May 14, 1940. A. L. JUDSON 2,200,845

OVERLOAD CUTOUT SWITCH

Filed March 17, 1938

Fig. 1

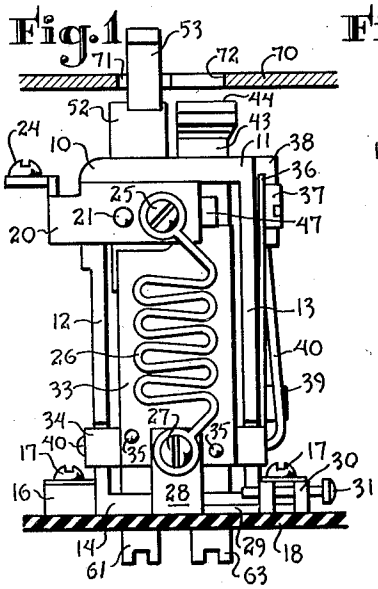


Fig. 2

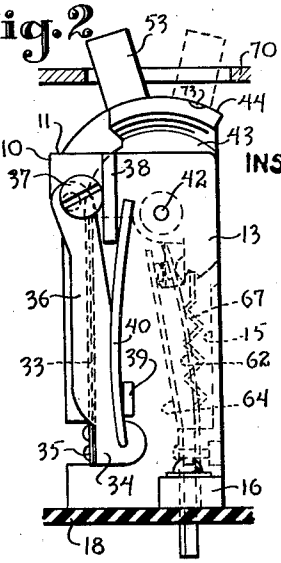


Fig. 3

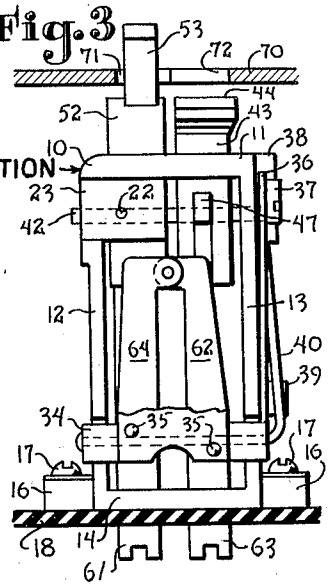


Fig. 5

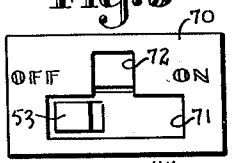


Fig. 6

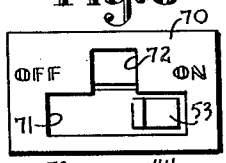


Fig. 7

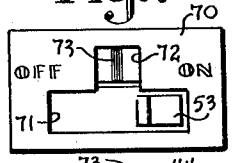


Fig. 8

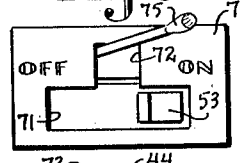
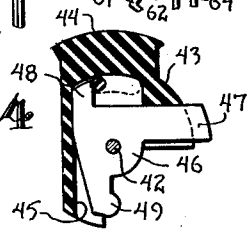


Fig. 4



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OVERLOAD CUTOUT SWITCH

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Application March 17, 1938, Serial No. 196,448

12 Claims. (Cl. 200—116)

This invention relates to switching mechanisms in general and more particularly to an overload cutout switch.

An object of this invention is to provide a novel mechanism for resetting an overload cutout switch which prevents closing of the contacts thereof during the resetting operation.

A further object of this invention is to provide a novel arrangement wherein the resetting mechanism for the overload cutout also forms a means for manually operating the switch.

Still another object of this invention is to provide a fool-proof arrangement wherein it is impossible to block the overload cutout switch in a closed position so that the overload cutout switch will at all times be responsive to overload conditions.

Other objects and advantages will become apparent to those skilled in the art upon reference to the accompanying specification, claims, and drawing; in which

Figure 1 is an elevational view of the switching mechanism of this invention.

