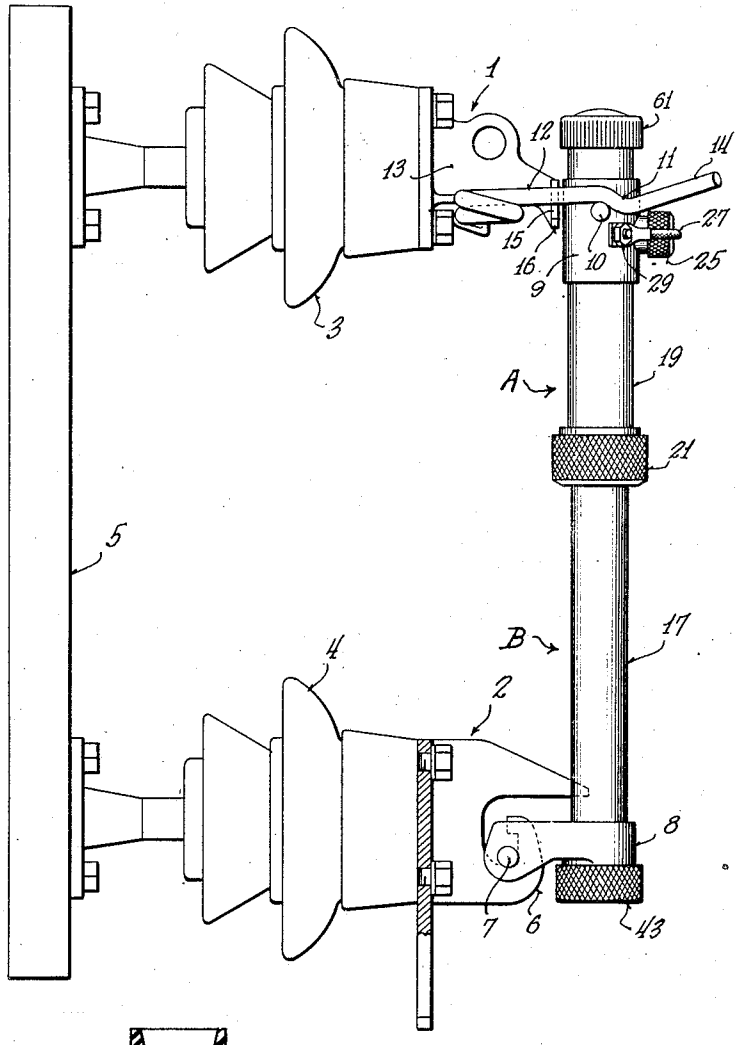
Jan. 27, 1948. R. H. EARLE 2,434,994

HIGH VOLTAGE CIRCUIT INTERRUPTER

Filed March 8, 1944 2 Sheets-Sheet 1

Fig. 1



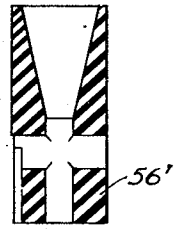


Fig. 6

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HIGH VOLTAGE CIRCUIT INTERRUPTER

