

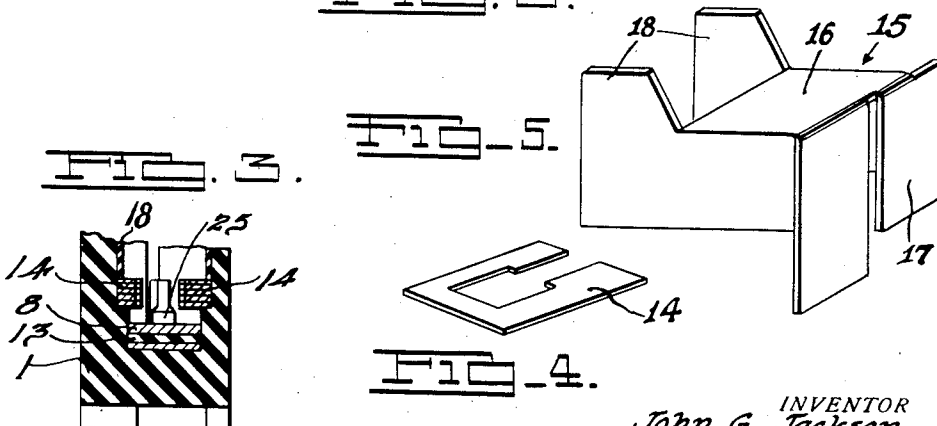
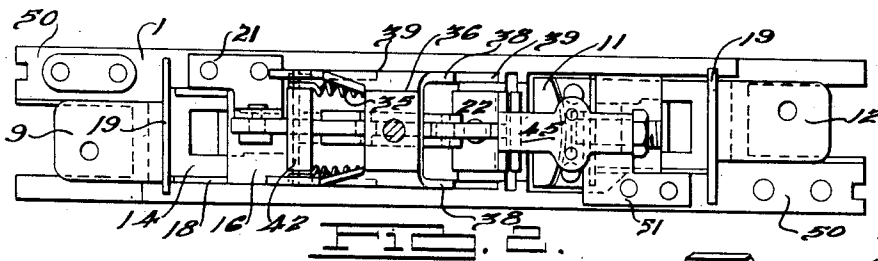
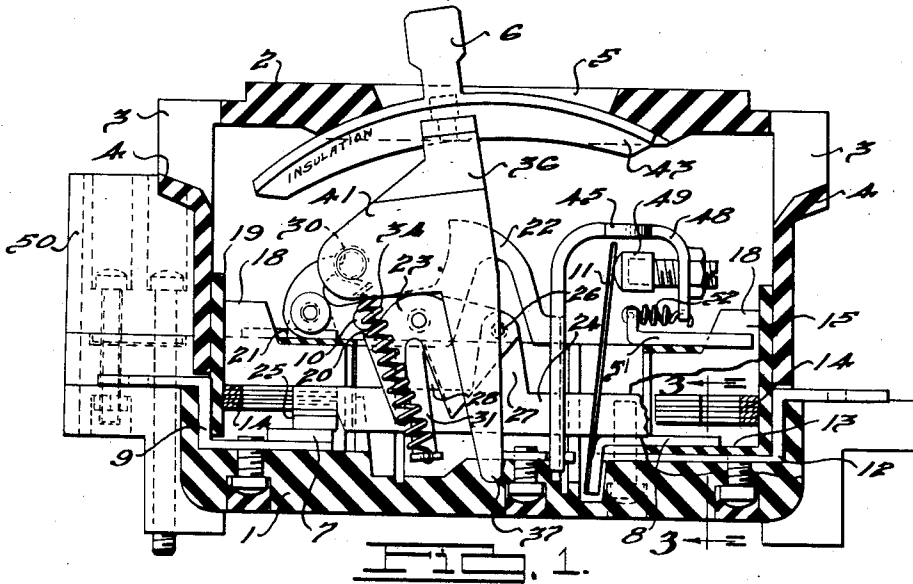
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CIRCUIT BREAKER

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CIRCUIT BREAKER

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4 Claims. (Cl. 200-147)

This invention relates to apparatus for making and breaking electrical circuits, and more particularly to an arc suppressor construction facilitating the rupture of arcs drawn between the cooperating contacts of such apparatus.

