May 13, 1958 F. J. CHAREWICZ ET AL 2,834,856

LOAD BREAK DEVICE

Filed Sept. 11, 1956 2 Sheets-Sheet 1

Fig. 1.

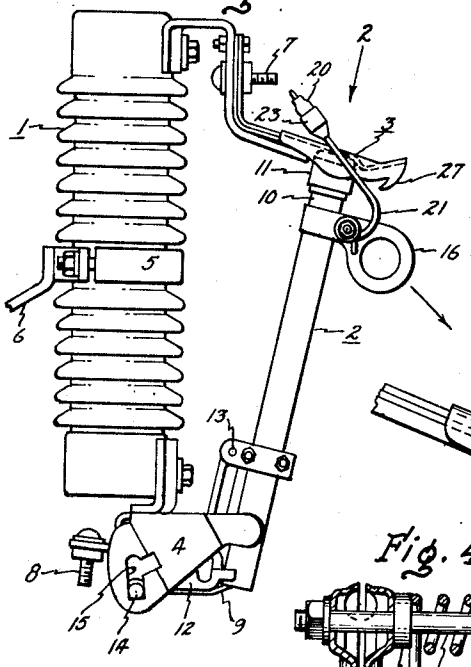



Fig. 2.

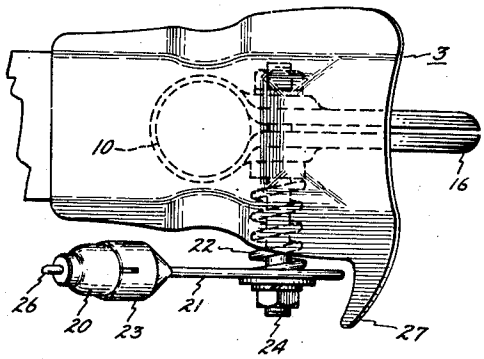



Fig. 3.

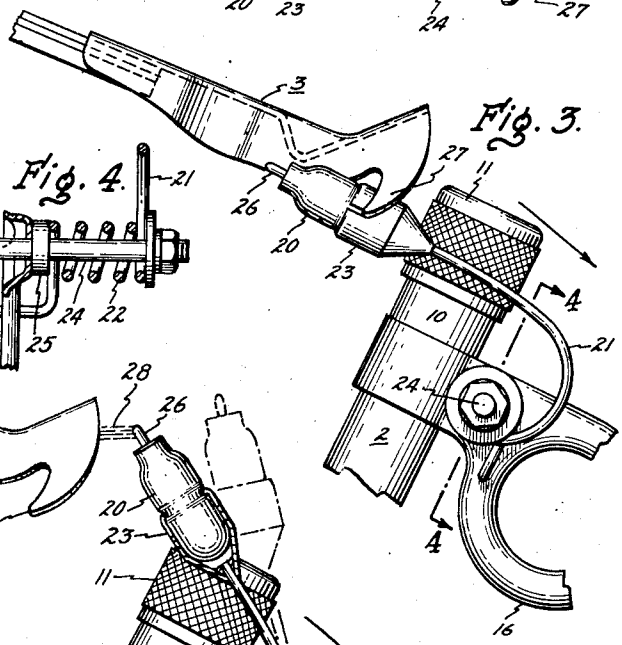



Fig. 4.



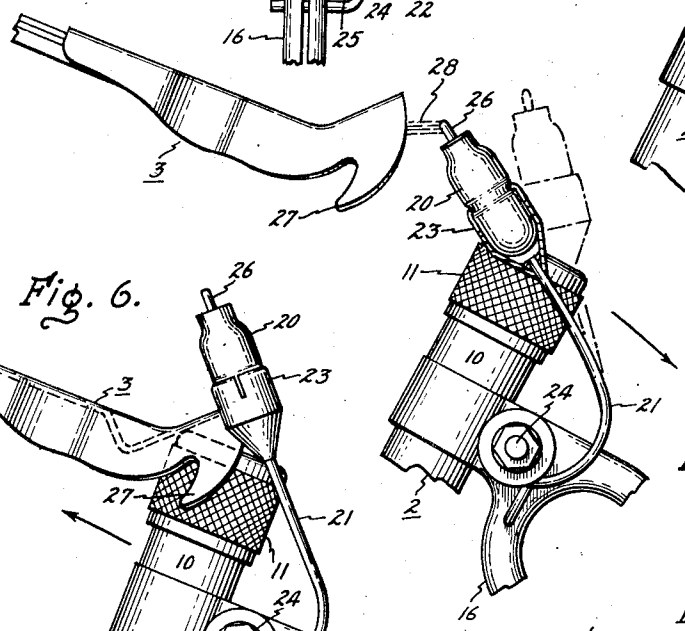




Fig. 5.

Fig. 6.




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LOAD BREAK DEVICE

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2 Sheets-Sheet 2

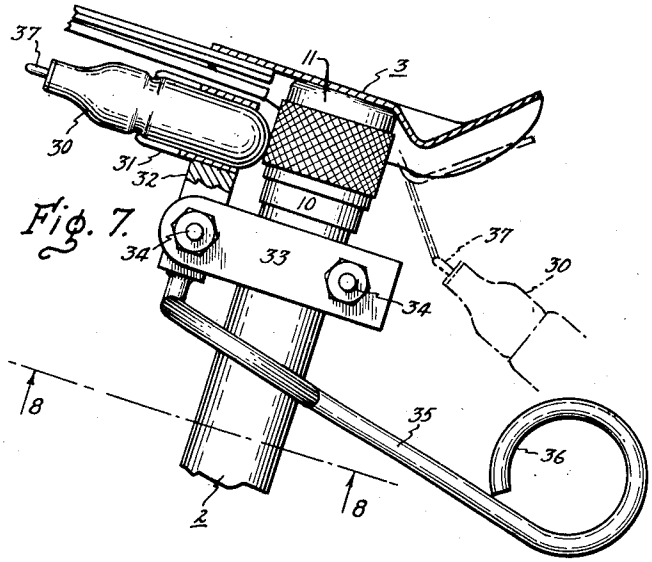



Fig. 7.