Filed March 8, 1944 2 Sheets-Sheet 2

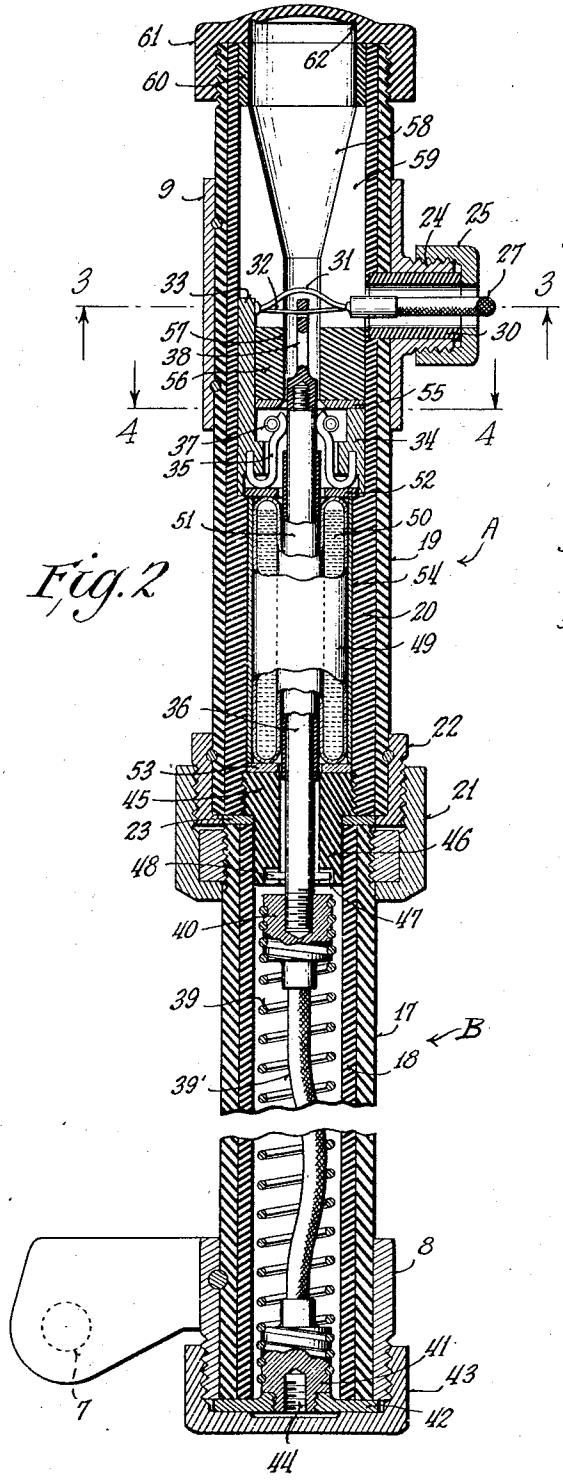


Fig. 2

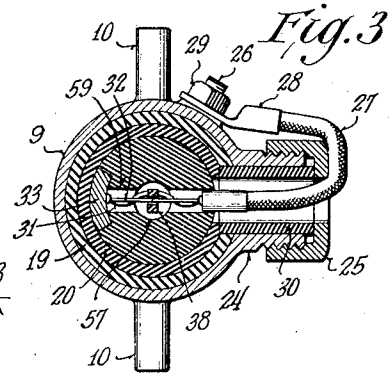


Fig. 3

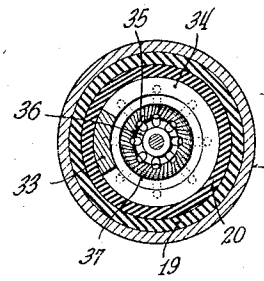


Fig. 4

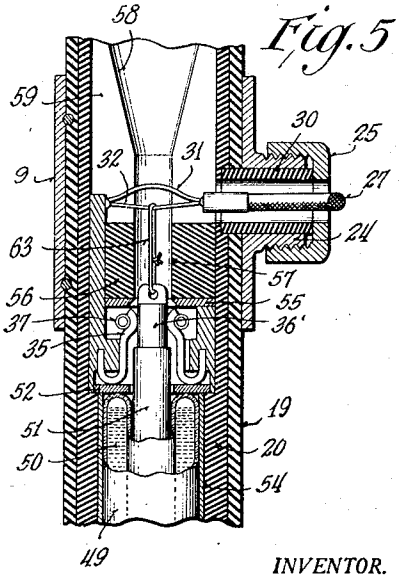


Fig. 5

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UNITED STATES PATENT OFFICE

2,434,994

HIGH-VOLTAGE CIRCUIT INTERRUPTER

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Application March 8, 1944, Serial No. 525,484

17 Claims. (Cl. 200—120)

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This invention relates to high voltage circuit interrupters.

Objects of this invention are to provide an interrupter which is capable of interrupting high voltage, heavy duty circuits, which rapidly extinguishes the resulting arc in an effective and reliable manner, and which is so constructed that the major part of the device may be used over and over again.

Various types of circuit interrupters have heretofore been constructed in which material which liberates gas when acted upon by an arc has been employed and in which the gas so liberated is distributed substantially throughout the entire length of the main arc channel and is diffused or mixed with the ionized gases produced by the arc.

Further objects of this invention are to provide a high voltage circuit interrupter in which the main arc is interrupted by a powerful cross blast of gas and at the same time an auxiliary arc is established in series with the main arc and is elongated so as to prevent restriking after the main arc has been extinguished, and in which the cross blast produces a concentrated effect at a localized point.