This application is a division of application Serial No. 12,798 filed March 25, 1935 for Circuit breakers now Patent Number 2,132,623, granted October 11, 1938.

One object of the invention is the provision of an improved form of arc suppressor for facilitating the rupture of arcs drawn between the cooperating contacts of an electric circuit breaker.

Another object of the invention is to provide a magnetic arc suppressor U-shaped and formed of a plurality of stacked laminations.

A further object of the invention is the provision of a magnetic arc suppressor for an electric circuit breaker formed of a plurality of U-shaped laminations, directly stacked, without the provision of insulation other than incidental surface oxide and incidental air space.

Further objects and features of the invention will be readily apparent to those skilled in the art from the following specification and the appended drawing illustrating certain preferred embodiments of the invention in which:

Figure 1 is a side elevational view of a circuit breaker in which the arc suppressor, according to the present invention, has been embodied, with a side of the enclosure cut away to show the interior of the breaker mechanism.

Figure 2 is a top plan view of the circuit breaker shown in Figure 1, with the cover and handle removed.

Figure 3 is a detailed sectional view on the line 3-3 of Figure 1.

Figure 4 is a view showing one of the laminations making up the arc suppressor.

Figure 5 is a perspective view of one of the insulating shields mounted about the cooperating contacts of the circuit breaker.

Referring to the drawing, in which like reference numerals indicate like parts, the enclosing structure for the circuit breaker comprises a base 1 and a cover 2. The ends of the cover adjacent to the top are provided with a plurality of slots 3 forming vents for the arc gases. The walls defining the slots are extended past the ends of the cover and are joined together by a bottom portion 4. The vent walls exercise a cooling action upon the arc gases and serve to lessen the flame ejected from the vents. The bottom portions 4 constitute baffles for directing the arc gases away from the connectors. The

top of the cover is provided with a slot 5 through which extends an operating knob 6. The base 1 is in the form of a shallow cup in which at opposite ends are disposed stationary contacts 7, 8.

Contact 7 is secured to a conducting connector 9 leading to the exterior of the enclosure. Contact 8 is rigidly secured to one leg of a U-shaped bimetallic member 11, to the other leg of which is rigidly secured a conducting connector 12 leading to the exterior of the breaker. The contact 8 and connector 12 have their ends bent over to engage the bottom of the legs of the bimetal 11 and are welded thereto to form a rigid permanent connection. The contact and connector are attached to the same face of the bimetal with the contact overlying the connector and insulated therefrom as by means of an insulating sheet 13. The contact 8 and connector 12 are rigidly secured to base 1 and thus support the bimetal 11 in operating position.

Over each of the contacts 7 and 8 is disposed an arc suppressor 14 formed of a plurality of thin, plate-like laminations of U-shape loosely supported upon the base 1 in spaced relation to the stationary contacts. The legs of the U are disposed on opposite sides of the path of movement of the movable contacts to be hereinafter described and are held in position by means of the shields 15. The inside edges of the ends or legs of the U-shaped laminations have been provided, as shown, with small extensions forming pole faces tending to concentrate the magnetic flux at these portions. The shields 15 as shown in the drawing have been cut away to more clearly show the parts of the breaker. They embody a top portion 16 and an end portion 17 having a slot for receiving the movable contact. Side portions depend from the shield to engage the top lamination on the arc suppressor and other side portions 18 extend upwardly to seal the joint between the cover and the base. The top 16 is open at the end of the enclosure to afford passage for the arc gases between the side portions 18. Shields 19 are provided to seal off the end junctions between the cover and the base.

A bracket 21 is rigidly secured to the base 1 adjacent the top thereof and extends over the top 16 of one of the barriers 15. On this bracket is pivotally mounted a carrier 22. Upon the carrier 22 intermediate its ends are pivotally mounted a pair of plates 23 disposed on opposite sides of the carrier 22. A conducting bar 24 having contact faces 25 adjacent its ends is pivotally supported on the plates 23 by the pivot 26 which also serves to join the plates 23 together for com-

