To move the lever 81 to this position and thereby provide means for

resetting the tripping mechanism, the projection 40 on the lever 7 extends sufficiently far beyond the adjacent side wall of the switch frame to engage the head of the T shaped lever during movement of the lever 7 to its "off" position. Hence, to reset the tripping mechanism, it is only necessary to push the lever 7 to its "off" position as indicated by the legend 92 on the front of the cover.

The latch unit 67, as best illustrated in Figure 6, comprises a cup 94 fixed to the shelf of the bracket 68, within which a hollow post 95 is mounted. The post 95 is insulated from the cup 94 by an insulating lining 96 covering both the bottom and sides of the cup, and is maintained assembled with the cup by spinning an annular flange 97 down into an annular groove in the post.

The upper closed end of the hollow post 95 has the stationary contact 66 sweated or otherwise fixed thereto, but inasmuch as the post 95 is insulated from the cup 94, and consequently the bracket, there is no direct electrical connection from the bracket to the stationary contact. The only connection from the bracket to the stationary contact is through a heater coil 98 disposed within the hollow of the post 95 with one end fixed in the closed upper end portion of the post 95 to have good electrical connection with the contact 66, and its other end passed down through a hole 99 in the bottom of the cup 94 to be embedded in a weld of solder 100 which also serves to secure the cup to the post.

The hollow of the post is filled with a refractory material 101 in which the coils of the heater are embedded so that the heat generated by the heater upon the passage of current therethrough in excess of the rated value of the latch unit, is conducted to the low temperature solder 102 which serves to secure the ratchet wheel 90 to the upper end of the post 95. The wheel 90 is journalled on the upper reduced end of the post and is held against endwise movement by a shoulder 103 and a spring ring 104 engaged under the overhanging peripheral edge of the contact 66.

Normally, the solder 102 secures the ratchet wheel against rotation, but when the current passing through the heater coil exceeds the predetermined value, the heat generated therein melts the solder and frees the ratchet wheel for rotation. Consequently, upon the occurrence of an overload condition in the circuit closed by the switch, the tripping mechanism is released and inasmuch as its spring 85 is stronger than the spring 46, the switch is automatically opened.

During the opening of the switch by the tripping mechanism, the position of the manually operable lever 7 is not disturbed. The indicator arm, however, moving with the movable contactor is swung to its position at which the white portion thereof is visible through the hole 62 to indicate that the switch is open. There is thus a discrepancy between the indicator and the visible designation of the lever 7, one indicating that the switch is closed and the other that the switch is open. This indicates that the switch has been tripped in response to an overload condition and that to reclose the switch it is necessary to first move the lever 7 to its resetting position which is the "off" position. Inasmuch as the solder cools quickly, to secure the ratchet wheel against rotation, resetting is possible shortly after the switch has tripped. Obviously, if the overload condition still exists the switch will again be opened by the thermal release of the tripping mechanism.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art to which this invention appertains, that this invention provides a novel combination of snap switch and overload protection for small electric motors, and that in utilizing the same set of contacts for opening and closing the circuit manually and opening the circuit in response to an overload, and in providing a single compact unit to form both the mounting for the stationary contact and the latch for the tripping mechanism of the overload release, exceptional compactness is achieved.

The construction of the latch unit is particularly conducive to compactness and simplicity of design, for it not only affords reduction in size of the elements which comprise its assembly, but it also provides an improved thermal latch for the fusible alloy type of overload release.

What I claim as my invention is:

1. In a combined manually operable and overload responsive switch, a stationary contact, a terminal for the stationary contact, a movable contactor engageable with the stationary contact, manually operable means to effect actuation of the movable contactor into and out of engagement with the stationary contact, a tripping lever for disengaging the movable contactor from the stationary contact independently of said manually operable means, means on said terminal to pivotally mount the tripping lever, a spring acting on the tripping lever and biased to a position at all times yieldably urging the tripping lever into engagement with the movable contactor, and releasable latch means to hold the tripping lever in an inactive potentially operative position with its spring under tension.

2. In a combined manually operable and overload responsive switch, a base, cooperating contacts, manually operable means to effect engagement and disengagement of the contacts, tripping mechanism to move one of the contacts out of engagement with the other, a ratchet wheel engageable by a part carried by the tripping mechanism for holding the tripping mechanism in a potentially operative position, fusible means to hold the ratchet wheel stationary, a heater to melt the fusible means, and common means to mount the ratchet wheel, the heater and said other contact from the base.

