May 19, 1953 R. C. INGWERSEN 2,639,348

CIRCUIT BREAKER WITH SPARK SEALING CASING CONSTRUCTION

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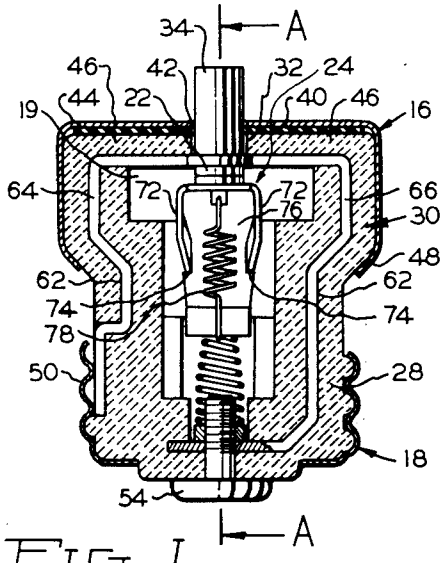

FIG. I.

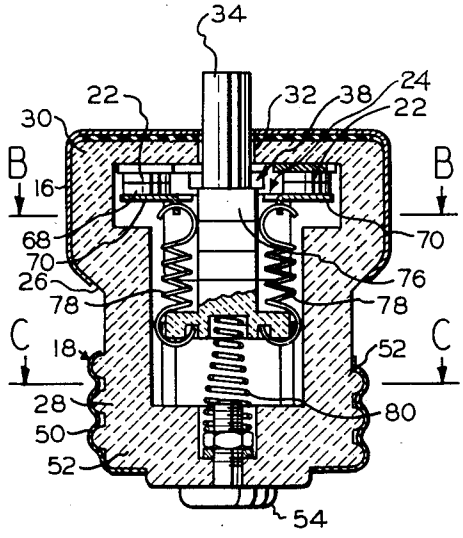

FIG. II.

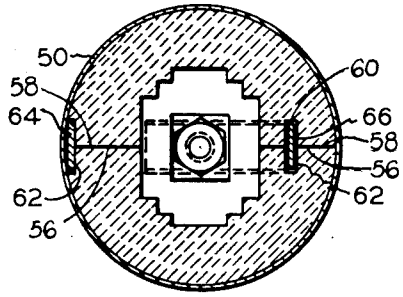

FIG. V.

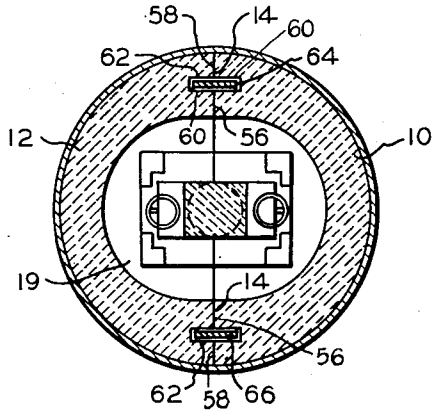

FIG. IV.

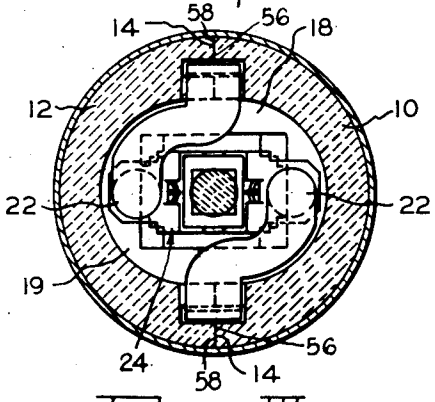

FIG. III.

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CIRCUIT BREAKER WITH SPARK SEALING CASING CONSTRUCTION

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5 Claims. (Cl. 200—116)

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This invention relates to electric circuit breakers and more particularly to electric circuit breakers of the household plug type, which require to be screwed or plugged into operative position.

The normal construction of these circuit breakers is one which involves a split hollow casing of insulating material, which casing forms a plug and houses the operative parts of the circuit breaker.

In particular, the invention relates to circuit breakers of the above type which involve a thermal latch and associated movable contacts, which are held latched in closed position with respect to fixed contacts but are automatically freed, for opening, upon the occurrence of a predetermined overload, due to the thermal latch being affected by the heat, set up by the conveyed current, and springing away from its latch support.

The construction involved in these circuit breakers is such as gives rise to arcing within the casing upon separation of the contacts under overload, and which also gives rise to a tendency for the insulated casing to burst apart by the pressure of the evolved gases.

