

April 6, 1943.

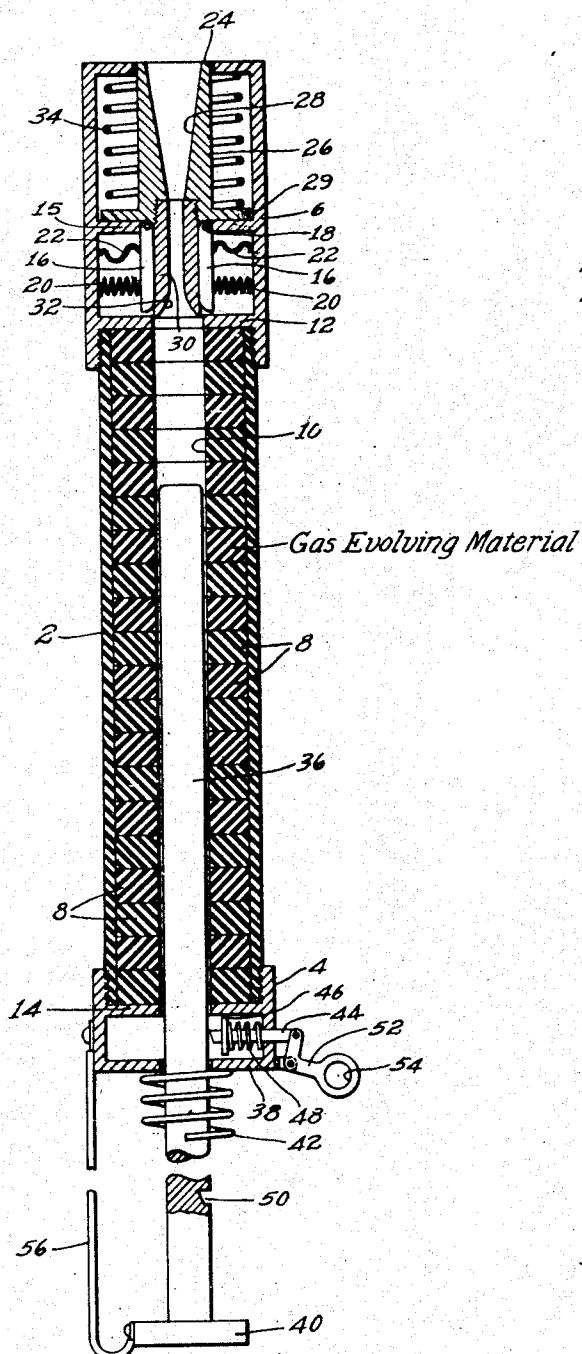
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2,315,618

CIRCUIT INTERRUPTER

Filed Nov. 26, 1941

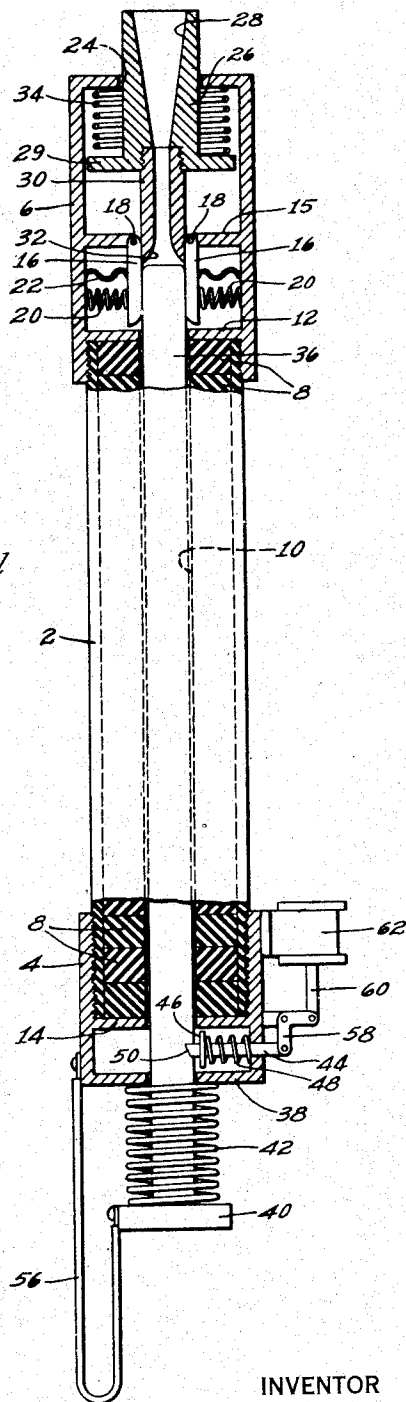
Fig. 1.