Figure 2 is an elevational view looking from the right in Figure 1,

Figure 3 is a view similar to Figure 1 with certain of the parts omitted,

Figure 4 is a sectional view of a portion of the apparatus of Figures 1, 2, and 3,

Figure 5 is an exploded view showing the positions of the various parts of the switching mechanism when the switching mechanism is manually positioned in an off position,

Figure 6 is an exploded view similar to Figure 5 but showing the parts in an on position with no overload condition occurring,

Figure 7 is an exploded view similar to Figures 5 and 6 showing the parts in a position representing the switch in an on position after the occurrence of an overload condition, and

Figure 8 is an exploded view similar to Figures 5, 6, and 7 showing the switch blocked in an on position after the occurrence of an overload condition.

The overload switching mechanism of this invention may find particular utility in the control arrangement shown and described in application Serial No. 196,447, filed by Albert L. Judson and Carl G. Kronmiller on March 17, 1938.

Referring now to Figures 1, 2, and 3 the switching mechanism is shown to comprise a casing 10 preferably made of insulating material and having a top wall 11, side walls 12 and 13, a bottom wall 14, and a back wall 15. If desired the casing may be formed of a single integral unit as shown. The side walls 12 and 13 are formed with ears 16 through which screws 17 extend for securing the casing to a base 18.

A conductor bracket 20 is suitably secured to the casing 10 by rivet 21 extending through an opening 22 in a pad 23 carried by the casing 10. The conductor bracket may be provided with a terminal 24 and also with a screw 25 to which one end of a heater element 26 is secured. The other end of the heater element 26 is secured by a screw 27 to another bracket having an upstanding lug 28, a conductor bar 29, and lugs 30 to which is secured a terminal 31. The terminals 24 and 31 may be included in series in a motor circuit such as a compressor circuit and the current flowing through this circuit will pass through the heater 26 so that the heater 26 is heated in accordance with the current conditions in the circuit.

A bimetallic element 33 is located adjacent the heater element 26 so as to be affected by the heat given off by the heater element. The bimetallic element 33 is secured to a bracket 34 by means of rivets 35, the bracket 34 having an arm 36 extending upwardly adjacent the side wall 13. The upper end of the arm 36 is provided with an eccentrically headed screw 37 which abuts against a pad 38 carried by the side wall 13. The arm 36 of the bracket 34 is also provided with a lug 39. A spring member 40 pivots the bracket 34 to the side walls 12 and 13 of the casing and extends upwardly between the lug 39 and the pad 38 to hold the eccentrically headed screw 37 in engagement with the pad 38. By rotating the eccentrically headed screw 37 the bracket 34 is rotated and hence the bimetallic element 33 is rotated inwardly or outwardly with respect to the casing 10. The construction thus far described provides a simple means for adjusting the position of the bimetallic element 33 as well as holding the parts in an assembled relation.

Extending through the casing 10 from one side wall 13 to the other side wall 12 is a pivot pin 42. Mounted on this pivot pin between the walls 12 and 13 is a first member 43 having an indicating surface 44. The member 43 is hollowed out at 45 as shown in Figure 4 and located in the hollowed out portion and also mounted on the shaft 42 is a second member 46. This second member 46 is provided with a tripping lug 47, a resetting lug 48, and a contact operating lug 49 as is clearly shown in Figure 4. The first member 43 is provided with an elongated slot 50, the function of which will be pointed out more fully hereafter.

Also mounted on the pivot pin 42 adjacent to the first member 43 is a third member 52 having an actuating handle 53. The third member 52 carries a pin 54 which extends through the slot 50 of the first member and which is adapted at certain times to engage the actuating lug 48 of the second member. The third member 52 is provided with opposed abutment surfaces 55 and 56 which are adapted to engage a lug 57 formed on the inner side of the pad 23. The lug 57 limits the amount of rotation of the third member 52 about the pivot pin 42. The third member 52 is provided with a contact operating lug 58 and is also provided with a V notch 59. A torsion spring 60 about the pivot pin 42 is interposed between the first member 43 and the third member 52, this spring acting to rotate the two members in the opposite direction. As viewed in Figure 5 this spring operates to rotate the first member 43 in a clockwise direction and the third member 52 in a counter-clockwise direction.

