July 14, 1953 T. M. COLE ET AL 2,645,693

MOLDED CASING FOR ELECTRICAL APPARATUS

Filed Sept. 13, 1949

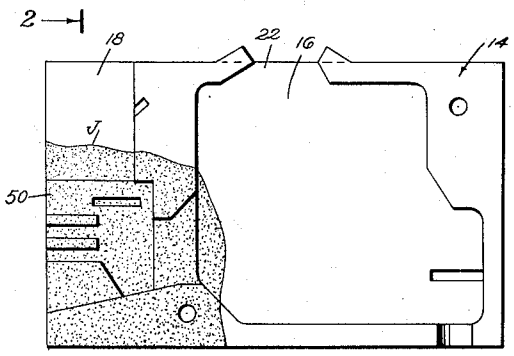


Fig. 1

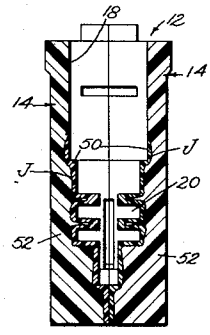


Fig. 2

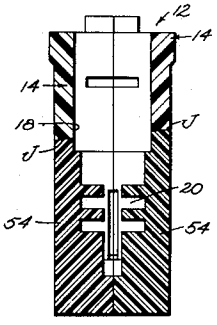


Fig. 2A

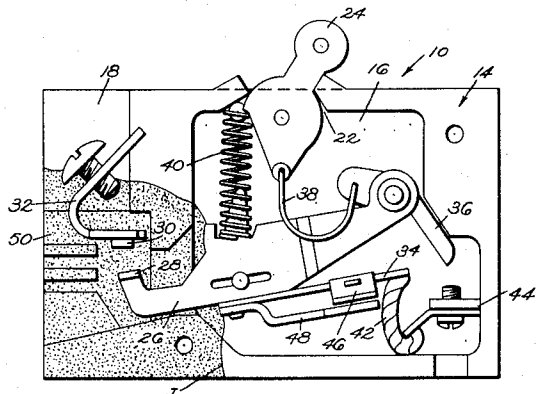


Fig. 3

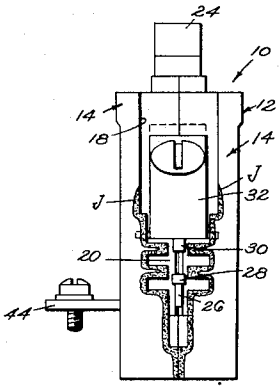


Fig. 4

Fig. 5

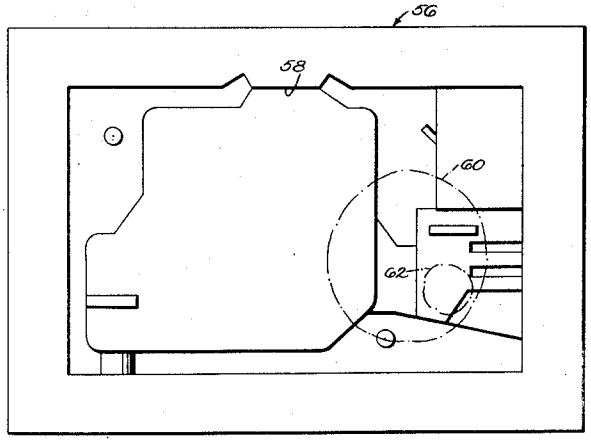
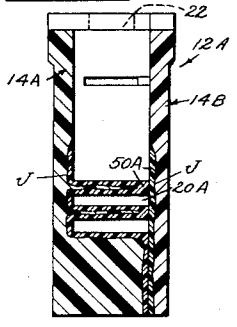


Fig. 6



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MOLDED CASING FOR ELECTRICAL APPARATUS

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2 Claims. (Cl. 200—144)

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The present invention relates to casings for electrical devices, especially molded insulation casings for automatic circuit breakers and switches. A circuit breaker and its casing, of the type shown by the patent to H. A. Humpage, No. 2,459,427, are represented on the accompanying drawings, primarily because the present invention was developed for such circuit breakers, and also for convenience in describing the invention. It will be understood, however, that while the invention is particularly applicable to circuit breaker casings of the type referred to, it is not necessarily so limited as concerns its broader aspects.

In the fabrication of casings for circuit breakers or other electrical devices in which arcing occurs or which are provided with arc chutes, as in the cited patent for example, for arcs which may be formed when a movable contact is separated from a stationary contact, the general practice, at present, is to use a general purpose resin, such as Bakelite, from which to mold the casing, and in the areas affected by the arc, the casing is provided with liners or other surface coverings of arc-resisting insulation material. While arc-resisting molding compounds are available, they are considerably more expensive than the general purpose molding compounds, and, therefore, it is rather expensive to make the casing entirely from such special purpose molding compounds.