WITNESSES:

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Fig. 2.



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2,315,618

CIRCUIT INTERRUPTER

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Application November 26, 1941, Serial No. 420,514

11 Claims. (Cl. 200—149)

This invention relates generally to electric circuit interrupters, and more specifically to interrupters of the gas blast type.

In interrupters which utilize a gas blast generated by the arc for extinguishing the arc formed upon movement of one contact of the interrupter away from its cooperating contact, it is desirable that the gas exhaust take place longitudinally of the arc so that the gases will pass through the entire arc length. In order to do this, it is necessary that the hot ionized gases be directed towards one of the contacts.

One object of this invention is to provide a novel contact construction for circuit interrupters having relatively fixed and movable contacts, wherein the arc gases are directed through one contact which is provided with means for shielding it from the deleterious effects of such gases.

Another object of this invention is to provide in an interrupter of the type described, a novel hollow fixed-contact construction having shielding means for protecting the contact from the arc and arc gases.

These and other objects of this invention will become more apparent upon consideration of the following detailed description of preferred embodiments thereof taken in connection with the attached drawing, in which:

Figure 1 is a longitudinal sectional view of a circuit interrupter constructed in accordance with this invention with the interrupter contacts shown in open circuit position, and

Fig. 2 is a partial sectional view of an interrupter similar to Fig. 1 with the interrupter contacts shown in the closed circuit position, and with a modified form of control means for the contacts.

The circuit interrupter shown in Figs. 1 and 2 of the drawing is preferably provided in a tubular insulating housing 2, which may be of any desired insulating material, such, for example, as fiber, a synthetic resin, or the like. The insulating tube 2 has the opposite ends thereof threaded for threadedly receiving cap-like end terminal structures 4 and 6, respectively. Interiorly of insulating tube 2 there is preferably provided a plurality of washer-like members 8 having a central aperture therethrough, with the apertures of all the members aligned to form a restricted arc bore 10. The washer-like members 8 are preferably of an insulating material which is capable of evolving an arc extinguishing gas when in proximity to an electric arc, such, for example, as boric acid, fiber, a synthetic resin having this property, or the like. The end ter-

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minal structure 6 is substantially cylindrical in form, and is provided with a transversely extending centrally apertured portion 12 adapted to seat on the end of insulating tube 2, with the aperture thereof aligned with bore 10, and this partition also serves to retain washer-like members 8 within insulating tube 2. The end terminal structure 4 is likewise provided with a transversely extending apertured partition 14 for retaining washer-like members 8 within insulating tube 2, and with the aperture in the partition aligned with bore 10.

