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June 16, 1936. D. S. RIVERS 2,044,448

CIRCUIT INTERRUPTER

Filed Nov. 22, 1933

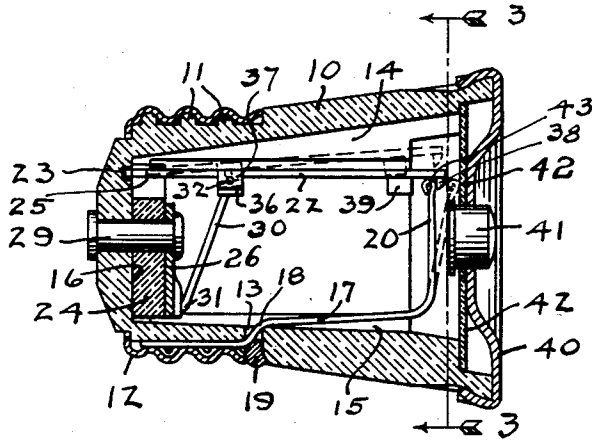


Fig. 2.

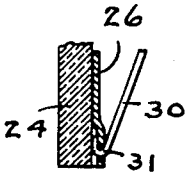


Fig. 6.

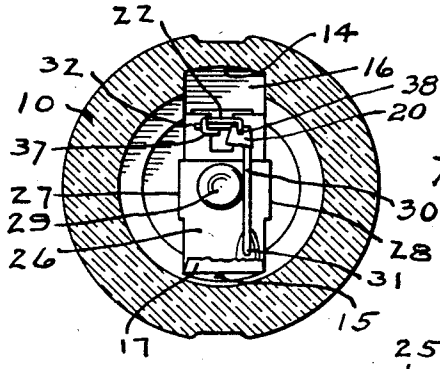


Fig. 3.

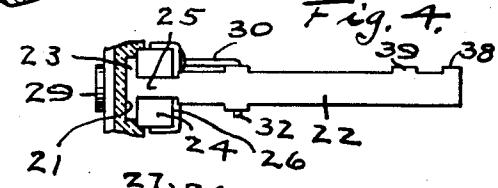


Fig. 4.

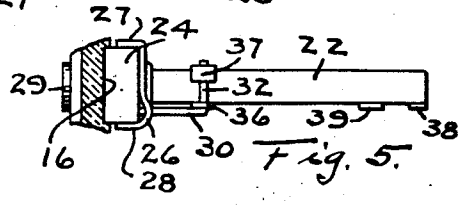


Fig. 5.

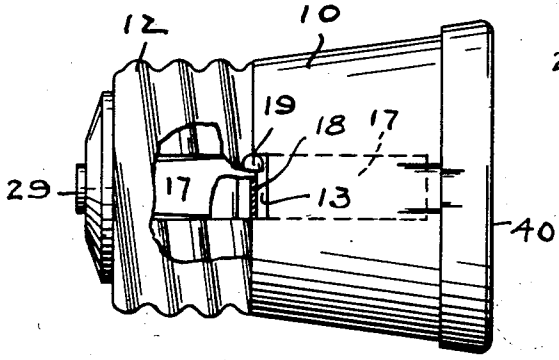


Fig. 1.

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CIRCUIT INTERRUPTER

Durward S. Rivers, Indianapolis, Ind.

Application November 22, 1933, Serial No. 699,103

10 Claims. (Cl. 200—116)

This invention relates to the art of circuit breakers and particularly to a structure adapted to replace the customarily employed plug type fuse. It is a primary object of my invention to provide a circuit breaking structure which will open a circuit upon a predetermined current flow by reason of expansion of an element rather than primarily melting a fuse link.

A further important object of the invention is to provide a combination for the above indicated purpose which may be produced and assembled at a relatively low cost and which will also be reliable over a long period of time.

Other objects and advantages of the invention will become apparent in the following description which is made in reference to the accompanying drawing, wherein

Fig. 1 is a fragmentary side elevation of a structure embodying my invention;

Fig. 2, a longitudinal central section;

Fig. 3, a transverse section on the line 3—3 in Fig. 2;

Fig. 4, a detail in top plan view of the shiftable lever and connections;

Fig. 5, a bottom plan view of the same lever, and

Fig. 6, a detail in section of the actuating wire anchor.

Like characters of reference indicate like parts throughout the several views.