3. A switch of the character described comprising a stationary contact, a movable contactor engageable with the stationary contact, a manually operable member to effect actuation of the movable contactor to and from engagement with the stationary contact, a contact spring directly connecting the movable contactor and said manually operable member to snap the movable contactor from one position to the other as the manually operable member is actuated, tripping mechanism for disengaging the movable contactor from the stationary contact independently of the manually operable member and the contact spring, said tripping mechanism including a spring of sufficient strength to overpower the contact spring and move the actuator to its "off" position even though the contact spring continues to urge the contact to its "on" position, and latch means for releasably holding the tripping mechanism in a potentially operative position with its spring under tension.

4. A switch of the character described comprising a stationary contact, a movable contactor engageable with the stationary contact, a manually operable member to effect actuation of the movable contactor to and from engagement

with the stationary contact, a contact spring directly connecting the movable contactor and said manually operable member to snap the movable contactor from one position to the other as the manually operable member is actuated, tripping mechanism for disengaging the movable contactor from the stationary contact independently of the manually operable member and the contact spring, said tripping mechanism including a spring of sufficient strength to overpower the contact spring and move the contactor to its "off" position even though the contact spring continues to urge the contactor to its "on" position, latch means for releasably holding the tripping mechanism is a potentially operative position with its spring under tension, and means connected in series with the stationary contact and movable contactor to be influenced by electric current flowing therethrough for releasing the latch means upon the passage therethrough of current in excess of a predetermined value.

5. In a switch of the character described, a base, cooperating contacts to be engaged and disengaged, manually operable means to engage and disengage the contacts, tripping mechanism to effect disengagement of the contacts independently of the manually operable means, said tripping mechanism including a spring and a pawl, a releasable latch in the form of a ratchet wheel engageable by the pawl to hold the tripping mechanism in a potentially operative position with its spring under tension, a common supporting post to mount the ratchet wheel and one of the contacts from the base, and means responsive to a predetermined condition for releasing the ratchet wheel for rotation on its supporting post.

6. A switch of the character described comprising a base, cooperating contacts to be engaged and disengaged, manually operable means to engage and disengage the contacts, tripping mechanism to effect disengagement of the contacts independently of the manually operable means, said tripping mechanism including a spring and a pawl, a releasable latch in the form of a ratchet wheel engageable by the pawl to hold the tripping mechanism in a potentially operative position with its spring under tension, a common supporting post to mount the ratchet wheel and one of the contacts from the base, and means enclosed within said post and responsive to a predetermined condition for releasing the ratchet wheel for rotation about the post.

7. A switch of the character described comprising a stationary contact, a movable contactor, means mounting the movable contactor for movement to and from engagement with the stationary contact, a manually operable actuator, a spring connecting the actuator and the movable contactor and adapted to snap the movable contactor from one position to the other as the actuator is moved, and tripping mechanism to disengage the movable contactor from the stationary contact, comprising a pivoted lever having a part engageable with the movable contactor to move the same out of engagement with the stationary contact, a spring for moving said pivoted lever to cause the same to disengage the movable contactor from the stationary contact, and latch means to releasably hold the pivoted lever in a potentially operative position with its spring under tension.

8. In a combined manually operable and overload responsive switch, a stationary contact, a post mounting the stationary contact, a terminal for the stationary contact, a bracket to which the post is secured, means for readily detachably mounting the bracket in direct contact with the terminal, a movable contactor, manually operable means to effect actuation of the movable contactor into and out of engagement with the stationary contact, a tripping lever for swinging the movable contactor out of engagement with the stationary contact, a tang on the terminal on which the tripping lever is pivotally mounted, a spring to swing the tripping lever into operative engagement with the movable contactor, and thermally responsive latch means mounted on the supporting post of the stationary contact for releasably holding the tripping lever inactive in a potentially operative position.

9. In a combined manually operable and overload responsive switch including a movable contactor and a stationary contact engageable thereby, a terminal for the stationary contact, a tripping lever for disengaging the movable contactor from the stationary contact, and means on the terminal to pivotally mount the tripping lever.

10. As a separate article of manufacture, a stationary contact and thermally responsive latch unit for use with a combined manually operable and overload responsive switch, said unit comprising a hollow post, a bracket supporting the hollow post but electrically insulated therefrom, a contact at the closed end of the post, a ratchet wheel journalled on the post, a fusible alloy normally securing the ratchet wheel against rotation on the post, and a heater coil disposed within the hollow of the post and having electrical connection with the bracket and the closed end of the post to conduct current from the bracket to the contact, the heat generated in said heater coil upon the passage of excessive current therethrough melting the fusible alloy to release the ratchet wheel for rotation on the post.