mon movement as a unit. The bar 24 is connected to the pivot 26 through the extension 27 and carrier 22 is similarly cut away to receive this extension in the "off" position of the breaker. The carrier 22 is provided with a pin 10 adapted to be engaged by the surface 20 on the plates 23 and serving as a stop therefor in the "overload off" position. The plates 23 are equipped with parallel notches 28 in which is disposed a flipper element having parallel legs 31 which are disposed in the notches 28 on opposite sides of the conducting bar 24 and carrier 22. The legs 31 of the flipper have a cross bar at their ends and beneath the bar 24 to which cross bar the operating springs 34 and 35 are connected. A U-shaped operating member 36 is fulcrumed in grooves 37 in the bottom of the cup-shaped base 1. The legs of U-shaped member 36 are disposed at the extreme sides of the enclosure and operate between stops 39 in the walls of base 1. The member 36 has parallel arms 41 integral therewith and at the extremities of these arms is supported a pin 42 to which the ends of operating springs 34 and 35 are secured. This pin 42 may be grooved to retain the springs at its ends in spaced relation to each other and to the moving parts. The carrier 22 is provided with an extension 30 adapted to be engaged by the pin 42 to limit movement of the member 36 and knob 6 in normal "on" position. The carrier 22 is further provided with a surface 40 engaged by pin 42 when the knob 6 is moved to the right from "overload off" position to reset the breaker after it has been operated in response to an overload.

To the member 36 is rigidly secured a shield 43 carrying the operating knob 6 which extends through the slot 5, the shield 43 serving to seal this slot. The carrier 22 is provided at its free end with a latching surface 44. This carrier is normally held in the position shown in Figure 1 by means of a latch 45. A supporting plate 46 is rigidly secured to the base 1 and is provided with grooves adjacent one end thereof. The latch 45 embodies a U-shaped element having legs 47 also provided with grooves adapted to enter and engage with those on the plate 46 to form a pivotal mounting for the latch 45. The latching surface 44 on the carrier 22 is engaged by the top of the slot between the legs 47 to latch the carrier in place. The connecting portion of the U-shaped latch 45 is return bent as shown to form a second U in a plane at right angles to the first. The legs of the second U are disposed on opposite sides of the bimetal member 11 and to the leg 48 thereof disposed on the low expansion side of the bimetal an insulating abutment 49 is adjustably mounted as by means of a stud and nut connection.

A bracket 51 is rigidly secured to the base 1 and a spring 52 connects the end of leg 48 to bracket 51 to bias the latch 45 toward the carrier 22.

The operation of the breaker described above should be readily apparent. With the parts in the "on" position as shown in Figure 1, movement of the knob 6 toward the right will move the member 36 and the operating springs 34 and 35. Before these springs have reached the effective dead center position the force of the springs on the flipper 29 will serve to move it within the slot 28 from the side shown in Figure 1 to the opposite side, thus quickly flipping the operating springs 34 and 35 past dead center position and causing the bell crank lever formed by plates 23 to rotate counter-clockwise into the po-

sition shown in Figure 3, moving the contact bar 24 to its "off" position. The flipper slot is shown to be directed toward the left of the bell crank pivot so that the operating springs 34 and 35 will exert a force tending to rotate the bell crank in a clock-wise direction, thus maintaining contact pressure even while the flipper is moving, as it can readily be seen that the torque on the bell crank will not change until the flipper actually engages the side of the groove 28. This results in maintaining pressure on the contacts until it is sharply released by engagement of the flipper with the side of the groove 28. It is thus impossible to manipulate the knob 6 so as to have a dead center position at which there is no pressure on the contacts and it can be readily seen that the change in pressure on the contact from "on" to "off" position will be brought about quickly regardless of the speed of operation of the knob 6 since the operating springs will always be quickly carried past their effective dead center position through the movement of the flipper. The operation from the normal "off" position of Figure 3 to "on" position of Figure 1 is in reverse direction. With the parts in the normal "off" position of Figure 3, movement of the operating handle to the left will move the flipper 29 from the side of the groove shown to the opposite side to move the operating springs through dead center position and thus move the contacts 25 to engaged position. Upon overload, the bimetal 11 which is in series with the breaker circuit and is self-heated by the current there-through, becomes heated and moves in a clock-wise direction to engage the stop 49 and move the latch 45 clockwise until it is moved beyond the latching surface 44 whereupon the carrier 22 is released and moves upward under the bias of the operating springs 34 and 35.