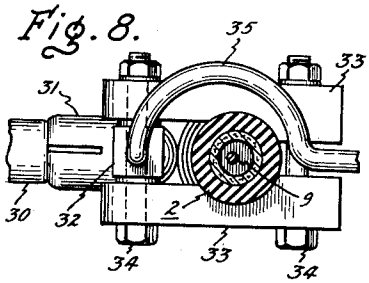



Fig. 8.

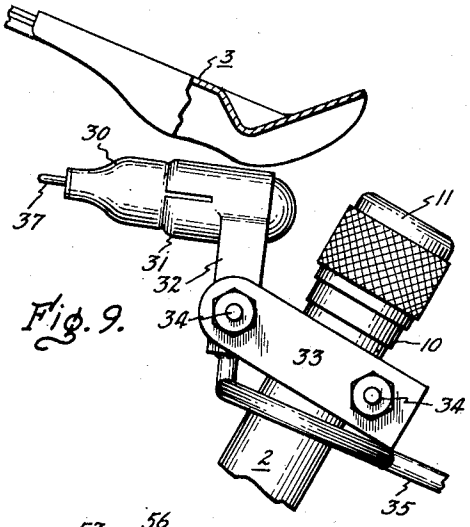



Fig. 9.

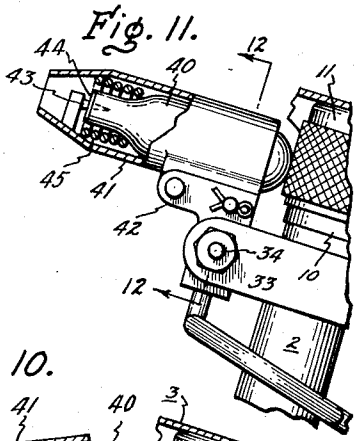



Fig. 11.

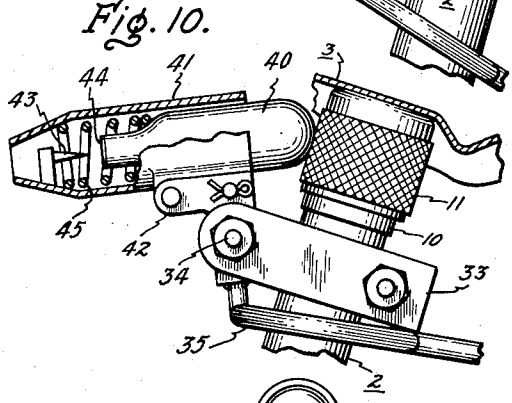



Fig. 10.

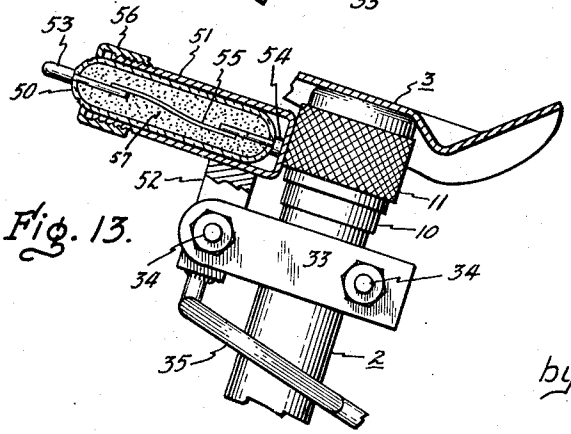



Fig. 13.

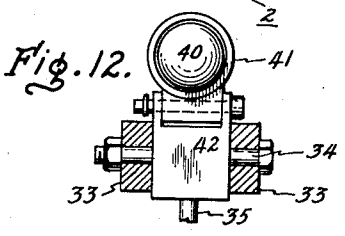



Fig. 12.

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United States Patent Office 2,834,856 Patented May 13, 1958



2,834,856

# LOAD BREAK DEVICE

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Application September 11, 1956, Serial No. 609,219

19 Claims. (Cl. 200—148)

This invention relates to a load break device, and more particularly, to a load break device of the general type comprising a very small expendable and replaceable cartridge, case, capsule or receptacle of high pressure blast generating material which is utilized to interrupt the electrical arc accompanying manual opening of a switch.

By a switch is meant a manually operable switch such as a disconnect blade, as well as manually and automatically operable circuit interrupters such as enclosed or open type cutouts.

The invention is an improvement on the load break device disclosed and broadly claimed in copending Carpenter and Smith patent application Serial No. 578,995, filed April 18, 1956, and assigned to the same assignee as the instant case.