In greater detail, further objects of this invention are to provide a high voltage, heavy duty circuit interrupter in which a main arc is produced in a relatively short channel part of which extends into and crossways of a relatively long channel, through the latter of which a powerful blast of arc extinguishing gas is projected, such gas being liberated from material which is acted upon by an auxiliary arc, the device being so constructed that the main and auxiliary arc are kept separate at all times, the auxiliary arc being in series with the main arc and being mechanically established whereas the main arc is established as a result of the fusing of a fuse link, the auxiliary arc being very quickly elongated to prevent restriking of the main arc after the main arc has been interrupted, the construction being such that the movable parts are of relatively small mass and are quickly accelerated and withdrawn to a considerable distance from their normal position to thus provide a substantial and effective gap, thereby securing the protection against restriking.

Further objects are to provide a construction in which refill units or renewable units are employed, in which the major portion of the apparatus may be used over and over again, and in which the refill units are so constructed that when they are returned to the factory, a major

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portion of such units may be used in the construction of a new refill unit.

In circuit interrupters in which a fuse link is employed it has been found that the fuse link heats up to a considerable extent when it is loaded to somewhere near its rated capacity. In some of the prior devices the fuse link has been located in proximity to the material adapted to liberate gas when acted upon by an arc and consequently the heat from the fuse link prior to rupture often causes an uncertainty or unreliability in the operation of the apparatus.

This invention is designed to overcome the above noted defects, and further objects of this invention are to provide a high voltage, heavy duty fuse construction in which none of the heat from the fuse link when it is carrying substantially its rated capacity of current is transmitted to the material which liberates the gas for extinguishing the arc, in which this material is carried at a point remote from the fuse link and is also insulated from a relatively heavy metal rod or conductor which does not heat up to any substantial degree when the fuse link is loaded to its rated capacity and which, therefore, is reliable and certain in its operation.

Further objects are to provide a heavy duty, high voltage fuse construction in which a simple type of fuse link may be employed which is adapted to rupture on overload and establish the main arc, and in which mechanical means are employed for establishing an auxiliary arc and for drawing the auxiliary arc into proximity to the gas liberating material, and also in which such mechanical means is withdrawn to a remote point so as to prevent restriking of either arc after the main arc has once been interrupted, the construction being such that the main arc is kept transversely of the gas blast channel and is not allowed to combine with the auxiliary arc so that the main arc is thus kept in position where it is most readily extinguished by the powerful cross blast.

Further objects are to provide a construction which is sturdy, in which the refill units may be handled without requiring any unusual care on the part of the lineman, and in which such renewable units may be very easily substituted for a previously used unit.

Embodiments of the invention are shown in the accompanying drawings, in which:

Figure 1 is a side elevation of the circuit interrupter, such view being partly in section.

Figure 2 is a longitudinal sectional view through the device, such view being partly broken away.

Figure 3 is a sectional view on the line 3—3 of Figure 2.

Figure 4 is a sectional view on the line 4—4 of Figure 2.

Figure 5 is a fragmentary view of a modified form of the invention.

Figure 6 is a sectional view through a modified form of a fiber plug.

Referring to the drawings, it will be seen that the circuit interrupter comprises upper and lower stationary terminals indicated respectively at 1 and 2 and supported by insulators 3 and 4 carried by a suitable base portion 5. The circuit interrupter is removably and pivotally supported from the lower contact. For example, the lower contact may be provided with a pair of hook like portions 6 within which trunnions 7 rigid with the circuit interrupter are positioned. Any other suitable support for the lower end of the circuit interrupter could be employed. The trunnions 7 in the form shown are rigidly formed with the lower terminal 8 of the circuit interrupter.

The circuit interrupter is provided with an upper terminal 9 which is provided with outwardly projecting pins 10 on opposite sides thereof which hook behind depressed portions 11 of a pair of spring arms 12 which are pivotally carried by the rigid member 13 of the upper terminal, such spring arms flaring outwardly and upwardly as indicated at 14.

The particular construction of this upper contact may be varied as desired. Preferably the spring arms 12 are U-shaped and bear against downwardly slanting cam portions 15 which are provided with stops 16 at their lower ends to limit the downward rocking motion of the spring arms 12, such spring arms being urged downwardly by the cam action of the cam portions 15. This construction forms the subject matter of the patent to William O. Schultz, No. 2,357,772 of September 5, 1944, for Cut-out construction.