A primary object of the present invention, therefore, is to provide a molded insulation casing which is well adapted to resist the effect of arcs in the region of the casing normally affected thereby and to accomplish this result without molding the casing entirely of the more expensive arc-resistant insulation material and without requiring the provision of liners or other arc-resistant coverings in the casing.

A further object is the provision of an improved and inexpensive molded casing for an electric circuit breaker, or the like, with an arc-chute or passage molded of arc-resistant insulation material and formed as an integral part of the casing which may be molded mainly of less expensive insulation material.

The above and other objects, features and advantages of the present invention will be fully understood from the following description considered in connection with the accompanying illustrative drawings.

In the drawings:

Fig. 1 is a side view of the inner surface of one part of a casing for an electric circuit breaker;

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Fig. 2 is a sectional view of the complete casing, taken on the line 2—2 of Fig. 1;

Fig. 2A is a view similar to Fig. 2 and showing another form of the invention;

Fig. 3 is a view similar to Fig. 1 showing the circuit breaker mechanism positioned in the housing;

Fig. 4 is an end view of the complete casing with the circuit breaker mechanism positioned therein;

Fig. 5 is a view similar to Fig. 2 showing a casing of another form; and

Fig. 6 is a view of a mold illustrative of the method employed in molding the housing.

Referring to Figs. 1 through 4 in detail, the automatic circuit breaker 10 is, as hereinbefore indicated, of the general type disclosed in the above cited patent to H. A. Humpage. Said circuit breaker has a two part insulation casing or housing 12 formed of two identical or symmetrical casing parts 14, each of said parts being formed of insulation material by a molding operation. In this form of the casing, each part 14 forms one-half of the housing, each part having a recess 16 for the mechanism, and the two casing parts being secured in housing defining relation in any suitable way. Each casing part 14 is provided at one of its ends with an open recessed portion 18 in which a terminal member and the stationary contact of the circuit breaker unit is positioned. An arcing chamber or chute is formed in the ends of the casing parts below said recessed portion 18 in the companion casing parts 14 as indicated at 20 in Figs. 2 and 4. The front of each casing is provided with recessed portions which define opening 22 through which the handle 24 projects for manual operation of the circuit breaker mechanism.

The circuit breaker mechanism in addition to the manually operable member 24, includes a movable contact member 26 mounted in the chamber 16 for pivotal movement. Said movable contact member is provided at one end thereof with a contact 28 which is engageable with and disengageable from a companion stationary contact 30 carried by a terminal member 32 of any suitable type. A thermal-current responsive member 34 which, as here shown, consists of a thermostatic bi-metallic flexible strip, is welded or otherwise secured at one end thereof to a side edge of movable contact member 26. The free end of bi-metallic strip 34 is arranged to releasably engage the end of one arm of a lever 36 pivotally mounted on the end of movable contact member 26 opposite the end which carries the

contact 28. The other arm of lever 36 is connected to the handle 24 by a resilient link 38. A coil spring 40 is operatively interposed between the movable contact member 26 and the handle 24 for biasing the movable contact member to its open position. A flexible metallic conductor or connector 42 is connected to the thermal element 34 and to a companion terminal member 44. Said thermal element is operable not only in response to the heating effect of the current passing therethrough but is also operable under the control of an electromagnetic member 46 mounted thereon, near the free end thereof, and a companion rigid armature 48 is fixed to the fixed end of thermal member 34. The manner of operation of the circuit breaker mechanism and its various components, is fully described in the above mentioned patent.

As is well understood, arcs are ordinarily formed within casing 12 when the movable contact 28 is separated from its companion stationary contact 30, and said arcs will play against the surfaces of the arc chamber or chute 20 and portions of the housing adjacent to the inner end of said chamber, i. e., in the region of contacts 28 and 30.

In accordance with the present invention, the casing 12 is, or may be, molded mainly or in large part of inexpensive material such as "Bakelite" which is a suitable general purpose phenolic molding compound. In order, however, that the arcing action may be properly resisted by those casing portions which are in the arc-region, casing 12 is molded, in said region thereof, from a special arc-resisting molding compound such as, for example and not by way of limitation, a melamine-formaldehyde condensation product, or other molding compounds having similar arc-resisting qualities or use characteristics. Examples of commercial products having arc-resisting characteristics are those produced by the Monsanto Chemical Company under the trade names Resimene 803A and Melmac 1500. Preferably, the arc-resisting material need only be a thin layer or lining 50 on the inside of walls 52 of the arc chamber and on the adjacent casing surfaces against which the arcs play, as illustrated in Fig. 2. However, if desired, substantially the entire thickness of the arc-chamber region of the casing and said adjacent wall portions of the casing may be formed of said arc-resisting material, as illustrated at 54 in Fig. 2A. In either case, the arc-resisting material is localized preferably only in those portions of the housing that are subjected to the action of the arc, the balance of the housing being formed, as hereinbefore stated, of a less expensive material which is not so highly arc-resistant.