In the forms of the invention illustrated in the drawing of said copending application the cartridge is shown as being located in the lower end of an enclosed type cutout although the invention is not necessarily restricted to such location of the cartridge. The cartridge could be positioned in the upper end of the enclosed cutout. However, such location of the cartridge may tend to complicate the upper end of the cutout. Also, if the cartridge is positioned in the upper end of the cutout there may be a greater danger of accidental initiation of the high pressure blast from the cartridge during closing movement of the cutout door unless special precautions are taken. By positioning the cartridge in the lower end of the cutout the danger of accidental firing is minimized since the lower contacts are closed before an arc is drawn between the upper contacts during closing movement of the door. Also, since the lower contacts are isolated from each other when the door is opened the lower end of the cutout is a practical place at which to draw an arc to the cartridge to initiate the high pressure blast. Inasmuch as the cutout is enclosed the high pressure blast from the cartridge will be reflected from the rear of the cutout housing across the arc drawn between the upper contacts or the high pressure blast may be directed directly across the electrical arc to be interrupted.

However, in open type cutouts there is no enclosed housing from which to reflect a high pressure blast. Also, in some forms of open type cutouts the lower contacts are not isolated from each other when the cutout is open. This means that if an electrical arc is to be drawn to the cartridge to fire the same it would be more practical to do this at the upper contacts. However, locating the cartridge at the upper end of the cutout still poses the problems of accidental initiation of the high pressure blast during closing of the cutout and possible complication of the upper end of the cutout.

It is desirable for a load break device to be uncomplicated, low cost, and have a relatively small number of parts for several reasons. Since load break devices are operated rather infrequently a high cost is not warranted. Also, if the load break device is complicated or has a relatively large number of parts it may be more apt to be faulty or inoperative when its service is required. For



instance, some prior art load break devices have rather complicated mechanical mechanisms which are apt to stick, jam, or become corroded, and particularly after installation and exposure to the weather for some time. These requirements that the load break device be uncomplicated and low cost, and have a relatively small number of parts generally speaking are in direct opposition to the requirement that no high pressure blast be accidentally initiated during closing movement of the cutout.

It is an object of this invention to provide a reliable, uncomplicated, and low cost load break device for open type switches and cutouts.

In our invention the load break device comprises a very small expendable and replaceable capsule of high pressure blast generating material or an electrical arc interrupting capsule. In the preferred forms of our invention the capsule is carried by the latched end of a switch member or fuseholder in a very uncomplicated manner which requires a very small number of parts. Means is provided for automatically or manually conditioning the capsule to be effective to interrupt an electrical arc which is drawn to said latched end when the switch member or fuseholder is being manually opened, but to otherwise automatically or manually render the capsule inactive, as when an electrical arc is being drawn to said latched end when the switch member or fuseholder is being manually closed. This means is likewise very uncomplicated and has a very small number of parts.

The subject matter which we regard as our invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. Our invention, however, both as to its organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings in which

Fig. 1 is a side elevation view of one form of our invention in the closed position; and

Fig. 2 is an enlarged top view of the load break device of Fig. 1 when viewed in the direction of arrow 2 of Fig. 1; and

Fig. 3 is an enlarged side elevation view similar to that of Fig. 1 just after unlatching of the switch member; and

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 3; and

Fig. 5 is a side elevation view similar to that of Fig. 3 just after the capsule has left the latch; and

Fig. 6 is an enlarged side elevation view to illustrate the position and operation of the parts during closing of the switch; and

Fig. 7 is a side elevation view of a second form of our invention at the start of opening of the switch member; and

Fig. 8 is a sectional view taken along the line 8—8 of Fig. 7; and

Fig. 9 is a side elevation view illustrating the position and operation of the parts during closing of the switch; and

Fig. 10 is a side elevation view of a third form of our invention in the closed position; and

Fig. 11 is a side elevation view during opening movement; and

Fig. 12 is a sectional view taken along the line 12—12 of Fig. 11; and

Fig. 13 is a side elevation view of a fourth form of our invention at the start of opening of the switch member.

Like reference numerals will be used throughout Figs. 1–13 to indicate identical parts.

Referring now particularly to Fig. 1, illustrated therein is an open type switch which comprises an elongated electrical insulator 1 and an elongated switch member

or fuseholder 2. This switch is an open type fused cutout of the kind more particularly described in Strobel Patent 2,685,013, issued July 27, 1954, and assigned to the same assignee as the instant case. The insulator 1 has a contact latch 3 mounted on the upper end thereof and a hinge element 4 mounted at the lower end thereof. A mounting strap 5 surrounds the central portion of the insulator 1 so that the switch can be mounted from the crossarm of a line pole or the like by virtue of a support bracket 6 which is connected to the strap 5. Obviously the latch 3 and hinge element 4 need not necessarily be mounted on an elongated insulator but may also be connected to two smaller insulators which are spaced with respect to each other and are suitably connected to a supporting or mounting structure. The insulator 1 may comprise porcelain or other appropriate electrical insulating material. The fuseholder 2 is of the type which will automatically interrupt an overcurrent and drop out to the open position. As will be more apparent hereinafter in our invention the load break device does not interfere with automatic dropout action of the fuseholder if such action is desired. Additionally, the holder 2 need not necessarily be a fused circuit interrupter but may comprise other types of electrical circuit interrupters. Also, in our invention a switch member such as a disconnect blade could be substituted for the fuseholder 2.

The contact latch 3 has a terminal 7 connected thereto for receiving an electrical line lead, and the hinge element 4 has a terminal 8 for receiving another electrical line lead. The upper end of the fuseholder 2 is latched closed by the latch 3 and the lower end of the fuseholder is pivoted or hinged to the hinge element 4. Accordingly, an electrical circuit is completed between the terminals 7 and 8 through the fuseholder 2.