The circuit interrupter comprises two main portions, an upper portion A and a lower portion B. The portion A is the renewable portion and the portion B and the remaining parts of the circuit interrupter are adapted to be used over and over again with successively substituted renewable portions A, suitable interlocking means hereinafter described being provided for detachably locking the main portions together. The lower portion B of the circuit interrupter comprises a composite tube which may be composed of an outer Bakelite tube 17 with a fiber inner tube or lining 18. The upper portion A comprises a composite tube which may have an outer Bakelite tube 19 and an inner fiber tube or lining 20. The two main portions of the apparatus are removably coupled together by means of a union like structure in which the lower knurled nut 21 revolubly carried by the lower tube is screw threaded onto a screw threaded nipple or collar 22 rigid with the upper tube or renewable unit, a suitable gasket 23 being interposed between the two units or main portions A and B. Obviously the nut 21 could be carried by the upper portion A and the collar by the lower portion B if desired.

The upper unit or renewable or refill unit carries the upper terminal 9 of the device. This terminal is provided with an outwardly projecting integral tubular portion 24 which is externally screw threaded and receives the apertured metal cap 25. The upper terminal 9 is also provided with a rigidly positioned threaded pin 26 which receives one end of the fuse link, such fuse link being preferably composed of a flexible leader 27

terminating in a fitting 28 apertured to slip over the pin 26 and being locked in place by means of a nut 29. The flexible leader extends through the apertured metal cap 25 and through the fiber tube 30 which lines the metal tube 24. The fiber tube 30 is fitted to or seats against the inner fiber tube 20 in a gas tight manner and is held in this position by means of the screw threaded apertured metal cap 25.

The inner end of the flexible leader is joined to a fusible section 31 and a strain wire 32. The other end of the strain wire and fusible section are joined to an upstanding intermediate terminal or member 33. The member 33 is a metal member integral with the metal ring like portion 34, such ring like portion being provided with a plurality of upwardly extending spring contact fingers 35 which are urged into engagement with the retractable plunger or metal rod 36 by their inherent resiliency supplemented by an annular helical spring 37 as shown in Figures 2 and 4. The retractable rod 36 is provided with a strain piece or fiber end portion 38 which is apertured at its upper end and through which the strain wire 32 passes. Preferably the fusible section 31 is bent upwardly and remains out of contact with the fiber piece 38. The upper end of the rod 36 is reduced and screw threaded into the lower end of the fiber piece 38.

The retractable rod or plunger 36 is constantly urged downwardly by means of a relatively heavy tension spring 39. Preferably this tension spring is secured at its upper end to an upper head piece 40 removably screw threaded onto the lower end of the rod 36 and to a lower head portion 41 on which a disk like nut 42 is screwed, these heads being electrically connected to a flexible leader 39'. The disk like nut 42 is held in clamped engagement with the lower terminal 8 by means of the lower metal cap 43. It is preferable to provide a threaded opening 44 in the lower head piece 41 to facilitate repositioning of such head piece during refusing in a manner hereinafter to appear. From the construction thus far given, it is apparent that the retractable plunger 36 is constantly urged downwardly and would move downwardly except that it is held by the strain wire 32. The flexible leader 27 is held snugly so as to hold the strain wire 32 relatively tight and minimize the sagging thereof due to the downward pull of the plunger 36. Of course, a certain amount of sagging does occur, for example, as shown in Figure 2, but this is not objectionable.

The lower end of the refill unit is provided with a screw threaded plug 45 of fiber which is screwed tightly into the lower end of the upper unit. This fiber tube is provided with a reduced downwardly extending portion 46 which fits within the lower composite tube. The fiber plug is also provided with a slot 47 at its lower end which slidably receives a pin 48 carried by the rod 36 to prevent relative rotation of the rod 36 with respect to the refill unit when the upper head 40 is screwed onto the lower end of the rod.

A container such as the torus-shaped glass member 49 is positioned within the refill unit and contains a gas liberating material such as the liquid 50. The rod 36 extends freely through this container and is provided with a heat insulating sheath 51 which may be of laminated Bakelite or of paper glued to or otherwise tightly secured to the rod and adapted to freely travel downwardly with the rod when the rod is retracted in a manner hereinafter to appear. The container 49 is held between upper and lower cushioning gaskets

52 and 53. The upper gasket is positioned immediately below the curved lower ends of the contact spring fingers 35. Preferably a cushioning shield 54 is provided outside of the container 49.