I form an insulating body 10 generally cup shaped and preferably made out of some such material as porcelain or glass. About the outer side of the body 10 near the closed end thereof are provided threads 11 over which screw-threadedly engages a metal ferrule 12 which is formed to have internal and external threads, the external threads being preferably formed to fit within the standard Edison socket or fuse receptacle. A hole 13 is left transversely through the body 10 at that end of the ferrule 12 removed from the base, Fig. 2.

The inner side of the body 10 is generally cylindrical and is formed to have a pair of diametrically positioned slots 14 and 15 cut back into the wall of the body to extend longitudinally thereof. A slot 16 extends across the inner side of the base to join the inner ends of the longitudinal slots 14 and 15. A spring connecter 17 is formed with an S bend 18 to permit one end of it to be in circuit from the inner side of the body out through the hole 13 to have the end carried along the side of the body 10 toward the base, the threads 11 being cut away to form a slot thereacross to receive this end. The ferrule 12 in engaging with the threads 11 compressively engages with this end of the connecter 17. Preferably a drop of solder 19 is employed to connect the ferrule with the connecter 17 at the outer exposure of the bend 18 so that the ferrule 12 may not be unscrewed from the body 10 and also to provide a positive electrical connection between the ferrule and the connecter 17.

From the S bend 18, the connecter 17 is carried along within the slot 15 and thence is bent inwardly to have an end 20 extending the major distance across the open end of the body to normally assume some such position as indicated by the dash lines in Fig. 2.

A transverse slot 21 is formed to extend across the bottom of the slot 16 adjacent the inner end of the longitudinal slot 16. An actuating lever 22 is formed to have a foot 23 fit within the slot 21. An insulating block 24 is formed to fit snugly by its lower side in the slot 16 and is itself slotted from one end to receive thereacross a restricted width 25 of the lever 22, this width 25 being less than that of the foot 23 so that the block 24 will serve as means to retain the foot 23 in the slot 21. A metal plate 26 is formed to have downturned ears 27 and 28 to fit over and down along the sides of the block 24 and a stud or rivet 29 having an outer head is passed through a hole provided in the base of the member 10 and through the block 24 and the overlying plate 26 and is spun over on the plate 26 to compressively engage the block 24 between it and the base of the member 10.

A wire 30 is formed to have a definite length between a hooked end 31 and a transversely bent end 32 for a given rated current carrying capacity, the diameter being made to secure such rating. This wire 30 is made out of a suitable metal which will expand upon a current flow exceeding that rated amount to such an extent that the increase in length of the wire in the expanded position will be an appreciable amount.

The hooked end 31 of the wire 30 is entered down through a hole in the plate 26 and turned to be directed toward the stud 29 as indicated in Fig. 6, this assembly being preferably completed before the rivet 29 is drawn up snugly so that the plate 26 will firmly grip the turned over end of the wire 30 against the block 24 so as to form a rigid and good electrical connection with the plate. Preferably the plate 26 is raised somewhat to permit the end of the wire 30 to enter thereunder and be held from twisting. The wire 30 is carried diagonally across from its connection with the plate 26 as indicated, Fig. 2, to

have the turned over end 32 inserted through an ear 36 turned over from the lever 22 and is carried on across to pass through a second ear 37 which is preferably bent over around and against this end 32 to press it against the inner side of the lever 22.

The lever 22 extends outwardly from the base of the body member 10 to terminate a slight distance within the open end of the body. On the outer end of the lever 22 is provided a dog 38 having an outer rounded contour so that the end 20 of the connecter 17 may be pressed inwardly thereagainst and spring under the dog 38 and be there retained. A stop 39 is also carried by the lever 22 a short distance inwardly from the dog 38 as a member limiting the inward travel of the end 20 as it may be pressed to engage under the dog 38. The wire 30 normally holds the lever 22 in the position indicated in Fig. 2 whereby the connecter member end 20 will be retained under the dog 38. The lever 22 is free to rock through the slotted end of the block 24 although this block serves to limit the withdrawal of the lever foot from the slot 21 and also serves to prevent side rocking thereof. The lever 22 is then restrained to movement into and out of the longitudinal slot 16, this slot being provided for clearance about the lever 22 during such rocking.