The end terminal structure 6 is provided with an intermediate, integral, transversely extending partition 15 having a central aperture for a purpose to be hereinafter referred to, and adapted to support on opposite sides of this aperture contact fingers 16, pivoted as at 18 on the partition. These pivoted contact fingers 16 provide the stationary contact structure for the interrupter, and they are resiliently biased towards each other and towards the central axis of the interrupter by a coil compression spring 20 for each pivoted contact 16, and positioned between the contact and the outer cylindrical wall of terminal structure 6. The pivoted contact fingers 16 are electrically connected with terminal structure 6 by flexible shunts 22 which may be soldered or otherwise secured to the contact fingers and the side wall of the terminal structure. The outer end wall of terminal structure 6 is also provided with a central aperture 24 which is aligned with bore 10 and the apertures through partitions 12 and 15, for slidably receiving the outer end 26 of a contact follower shield member. This shield member may be of integral construction, but preferably, for assembly purposes, is made of two parts as shown, including an outer end portion 26 having an outwardly flaring outlet passage 28 therethrough, and an outwardly extending flange 29 at the inner end thereof, and an inner end portion 30, threadedly engaged with outer portion 26 and adapted to be slidably mounted in the aperture in partition 15. The inner portion 30 of the shield is also provided with a central passage having an outwardly flared entrance 32 which is aligned and communicates with flared outlet passage 28. It will be noted that the follower shield is slidably mounted in aperture 24 and the aperture in partition wall 15, and a coil compression spring 34 is seated between the flange 29 of the follower and the outer end wall of terminal structure 6 so as to continually bias the follower inwardly with respect to the terminal housing. This inward movement of the follower

is limited by engagement of flange 29 with partition 15, and the follower is movable outwardly from the position shown in Fig. 1 to that shown in Fig. 2, by engagement of movable contact rod 36 therewith.

Movable contact rod 36 is adapted to be slidably mounted through arc bore 10 and through apertures in partition 14 and end wall 38 of terminal cap structure 4. The outer end of contact rod 36 is provided with an enlarged head portion 40, and the contact rod is normally biased outwardly relative to insulating tube 2 by a coil compression spring 42 seated between head 40 of the rod, and end wall 38 of terminal structure 4.

The contact rod is adapted to be maintained in a closed circuit position wherein the inner end thereof is positioned between contact fingers 16, by a slidable latch bar 44 movably mounted through the side wall of terminal structure 4 and engageable in notch 50, formed adjacent the outer end of contact rod 36. The latch bar 44 is provided with a flange 46 at the inner edge thereof, and a coil compression spring 48 seated between the flange 46 and side wall of terminal structure 4 is adapted to continually bias the latch bar inwardly into engagement with contact rod 36. The outer end of latch bar 44 is pivotally connected to one arm of a bell crank lever 52, and the other arm of the bell crank lever is provided with a hook eye 54 for the reception of a hook-stick operating member or the like, for retracting the latch bar 44 from notch 50. It will also be noted that contact rod 36 is electrically connected to terminal structure 4 by means of a flexible shunt 56 secured to the terminal structure and the enlarged head 40 on the contact rod.

In the embodiment of the invention shown in Fig. 2, latch bar 44 is under the control of bell crank lever 58, which, in turn, is pivoted to the plunger rod 60 of a solenoid 62.

In the operation of the interrupter shown in Figs. 1 and 2, it will be observed that in the closed circuit position shown in Fig. 2, the circuit through the interrupter extends from terminal structure 6 through flexible shunts 22, contact fingers 16, contact rod 36, flexible shunt 56 to terminal structure 4. It will also be observed that the contact rod is maintained in the closed circuit position by engagement of latch bar 44 in notch 50, with operating spring 42 in a compressed condition. Now, upon a circuit interrupting operation caused by withdrawal of latch bar 44 from notch 50, it will be apparent that the operating spring 42 will then be free to move contact rod 36 downwardly out of engagement with contact fingers 16 and the arc will be drawn out in bore 10 where it is restricted and subjected to the action of the gases evolved from the material comprising washer-like members 8. In order that a blasting action of such cases may take place longitudinally through the entire extent of the arc, and be exhausted through the fixed contact structure, this structure, including the follower shield 26, 30 is provided with the passages 32, 28 which in effect form a Venturi outlet to aid in the blasting action. It will be observed that as soon as contact rod 36 moves downwardly from the position shown in Fig. 2, that it will be closely followed by the follower shield moving under the influence of its spring 34. Furthermore, but a relatively small movement of contact rod 36 downwardly, will be required before contact fingers 16 are completely covered by the inner portion 30 of the follower shield, and since the shield is of some good conducting material such, for ex-

ample, as copper or a copper alloy, the arc will be transferred from the contact fingers to the shield, and furthermore, the hot gases expelled from arc bore 10 will be prevented from contacting contact fingers 16, because the shield forms a passage independent of these contact fingers.

