Feb. 17, 1953 P. V. YINGST 2,629,035

MAGNETIC BLOWOUT CONSTRUCTION AND SHIELD

Original Filed Feb. 12, 1948

Fig. 1

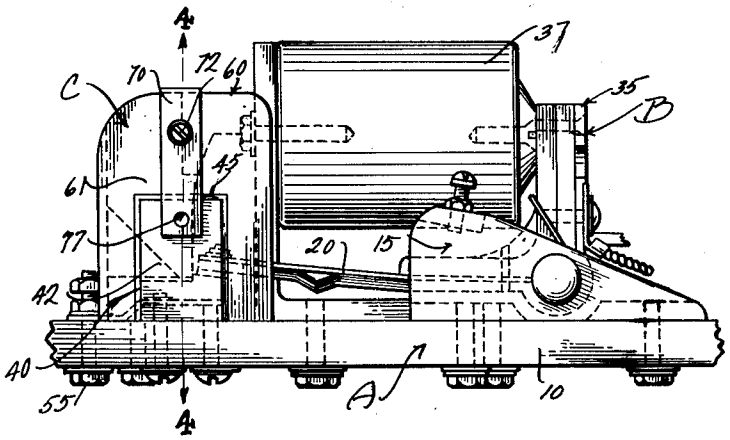


Fig. 4

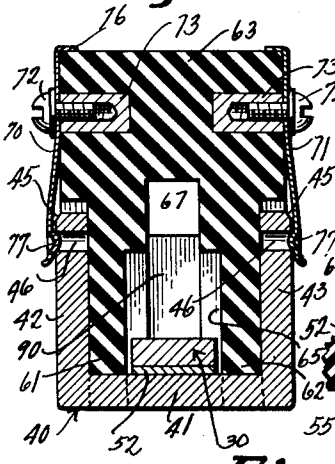


Fig. 2

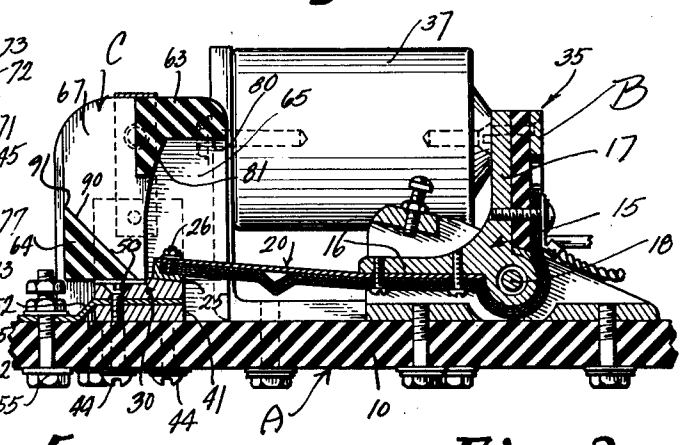


Fig. 5

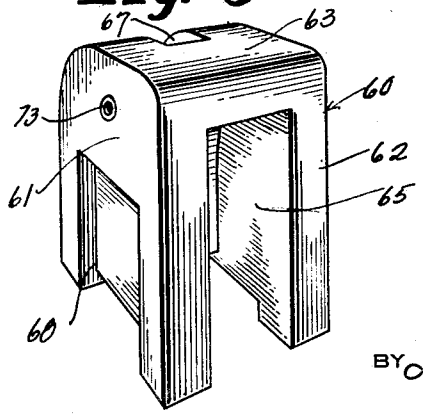
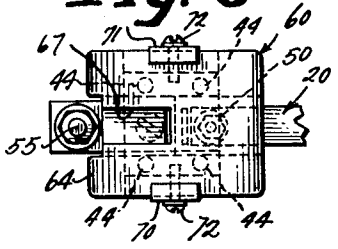


Fig. 3



INVENTOR.

PAUL V. YINGST

BY Lancaster, Allen & Rommel

ATTORNEYS.

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MAGNETIC BLOWOUT CONSTRUCTION AND SHIELD

Paul V. Yingst, Norwood, Ohio, assignor to The Post-Glover Electric Company, Cincinnati, Ohio, a corporation

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8 Claims. (Cl. 200—147)

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The present invention relates to improvements in contactor constructions, and more particularly in connection with an improved magnetic blowout construction and shield therefor.

The present invention is a division out of parent application Serial Number 7,893, filed February 12, 1948.