The portion 34 has an upper shouldered face upon which a metal washer 55 rests. Above this washer a fiber block or plug like member 56 is positioned. This plug like member is provided with an aperture 57 therethrough within which the fiber strain piece 38 is positioned. This aperture extends upwardly and joins an upwardly flaring aperture 58 formed in the fiber plug 56. The upper portion of the fiber plug 56 is slotted transversely as indicated at 59 and as shown particularly in Figure 3. It is held in place at its upper end by means of a fiber sleeve or spacing member 60 which in turn is held in place by the Bakelite cap 61 screw threaded on the upper end of the refill unit. This Bakelite cap is provided with an internal annular groove 62 so as to provide a weakened central portion so that the central portion will be blown outwardly to provide free venting of the device upon overload.

When an overload occurs, the fusible section 31 is ruptured and instantly the strain wire 32 is ruptured. The flexible leader 27 is immediately blown laterally from the device through the tube 30. At the same time the rod 36 is released and is drawn downwardly with extreme rapidity by means of the spring 39, thus establishing an auxiliary arc from the contact fingers 35 to the upper end of the rod 36. This auxiliary arc is drawn downwardly into proximity to the gas liberating material and breaks the container 49 and liberates a quantity of arc extinguishing gas which passes upwardly through the aperture 57 transversely of the main arc and is vented outwardly through the flaring vent passage 58, thus blowing transversely of the main arc and quickly extinguishing the main arc. the weakened central portion of the cap having blown off and providing free venting. The proportion of the parts is such that the plunger 36 is never withdrawn below the plug 45. The downward motion of the plunger 36 performs an additional function in that it extends the auxiliary arc and thus lengthens the distance between the rod 36 and the spring fingers 35 so as to prevent restriking after the main arc has been extinguished.

It is to be noted particularly that a violent blast of gas is projected transversely or crossways of the main arc and the arc extinguishing effect as a result of such violent transverse blast is confined to a restricted zone so as to have its maximum effect at this selected point and thus insure extinguishing of the main arc. When the main arc has been extinguished, it will be found that the plunger 36 is fully retracted and consequently there is no danger of restriking though the path where the main arc had existed is relatively short.

After the device has operated, the circuit interrupter may be removed and may be refused. In refusing, a new refill or renewable unit is substituted for the previously used unit. This is easily accomplished by removing the lower screw cap 43 and screwing the threaded end of an instrument, not shown, into the threaded aperture 44 and pulling the lower head 41 outwardly a slight distance. Thereafter the disk like nut 42 is removed and the head 41 is allowed to be retracted inwardly by the spring 36. Thereafter the union nut 21 is unscrewed and the upper unit is bodily removed. Subsequently the upper head 40 is unscrewed from the rod 36. A new unit is then positioned by screwing the upper head 40 onto the rod 36 of a new unit, the pin 48 in the slot 47 preventing rotation of the rod 36 with reference to the upper unit. After this has been accomplished, the upper unit or refill unit is positioned on the lower unit with the reduced portion 46 of the plug 45 positioned within the composite lower tube 18, 17. Thereafter the nut 21 of the union is tightened. The rod threaded into the lower head 41 is now pulled outwardly from the lower unit and the disk like nut 42 screwed onto the lower head 41. Thereafter the rod which had been used to pull the lower head outwardly is removed and the lower metal cap 43 is screwed into place and the circuit interrupter is ready for repositioning between the lower and upper stationary contacts.

The major part of a circuit interrupter is thus used over and over again and it has been found that in addition to this, the used refill units which are returned to the factory are so made that the major part of such units can be used in making new units.

While it is preferable to provide the slot 59 in the upper insulating plug or block 56, as this slot facilitates the assembling of the refill unit at the factory, nevertheless it is within the province of this invention to dispense with the transverse slot 59 and to use instead a transverse hole aligning with the hole through the fiber sleeve 30 though the assembling of the device is complicated by this construction. The fiber plug with the transverse hole therethrough in place of the slot is illustrated in section in Figure 6 and is indicated by the reference character 56'.

The invention may take other forms. For example as shown in Figure 5, a looped cord or heavy thread 63 may be employed to initially hold the plunger 36' in position. This thread or cord is looped over the strain wire 32 and is out of engagement with the upwardly looped fusible section 31. The upper end of the rod 36' is provided with an opening for the reception of the looped cord or thread 63. This cord or thread 63 is made of insulating combustible material and is partially or completely destroyed when the fuse link is ruptured.

