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BLOWOUT DEVICE FOR ELECTRIC SWITCHES

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Fig. 1

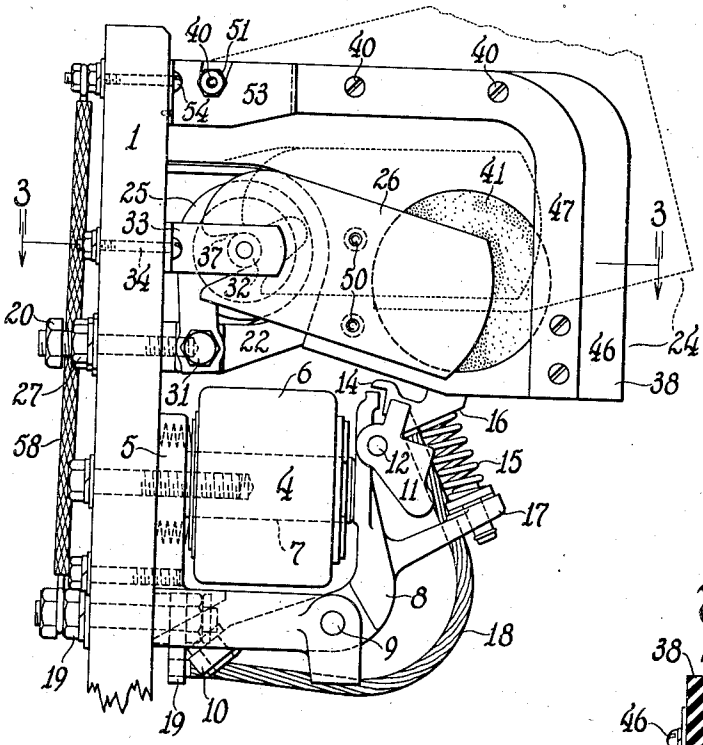


Fig. 2

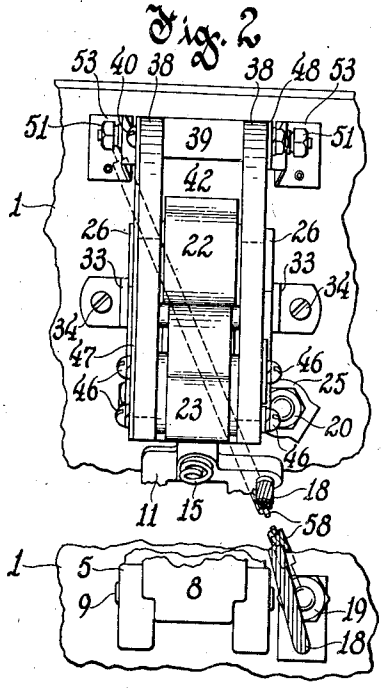
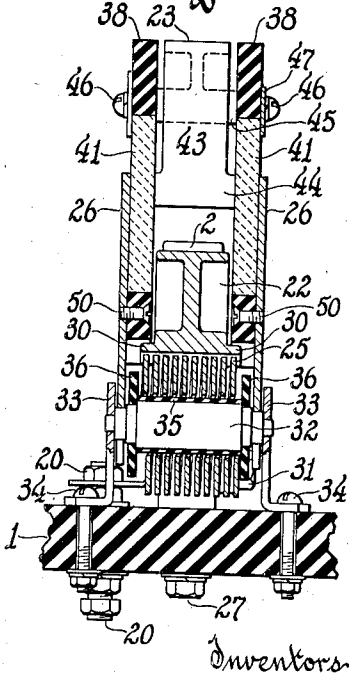


Fig. 3



Inventors.
Theodore B. Jochem.
Clarence W. Kuhn.
William C. Stevens.
By Frank H. Hubbard
Attorney.

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BLOWOUT DEVICE FOR ELECTRIC SWITCHES

Theodore B. Jochem and Clarence W. Kuhn, Wauwatosa, and William C. Stevens, Milwaukee, Wis., assignors to Cutler-Hammer, Inc., Milwaukee, Wis., a corporation of Delaware

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6 Claims. (Cl. 200—147)

This invention relates to magnetic blowout devices for electric switches.

The invention relates more particularly to magnetic blowout devices in which the arc formed upon opening of the switch contacts is transferred to spaced arc dissipating elements to extinguish the same.

The invention has among its objects to provide a rugged and efficient blowout device of the aforesaid character which is of improved construction and can be readily manufactured at low cost.

Another object is to provide a blowout device of the aforesaid character including an arc chute which can be readily removed to permit inspection or repair of the switch contacts or parts of the blowout device.

Another object is to provide a blowout device having arc dissipating elements which are of heavy section and of high thermal conductivity to effect rapid cooling of the arc.