The present invention has for its object to provide a circuit breaker of the type referred to which has an improved casing construction and arrangement of associated parts which offer a safeguard against the possibility of the arcing condition causing flashing to the outside of the casing, and which also eliminates damage to, or bursting, of the casing due to the gas pressure evolved within the casing.

Another object of the invention is to provide a circuit breaker of the above type with an arrangement of end caps, contact strips, and sealing means which serve to baffle the escape, to the outside of the casing, of the gases evolved within the casing due to arcing, and which end caps serve also to hold the casing parts against bursting apart by the pressure of the gases evolved within the casing.

The above and other objects and advantages of the invention, residing in the construction, arrangement and combination of parts will be more fully understood and appreciated from a consideration of the following specification and appended claims.

In the drawings:

Fig. I is a vertical section of a circuit breaker in accordance with this invention,

Fig. II is a cross-section on the line A—A of Fig. I,

Fig. III is a cross-sectional plan view of this circuit breaker construction,

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Fig. IV is a cross-section of the casing construction itself, on the line B—B of Fig. II, and

Fig. V is a cross-section of the casing construction itself on the line C—C of Fig. II.

In the drawings, the casing construction is shown composed of two similar semi-cylindrical sections 10 and 12 of insulated material which define a longitudinally extending split 14 on opposite sides of the casing construction, and which sections are held in assembled relationship by a pair of end caps, indicated generally by the references 16 and 18.

The casing sections combine to define an interior chamber 19 in which there are mounted, in fixed relationship, a pair of fixed electrical contacts 22, and in which chamber 19 there is also mounted a combined movable contact, thermal latch and actuator structure, indicated generally at 24, and described in detail hereinafter.

The casing structure presents a cylindrical exterior surface of stepped formation, with an annular shoulder 26 joining an end portion 28 of the casing of reduced diameter with the opposite casing end portion 30 of increased diameter. The casing is formed with a central aperture 32 at one end, for the passage of the thermal latch actuator, in the form of a plunger 34, which plunger in the portion within the chamber 19 and adjacent the opening 32 has a washer member 38, the purpose of which, upon release of the thermal latch, is to seal the opening 32 at its inner end against the flow of gases and flame therethrough evolved upon the circuit breaker coming into operation to interrupt the controlled electric circuit.

The one end cap 16 has an annular end wall 40 with an opening 42 for the passage of the actuator plunger 34. A sealing washer 44 of fibre, or suitable material, is interposed between this wall 40 and the adjacent wall 46 of the casing construction. This sealing washer 44 extends across the upper ends of the splits 14 and serves, therefore, to seal the casing interior against escape of the aforesaid evolved gases and flame through the split ends of the casing. The end cap 16 is deformed at its inner end, as by spinning, to permanently embrace the shoulder 26, as indicated at 48.

The other end cap 18 is conveniently formed with a screw threaded skirt portion 50 screwed into position upon the corresponding screw threaded end portion 52 of the casing sections and adapted for screwing into operative position with respect to a socket containing the main electric supply terminals of the circuit to which

the circuit breaker is required to be applied, and with which electrical connection is maintained by the terminal end cap 54.

The casing sections 10 and 12, along their longitudinally opposed edge surfaces 56 and 58, are formed with complementary, elongated recesses 60, which define longitudinally extending channels 62 in which electrical conductor strips 64 and 66 are housed, the conductor 66 being in electrical conducting relationship to the terminal end cap 54, and the other conductor strip 64 being in electrical conducting relationship with respect to the screwed cap portion 50.

These conductor strips are fixed in position within the casing, and carry the fixed contacts 22. As appears clear in Fig. I, in particular, the channels 62 are of tortuous form, and the contact strips therefor are correspondingly formed. As a result, such portion of the evolved gases and flame as may seek to escape along these conductor strips within their respective channels will be constrained to take a correspondingly tortuous path, with an effective baffling of such flow to the exterior of the casing.