It is to be noted from reference to Figure 3 that the opening 57 for the violent blast of gases is larger than the transverse slot 59. By having the opening 57 larger than the slot 59, there is no tendency for the arc to pass around the upward blast of gases and fail to be extinguished. Instead the upward blast of gases extinguishes the arc in a reliable and effective manner even for heavy voltage, heavy duty circuits and under heavy overload.

It is to be noted also that the transverse passage for the main arc is relatively short and consequently high pressure cannot build up in this passage as it is freely vented laterally to the outside air. In addition to this, the pressure within the refill unit is resisted by the composite tube which is reinforced by the surrounding upper terminal 9 and the lower ring like portion 22 of the metal union, thus imparting considerable strength to the refill unit.

It will be seen that novel forms of circuit interrupters have been provided in which the main arc channel is relatively short and the main arc is confined to a predetermined position so that a localized portion thereof may be violently acted on by a cross blast of arc extinguishing gas to extinguish the main arc, and in which an auxiliary arc is formed and led into proximity to gas liberating material and is elongated to prevent re-

striking after the main arc has been extinguished.

It will be seen further that the operation of the apparatus is very rapid even under high voltage, heavy overloads.

It is to be noted also that the refill units may be very easily substituted for previously used units and that no particular skill is required in their installation.

It will be seen also that the major part of the circuit interrupter can be used over and over again and in addition to this, that a large part of the refill units returned to the factory may be used in making new refill units.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. A circuit interrupter comprising a body portion having an elongated auxiliary arc channel and a relatively short main arc channel extending transversely of said auxiliary arc channel, said body portion having venting means located on one side of said main arc channel, gas liberating means within said auxiliary arc channel located on the other side of said main arc channel adapted to liberate gas when acted upon by an arc, means adapted to interrupt a circuit and establish a main arc in said main arc channel, and means in said auxiliary arc channel for establishing an auxiliary arc in proximity to said gas liberating means in series with said main arc and for elongating said auxiliary arc.

2. A circuit interrupter comprising a body portion having an elongated auxiliary arc channel and a relatively short main arc channel, means adapted to interrupt a circuit and establish a main arc in said main arc channel, gas liberating means in said auxiliary arc channel adapted to liberate gas when acted upon by an arc, means in said auxiliary arc channel for establishing an auxiliary-arc in proximity to said gas liberating means in series with said main arc and for elongating said auxiliary arc, and means for guiding the liberated gas under pressure into said main arc from said auxiliary arc channel.

3. A circuit interrupter comprising a body portion having an elongated auxiliary arc channel and a relatively short main arc channel, means adapted to interrupt a circuit and establish a main arc in said main arc channel, gas liberating means in said auxiliary arc channel adapted to liberate gas when acted upon by an arc, means in said auxiliary arc channel for establishing an auxiliary arc in proximity to said gas liberating means in series with said main arc and for elongating said auxiliary arc, and means for guiding the liberated gas transversely across said main arc.

4. A circuit interrupter comprising a body portion having an elongated auxiliary arc channel and a relatively short main arc channel extending transversely with respect to said auxiliary arc channel, said body portion having venting means for said auxiliary arc channel located on one side of said main arc channel, gas liberating means in said auxiliary arc channel located on the other side of said main arc channel and adapted to liberate gas when acted upon by an arc, a fuse link in said main arc channel extending transversely across said auxiliary arc channel and adapted to establish a main arc in said main arc channel on the occurrence of an overload, and biased means normally restrained by said fuse link and located in said auxiliary arc channel and adapted to establish an auxiliary arc in series with said main arc upon rupture of said fuse link and to draw said auxiliary arc into proximity to said gas liberating means and to extend said auxiliary arc.

5. A circuit interrupter comprising a body portion having a relatively long auxiliary arc channel extending lengthwise thereof and having a relatively short main arc channel extending transversely thereof and freely open at one end, a terminal adjacent the open end of said main arc channel, a fuse link extending from said terminal through said main arc channel transversely of said auxiliary arc channel and adapted to interrupt a circuit on overload and form a main arc transversely of said auxiliary arc channel, said main arc channel having an expulsion action, gas liberating means adapted to liberate gas when acted upon by an arc located in said auxiliary arc channel, means adapted to form an auxiliary arc in said auxiliary arc channel in proximity to said gas liberating means upon rupture of said fuse link, and means for directing the liberated gas transversely across said main arc.