A closure 40, here shown as being a metallic cap is provided to cover over the open end of the body 10 and is here shown as having a flange turned back around the outer side of the body, which flange is depressed at two points within depressions provided on the sides of the body as means to retain the cap in position on the body. A button 41 slidably passes through a central hole in the cap 40 and has an annular flange around its inner end to limit the outward travel thereof. Inward travel of the button is limited by its contact with the connecter end 20. Preferably an insulating disk 42 is carried to rest within a recess around the outer end of the body 10 to be held therein by a depressed central portion of the cap 40.

In operation, a circuit is provided through the structure above described through the members 29, plate 26, wire 30, lever 22, connecter 17, and the ferrule 12. Should the flow of current exceed the rated amount as determined by the diameter of the wire 30, the wire 30 will become heated and will expand longitudinally to rock the lever 22 to some such position as indicated by the dash lines, Fig. 2, whereupon the connecter end 20 will be released and will fly out to the dash line position being limited by the insulating disk 42. In any event the outward movement of the end 20 is sufficient so that after the circuit is broken between it and the lever 22, and the wire 30 becomes cooled and pulls the lever 22 back to the straight line position, the lever 22 will not, by this return motion, come into contact with the connecter end 20. This end 20 must be pushed into engagement under the dog 38 by pressing in on the button 41 so as to close the circuit. Extension of the button 41 to its outermost position will indicate an open circuit.

Should the break between the lever 22 and the connecter end 20 fail to be made for any reason, continued flow of the current above the rated wire capacity will melt the wire 30 and thus break the circuit. It is to be understood however, that the normal break of the circuit is supposed to occur as above indicated by expansion of the wire 30 to push the lever 22 away from the connecter end 20 and that the melting of the wire 30 only occurs in an emergency as a safety factor.

The various elements are so formed that the body 10, ferrule 12 and the connecter 17 may be assembled as one unit and the lever 22, block 24, plate 26, and wire 30 as another unit, the lever being carried by the block 24 through the slotted end. This last named assembly is then united with the body assembly by means of the rivet or stud 29. The assembly of the lever 22 and its connected parts is thus made outside of the body where it can be operated upon without difficulty as would be the case were it attempted to be assembled within the body.

Particular attention is directed to the contacting end of the connecter end 20 in that it is formed to have a cylindrical surface where it engages under the dog 38. This surface is formed by bending the end around, Fig. 2, in the form of a loop 43 which extends outwardly somewhat to present a surface raised from that of the outer side of the member 20. By using the loop 43, not only is it easier to insert the end 20 under the dog 38, but the end is also more quickly released with less push by the wire 30 since it requires but slight movement of the lever 22 to carry the dog 38 past the center of the cylindrical surface of the loop 43, whereupon the angularity of contact therebetween then, of itself, tends to push the lever 22 away from the loop 43.

While I have herein shown and described my invention in the one best form as now known to me, it is obvious that structural changes may be made without departing from the spirit of the invention and I, therefore, do not desire to be limited to that precise form beyond the limitations as may be imposed by the following claims.

I claim:

1. In a circuit interrupter, a body, a conducting member inside of the body, a contacting stud extending through the body and conducting member, a shiftable lever, an expansible member interconnected with said conducting member and said lever, a conducting ferrule on the outside of the body, a conductor spring electrically connecting with the ferrule, and releasable means on the shiftable lever engaging said conductor spring when said expansible member is in its normal state and circuit closed, said expansible member being formed to expand longitudinally upon a flow of current thereover in excess of a predetermined rate and shift the lever out of engagement with the conductor spring to break the circuit.

2. In a circuit interrupter, a cup-shaped insulating body, a screw-threaded ferrule fitted around the body adjacent the closed end, a metal plate inside of the body, a contacting stud extending through the closed end of the body and plate, a lever carried within the body and rockably mounted to have a free end directed toward the open end of the body, an expansible wire electrically connected with said plate and held against it by the stud and also connected with said lever to cause movement of the lever upon expansion of the wire, a spring connector in electrical circuit with said ferrule extending along said body therewithin and bent over by its outer end to engage normally said lever, said outer end being formed to tend to move longitudinally of

the body, and a dog on said lever, said outer end being normally retained under said dog.