A resilient contact arm 62 is suitably carried by the back wall 15 of the casing 10 and extends downwardly through the base 13 to form a terminal 63. A second resilient contact arm 64 also suitably secured to the back wall 15 of the casing 10 extends downwardly through the base 13 to form a terminal 61. The contact arm 62 carries a contact 65 and the contact arm 64 carries a contact 66, these contacts engaging each other under certain conditions. The contact arm 64 is normally in a relatively vertical position and the contact arm 62 is biased by its own resiliency to move normally the contact 65 out of engagement with the contact 66. A spring, which may be of the corrugated type, is shown at 67 in Figure 2 and this spring extends between the V notch 59 of the third member 52 and a suitable notch formed in the back wall 15 of the casing 10. This spring operates as a detent or over-center device for holding the third member 52 in either of its extreme positions.

A suitable cover 70 for enclosing the structure thus far described may be provided and located in this cover are two openings 71 and 72. The opening 71 receives the handle 53 of the third member and the opening 72 exposes the indicating surface 44 of the first member 43. Formed on the indicating surface 44 of the first member 43 is an indicator 73 which moves into alignment with the opening 72 in the cover 70 whenever the switching mechanism is tripped open upon the occurrence of an overload condition.

Referring now to the exploded views of Figures 5, 6, 7, and 8 the mode of operation of this switching mechanism is disclosed. Each of these figures set forth the positions of the parts with respect to the openings in the casing 70, the positions of the contacts 65 and 66 and the bimetallic element 33 and the positions of the first, second, and third members 43, 46, and 52, respectively. Figure 5 illustrates the bimetallic element 33 engaging the tripping lug 47 of the second member 46 to hold the contact 65 in a position where it would normally be engaged by the contact 66. However, the handle 53 of the third member 52 is moved to the off position and is held in this off position by the corrugated over-center spring 67. When the member 52 is in the off position the contact operating lug 58 thereof engages the contact arm 64 to move the contact 66 to the right out of engagement with the contact 65. Hence with the parts in the position shown in Figure 5 the contacts 65 and 66 are separated and the switch is in the "off" or "open" position.

In Figure 6 the thermostatic element 33 is engaging the tripping lug 47 of the second member 46 and hence the contact arm 62 and contact 65 are held in a closed position. The handle 53 however is moved to the "on" position and is held in the "on" position by the corrugated over-center spring 67. With the third member 52 in this position the contact operating lug 58 is moved away from the contact member 64 so that the contact 66 is in engagement with the contact 65 and the switch is in an "on" position.

If now an overload condition in the motor circuit should occur which results in excessive heating of the heater element 26 the bimetallic element 33 is flexed to the right as shown in Figure 7. When this occurs the bimetallic element 33 moves out from under the tripping lug 47 and the spring 60 rotates the first member 43 and hence the second member 47 in a clockwise direction. When this occurs the contact operating lug 48 of the second member 46 moves away from the contact arm 62 and due to the resiliency of the contact arm 62 the contact 65 is moved out of engagement with the contact 66. Hence even though the handle 53 of the third member 52 is in the "on" position and an overload condition occurs, the contact 65 is moved out of engagement with the contact 66. The occurrence of an overload condition is indicated by the mark 73 of the indicating surface 44 being exposed in opening 72.

When the overload condition no longer exists and the thermostatic element 33 cools down to move towards the left the switching mechanism may be reset by moving the handle 53 of the third member 52 to the "off" position. When the handle 53 is thus moved to the off position the contact operating lug 58 of the third member 52 engages the contact arm 64 to move the contact 66 to the right and the first and second members 43 and 46 are moved in a counter-clockwise direction by the pin 54 of the third member 52 to allow the bimetallic element 33 to engage the tripping abutment 47. The parts then assume the position shown in Figure 5 and when the handle is then moved to the "on" position as shown in Figure 6 the contact 66 engages the contact 65 as shown in Figure 6 and the parts are in position for further operation. From the above it is seen that the contacts 65 and 66 may be manually opened or closed and that they may be opened upon the occurrence of an overload condition. The parts are also arranged so that when the switching mechanism is being reset following the occurrence of an overload condition, the contacts are maintained apart until the switching mechanism is subsequently returned to the "on" position.