11. As a separate article of manufacture, a combined latch unit and stationary contact comprising a hollow post open at one end, a mounting cup closing the open end of the post but electrically insulated therefrom, means engaged with the mounting cup to support the entire unit, the closed end of the post having a contact surface, a latch member journalled on the post, a fusible alloy normally securing the latch member against rotation on the post, and a heater coil having one end electrically connected with the closed end of the post and its other end electrically connected with said cup to carry current from the cup to the contact surface at the closed end of the post, said post being thermally influenced by the temperature of the heater coil whereby the passage of excessive current through the heater coil melts the fusible alloy and releases the latch member for rotation on the post.

12. In a combined manually operable and overload responsive switch, a unitary structure affording both a thermally responsive latch and a stationary contact comprising a hollow post having one open end and one closed end, means at the closed end affording a contact, a releasable latch member journalled on the post, a fusible alloy normally securing the latch member against rotation on the post, a cup closing the open end of the post, means to electrically insulate the cup from the post, means engaged with the cup to mount the structure, a heater coil disposed within the hollow of the post and having one end fixed to the closed end of the post and its other end electrically connected with the supporting means for the cup whereby electric current may be passed through said supporting means and the

coil to said contact portion, and a refractory material filling the hollow of the post and having the heater coil embedded therein to transmit heat from the coil to the post, whereby upon the passage of excessive current through the heater coil the fusible alloy melts to release the latch means.

13. A latch unit for fusible alloy type overload release mechanisms comprising a rotatable latch member, a hollow post on which the rotatable latch member is mounted, a fusible alloy normally securing the latch member against rotation on the post, and a heater element contained within the hollow of the post to melt the fusible alloy and release the latch member for rotation.

14. A latch unit of the character described comprising a fixed hollow stem, a ratchet wheel journalled on the stem, a fusible alloy normally securing the ratchet wheel against rotation on the stem, and a heater element housed within the hollow of the stem and adapted to melt the fusible alloy to release the ratchet wheel for rotation.

15. A latch unit of the character described comprising a hollow stem, a latch member movably mounted on the hollow stem, a fusible alloy normally holding the latch member fixed to the stem, and a heater element enclosed within the hollow of the stem to melt the fusible alloy and release the latch member for movement.

16. A latch unit of the character described comprising a hollow post, means in direct electrical connection with the post for closing one end thereof, means electrically insulated from the post for closing the opposite end thereof, a movable latch member mounted on the post, a fusible alloy normally securing the latch member against motion on the post, and a heater element contained within the hollow of the post and having its opposite ends connected with the means closing the ends of the post to conduct electric current from one of said means to the other, the passage of an excessive current through the heater element causing the heater element to generate sufficient heat to melt the fusible alloy and release the latch member.

17. A switch of the character described comprising, a stationary contact, a movable contactor, a frame in which the movable contactor is mounted for swinging movement into and out of engagement with the stationary contact, a manually operable lever pivoted in said frame, spring means directly connecting the manually operable lever and the movable contactor to snap the movable contactor from one position to the other as the pivoted lever is moved from one limit of movement to the other, a tripping lever pivotally mounted adjacent the frame to strike the movable contactor and disengage it from the stationary contact, a spring to cause the tripping lever to strike the contactor, a releasable latch to hold the tripping lever in its potentially operative position with its spring under tension and ready to cause the tripping lever to strike the movable contactor, and means on the manually operable pivoted lever engageable with the tripping lever to swing the same on its pivotal mounting so as to reset the tripping lever after release from its latch.

18. In a snap switch, a base having its front face hollowed out, a cover to close the front of the base and cooperate therewith to form a housing, a stationary contact mounted on the base within the housing, a movable contactor, a frame having spaced side walls fixed on the base, a movable contactor having a part disposed between the side walls and pivotally mounted therefrom for movement into and out of engagement with the stationary contact, a manually operable lever projecting through a hole in the cover and having its inner end received between the side walls and pivotally mounted therefrom, a compression spring confined between the inner end of the manually operable lever and the portion of the movable contact disposed between the side walls to snap the movable contactor into and out of engagement with the stationary contact upon movement of the manually operable lever, cooperating means on the manually operable lever and one of the side walls to define the limits of movement of said lever, cooperating means on the movable contactor part between the side walls of the frame and one of said side walls to define the limits of movement of the movable contactor, and an indicator movable with the movable contactor and having a part visible through an opening in the cover to visually indicate the position of the contactor.