6. A circuit interrupter comprising a body portion having a main arc channel and an auxiliary arc channel, gas liberating means in said auxiliary arc channel adapted to liberate gas when acted upon by an arc, a fuse link in said main arc channel adapted to rupture on overload and establish a main arc in said main arc channel, biased movable means in said auxiliary arc channel normally restrained by said fuse link and adapted to establish an auxiliary arc in series with said main arc and in proximity to said gas liberating means upon rupture of said fuse link, heat insulating means surrounding said biased movable means, and means for directing the liberated gas into said main arc from said auxiliary arc channel.

7. A circuit interrupter comprising a body portion having a main arc channel and an auxiliary arc channel, gas liberating means in said auxiliary arc channel adapted to liberate gas when acted upon by an arc, a fuse link in said main arc channel adapted to rupture on overload and establish a main arc in said main arc channel, biased movable means in said auxiliary arc channel normally restrained by said fuse link and adapted to establish an auxiliary arc in series with said main arc and in proximity to said gas liberating means upon rupture of said fuse link, heat insulating means carried by and surrounding said biased movable means, and means for directing the liberated gas into said main arc from said auxiliary arc channel.

8. A circuit interrupter comprising a body portion having a main arc channel and an auxiliary arc channel, gas liberating means in said auxiliary arc channel adapted to liberate gas when acted upon by an arc, a fuse link in said main arc channel adapted to rupture on overload and establish a main arc in said main arc channel, biased movable means in said auxiliary arc channel for establishing an auxiliary arc in series with said main arc and in proximity to said gas liberating means upon rupture of said fuse link, insulating means mechanically interposed between said fuse link and said biased movable means for mechanically restraining said biased movable means while said fuse link is intact, and means for directing the liberated gas into said main arc.

9. A circuit interrupter comprising a body por-

tion having a main arc channel and an auxiliary arc channel, gas liberating means in said auxiliary arc channel adapted to liberate gas when acted upon by an arc, a fuse link in said main arc channel adapted to rupture on overload and establish a main arc in said main arc channel, biased movable means in said auxiliary arc channel for establishing an auxiliary arc in series with said main arc and in proximity to said gas liberating means upon rupture of said fuse link, insulating means mechanically interposed between said fuse link and said biased movable means for mechanically restraining said biased movable means while said fuse link is intact, means for directing the liberated gas into said main arc, and means for elongating at least one of said arcs.

10. A circuit interrupter comprising a body portion having a main arc channel and an auxiliary arc channel, gas liberating means in said auxiliary arc channel adapted to liberate gas when acted upon by an arc, a fuse link in said main arc channel adapted to rupture on overload and establish a main arc in said main arc channel, biased movable means in said auxiliary arc channel for establishing an auxiliary arc in series with said main arc and in proximity to said gas liberating means upon rupture of said fuse link, insulating means mechanically interposed between said fuse link and said biased movable means for mechanically restraining said biased movable means while said fuse link is intact, means for directing the liberated gas into said main arc, and means for elongating said auxiliary arc to prevent restriking after said main arc has been extinguished.

11. A circuit interrupter comprising a body portion having a main arc channel and an auxiliary arc channel, gas liberating means in said auxiliary arc channel adapted to liberate gas when acted upon by an arc, a fuse link in said main arc channel adapted to rupture on overload and establish a main arc in said main arc channel, biased movable means in said auxiliary arc channel for establishing an auxiliary arc in series with said main arc and in proximity to said gas liberating means upon rupture of said fuse link, insulating means rigid with and carried by said biased movable means and mechanically interposed between said fuse link and said biased movable means for mechanically restraining said biased movable means while said fuse link is intact, and means for directing the liberated gas into said main arc.

12. A circuit interrupter comprising a body portion having a main arc channel and an auxiliary arc channel, gas liberating means in said auxiliary arc channel adapted to liberate gas when acted upon by an arc, a fuse link in said main arc channel adapted to rupture on overload and establish a main arc in said main arc channel, biased movable means in said auxiliary arc channel for establishing an auxiliary arc in series with said main arc and in proximity to said gas liberating means upon rupture of said fuse link, combustible insulating means mechanically interposed between said fuse link and said biased movable means for mechanically restraining said biased movable means while said fuse link is intact, and means for directing the liberated gas into said main arc.