A further object of this invention is the provision of an improved arc blowout hood, shield or chute construction.

A further object of this invention is the provision of an improved arc blowout construction including a permanent magnet associated with contact tips of a switch construction in such manner as to produce a high flux density in the region between the breaking contacts.

A further object of this invention is the provision of an improved arc blowout construction including a permanent magnet so constructed and arranged with respect to the contact tips as to produce a strong magnetic flux in the air gap between the tips and produce a flux density which will not diminish with decrease in the load current carried by the contactor. This is particularly advantageous where the contactor breaks the circuit rapidly and is connected to a high inductive load. In the latter case, if an electromagnetic arc blowout were used in conjunction with a low load current, the flux density present to extinguish the high voltage arc produced by the inductive reactance will naturally be low.

A further object of this invention is the provision of a simplified type of arc blowout construction which utilized a U-shaped permanent magnet so constructed and arranged with respect to the contact tips that the most intense portion of the flux is disposed at approximately the midpoint of the arc created by the parting of the contacts.

A further object of this invention is the provision of a simplified arc blowout utilizing a permanent magnet so associated and arranged with respect to the contactor breaker tips that the most intense point of the flux density is approximately in a plane normal to and at the midpoint of the arc when the contact tips are at the extent of their separation.

Other objects and advantages of this invention will be apparent during the following detailed description.

In the accompanying drawing, forming a part of this specification, and wherein similar reference characters designate corresponding parts thruout the several views,

Figure 1 is a side elevation of a contactor having associated therewith the improved magnetic blowout construction including a shield therefor.

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Figure 2 is a cross sectional view taken in a vertical plane thru the contactor showing associated features of switch contacts with respect to the magnetic blowout construction and its shield.

Figure 3 is a plan view showing associated features of the magnetic blowout construction and its shield.

Figure 4 is a transverse cross sectional view taken thru the magnetic blowout construction and its shield substantially on the line 4—4 of Figure 1.

Figure 5 is a perspective view of an improved insulation shield or chute.

In the drawing, wherein for the purpose of illustration is shown a contactor switch and associated details of the magnetic blowout construction and shield therefor, the letter A generally designates a contactor having a switch structure B operatively mounted thereon and having associated with the latter an arc extinguishing device C.

The contactor A includes an insulation panel 10, such as described in detail in my co-pending application Serial Number 7,893 filed February 12, 1948, upon which the switch structure B is mounted. This switch structure is of the type described in my said co-pending application and includes a cast aluminum rocker arm structure 15 of L-shaped formation, including a lower arm portion 16 and an upstanding arm portion 17. The rocker arm 15 is specifically pivoted at 18 upon the panel structure in a manner described in the aforesaid co-pending application. The rocker arm portion 16 has connected therewith a compound switch arm construction 20, such as specifically described in said co-pending application. which is provided at its free end with a silver inlaid copper contact tip 25 detachably connected thereto by means of a bolt 26.

The arm portion 17 of the rocker construction is provided with an armature 35 associated with an electromagnet 37 which is mounted upon the panel 10, it being understood that said armature and the electromagnet and its purposes are more fully described in my aforesaid co-pending application.

Referring to the magnetic blowout construction and shield therefor, a U-shaped permanent magnet 40 is mounted upon the panel 10. It includes a short and narrow base 41 and upstanding right angled short pole portions 42 and 43. The base 41 is secured upon the outer face of the panel 10 by means of screws or bolts 44. Four

of the latter are provided, as shown in dotted lines in Figure 3 and elsewhere. The leg or pole portions at their marginal edges and particularly their top outer edges are beveled at 45 and likewise provided with transverse apertures 46 for purposes to be subsequently described.

A silver inlaid copper contact 30 is associated in complementary relation with the contact tip 25 above described. The contact 30 is detachably connected by a countersunk head bolt 50 upon the base portion 41 of the permanent magnet 40, as shown in Figure 2. The copper-silver contact 30 is provided with a sloping face, as shown in Figure 2, for complementary contact with the tip 25 of the switch arm 20, and it is to be noted that the tips of the switch arm and the contact 30 lie between the pole pieces 42 and 43 of the permanent magnet 40, in the space provided therebetween. A copper connecting link 52 is clamped between the contact 30 and the base 41 of the permanent magnet for conducting attachment with a binding post 55 located upon the panel, as shown in Figure 2.