Obviously, by this construction the contact fingers 16 of the fixed contact construction are not only protected from the deleterious effects of arcing, but are also protected from the high temperature and high velocity of the gases expelled from bore 10, which would cause excessive erosion of the contact surfaces were it not for follower shield 26, 30. This erosion of contacts 16, as well as deposits of material thereon from gases evolved, would obviously result in a very poor contact between contact fingers 16 and contact rod 36 when the interrupter was reclosed. With the construction described above, the fixed contact fingers 16 are entirely protected from the effects of the arc and hot gases expelled, while at the same time an outlet is provided through the fixed contact construction for the arc gases in novel manner.

In the embodiment of the invention shown in Fig. 1, latch bar 44 is readily released to effect a circuit interrupting operation by merely pulling downwardly on hook eye 54. In the embodiment shown in Fig. 2 of the drawing, latch bar 44 is adapted to be released by energization of solenoid 62, and this may be remotely controlled, or the solenoid may be connected in the interrupter circuit so as to be responsive to predetermined electrical conditions to effect a circuit interrupting operation of the interrupter.

After a circuit interrupting operation, it is obvious that the circuit may be reclosed by moving contact rod 36 upwardly from the position shown in Fig. 1, for example, as by a force exerted on the flanged head 40 thereof. In its upward movement, the contact rod will first engage the inner end of inner portion 30 of the follower shield and thereafter cause movement of the shield upwardly while the inner end of the contact rod moves between contact fingers 16 to the position shown in Fig. 2 of the drawing, wherein the circuit through the interrupter is reestablished.

From the foregoing it is believed to be readily apparent that the circuit interrupter herein disclosed is provided with a novel fixed contact construction embodying a follower shield means capable of not only protecting the fixed contacts from arcing, but also providing a passage for gases expelled during interruption, while protecting the fixed contacts from the deleterious effects of such gases. It is also apparent that this invention provides a hollow contact construction with hollow shielding follower means associated therewith providing a gas passageway therethrough of optimum design, and which is automatically operable upon a circuit interrupting operation to shield and protect the contact from arcing and from the hot gases expelled.

Having described preferred embodiments of the invention in accordance with the patent statutes, it should be understood that the invention is not to be limited to the particular embodiments herein described, inasmuch as it will be obvious, particularly to those skilled in the art that many changes and modifications may be made in these particular embodiments without departing from the broad spirit and scope of this invention. Thus, for example, although the interrupter is shown for use with substantially circular contacts, it is apparent that contacts

having other cross-sectional forms can be readily used with this invention. Therefore, it is desired that the invention be interpreted as broadly as possible in view of the prior art.

I claim as my invention:

1. In a circuit interrupter, separable contacts one of which is tubular to receive the other in closed circuit position and to vent the arc gases formed when said contacts separate, and tubular shielding means telescopically engaged with said one contact and automatically movable in response to separation of said contacts to a shielding position with respect to said one contact.

2. In a circuit interrupter, separable contacts one of which is tubular to receive the other in closed circuit position and to vent the arc gases formed when said contacts separate, and tubular shielding means of conducting material telescopically engaged with said one contact and automatically movable in response to separation of said contacts to a shielding position with respect to said one contact and to a position closer to said other contact than said one contact so that the arc drawn will be transferred to said shielding means.