Various 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 various modifications may be made in the embodiment illustrated without departing from the spirit and scope of the appended claims.

In the drawings—

Figure 1 is a side elevational view of a switch having a blowout device embodying the invention associated therewith;

Fig. 2 is a fragmentary front elevational view of the switch and blowout device shown in Fig. 1;

Fig. 3 is a sectional view taken substantially on line 3—3 of Fig. 1;

Fig. 4 is a vertical sectional view on line 4—4 of Fig. 2;

Fig. 5 is a side elevational view of the blowout device with the chute removed;

Fig. 6 is a top plan view of the parts shown in Fig. 5, and

Fig. 7 is a perspective view of certain of the parts illustrated in Figs. 5 and 6.

Fig. 1 illustrates the blowout device in connection with an electromagnetic contactor mounted upon a vertically arranged insulating panel 1 and provided with cooperating stationary and movable contacts 2 and 3 (Fig. 4) and an operating magnet 4. Magnet 4 includes a magnet frame 5 fixed to panel 1, an operating winding 6 mounted upon a core member 7 associated with said magnet frame, and a movable armature member 8 pivotally mounted upon a pin 9 carried by said frame. Armature member 8 is biased to move outwardly with respect to core member 7, such movement being limited by an arm 10 thereon which cooperates with a stop surface on the under side of magnet frame 5. Movable contact 3 is fixed to a rocker arm 11 which is pivoted upon a pin 12 mounted adjacent the upper end of armature 8. Rocker arm 11 is provided with a stop projection 14 which is normally held against the upper end of armature 8 by a spring 15 held under compression between a shoulder 16 on said rocker arm and a projection 17 on armature 8. Contact 3 engages its cooperating stationary contact 2 prior to full movement of armature 8 into its attracted position and during final movement of said armature into its attracted position contact 3 and its associated rocker arm 11 are rotated upon pin 12 against the action of spring 15. Rocker arm 11 and its associated contact 3 are permanently connected by a flexible lead 18 to a terminal element 19 fixed to panel 1 and as hereinafter set forth stationary contact 2 is permanently connected to a terminal element 20 fixed to panel 1 through the medium of a blowout coil associated with the blowout device.

The blowout device includes a pair of stationary arc horns 22 and 23, the former being mounted upon panel 1 and having stationary contact 2 fixed thereto, and the latter being associated with the movable contact 3 and being carried by an arc chute 24. Said blowout device also includes a blowout coil 25 having a pair of pole plates 26—26 associated therewith which are fixed to opposite sides of arc chute 24.

More specifically arc horn 22 comprises a U-shaped member the ends of which abut the face of panel 1. Arc horn 22 is secured to panel 1 by a bolt 27 (Fig. 3) and stationary contact 2 is fixed to the front end of arc horn 22 by a screw 28. The upper side of said arc horn provides an arc dissipating surface 29 which extends upwardly and rearwardly from said stationary contact and terminates adjacent the face of panel 1. Arc horn 22 also has curved rib projections 30—30 on opposite sides thereof which as hereinafter set forth cooperate with side shields of arc chute 24.

Arc horn 22 straddles the blowout coil 25 and one end of said coil is secured to the lower leg of said arc horn by a bolt 31 and the opposite end thereof is secured to terminal element 20. As shown in Fig. 3 blowout coil 25 is provided with a core member 32 which is supported at opposite ends by brackets 33—33 fixed to the face of

panel 1 by bolts 34. Core member 32 is insulated from blowout coil 25 by an insulating sleeve 35, and said core member also carries insulating washers 36—36 which are spaced with respect to brackets 33—33 to provide spaces for receiving pole plates 26. The inner ends of pole plates 26 are recessed as shown at 37 in Fig. 5 to receive core member 32 and said pole plates project forwardly to embrace the region adjacent and above the tips of contacts 2 and 3.

Arc chute 24 is formed of material such as asbestos board and is provided with side shields 38—38 which are secured to opposite sides of a horizontally arranged top shield 39 by bolts 40. Said side shields are shaped to fit over the rib projections 30 on opposite sides of arc horn 22 and are provided with circular openings for receiving inserts 41 which are located on opposite sides of contacts 2 and 3 and are formed of material such as "Carbofrax," or other arc resisting material. Top shield 39 is spaced with respect to the upper side of arc horn 22 and the rear end thereof and also the rear ends of side shields 38 abut the front face of panel 1 to provide an air pocket 42 of relatively small cross sectional area at the rear end of the arc dissipating surface 29.