The stop 30 is moved above the pin 42 by this movement of the carrier 22 whereupon the member 36 and knob 6 move to their extreme position. In this movement of the carrier 22 to its released position, the plates 23 are prevented from rotating relative to the carrier by engagement of the surface 20 with the pin 10 and the contact bar 24 is thus quickly moved to "off" position with a snap action. Upon resetting, the knob 6 is moved to the right whereupon pin 42 engages the surface 40 on the carrier 22 and moves the latching surface 44 downward into position to be engaged by the latch 45, if in the meantime the bimetal 11 has cooled sufficiently to allow the latch to be pulled to its normal position by the spring 52. When the surface 44 is thus engaged by latch 45 the parts will be reset in their normal position as in Figure 3. Movement of the knob 6 to the left will then move the breaker to its "on" position as in Figure 1. It should be noted that the arrangement of parts is such that the pin 42 will not move the cradle to reset position until after the flipper 31 has been moved to the opposite side of the slot by the resetting movement of the handle.

The arc suppressor 14 herein shown is built up of a plurality of U-shaped, thin, plate-like laminations loosely disposed in recesses in the sides of the base 1 and held therein by the shield 15. The legs of the U are disposed on opposite sides of the path of travel of the conducting bar 24. The laminations have no insulation other than incidental insulation due to surface oxide and to air space and no attempt is made to insulate them from each other nor is any insulation placed upon the inside surfaces of the laminations to

insulate them from any arc which may be formed. The suppressor in its entirety consists simply of the ordinary laminations built up without any positive attempt to secure insulation.

In connection with the arc suppressor herein described, it should be noted that the connectors 9 and 12 have portions extending along side the arc suppressors and this results in a more complete turn about the laminations and hence increases the strength of the field induced by the current through the connecting member and thus increases the efficiency of the magnetic effect.

While certain preferred embodiments of the invention have been specifically described and illustrated, it is understood that the invention is not limited thereto as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims:

What is claimed is:

1. In a circuit-breaker, a stationary contact, a group of U-shaped magnetic laminations mounted over said contact, a contact movable between the legs of the U, a shield mounted over said laminations, said shield having a top portion serving as an insulating stop for the movable contact and an end portion slotted to receive and guide said contact and shielding the arc from the interior of the breaker.

2. In a circuit breaker, a stationary contact having a substantially flat contacting surface, a movable contact arm carrying a substantially flat contact surface adjacent its end adapted to make butt contact with said stationary contact, a U-shaped magnetic arc suppressor disposed in spaced parallel relation to the surface of said stationary contact and with its legs on opposite sides of the path of movement of the movable contact, said suppressor comprising a directly stacked group of thin, plate-like magnetic lamination, and an insulating housing operating to form a local enclosure for said stationary and

movable contacts and having one wall thereof provided with a slot for receiving and guiding said contact arm, and another wall serving as a limiting stop for the extreme separated position of the movable contact.

3. In a circuit breaker, a stationary contact having a substantially flat contacting surface, a movable contact arm carrying a substantially flat contact surface adjacent its end adapted to make butt contact with said stationary contact, a U-shaped magnetic arc suppressor disposed in spaced parallel relation to the surface of said stationary contact and with its legs on opposite sides of the path of movement of the movable contact, said suppressor comprising a directly stacked group of thin, plate-like magnetic laminations, an insulating housing operating to form a local enclosure for said stationary movable contacts and having one wall thereof provided with a slot for receiving and guiding said contact arm, and another wall serving as a limiting stop for the extreme separated position of the movable contact, and a venting opening in said housing for exit of the gaseous products of an arc drawn between the cooperating contacts.

4. In a circuit breaker, a base, a stationary contact mounted on said base and having a substantially flat contacting surface, a contact arm carrying a contact surface at the end thereof adapted to make butt contact with said stationary contact surface, a group of directly stacked U-shaped magnetic laminations mounted over said stationary contact with their legs disposed on opposite sides of the path of movement to the movable contact, and a local housing for said cooperating contacts mounted over said laminations and providing holding means for maintaining them in position, said housing including a slotted portion receiving said contact arm to permit movement of said movable contact.

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