The movable contact and thermal latch and actuator structure 24 comprises the movable contacts 68 positioned opposite the fixed contacts 22 and carried at the ends of arms 70 upon the thermal latch structure, which latter is in electrical connection with the controlled circuit and comprises the U-shape latch plates 72 which are adapted to have located engagement with ledges 74 on opposite sides of the actuator body structure 76. The movable contacts and latch plates form a unitary structure which is slidable with respect to the body structure 76 and is resiliently connected with the latter by a pair of coil springs 78. When the actuator plunger 34 is depressed to set the thermal latches 72 against the ledges 74 these springs 78 are tensioned, while at the same time a coil spring 80 operating against the inner end of the actuator body structure 76 is compressed. Upon the occurrence of a current overload of predetermined value, the thermal latch plates 72 will move away from the ledges 74 and thereupon the springs 78 will immediately operate to move the movable contacts 70 away from the fixed contacts 20 with snap action. At the same time, the spring 80 will function to move the latch actuator structure to project the button further outwardly through the casing opening and re-position the latch ledges 74 for re-engagement of the thermal latch plates 72 therewith when the actuator plunger 34 is again depressed.

Having thus described my invention, what I consider as new and wish to secure by Letters Patent is as follows:

1. In an electric circuit breaker, casing structure, said casing structure being constituted by two similar molded sections of insulating material defining a split between them which extends diametrically across annular end walls defined by the assembled sections and continuously along a cylindrical body also defined by said assembled sections, one end portion of said cylindrical body having external screw threads, said assembled sections defining a single interior compartment with its opposite ends in communication with restricted openings defined by the central openings in said annular end walls, circuit breaker mechanism mounted within said casing compartment and including an actuator plunger, said plunger extending slidably through one said restricted opening and carrying a sealing washer for fluid sealing engagement with the interior end wall surface portion defining said restricted opening, a pair of end cups, one said end cup being press-fitted over the end portion of the casing through which the said actuator plunger extends and the other end cup having a screw-threaded skirt engaged with said screw-threaded body portion, said first mentioned end cup having an annular end flange extending over and covering the diametrical split in the corresponding casing end wall, and an annular fluid sealing washer clamped between said annular end flange and said casing end wall.

2. An electric circuit breaker as claimed in claim 1, said cylindrical body having a reduced portion defining an annular ledge, said press fitted end cap having its skirt portion inturned at one end into press fitted relation to said ledge.

3. An electric circuit breaker as claimed in claim 1, said circuit breaker mechanism including contact strips with angularly bent portions, said casing sections having complementary recesses along the split defining channels in which said angularly bent contact strips are fitted.

4. In an electric circuit breaker, hollow casing structure formed by two casing sections of insulating material assembled together to define a split between them extending continuously across the casing end walls and along opposite sides thereof, said casing having an interior compartment with an opening extending through one of the casing end walls, circuit breaker mechanism in said casing, including fixed and movable contacts confined within said compartment and an actuator plunger actuatable to close the movable contacts against the fixed contacts, said plunger extending through said end wall opening for actuation from outside the casing, sealing means on said plunger and within said compartment, said sealing means engaging the inner surface of said one casing end wall to seal said opening when the plunger is projected through the opening upon the contacts being opened, a pair of end cups fitted firmly over the opposite end portions of the casing to hold the casing sections in assembled positions, said end cups including an end cup completely encasing the portion of the casing containing said compartment and having an end wall with an opening through which said plunger extends to the outside of the casing, and a sealing washer confined between said cup end wall and the casing end wall with said opening, said sealing washer covering the split at the corresponding end of the casing, said plunger sealing means and said sealing washer being formed and arranged to seal the casing against the escape through said opening and split of the arc gases evolved when the contacts are suddenly opened upon the occurrence of current overload.

5. In an electric circuit breaker, hollow cylindrical casing structure, said casing structure being formed by a pair of sections of insulating material defining a split between them extending diametrically across annular end walls and continuously along the cylindrical casing wall, said casing defining an interior compartment in communication with openings extending through said casing end walls, circuit breaker mechanism mounted in said casing compartment and including an actuator plunger and fixed and movable contacts, said fixed and movable contacts being confined within a portion of said compartment when in the contact closed condition and said plunger being reciprocable through one of said end wall openings, a washer on said plunger in position to seal around the inner end of said one

end wall opening upon the plunger moving outwardly with respect to said casing end wall, a pair of end cups encasing the opposite end portions of said casing, including the end portion containing said one end wall opening through which said plunger extends, the end cup encasing said last mentioned casing end wall having an end wall with an opening through which said plunger extends outside the casing, said end cup end wall extending over the diametral split in said casing end wall and said end cup having a cylindrical side flange completely encasing the portion of said casing compartment in which said fixed and movable contacts are confined when in

closed condition, and a sealing washer held clamped between the one said end cup end wall and the casing end wall with the plunger opening.

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