The fuseholder 2 has an eletrical fuse link 9 disposed therein. The upper end of the fuseholder 2 has a metallic collar 10 secured thereto. The upper end of the fuse link 9 is electrically connected to the collar 10 as well as to a closure contact cap 11 for the upper end of the fuseholder 2 inasmuch as the upper end of the fuse link 9 is clamped between the collar 10 and cap 11 in a manner which is well known to those skilled in the art.

The fuseholder 2 has an electrical fuse link 9 disposed lating material and the interior thereof is so constructed whereby electrical arc extinguishing gases are generated within holder 2 when the fuse link 9 is ruptured to cause a gaseous expulsive action out of the lower open end of the holder 2. Such gaseous expulsive action may be obtained by lining or coating the interior of the holder 2 with a material which will evolve electrical arc extinguishing gases when subjected to an electrical arc or the heat thereof.

The holder 2 has a generally L-shaped metallic member 12 pivotally connected at the upper end thereof to the holder 2 at the pivot point 13. The lower left-hand end of the member 12 has a pair of trunnions 14 formed thereon which are adapted to be received in a pair of bearing grooves 15 formed in the hinge element 4. The holder 2 and member 12 together comprise a toggle. The fuse link 9 is brought out of the lower open end of the holder 2 and is tautly fastened to the member 12 to keep the right-hand side thereof butted up against the holder 2. The member 12 also has a not shown contact portion formed thereon which is engaged with a not shown contact portion of hinge 4 when the fuseholder 2 is in its closed position. This is described in greater detail in said Strobel Patent 2,685,013.

When the fuseholder 2 is latched closed an electrical circuit is completed from the terminal 7 through the latch 3, cap 11, fuse link 9, member 12, hinge element 4, to the terminal 8. If an overcurrent occurs in this electrical circuit the fuse link 9 will be melted. This means that the holder 2 and the member 12 are no longer immovably connected with respect to each other whereby the holder 2 is free to drop in a downward direction to disengage itself from the latch 3. It will be appreciated that this downward movement of the holder 2 during self unlatching is accompanied by pivotal movement of the holder 2 about the point 13 with respect to the member 12 as well as pivotal movement of the member 12 with respect to the hinge element 4 about the pivot point 14. Such movement results in extraction of the lower fused end of the fuse link 9 from within the holder 2 and simultaneously gases are evolved within the holder 2 and expelled out of the lower open end of the holder. Removal of the fuse link 9 from within the holder 2 results in elongation of the electrical arc and the expulsive gaseous action also contributes to extinguishment of the fuse arc. The fuseholder 2 will ultimately drop down to a position which is reversed with respect to that shown in Fig. 1 whereby the lower end of the fuseholder will be positioned above the upper end. In our invention the load break device does not interfere with dropout action of the holder 2. After the holder 2 drops out to a full open position it can be unhinged from the hinge element 4 and re-fused and then rehinged with respect to the hinge element 4 and fully closed.

Sometimes it is desired to manually interrupt the electrical circuit as when it is desired to make repairs on electrical equipment on the line. This can be accomplished by manually opening the fuseholder 2. An eyelet handle 16 is connected to the upper end of the fuseholder and this eyelet handle is adapted to receive the hook of a conventional switch stick whereby the holder 2 may be manually pivoted open. During manual opening of the fuseholder 2 the fuse link 9 is intact whereby an electrical arc is drawn between the latch 3 and the contact cap 11 as these two parts are being separated. If the line is carrying heavy currents at high voltages this arc will persist even if the fuseholder 2 is moved to the fully opened position. It will be appreciated that this condition is dangerous to the safety of the lineman even though he may be opening the switch with a switch stick. Also this condition may have an injurious effect on the cutout parts as well as cause a short circuit to ground. For instance, a high wind may blow the heavy arc into the lineman or into contact with a grounded object. Also, heavy arcing has a corrosive effect on the cutout parts. This arc may be interrupted by reclosing the fuseholder 2. However, if heavy currents at high voltages are present on the line similar arcs will be drawn between the latch 3 and the cap 11 on subsequent reopenings of the fuseholder 2. For this reason a load break device is very desirable.

Referring now also to Figs. 2–6, in the first form of our invention the load break device comprises a very small expendable and replaceable cartridge, case, capsule, or receptacle of high pressure blast generating material which is utilized to interrupt the electrical arc accompanying manual opening of the switch. For instance, a cartridge 20 may be filled with compressed gas such as carbon dioxide, nitrogen, or sulphur hexafluoride, or chemical compounds which will evolve a gas blast when subjected to an electrical arc, or even gunpowder. The capsule 20 is pivotally connected to the upper end of the fuseholder 2 by a spring finger 21 of a spring 22. A capsule holder 23 is connected to the spring finger 21 at the upper end thereof and the lower end of the spring 22 is coiled about a stud 24 and then connected to the eyelet handle 16. The eyelet handle 16 may be fabricated from a metallic strip which has two eyelets formed at the opposite ends of the strip. This strip is folded about the collar 10 so as to be in electrical contact therewith and then the folded strip is bolted to the collar by the stud 24 with the two eyelets of the strip being in registration with each other. Thus, as probably best illustrated in Fig. 4, the stud 24 has a pair of nuts at the opposite ends thereof and a collar 25 between the nuts.

Opposite portions of the eyelet handle **16** are disposed between one of the nuts and the collar **25**, and the coiled portion of spring **22** is disposed between the other one of the nuts and the collar **25**. However, the particularly illustrated manner of connecting the spring finger **21** to the upper end of the fuseholder **2** is not absolutely necessary. Obviously other equivalent means could be employed for performing this function. The important consideration is that the spring finger **21** be electrically connected to the contact cap **11** so that when the fuseholder **2** is opened an electrical arc will be drawn from the latch **3** to the cartridge **20** instead of to the cap **11**.