3. In a circuit interrupter, relatively fixed and movable contact means, said fixed contact being tubular to receive said movable contact in closed circuit position and to vent the arc gases formed when said movable contact is moved away from said fixed contact, and a tubular shielding means adapted for telescoping movement in said fixed contact in response to movement of said movable contact away from said fixed contact to shield the inner wall of said fixed contact from the deleterious effects of said arc gases.

4. In a circuit interrupter, relatively fixed and movable contact means, said fixed contact being tubular to receive said movable contact in closed circuit position and to vent the arc gases formed when said movable contact is moved away from said fixed contact, tubular shielding means adapted for telescoping movement in said fixed contact in response to movement of said movable contact away from said fixed contact to shield the inner wall of said fixed contact from the deleterious effects of said arc gases, and said shielding means having a flared outlet.

5. In a circuit interrupter, relatively fixed and movable contact means, said fixed contact being tubular to receive said movable contact in closed circuit position and to vent the arc gases formed when said movable contact is moved away from said fixed contact, tubular shielding means of conducting material adapted for telescoping movement in said fixed contact in response to movement of said movable contact away from said fixed contact to shield the inner wall of said fixed contact from the deleterious effects of said arc gases, and to a position closer to said other contact than said one contact so that the arc drawn will be transferred to said shielding means, and said shielding means having a flared outlet.

6. In a circuit interrupter, relatively fixed and movable contact means, said fixed contact being tubular to receive said movable contact in closed circuit position and to vent the arc gases formed when said movable contact is moved away from said fixed contact, and a tubular shielding means adapted for telescoping movement in said fixed contact, means biasing said shielding means towards said movable contact whereby when said movable contact moves away from said fixed

contact said shielding means will follow to shield said fixed contact from the arc gases, and stop means for preventing such following movement of said shielding means substantially beyond its shielding position.

7. In a circuit interrupter, a tubular casing of insulating material having an open end, spaced terminals on said casing, interrupting means in said casing including a tubular contact means adjacent said open end of the casing, and a rod-like contact movably mounted longitudinally of said casing, said contacts electrically connected to said terminals, respectively, means of insulating material in said casing forming a restricted arc passage in which said rod-like contact is adapted to move, at least inner wall portions of said passage being of a material capable of evolving an arc extinguishing gas when in proximity to an electric arc, and tubular shielding means adapted to move into said fixed contact means in response to movement of said rod-like contact away from said fixed contact to shield the inner wall of said fixed contact from the deleterious effects of the hot ionized gases escaping from the open end of said passage.

8. In a circuit interrupter, means forming an arc chamber having an opening for venting the arc gases, separable contacts in said chamber, one of which is positioned in the path of gases escaping from said vent when the circuit is interrupted, and shielding means movable in response to separation of said contacts to a position for shielding said one contact from the deleterious effects of said gases.

9. In a circuit interrupter, means forming an arc chamber having an opening for venting the arc gases, separable contacts in said chamber, one of which is positioned in the path of gases escaping from said vent when the circuit is interrupted, and shielding means of conducting material associated with said one contact and movable in response to separation of said contacts to a position for shielding said one contact from the deleterious effects of said gases for relieving said one contact of arcing.

10. In a circuit interrupter, means forming an arc chamber having an opening for venting the arc gases, separable contacts in said chamber, one of which is positioned in the path of gases escaping from said vent when the circuit is interrupted, and tubular shielding means movable axially of said opening to a position shielding said one contact from the arc gases and providing a passage for said gases axially to said vent opening.

11. In a circuit interrupter, means forming an arc chamber having an opening for venting the arc gases, separable contacts in said chamber, one of which is positioned in the path of gases escaping from said vent when the circuit is interrupted, tubular shielding means normally positioned in said vent opening and substantially filling the same, with at least a portion thereof projecting outwardly through said vent opening, means moving said shielding means into said chamber in response to separation of said contacts to a position shielding said one contact, and means limiting inward movement of said shielding means so that a portion thereof remains in said vent opening to conduct the arc gases therethrough.

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