Arc horn 23 is arranged in front of movable contact 3 and is shaped to provide an elongated arc dissipating surface 43 which is spaced with respect to the side shields 38 and extends upwardly and rearwardly from the front ends of said shields. The inner end of arc horn 23 is provided with a tip 44 of increased width which abuts the inner faces of inserts 41 and is located above and adjacent the tip of movable contact 3 and the under side of said arc horn is provided with a projection 45 which abuts the inner faces of side shields 38. Arc horn 23 is secured between the side shields 38 by screws 46 which pass through openings in said shields into tapped openings in projection 45. The screws 46 on one side of arc horn 23 serve to electrically connect said arc horn to a flat conductor strip 47. As shown in Figs. 1 and 2 conductor strip 47 is arranged on the left hand face of arc chute 24 and extends upwardly adjacent the front end of said chute and rearwardly along the upper edge thereof. Conductor strip 47 is secured to arc chute 24 by the bolts 40 and said bolts also serve to secure a flat reinforcing strip 48 to the right hand face of said chute. Pole plates 26 are secured to the outer faces of side shields 38 by screws 50 (Fig. 3) and the front ends of said pole plates overlap the inserts 41 to clamp the same against opposite sides of tip 44 on arc horn 23.

One of the bolts 40 associated with arc chute 24 is located adjacent the rear end of said arc chute and has nuts 51 (Fig. 6) on opposite ends thereof each of which is provided with a cylindrical shank 52. The shanks 52 of nuts 51 interlock with a pair of brackets 53—53 which are secured to the face of panel 1 by bolts 54 and are arranged on opposite sides of arc chute 24. As shown in Fig. 7 each of the brackets 53 is provided with a forwardly projecting arm 55 having a recess 56 in the upper edge thereof and a tapered projection 57 on the front end thereof. The shanks 52 of nuts 51 engage within the recesses 56 in brackets 53 to provide a hinge support for the arc chute 24 and as is apparent from Fig. 1 when said arc chute is in operative position core member 32 of blowout coil 25 engages within the recesses 37 in pole plates 26 to hold shanks 52 of nuts 51 against the bottoms of recesses 56. Also when the arc chute 24 is in operative position the projections 57 on the front ends of brackets 53 yieldingly engage the conductor strip 47 and the reinforcing strip 48 which are located on opposite sides of said chute. The upper and lower edges of the recesses 37 in pole plates 26 are substantially concentric to the axis of the rear bolt 40 of arc chute 24, and said arc chute can thus be swung upwardly into a position shown in dotted lines in Fig. 1 to disengage said pole plates from core member 32. As is apparent, arc chute 24 can then be removed by lifting the same upwardly into a position wherein the shanks 52 of nuts 51 clear the recesses 56 in brackets 53. The left hand bracket 53 (Fig. 2) is electrically connected to terminal element 19 by a lead 58, and as hereinbefore set forth terminal element 18 is permanently connected to movable contact 3 by a flexible lead 18. It is thus apparent that when the arc chute 24 is in operative position arc horn 23 is electrically connected to the movable contact 3 through the medium of conductor strip 47.

The operation of the aforedescribed switch and blowout device is as follows:

Upon energization of winding 6 movable contact 3 engages stationary contact 2 to establish circuit between terminal elements 19 and 20, such circuit including the arc horn 22 and blowout coil 25. Energization of blowout coil 25 establishes a magnetic field and a large portion of the magnetic flux of said field is concentrated by the pole plates 26 in the region within the contacts 2 and 3 and immediately above the tips thereof. Upon deenergization of winding 6 contact 3 moves out of engagement with stationary contact 1 and at the instant the surfaces of said contacts disengage an arc is formed therebetween. The relative direction of the current conducted by the arc and the direction of the magnetic flux in the field produced by blowout coil 25 is such that the arc is caused to move upwardly and when the arc reaches the upper tips of contacts 2 and 3 it is transferred to arc horns 22 and 23 and passes between the arc dissipating surfaces 29 and 43. After the arc is moved upwardly and between the arc dissipating surfaces 29 and 43 contacts 2 and 3 are no longer in circuit and current is supplied to the arc from terminal element 19 which as hereinbefore stated is connected to arc horn 23 through the medium of conductor 58 and strap 47. When the arc is transferred to arc horns 22 and 23 the same continues to move upwardly and one end of said arc travels rearwardly over the arc dissipating surface 29 while the opposite end thereof travels forwardly over the arc dissipating surface 43. During such movement of the arc the same is continually elongating and is rapidly cooled by the surrounding air and the arc horns 22 and 23 which are of high thermal conductivity and of large heat capacity. When the rate of dissipation of energy from the arc exceeds the rate of energy supplied thereto the arc is extinguished.

In practice it has been found that the pocket 42 at the rear end of arc chute 24 prevents the arc from traveling to the rear end of the arc dissipating surface 29. It has also been found that spacing of the arc surface 43 with respect to the side shields 38 of the arc chute tends to maintain the arc away from said side shields 38.