The upper end of the capsule **20** has a tip **26** formed thereon which is hollow and very thin walled so that an electrical arc can easily burn therethrough to initiate a high pressure blast from the capsule **20**. In the closed position of the fuseholder **2** the spring finger **21** extends across the generally horizontal plane of the latch **3** along the left-hand edge thereof when the switch is viewed from the right-hand side. Also, along said left-hand edge adjacent to the outer end of the latch **3** is formed a tab or catch **27**. Obviously the parts could be reversed to place the catch **27** and the spring finger **21** with its capsule **20** on the right-hand side of the switch. In the inactive position of the load break device illustrated in Fig. 1 the capsule **20** is positioned above the horizontal plane of the latch **3** as well as above the contact **11**, and the catch **27** is disposed in front of the spring finger **21**.

When the fuseholder **2** is opened the catch **27** will deflect the spring finger **21** downwardly slightly and the spring finger **21**, capsule holder **23**, and the capsule **20** will slide along the catch **27**. The contact cap **11** will break contact with the latch **3** before the capsule **20** breaks contact with the latch **3** and the tip **26** will be the last point of electrical contact between the latch **3** and the upper end of the fuseholder **2**. Accordingly, an electrical arc **28** drawn between the latch **3** and the upper end of the fuseholder **2** will be established between the latch **3** and the tip **26** of the capsule **20**. This action is illustrated in Figs. 3 and 5. The electrical arc **28** will burn through the tip **26** and initiate a high pressure blast across the electrical arc **28**. If a compressed gas such as carbon dioxide gas is contained within the capsule **20** the sudden escape of this gas therefrom will have a cooling effect on the termini of the electrical arc **28** at the latch **3** and the upper end of the capsule **20** as well as on the arc itself. Such high pressure blast as well as this cooling effect either alone or in combination will be effective to extinguish the electrical arc **28**.

After the cartridge **20** leaves the latch **3** it will return from its slightly downwardly deflected position to its inactive position illustrated in Figs. 1 and 6. This return of the load break device to its inactive position is automatic by virtue of the resiliency of the spring finger **21** whereby when the used cartridge **20** is replaced with a new cartridge the new cartridge will not be accidentally fired during manual closing of the fuseholder **2**. It will be appreciated that as the fuseholder **2** is being pivoted closed an electrical arc may be established between the latch **3** and the upper end of the fuseholder and during this time it is desirable for such electrical arc to be drawn between the latch **3** and the cap **11** instead of between the latch **3** and the capsule **20** so that the new capsule will be preserved for use during a subsequent manual opening of the switch. As illustrated in Fig. 6, during closing movement of the switch the capsule **20** and its tip **26** is positioned well above the contact cap **11** so that any arc which is drawn between the latch **3** and the upper end of the fuseholder **2** will extend from the latch **3** to the contact cap **11**. Referring also to Fig. 2, it will be seen that due to the particular curvature given to the outermost edge of the catch **27** the catch **27** will not interfere with full closure of the switch. The spring finger **21** will be deflected slightly in a sidewise direction away from the fuseholder **2** and slide along the catch **27** as the switch is being fully closed after which spring finger **21** will ultimately pass the catch **27** and snap back to its position illustrated in Figs. 1 and 2. This action is automatic and due to the inactive position of the load break device as illustrated in Figs. 1 and 2 it will now be readily apparent that the load break device will not interfere with automatic dropout action of the fuseholder **2** if such action is provided for in the open type cutout.

Referring now to Figs. 7–9, in the second form of our invention the load break device is manually inactivated during closing movement of the switch and is manually conditioned to be effective in interrupting the electrical arc during opening of the switch. The cartridge **30** is carried in front of the cap **11** by a cartridge holder **31**. The cartridge holder **31** is in turn carried by a member **32** which is pivotally connected to and carried by the upper end of the fuseholder **2**. The member **32** is connected to the upper end of fuseholder **2** by virtue of a clamp which comprises a pair of clamping blocks **33** and bolts **34**. The member **32** is pivoted to the left-hand bolt **34** and the blocks **33** are constructed from electrical insulating material or are spaced from the collar **10** so that the cartridge **30** preferably is electrically connected to the cap **11** only when its rear end butts up against the cap **11**. An operating handle **35** which has an eyelet **36** formed at the outer end thereof is connected at the inner end thereof to the lower end of the member **32** such as by welding, or the members **32** and **35** may comprise integral extensions of each other. As illustrated in Fig. 9, when the switch is being closed the handle **35** is pushed upwardly and toward the left. This causes the cartridge **30** to pivot away and out of contact with the cap **11**. This means that the cartridge **30** is not electrically connected to the cap **11** whereby if an electrical arc is drawn between the latch **3** and the upper end of the fuseholder **2** during closing movement of the switch, said electrical arc will be drawn between the latch **3** and the cap **11** instead of between the latch **3** and the tip **37** of the cartridge **30**. Forward pivotal movement of the cartridge **30** away from the cap **11** is limited by abutment of a central portion of the handle **35** with the underside of the clamping blocks **33** in the manner illustrated in Fig. 9. When it is desired to manually interrupt the load current the handle **35** is pulled downwardly and outwardly to the position illustrated in Fig. 7. This causes the cartridge **30** to pivot toward the cap **11** and be placed in electrical contact with the cap **11**. The cap **11** leaves the latch **3** before the capsule **30** and the tip **37** is the last point of electrical contact between the latch **3** and the upper end of the fuseholder **2** whereby an electrical arc is drawn between the latch **3** and the tip **37** in the manner illustrated in broken line outline in Fig. 7. Said arc will burn through the tip **37** and cause a high pressure blast to emanate from the cartridge **30** to interrupt said arc. If it is desired to have no arcing to the cap **11** when closing the fuseholder in order to prohibit corrosion of cap **11** by arcing the blocks **33** may be made from conducting material and be placed in contact with the collar **10** whereby the cartridge **30** and holder **31** are at all times in electrical contact with cap **11**. However, when the fuseholder is being closed no arc will be drawn to tip **37** since the cartridge **30** is still pivoted away from cap **11**, and the arc which is drawn to the upper end of the fuseholder is drawn to the holder **31** instead of to the cap **11**.