It will be noted, as illustrated in Figs. 1, 2 and 2A, that the separate molding compounds are intermolded at their juncture J and are integrally united into the single mass which forms each casing part 14. It will be understood that each casing part 14 is provided with the individual use characteristics or qualities associated with each of the separate compounds, said use characteristics being retained by the separate compounds after the intermolding thereof and being available in those portions of the casing part wherein the associated compound is localized. Specifically, the casing will have superior arc-resisting characteristics in their portions 50, 54 containing the arc-resisting compound.

The casing 12A illustrated in Fig. 5 represents the presently preferred form of our invention. It differs from the casing 12 in that the companion complementary parts 14A and 14B thereof are not symmetrical halves in the manner of the parts 14. Casing part 14A is similar to part 14 but is of greater depth than the latter in order to contain the complete circuit breaker apparatus illustrated in Fig. 3. Casing part 14A constitutes the body portion of casing 12A, and casing part 14B constitutes the complementary cover or closure member for said casing. Casing 12A is provided with the arc chamber 20A which is similar to arc chamber 20. It will be understood that the arc-resisting material may be provided only as a layer on the inner surfaces of casing 12A in the vicinity of the arcs, as at 50A, or it may form the entire thickness of the arc chamber region and adjacent wall portions of the casing in the same manner as wall portions 54 in Fig. 2A.

A method of producing a housing formed of both a general purpose molding compound and an arc-resisting molding compound is illustrated schematically in Fig. 6. As there shown, there is provided a mold 56 for forming a casing part 14. Said mold is provided with a cavity 58 of the required casing shape. A disk or pellet of the general purpose molding compound, indicated in phantom at 60, is positioned in the cavity 58, and a smaller disk or pellet of the arc-resisting molding compound, indicated in phantom at 62, is positioned on top of pellet 60, both pellets being disposed in the part of the mold cavity 58 where the arc-resistant layer 50 or arc-resistant portion 54 of casing 14 is to be formed. Pressure is then applied against both pellets, for example a mold plunger may be forced against said pellets, and, as a result, the pellets are intermolded and the casing 14 is formed having the layer 50 or the portion 54 in the region where the arcing occurs. It will be apparent that whether only the layer 50 or the complete wall portion 54 is formed of the arc-resisting compound will depend upon the relative quantities of each of the separate compounds in the mold.

While we have illustrated and described our invention in connection with casings provided with arc chamber, it will be understood that it is not limited thereto and that the arc-resistant material can be used in any casing where arcing occurs.

While we have shown and described the preferred embodiment of our invention, it will be understood that the latter may be embodied otherwise than as herein specifically illustrated or described, and that in the illustrated embodiment certain changes in the details of construction and in the arrangement of parts may be made without departing from the underlying idea or principles of the invention within the scope of the appended claims.

Having thus described our invention, what we claim and desire to secure by Letters Patent, is:

1. In a circuit breaker having mechanism including companion relatively movable contacts, actuating means for operatively effecting the engagement thereof and means for effecting the disengagement thereof in response to predetermined current in the circuit; a casing for enclosing said mechanism, said casing comprising companion complementary parts mutually secured in housing-defining relation for enclosing said mechanism, a separate casing portion defined by said companion complementary parts in the region adjacent said contacts, said separate casing portion defining an arc chute within said casing

and being in integral relation with said complementary parts, each of the latter being formed of two insulation materials in integral relation, one of said materials having a higher arc-resistant characteristic than the other of said materials, said one material being formed in said separate casing portion to resist the arcing of said contacts.

2. In a circuit breaker having mechanism including companion relatively movable contacts, actuating means for operatively effecting the engagement thereof and means for effecting the disengagement thereof in response to predetermined current in the circuit; a casing for enclosing said mechanism, said casing comprising companion complementary parts mutually secured in housing-defining relation for enclosing said mechanism, a separate casing portion defined by said companion complementary parts in the region adjacent said contacts, said separate casing portion defining an arc chute within said casing and being in integral relation with said complementary parts, each of the latter being formed of two insulation materials in integral relation, one of said materials having a higher arc-resistant characteristic than the other of said materials, said one material being formed in said separate casing portion to resist the arcing of said contacts, said one material being formed as an inner lining layer on said other material.

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PAUL M. CHRISTENSEN.

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