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

1. The combination with a vertically arranged

insulating panel having a switch mounted upon the front face thereof, said switch having a stationary contact and a cooperating movable contact, a blowout coil having a horizontally arranged core member associated therewith which is fixed to the front face of said panel, an arc chute mounted upon said panel and including spaced side shields arranged on opposite sides of said contacts, each of said side shields having an opening therein located adjacent said contacts, Carbofrax inserts located within the openings in said side shields, an arc horn mounted between said side shields, and provided with an arcing tip which abuts said inserts and is located above and adjacent said movable contact, and a pair of pole plates associated with opposite ends of said core member and secured to the outer faces of said side shields, said pole plates overlapping said inserts to hold the same in place within the openings in said coil shields.

2. The combination with a vertically arranged insulating panel having a switch mounted upon the front face thereof, said switch including a stationary contact and a cooperating movable contact, an insulating blowout chute having spaced side shields located on opposite sides of said contacts, an arc horn mounted between said side shields and associated with said movable contact, a conductor fixed to the outer face of one of said side shields and electrically connected to said arc horn, and a support for said arc chute fixed to said panel and electrically connected to said movable contact, said support and said arc chute having interlocking parts which are releasable to permit removal of said arc chute, and said support also having a part for yieldingly engaging said conductor to electrically connect said arc horn to said movable contact when said arc horn is in operative postion.

3. The combination with a vertically arranged insulating panel having a switch mounted upon the front face thereof, said switch having a stationary contact and a cooperating movable contact, a blowout coil having a horizontally arranged core member associated therewith which is fixed to the front face of said panel, an arc chute mounted upon said panel and including spaced side shields arranged on opposite sides of said contacts, each of said side shields having an opening therein located adjacent said contacts, inserts formed of heat resisting refractory material located within the openings in said side shields, and a pair of forwardly extending pole plates associated with opposite ends of said core member, said pole plates being secured to the outer faces of said side shields and overlapping said inserts to hold the same in place within the openings in said coil shields.

4. The combination with a vertically arranged insulating panel having a switch mounted upon the front face thereof, said switch including a stationary contact and a cooperating movable contact, a blowout coil having a horizontally arranged core member associated therewith which is mounted upon the front face of said panel, an arc chute including vertically arranged side shields located on opposite sides of said contacts, and a horizontally arranged top shield located above said contacts, a support for said arc chute located above said blowout coil and adjacent to the front face of said panel, said support including interlocking hinge parts secured to said panel and said arc chute which are disengageable upon upward bodily movement of said arc chute out of operative position, and a pair of pole plates secured to the outer faces of said side shields and interlocked with opposite ends of said core member to prevent disengagement of said hinge parts, said pole plates being disengaged from said core member upon upward pivotal movement of said chute, and said hinge parts being then disengageable for removal of said chute.

5. The combination with a vertically arranged insulating panel, a switch mounted upon the front face of said panel and including a stationary contact and a cooperating movable contact, a forwardly extending arc horn secured to the front face of said panel and having said stationary contact fixed to the front end thereof, said arc horn having an elongated arc dissipating surface extending upwardly and rearwardly from said stationary contact and terminating adjacent the front face of said panel, an insulating arc chute extending forwardly from the front face of said panel and having spaced side shields located on opposite sides of said contacts and a top shield arranged above said arc dissipating surface and spaced with respect thereto, a second arc horn carried between the side shields of said chute and associated with said movable contact, said latter arc horn having an arc dissipating surface extending forwardly to the front end of said arc chute, means for detachably securing said arc chute to said insulating panel, and means carried by said arc chute and associated with said former means for electrically connecting said second mentioned arc horn to said movable contact.

6. The combination with a vertically arranged insulating panel, a switch mounted upon the front face of said panel and having a stationary contact and a cooperating movable contact, a forwardly extending arc horn secured to the front face of said panel and having said stationary contact fixed to the front end thereof, said arc horn having an elongated arc dissipating surface extending upwardly and rearwardly from said stationary contact and terminating adjacent the front face of said panel, an insulating arc chute extending forwardly from the front face of said panel and having spaced side shields located on opposite sides of said contacts and a top shield arranged above said arc dissipating surface and spaced with respect thereto, a second arc horn carried between the side shields of said chute and associated with said movable contact, said latter arc horn having an arc dissipating surface which extends forwardly to the front end of said arc chute and is spaced with respect to the side shields of said chute, a support for said arc chute including interlocking parts mounted upon said panel and said arc chute, said parts being releasable to permit removal of said chute, and means carried by said arc chute and associated with said support for electrically connecting said second arc horn to said movable contact.

THEODORE B. JOCHEM.
CLARENCE W. KUHN.
WILLIAM C. STEVENS.