The third form of our invention illustrated in Figs. 10–12 is similar to the second form of the invention except that the high pressure blast is manually initiated by mechanical puncturing of the cartridge but the load break device is automatically held in an inoperative condition during closing movement of the switch. The cartridge **40** is carried by a cartridge holder **41** which in turn is removably connected to a member **42** which is pivotally connected to one of the bolts **34** and the operating handle

35. The cartridge 40 is freely slidable within the cartridge holder 41 and protrudes at its rear end through the rear end of holder 41 whereby the rear end of the cartridge 40 is in continuous contact with the cap 11. Within the forward end of the holder 41 is positioned a sharp barb 43 which is adapted to puncture the front end of the cartridge 40 when the handle 35 is moved towards the right and downwardly to open the switch. The front end of cartridge 40 is closed by a very thin diaphragm 44 which may be readily punctured by the barb 43 whereby a high pressure blast will be released from within the cartridge 40 out through the front open end of the holder 41. The front end of the holder 41 is tapered slightly and positioned between this tapered portion and the cartridge 40 is a spring 45 which continuously urges the cartridge 40 against the cap 11 and the cartridge holder 41 in a pivotal direction away from the cap 11 so that the barb 43 is spaced from the diaphragm 44 except when the switch is being manually opened. As illustrated in Fig. 11 when the handle 35 is moved outwardly and downwardly the cartridge holder 41 is caused to pivot toward the cap 11 whereby the diaphragm 44 is punctured by the barb 43. Simultaneously the cartridge 40 is caused to roll or pivot about its rear end on the cap 11 whereby the punctured end of the cartridge 40 will be pointed towards the latch 3. The last point of electrical contact between the latch 3 and the upper end of the fuseholder 2 is at the restricted forward end of the cartridge holder 41. That is, the path of electrical current flow between the latch 3 and the upper end of the fuseholder 2 is along an arc which extends between the latch 3 and the front end of cartridge holder 41 and then through the cartridge holder 41, spring 45, and cartridge 40 to the cap 11. When the diaphragm 44 is punctured a high pressure blast of gas will be released therefrom across and into the arc to extinguish the same.

Referring now to Fig. 13, in the fourth form of our invention the capsule or cartridge 50 is constructed from frangible electrical insulating material. The cartridge 50 is carried by a metallic cartridge holder 51 which is pivotally connected to the upper end of the fuseholder 2 at the bolt 34 by the member 52 which carries the cartridge holder 51. At the front of the cartridge 50 is a metallic terminal or tip 53 and at the rear of the cartridge 50 is a metallic terminal 54. The terminals 53 and 54 are interconnected by a fusible element 55. The cartridge 50 is filled with a material 57 which is adapted to generate copious quantities of electrical arc extinguishing gases or vapors. For instance, the capsule 50 may be filled with boric acid powder which will evolve gases at high fuse currents or it may be filled with a liquid such as water which will evolve vapors. A cap 56 or other equivalent means on the front end of the cartridge holder 51 forces the terminal 54 into electrical contact with the rear of the cartridge holder 51. When the switch is being manually closed the handle 35 is moved upwardly which causes the rear of the cartridge holder 51 to move away from the cap 11 whereby electrical contact therebetween is broken. When the switch is being manually opened the member 52 is pivoted in a right-hand direction which places the rear of cartridge holder 51 in electrical contact with the cap 11. Accordingly the last point of electrical contact between the latch 3 and the upper end of the fuseholder 2 will be at the terminal tip 53 which projects a slight distance from the front of capsule 50. An arc will be drawn between the latch 3 and the tip 53 and the path of electrical current flow will be from tip 53 through the fusible element 55, terminal 54, and the rear of cartridge holder 51 to the cap 11. The current will melt the fusible element 55. If the current is relatively high, high gas or vapor pressures will be generated from the cartridge filler material 57 whereby the cartridge 50 will be fractured and a high pressure blast will be directed across and into the electrical arc between latch 3 and tip 53. In order for the cartridge 50 to be frangible it may be constructed from electrical insulating material such as glass although the invention is not necessarily restricted thereto inasmuch as other electrical insulating materials which will burst under high pressures can be utilized. At low electrical currents the element 55 will fuse and the fuse arc may be extinguished within the cartridge 50 before sufficient pressures are built up within the cartridge 50 to fracture the same. That is, the various part of the cartridge 50 may be so constructed and calibrated such that the electrical circuit is interrupted within the cartridge 50 without rupture of the same at low currents but at high currents the electrical circuit may be interrupted by fracture of the cartridge 50 and an accompanying high pressure blast across and into the electrical arc. However, it will be appreciated that this difference in extinguishing the electrical circuit depending upon whether the current is a relatively low or high one is not absolutely necessary. For instance, the arrangement may be such whereby the cartridge 50 is exploded at both low and high currents with the electrical circuit being interrupted by a high pressure blast and the arc cooling effect of the filler material 57. Alternately, the arrangement may be such whereby the electrical circuit will be interrupted at both low and high currents within the cartridge 50 without explosion of the same. Also, as explained with respect to Figs. 7 to 9 the blocks 33 may be made from conducting material and be placed in contact with collar 10 to draw the arc upon closing movement of the fuseholder to the holder 51 instead of to the cap 11. However, in this arrangement too, the arc is not drawn to the tip 53 when the fuseholder is being closed since when the fuseholder is being closed the cartrigde 50 and holder 51 are pivoted away from the cap 11.