3. In a circuit interrupter, a cup-shaped insulating body, a screw-threaded ferrule fitted around the body adjacent the closed end, a contacting stud extending through the closed end of the body, a lever carried within the body and rockably mounted to have a free end directed toward the open end of the body, an expansible wire electrically connected with said stud and said lever to cause movement of the lever upon expansion of the wire, a spring connector in electrical circuit with said ferrule extending along said body therewithin and bent over by its outer end to engage normally said lever, said outer end being formed to tend to move longitudinally of the body, and a dog on said lever, said outer end being normally retained under said dog, said body being formed to have a slot, said lever having its inner end seated in said slot as a bearing, and an insulating member slidably engaging about the lever to maintain the lever end in the bearing.

4. In a circuit interrupter, a cup-shaped insulating body, a screw-threaded ferrule fitted around the body adjacent the closed end, a contacting stud extending through the closed end of the body, a lever carried within the body and rockably mounted to have a free end directed toward the open end of the body, an expansible wire electrically connected with said stud and said lever to cause movement of the lever upon expansion of the wire, a spring connector in electrical circuit with said ferrule extending along said body therewithin and bent over by its outer end to engage normally said lever, said outer end being formed to tend to move longitudinally of the body, and a dog on said lever, said outer end being normally retained under said dog, said body being formed to have a slot, said lever having its inner end seated in said slot as a bearing, and an insulating member slidably engaging the lever to maintain the lever end in the bearing, a plate on the insulating member, said stud extending through the insulating member and the plate compressibly engaging them against the body, and said wire being fixed to the plate by one end.

5. In a circuit breaker, the combination with a member swingable laterally about one end, and a fixed member, of an expansible member interconnected therebetween to move the swingable member laterally upon heating of the expansible member above a predetermined temperature which causes it to lengthen, said fixed member having a hole therethrough and a channel leading thereunder from the hole, said expansible member having a hooked end to be inserted through the hole and into the channel, and having the other end engaged with said swingable member, and a conductor spring, said swingable member having means for engaging and holding an end of the conductor spring.

6. In a circuit interrupter, an insulating body, screw-threads formed about the periphery of the body, a metal ferrule screw-threadedly engaging the body threads, said threads being slotted or interrupted thereacross, said body having a hole therethrough communicating with the slot across the threads, and a connector extending from the inside of the body out through said hole and along said slot whereby said ferrule upon engaging said body threads is brought into compressive contact with said connector said connector and ferrule being soldered together, a button normally contacted by the connector, a shiftable lever having a catch to engage and hold the connector out of contact with the button, and electrically operated means to move the shiftable lever to release the connector from the catch on the lever.

7. In a circuit interrupter, an insulating body, screw-threads formed about the periphery of the body, a metal ferrule screw-threadedly engaging the body threads, said threads being slotted or interrupted thereacross, said body having a hole therethrough communicating with the slot across the threads, and a connector extending from the inside of the body out through said hole and along said slot whereby said ferrule upon engaging said body threads is brought into compressive contact with said connector, said body being formed to have an internal longitudinal slot through which said hole is placed, and said connector being formed to have an S bend about said hole to have at least a portion of the connector to lie within the internal slot to prevent lateral rocking of the connector and solder joining the connector with the ferrule at the outer exposure of the bend in the connector, a button normally contacted by the connector, a shiftable lever having a catch to engage and hold the connector out of contact with the button, and electrically operated means to move the shiftable lever to release the connector from the catch on the lever.

8. In a circuit breaker, an insulating body, a body end having a slot therein, a shiftable lever, a foot on the lever rockably fitting in said slot, a stud through the body end, and a block retained by said stud, said body end having a second slot into which said block is seated, said block having an end engaging said foot and retaining it in its slot.

9. In a circuit interrupter, a body, a shiftable lever carried by the body, a dog on the lever, a spring member normally retained under the dog, a closure over the body, a spring member shifting button slidably guided through the closure, a stop on the button limiting outward movemen of the button, and a stop on said lever spacec from said dog in the path of said spring member limiting the inward travel of said button.

10. In a circuit breaker, a shiftable lever, an expansible member for shifting the lever, a spring connector, a dog on the lever under which an end of the connector may engage, a stop on the lever limiting the inward travel of the end of the connector said connector being directed toward the lever in its direction of movement when engaged under said dog, and tending to spring out approximately perpendiclularly of the lever line of travel when the lever shifts thereaway, and a surface on the connector sloping to give the lever an added impetus as the dog starts to leave the connector end.

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