19. In a snap switch, a base, a cover cooperating with the base to provide a housing, a stationary contact mounted on the base, a movable contactor, a frame having spaced side walls mounted on the base, the movable contactor having a part disposed between the side walls of the frame, tangs extending laterally from the side edges of said movable contactor part and received in aligned holes in the side walls of the frame to pivotally mount the movable contactor for swinging movement to and from engagement with the stationary contact, a manually operable lever having its outer end projecting through a hole in the cover and its inner end portion received between the side walls of the frame, tangs extending laterally from the side edges of said inner portions of the lever and journalled in holes in the side walls of the frame to pivotally mount the lever, a compression spring confined between the inner ends of said contactor part and the pivoted lever between the side walls of the frame to snap the movable contactor from one position to the other as the pivoted lever is moved, a tang extending sidewise from the pivoted lever and engageable with stops formed on one of the side walls to limit its angular distance of motion, a tang extending from the side edge of said movable contactor part between the side walls and engageable with stops on the adjacent side wall to define the limits of movement of the contactor, and an indicator carried by said last named tang and the adjacent trunnion of the movable contactor to swing with the movable contactor, said indicator having a part visible through a hole in the cover to visually indicate the position of the movable contactor.

20. In an electric switch, a movable contactor, a manually operable actuator to move the contactor to and from circuit closing position, means entirely independent of the manually operable actuator for automatically tripping the contactor to an "off" position, visual indicating means on the actuator to indicate the position to which the contactor has been moved by the actuator, and other indicating means movable with the contactor independently of the actuator and visible whenever the contactor is in its "off" position, whereby a discrepancy between the first and second named indicating means indicates that the contactor has been tripped automatically.

21. In a combined manually operable and over-

load responsive switch, a housing having two openings through an outer wall thereof, a contactor movable between "on" and "off" positions, a manually operable actuator operable from the exterior of the housing and connected with the contactor to move the same from one position to the other, overload responsive means for automatically tripping the contactor independently of the manually operable actuator to move the contactor to its "off" position, indicating means on the actuator visible through one of the openings in the housing wall for indicating the position to which the contactor has been moved by the actuator, and a second indicating means movable with the contactor and visible through the other opening when the contactor is in its "off" position so that by a discrepancy between the two indicating means with the indicating means on the actuator showing "on" and the indicating means movable with the contactor showing "off" the fact that the switch has been automatically opened in response to an overload is indicated.

22. In an electric switch having stationary and movable contacts, manually operable means to move the movable contact and effect opening and closing of the switch, primary spring means actuatable by the manually operable means to move the movable contact with a snap, and secondary spring means operable upon the occurrence of a predetermined condition to move the movable contact out of engagement with the stationary contact entirely independently of the primary spring means which continues to urge the movable contact toward the stationary contact.

23. In an electric switch, stationary and movable contacts, an actuator to effect movement of the movable contact, primary spring means actuatable by the actuator and adapted to move the movable contact with a snap, a member movable to push the movable contact out of engagement with the stationary contact, and secondary spring means released for operation upon overload to move said member and cause it to push the movable contact out of engagement with the stationary contact.

24. In an electric switch, stationary and movable contacts, an actuator to effect movement of the movable contact, a member carrying the movable contact and forming part of the electric circuit when the switch is closed, primary spring means actuatable by the actuator and adapted to move said member with a snap in a direction to disengage the movable contact from the stationary contact, secondary spring means normally restrained against acting but released upon overload, and a member arranged to be moved by the secondary spring means and adapted to push the contact carrying member so as to disengage the movable contact from the stationary contact with a snap.

25. In an electric switch, cooperating contacts, a hollow stem mounting one of the contacts, a latch member movably mounted on the hollow stem, a fusible alloy normally securing the latch member against movement on the stem, and a heater element enclosed within the hollow of the stem to melt the fusible alloy and release the latch member for movement, one end of said heater element being electrically connected with said designated contact to be connected in the circuit controlled by the contacts so that current flowing from one contact to the other flows through the heater element.

26. As a separate article of manufacture a combined latch unit and contact for use with an overload responsive switch, comprising a hollow stem, a latch member journaled on the stem, a fusible alloy normally securing the latch member to the stem, a heater element contained within the hollow of the stem to melt the fusible alloy and release the latch member for rotation, and a part carried by the stem to provide a switch contact and having one end of the heater element electrically connected thereto.

27. In an electric switch, cooperating movable and stationary contacts, a hollow stem mounting the stationary contact, a ratchet wheel journaled on the stem, a fusible alloy normally securing the ratchet wheel against rotation on the stem, and a heater element housed within the hollow of the stem and adapted to melt the fusible alloy to release the ratchet wheel for rotation, said heater element being electrically connected with the stationary contact so that the contacts and the heater element may be connected in one circuit.

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