In our invention means is provided whereby the arc interrupting cartridges 20, 30, 40 and 50 are not expended when the fuseholder 2 is being closed in on the contact latch 3 which is adapted to have an electrically energized or live section or branch line connected to the terminal 7 thereof. It will occur to those skilled in the art that it is possible for such means to be omitted and for the cartridges to be mounted on the fuseholder after it has been closed. However, this procedure is not recommended since it would be a threat to the safety of the lineman. Of course if such a procedure were followed this section of the line could be de-energized by opening a main breaker back in the main line, but this would result in interruption of service on other sections of the line. In our invention since means is provided whereby a new cartridge will not be expended when the fuseholder is being closed the lineman may put in a new cartridge by working with hot line tools which does not threaten his safety or necessitate an interruption of service on other sections of the line.

While there have been shown and described particular embodiments of the invention, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention, and therefore, it is intended by the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. A manually operable circuit maker and breaker for controlling the energization of electrical apparatus from a source of electrical energy, comprising, in combination, a fixed contact for connection to said source, a cooperating manually operable and removable switch member for connection to said apparatus, an expendable and replaceable cartridge for producing an electrical arc interrupting fluid blast, said cartridge being small with respect to said switch member and being detachably mounted on said switch member, means for initiating said fluid blast into an electrical arc which

is established when said switch member is manually opened, and means rendering said initiating means inactive when said switch member is being manually closed and active when said switch member is being manually opened.

2. A manually operable circuit maker and breaker for controlling the energization of electrical apparatus from a source of electrical energy comprising, in combination, a fixed contact for connection to said source, a cooperating manually operable and removable switch member for connection to said apparatus, an expendable and replaceable cartridge for producing an electrical arc interrupting fluid blast, said cartridge being small with respect to said switch member and being detachably and pivotally mounted on said switch member, means for initiating said fluid blast into an electrical arc which is established between said fixed contact and switch member, and means for operating said initiating means to an active condition when said switch member is being manually opened but to an inactive condition when said switch member is being manually closed.

3. An automatic overload responsive circuit breaking device which is manually operative to close a circuit and selectively manually operative to open said circuit for controlling the energization of electrical apparatus from a source of electrical energy, comprising, in combination, a fixed contact for electrical connection to said source, a cooperative manually operable and removable switch member for connection to said apparatus, a replaceable and expendable fluid blast producing cartridge, said catrtridge being small with respect to said switch member and being detachably carried by said switch member, means for initiating said fluid blast into an electrical arc which is established at said switch member, and means rendering said initiating means operative when said switch member is being manually opened but inoperative when said switch member is being manually closed.

4. An automatic overcurrent responsive circuit breaking device which is manually operative to close a circuit and selectively manually operative to open said circuit for controlling the energization of electrical apparatus from a source of electrical energy, comprising, in combination, a fixed contact for electrical connection to said source, a cooperative manually operable and removable switch member for connection to said apparatus, said switch member comprising an elongated fuseholder which is removably pivoted adjacent one end thereof, said fuseholder having a fuse link therein, the other end of said fuseholder having a contact thereon which is engageable with said fixed contact, a replaceable and expendable fluid blast producing cartridge, said cartridge being small with respect to said fuseholder and being detachably and pivotally mounted on said fuseholder adjacent said other end of said fuseholder, means for initiating said fluid blast into an electrical arc which is established when said fuseholder is selectively manually opened, and means rendering said initiating means operative only when said fuseholder is being selectively manually opened but otherwise inoperative.

5. In an open type switch which comprises an electrically energized line terminal contact and a cooperative manually removable switch member, means for interrupting an electrical arc which is drawn at said terminal contact when said switch member is being manually opened, said means comprising an expendable and replaceable electrical arc interrupting member which is small with respect to said switch member, and means for detachably mounting said arc interrupting member on said switch member before said switch member is closed, and means whereby said arc interrupting member will not be expended when said switch member is closed in on said energized line terminal contact.

6. A load break device for interrupting an electrical arc which is drawn at an open type manually removable switch arm when said switch arm is manually opened, said load break device comprising an expendable and replaceable electrical arc interrupting member which is carried by said switch arm and interrupts said arc when said switch arm is manually opened, said member being small with respect to said switch arm, and means whereby another member which is substituted for said first mentioned member following manual opening of said switch arm is not expended when another electrical arc is drawn when said switch arm is manually closed.

7. A load break device for interrupting an electrical arc which is drawn at an open type manually removable switch arm when said switch arm is manually opened, said load break device comprising an expendable and replaceable member which is carried by said switch arm and interrupts said arc when said switch arm is manually opened by directing a high pressure blast into said arc, said member being small with respect to said switch arm, and means whereby another member which is substituted for said first mentioned member following manual opening of said switch arm is not expended when another electrical arc is drawn when said switch arm is manually closed.