The arc shield, hood or chute 60 may be constructed of any approved insulation material such as moulded synthetic resin, hard rubber, cement-asbestos or other material suitable for the purpose. It includes side walls 61 and 62, entirely open at the front of the shield, thru which the switch arm 20 extends. The rear wall 64 is provided with a passageway 67 of a specific construction to be subsequently described.

The walls 61 and 62 of the shield C are recessed at 68, on the outer sides thereof, for receiving the pole legs 42 and 43 of the permanent magnet 40 in countersunk relation therewith. The shield C is provided with fastener elements in the nature of spring arms 70 and 71, preferably of metal, secured to the shield intermediate their ends by means of screws or other fastening elements 72. Tapped metal plugs 73 are molded in the shield, as shown in Figure 4, and provided with screw threaded sockets for receiving the bolts 72; said sockets opening at the outer surfaces of the side walls. The spring arms 70 and 71 are elongated and have top flanges 76 engaging over the top wall of the shield. The lower ends extend downwardly below the tops of the recesses 68, and at their lower ends they are provided with bosses 77 projecting at the inner surfaces thereof which are adapted to snap into the openings 46 upon the pole legs of the permanent magnet, as shown in Figure 4. The shield walls 61 and 62 have a snug fit in the space between the legs of the permanent magnet, but the spring arms 70 and 71 serve to hold the shield in secure position with a force sufficient to prevent dislodgement of the shield due to arcing when the switch contacts are opened. It is to be noted that the lower ends of the spring arms are sloped outwardly and the beveled edges 45 of the legs of the permanent magnet cooperate therewith in a cam fashion to permit the arms to be readily engaged with respect to the openings 46.

It is to be noted that the shield walls 61 and 62 are of a width appreciably greater than the width of the permanent magnet legs 42 and 43 and project forwardly and rearwardly of the fore and rear edges of said legs. The switch contacts are positioned in the compartment 65 of the shield in the lower portion thereof adjacent to the base 41. The compartment 65 extends upwardly and terminates at the under surface 80 of the top wall 63 of the shield above the pole ends of the magnet legs 42 and 43. The rear wall 64 at the

inner surface facing the compartment 65 is concaved and forwardly sloped at 81. The switch arm 20 has plenty of space to swing upwardly in the compartment 65 without interfering with any part of the shield.

The shield passageway 67 opens to the compartment 65 at about the vertical medial plane of the pole pieces. The wall 90 slopes upwardly from the compartment 65 and terminates at an edge 91 appreciably above the engaging point of the switch contacts. The shield passageway 67 is narrower than the compartment 65 and the portion of the opening 67, adjacent the switch contacts directly faces a sloping surface 90, which is part of the wall 64. The passageway 67 opens rearwardly thru the wall 64 and also upwardly thru the top wall 63.

It will be noted that the rear wall 64 is recessed from its lower portion to accommodate the contact 30 and the link 52, as shown in Figure 2.

It will be appreciated from the foregoing that a relatively simple type of arc blowout construction has been provided for direct current contactors and other types of switches wherein the permanent magnet is so constructed and arranged with respect to the contact tips, that a high flux density is produced directly in the region between the breaking contacts. In this connection it should be noted that the relatively short poles and the short and narrow base of the U-shaped magnet are so constructed and arranged with respect to the contact tips received therein, as to reduce leakage flux to a minimum. The most intense portion of the flux is concentrated at approximately the midpoint of the arc created by the parting of the contacts. The direction of the magnetic field between the pole pieces of the permanent magnet is such as to cause the arc to be elongated from the chamber 65 into the chamber 67. The most intense point of the flux density is approximately in a plane normal to and at the midpoint of the arc when the contacts are at the extent of their separation. The limit of travel of the contacts is relatively short, as can be understood and the concentration is approximately at the point where the chamber 65 ends and chamber 67 begins.

The sloping surface 90 is chiefly instrumental in protecting the terminal connection 55 from burning.

Various changes in the shape, size and arrangement of parts may be made to the form of invention herein shown and described without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. As an article of manufacture an arc chute of insulation material for circuit interrupters comprising top, side and rear walls defining a compartment open at the front of the chute, said rear wall having a discharge opening therethru to said compartment, the surface of the rear wall facing the normal arc zone of the compartment being sloped at an acute angle to the vertical and horizontal directly at said rear wall opening in direct facing relation with respect to the arc zone.