It is found that in previous overload cut-out arrangements that persons not familiar with the operation of the same will attempt to block the overload cut-out switching mechanism in the "on" position to prevent the same from cutting out upon the occurrence of overload conditions. By reason of the construction of the overload cut-out switching mechanism of this invention blocking of the switching mechanism in the "on" position to prevent the same from cutting out upon the occurrence of an overload condition is impossible. As outlined above in connection with Figures 5, 6, and 7 the switching mechanism will open upon the occurrence of an overload condition even though the handle 53 of the third

member is held in the "on" position. Even if the first member is blocked in the "on" position as by a match or other device the switching mechanism will be opened upon the occurrence of an overload cut-out condition.

Referring now to Figure 8 the first member or indicating member is shown blocked in an "on" position by a match **75**. If an overload condition should occur to move the bimetallic element **33** to the right the tripping lug **47** will be disengaged and the resiliency of the contact member **62** will rotate the second member **46** in a clockwise direction to allow movement of the contact **65** out of engagement with the contact **66**, hence it is impossible to prevent the contacts **65** and **66** from separating upon the occurrence of an overload condition.

Although for purposes of illustration one form of this invention has been disclosed other forms thereof may become apparent to those skilled in the art upon reference to this disclosure and therefore this invention is to be limited only by the scope of the appended claims and prior art.

I claim as my invention:

1. In combination, first and second contacts, means for biasing the first contact away from the second contact, trip means for holding the first contact in engagement with the second contact when set and for allowing the contacts to separate when tripped, manual means for resetting the trip means including means for maintaining the contacts separated until the trip means is reset, and means associated with said manual means for holding it in a position to-maintain the second contact out of engagement with the first contact.

2. In combination, first and second contacts, means for biasing the first contact away from the second contact, trip means for holding the first contact in engagement with the second contact when set and for allowing the contacts to separate when tripped, manual means for resetting the trip means including means for holding the second contact out of engagement with the first contact until the trip means is reset, and spring means operative upon said manual means for holding the second contact out of engagement with the first contact.

3. In combination, first and second contacts, means for biasing the first contact away from the second contact, trip means for holding the first contact in engagement with the second contact when set and for allowing the contacts to separate when tripped, manual means movable from a first position to a second position for resetting the trip means and for holding the second contact out of engagement with the first contact until the trip means is reset, and detent means for holding the manual means in the second position for maintaining the second contact out of engagement with the first contact.

4. In combination, first and second contacts, means for biasing the first contact away from the second contact, an arm movable to a first position to hold the first contact in engagement with the second contact and movable to a second position to allow the first contact to separate from the second contact, means for normally holding the arm in the first position, manually operated means movable from a first position to a second position for moving the second contact away from the first contact and detent means for holding the manually operated means in the second position.

5. In combination, first and second contacts, means for biasing the first contact away from the second contact, an arm movable to a first position to hold the first contact in engagement with the second contact and movable to a second position to allow the first contact to separate from the second contact, means for normally holding the arm in first position but operative to allow the arm to move to the second position upon the occurrence of a predetermined condition, manually operated means movable from a first position to a second position to move the arm from the second position to the first position and to move the second contact away from the first contact, and detent means for holding the manually operated means in either of its positions.

6. In combination, first and second contacts, means for biasing the first contact away from the second contact, an arm movable to a first position to hold the first contact in engagement with the second contact and movable to a second position to allow the first contact to separate from the second contact, means for normally holding the arm in the first position but operative to allow the arm to move to the second position upon the occurrence of a predetermined condition, manually operated means movable from a first position to a second position to move the arm from the second position to the first position and to move the second contact away from the first contact, and over-center spring means for maintaining the manually operated means in either the first or second positions.