8. In an open type manually removable switch arm, a load break device for interrupting an electrical arc which is drawn at said open type switch arm when said switch is manually opened, said load break device comprising an expendable and replaceable capsule which is carried by said switch arm and directs a blast of high pressure fluid into said arc when said switch arm is manually opened, said capsule being small with respect to said switch arm, and means whereby another capsule which is substituted for said first mentioned capsule following manual opening of said switch arm is not expended when another electrical arc is drawn when said switch arm is manually closed.

9. A load break device for interrupting an electrical arc which is drawn between a fixed contact and one end of a manually removable switch member of an open type switch when said switch member is being manually opened, said load break device comprising a small expendable and replaceable electrical arc interrupting member which is pivotally connected to and carried by said one end, said arc interrupting member being small with respect to said switch member, means whereby said small member is electrically connected to said one end when said switch member is being manually opened whereby the electrical current path of said arc is through said small member when said switch member is being manually opened, and means whereby another small member which is similar to and replaces said first mentioned small member is not expended when another electrical arc is drawn between said contact and one end when said switch member is being manually closed.

10. In an open type switch comprising a latch and a hinge element which are spaced with respect to and insulated from each other, a manually removable switch member which is removably pivoted at one end thereof to said hinge element and latched at the other end thereof to said latch, said latch and switch member other end having an electrical arc drawn therebetween when said switch member is manually opened and closed, means for interrupting said arc when said switch member is manually opened, said means comprising an expendable and replaceable electrical arc interrupting member which is carried by said switch member other end, said arc interrupting member being small with respect to said switch member, and means for rendering said small member active to interrupt said arc when said switch member is manually opened but otherwise inactive.

11. In an automatically operable open type fused cutout comprising an elongated electrical insulator having a latch at the upper end thereof and a hinge element at the lower end thereof, and an elongated fuseholder

which is removably pivoted at the lower end thereof to said hinge element and latched at the upper end thereof to said latch, said fuseholder having a fuse link therein, said latch and fuseholder upper end having an electrical arc drawn therebetween when said fuseholder is manually opened and closed, an expendable and replaceable electrical arc interrupting cartridge, said cartridge being small with respect to said fuseholder and being carried by said fuseholder upper end, and means for causing said cartridge active to interrupt said arc when said fuseholder is manually opened but otherwise inactive.

12. In an open type fused cutout as in claim 11, wherein said cartridge comprises a cartridge of compressed gas which is carried by said fuseholder upper end by a spring finger and the means for causing said cartridge active and inactive is automatically operative and comprises said spring finger and a catch on said latch which is engageable with said spring finger when said fuseholder is manually opened and closed.

13. In an open type fused cutout as in claim 11, wherein said cartridge comprises a cartridge of compressed gas which is punctured by the termination of an electrical arc thereon, and the means for causing said cartridge active and inactive is manually operative and comprises a handle for operating said fuseholder.

14. In an open type fused cutout as in claim 11, wherein said cartridge comprises a cartridge of compressed gas which is mechanically punctured during manual opening of said fuseholder, and the means for causing said cartridge active and inactive comprises a spring and a handle for operating said fuseholder.

15. In an open type fused cutout as in claim 11, wherein said cartridge is a fused cartridge, and the means for causing said cartridge active and inactive comprises a handle for operating said fuseholder.

16. In a circuit interrupter, a load break device for extinguishing an electrical arc which is established in said circuit interrupter when said circuit interrupter is being manually opened to interrupt an energized electrical circuit, said circuit interrupter comprising a switch member and having means for automatically interrupting said energized circiut and automatically opening said switch member upon the occurrence of an overcurrent in said energized circuit, said load break device comprising an expendable and replaceable electrical arc extinguishing member which is mounted on said switch



member for extinguishing said electrical arc, said arc extinguishing member being small with respect to said switch member, said switch member being bodily removable from said circuit interrupter for reloading said switch member with another small expendable and replaceable electrical arc extinguishing member after the first one is expended extinguishing said electrical arc during interruption of said energized circuit by manually opening said switch member, and means for prohibiting expending of said electrical arc extinguishing members while said circuit interrupter is operating automatically or is being manually closed to close said energized circuit whereby said small expendable and replaceable electrical arc extinguishing members are expended only when said energized circuit is being interrupted by manually opening said switch member.

17. In a circuit interrupter as in claim 16, wherein said switch member comprises a pivotally mounted fuse assembly and said circuit interrupter has a contact latch which is connected in said energized circuit for latching said fuse assembly closed, the last point of electrical contact between said fuse assembly and said contact latch being at said electrical arc extinguishing members when said fuse assembly is being manually pivoted open.

18. In a circuit interrupter as in claim 16, wherein said last-mentioned means comprises a movable handle on said switch member for manually opening and closing said switch member which is movable with respect to said switch member and a movable carrier for said electrical arc interrupting members which can be moved with respect to said switch member by movement of said handle.

19. In a circuit interrupter as in claim 18, wherein said switch member comprises a pivotally mounted fuse assembly and said circuit interrupter has a contact latch which is connected in said energized circuit for latching said fuse assembly closed, the last point of electrical contact between said fuse assembly and said contact latch being at said electrical arc extinguishing members when said fuse assembly is being manually opened.

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UNITED STATES PATENT OFFICE

# CERTIFICATE OF CORRECTION

Patent No. 2,834,856

May 13, 1958

Francis J. Charewicz et al.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 43, strike out "has an electrical fuse link 9 disposed" and insert instead -- is constructed from electrical insu- --.

Signed and sealed this 8th day of July 1958.

(SEAL)

Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON

Commissioner of Patents

# UNITED STATES PATENT OFFICE

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