2. In a permanent magnet and arc chute for circuit interrupters the combination of a substantially U-shaped permanent magnet including a base and magnetic pole pieces in spaced relation connected therewith and extending normal thereto, an arc chute of insulation material including side walls, a rear wall and a top wall, the side walls being spaced to define a compart-

ment opening at the front of said chute, said side walls being recessed upwardly from the bottom ends thereof and also laterally at the outer surfaces thereof for receiving the base and pole pieces of the permanent magnet, the rear wall of the arc chute being provided with a discharge opening for said compartment, said rear wall having a surface defining a portion of said opening extending from the base of the permanent magnet in upwardly and rearwardly sloping relation to said rear wall opening and in direct facing relation with the arc zone of said compartment.

3. In a permanent magnet and arc chute for circuit interrupters the combination of a substantially U-shaped permanent magnet including a base and magnetic pole pieces in spaced relation connected therewith and extending normal thereto, an arc chute of insulation material including side walls, a rear wall and a top wall, the side walls being spaced to define a compartment opening at the front of said chute, said side walls being recessed upwardly from the bottom ends thereof and also laterally at the outer surfaces thereof for receiving the base and pole pieces of the permanent magnet, the rear wall of the arc chute being provided with a discharge opening for said compartment, said rear wall having a surface defining a portion of said opening extending from the base of the permanent magnet in upwardly and rearwardly sloping relation and in direct facing relation with the arc zone of said compartment, said opening extending thru the rear portion of the top wall of the arc chute.

4. In an arc extinguishing and magnetic blowout construction for switch mechanisms, the combination of a permanent magnet including a base portion and pole pieces extending transversely thereto, an arc chute of insulation material detachably mounted upon said pole pieces in the space therebetween said arc chute having a compartment therein between said pole pieces and having a discharge passageway opening externally of the arc chute, and resilient detent means carried by said chute detachably engaging said pole pieces for releasably mounting said arc chute in detachable connection upon the magnet.

5. As an article of manufacture an arc chute of insulation material for circuit interrupters having a relatively thick rear wall, side walls and a top wall, the side walls and top wall forwardly of said rear wall defining a compartment entirely open at the front of said chute, the rear wall having intermediate the height thereof a reduced opening to the intermediate portion of said compartment, said rear wall having a sloping arc deflecting surface facing leading to the opening of the rear wall, and said chute having the said rear wall opening extending entirely through the rear wall at the upper portion thereof and through said top wall, the width of the arc discharge opening through the rear wall being narrower than the width of said compartment.

6. As an article of manufacture an arc chute of insulation material for circuit interrupters having a relatively thick rear wall, side walls and a top wall, the side walls and top wall forwardly of said rear wall defining a compartment entirely open at the front of said chute, the rear wall having intermediate the height thereof an opening to the intermediate portion of said compartment, said rear wall having a sloping arc deflecting surface facing said opening of the rear wall, the width of the arc discharge opening through the rear wall being narrower than the width of said compartment, the rear wall at the lower portion thereof being recessed therethrough into communicating relation with said compartment, and the side walls being likewise recessed from the lower margins thereof, the outer surfaces of said side walls being laterally recessed through part of the thickness thereof and communicating with the recesses in the lower margins of said side walls.

7. As an article of manufacture an arc chute of insulation material for circuit interrupters comprising top, side and rear walls, said chute between said side walls having a compartment substantially entirely open forwardly of the chute, the rear wall having a discharge passageway to said compartment, the rear wall directly facing said rear wall opening having a bottom surface sloping rearwardly and upwardly, and said rear wall vertically above said sloping surface and to the rear above said sloping surface being entirely opened.

8. In combination with a switch structure including a pair of separable contacts, a substantially U-shaped permanent magnet including a base portion and a pair of pole pieces extending transversely to the base portion in spaced relation to each other, one of said contacts being mounted in stationary position upon the base portion of the permanent magnet between said pole pieces, the latter having a magnetic field which increases in strength towards the free ends of the pole pieces, and an insulation arc chute covering said contacts in cooperative relation with respect to the permanent magnet having a compartment therein which is entirely opened forwardly thereof, said arc chute including side, top and rear walls, and the rear wall having an opening therein less in width and less in height than the compartment and located substantially centrally of the height and width of the compartment and directly facing the normal arc zone of said contacts, said rear wall having a sloping surface directly facing said rear opening and which slopes rearwardly and upwardly, said rear wall vertically above and to the rear thereof above said sloping surface forming a continuation of the rear wall opening.

PAUL V. YINGST.

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