7. In combination, first and second contacts, means for biasing the first contact away from the second contact, a movable member movable to a first position to hold the first contact in engagement with the second contact and movable to a second position to allow the first contact to separate from the second contact, an indicator member having a one way connection with the movable member and urged from a first position toward a second position for urging the movable member towards the second position, means for normally holding the movable member and the indicator member in their first positions but operative to allow the movable member and the indicator member to move to their second positions upon the occurrence of a predetermined condition, the arrangement being such that even though the indicator member is held in the first position, the movable member can move to the second position to allow the first contact to separate from the second contact.

8. In combination, first and second contacts, means for biasing the first contact away from the second contact, a movable member movable to a first position to hold the first contact in engagement with the second contact and movable to a second position to allow the first contact to separate from the second contact, an indicator member having a one way connection with the movable member and urged from a first position toward a second position for urging the movable member toward the second position, means for normally holding the movable member and the indicator member in their first positions but operative to allow the movable member and the indicator member to move to their second positions upon the occurrence of a predetermined condition, the arrangement being such that even though the indicator member is held in the first position, the movable member can move to the second position to allow the

first contact to separate from the second contact, manually operated means movable from a first position to a second position to move the movable member and the indicator member from their second positions to their first positions.

9. In combination, first and second contacts, means for biasing the first contact away from the second contact, a movable member movable to a first position to hold the first contact in engagement with the second contact and movable to a second position to allow the first contact to separate from the second contact, an indicator member having a one way connection with the movable member and urged from a first position toward a second position for urging the movable member toward the second position, means for normally holding the movable member and the indicator member in their first positions but operative to allow the movable member and the indicator member to move to their second positions upon the occurrence of a predetermined condition, the arrangement being such that even though the indicator member is held in the first position, the movable member can move to the second position to allow the first contact to separate from the second contact, manually operated means movable from a first position to a second position to separate the contacts.

10. In combination, first and second contacts, means for biasing the first contact away from the second contact, a movable member movable to a first position to hold the first contact in engagement with the second contact and movable to a second position to allow the first contact to separate from the second contact, an indicator member having a one way connection with the movable member and urged from a first position toward a second position for urging the movable member toward the second position, means for normally holding the movable member and the indicator member in their first positions but operative to allow the movable member and the indicator member to move to their second positions upon the occurrence of a predetermined condition, the arrangement being such that even though the indicator member is held in the first position, the movable member can move to the second position to allow the first contact to separate from the second contact, manually operated means movable from a first position to a second position to move the movable member and the indicator member from their second positions to their first positions and to move the second contact away from the first contact.

11. In combination, first and second contacts, means for biasing the first contact away from the second contact, a movable member movable to a first position to hold the first contact in engagement with the second contact and movable to a second position to allow the first contact to separate from the second contact, an indicator member having a one way connection with the movable member and urged from a first position toward a second position for urging the movable member toward the second position, means for normally holding the movable member and the indicator member in their first positions but operative to allow the movable member and the indicator member to move to their second positions upon the occurrence of a predetermined condition, the arrangement being such that even though the indicator member is held in the first position, the movable member can move to the second position to allow the first contact to separate from the second contact, manually operated means movable from a first position to a second position to move the movable member and the indicator member from their second positions to their first positions and to move the second contact away from the first contact, and detent means for holding the manually operated means in either of its positions.

12. In an overload cut-out switch having switching means and tripping means for opening the switching means upon the occurrence of an overload condition including a latch member and a thermostatic element normally engaging the same but disengaging the latch member upon the occurrence of an overload condition, the combination of, an adjustable support for the thermostatic element, an eccentric carried by the support, a relatively stationary abutment, and resilient means carrying said support and urging the eccentric into engagement with the abutment, the arrangement being such that upon adjustment of said eccentric the support is adjusted to adjust the position of the thermostatic member with respect to the latch member.

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