13. A circuit interrupter comprising a body portion having a main arc channel and an auxiliary arc channel, gas liberating means in said auxiliary arc channel adapted to liberate gas

when acted upon by an arc, a fuse link in said main arc channel adapted to rupture on overload and establish a main arc in said main arc channel, said fuse link including a fusible section and a strain wire, a first terminal, said fuse link having one end connected to said first terminal, a conductor within said body portion electrically connected to the other end of said fuse link, biased movable means normally electrically connected to said conductor and located in said auxiliary arc channel for establishing an auxiliary arc in series with said main arc and in proximity to said gas liberating means upon rupture of said fuse link, a second terminal electrically connected to said biased movable means, insulating means mechanically interposed between said strain wire and said biased movable means for mechanically restraining said biased movable means while said fuse link is intact, and means for directing the liberated gas into said main arc.

14. A circuit interrupter comprising a body portion having a main arc channel and an auxiliary arc channel, gas liberating means in said auxiliary arc channel adapted to liberate gas when acted upon by an arc, a fuse link in said main arc channel adapted to rupture on overload and establish a main arc in said main arc channel, a first terminal, said fuse link having one end connected to said first terminal, a conductor within said body portion electrically connected to the other end of said fuse link, biased movable means normally electrically connected to said conductor and located in said auxiliary arc channel for establishing an auxiliary arc in series with said main arc and in proximity to said gas liberating means upon rupture of said fuse link, a second terminal electrically connected to said biased movable means, insulating means mechanically interposed between said fuse link and said biased movable means for mechanically restraining said biased movable means while said fuse link is intact, and means for directing the liberated gas into said main arc.

15. A circuit interrupter comprising a body portion having a main arc channel and an auxiliary arc channel extending transversely of said main arc channel, said main arc channel having an open end and said auxiliary arc channel having venting means adjacent one end, a terminal adjacent the open end of said main arc channel, a fuse link having one end connected to said terminal and located within said main arc channel and adapted to interrupt a circuit on overload and form a main arc in said main arc channel transversely of said auxiliary arc channel, gas liberating means located in said auxiliary arc channel adapted to liberate gas when acted upon by an arc, said gas liberating means and said venting means being located on opposite sides of said main arc channel, biased mechanically movable means electrically connected to and normally restrained by said fuse link and adapted to form an auxiliary arc in said auxiliary arc channel in proximity to said gas liberating means upon rupture of said fuse link, and a second terminal electrically connected to said biased mechanically movable means.

16. A circuit interrupter comprising two main portions: one of said main portions including a body portion and retracting means carried by said body portion; the other of said main portions constituting a renewable portion and including an insulating member having an auxiliary arc channel and a main arc channel extending transversely across said auxiliary arc channel, gas

liberating means adapted to liberate gas when acted upon by an arc located in said auxiliary arc channel, a fuse link in said main arc channel adapted to rupture and form a main arc transversely of said auxiliary arc channel on overload, and a retractable member within said auxiliary arc channel detachably attached to the said retracting means of said first portion and normally restrained by said fuse link and adapted to draw an auxiliary arc into proximity to said gas liberating means upon rupture of said fuse link; said two main portions having interengaging portions for detachably locking said two main portions together.

17. A circuit interrupter comprising two main portions: one of said main portions including a body portion and retracting means within said body portion; the other of said main portions constituting a renewable portion and including a second body portion having an auxiliary arc channel extending lengthwise thereof and a main arc channel extending transversely thereof across said auxiliary arc channel, gas liberating means adapted to liberate gas when acted upon by an arc located in said auxiliary arc channel, a fuse link in said main arc channel adapted to rupture

and form a main arc transversely of said auxiliary arc channel on overload, and a retractable member within said auxiliary arc channel detachably attached to the said retracting means of said first portion and normally restrained by said fuse link and adapted to draw an auxiliary arc into proximity to said gas liberating means and to elongate said auxiliary arc upon rupture of said fuse link; said two main portions having interengaging portions for detachably locking said two main portions together.

RALPH H. EARLE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
465,893	Fisher	Dec. 29, 1891
2,091,430	Conrad	Aug. 31, 1937
2,100,413	Steinmayer	Nov. 30, 1937
Re. 20,450	Hill	July 20, 1937
1,859,377	Boudion	May 24, 1932
2,386,886	Earle et al.	Oct. 16, 1945