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W. O. SCHULTZ

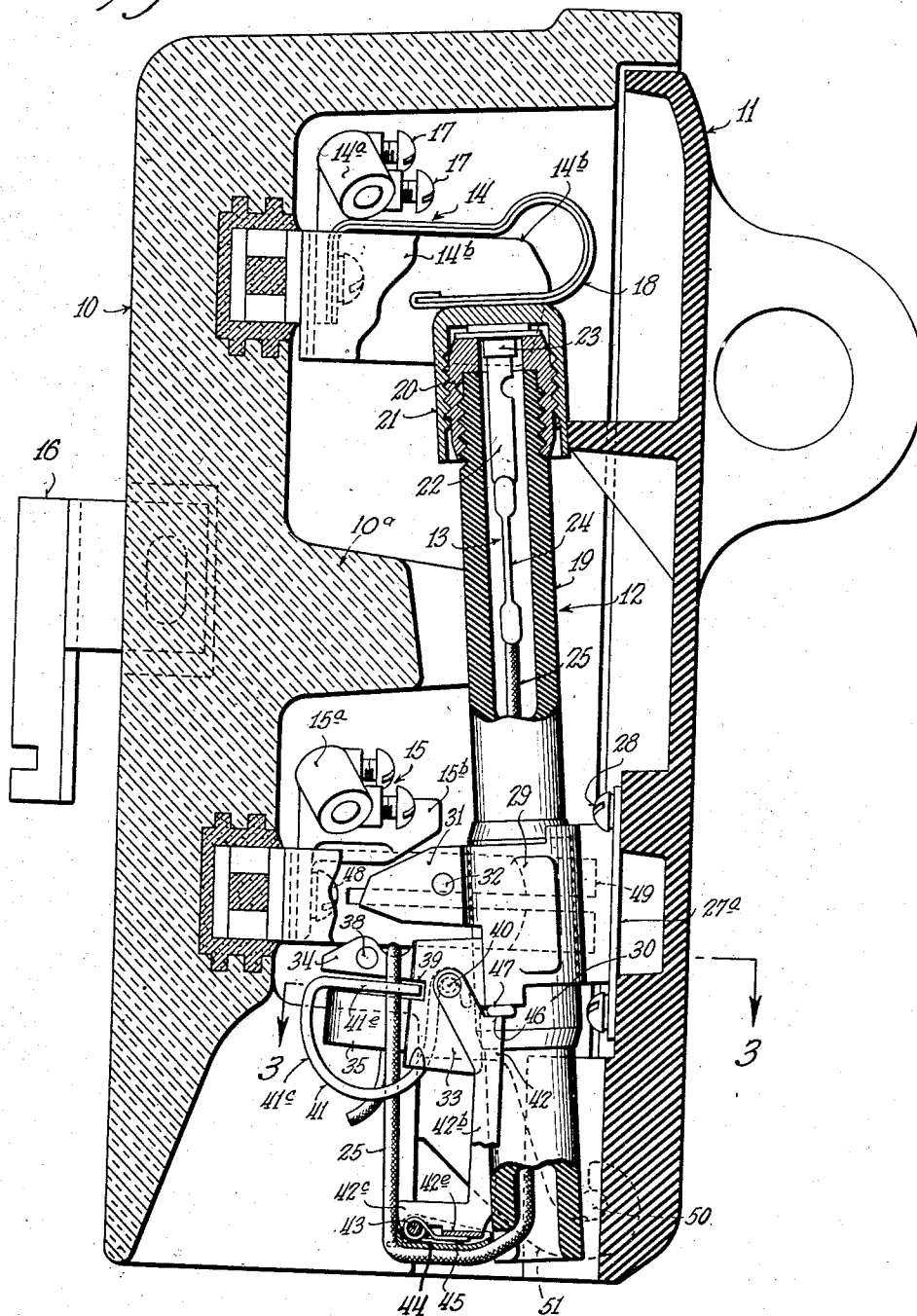
2,385,473

FUSE CUT-OUT

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2 Sheets-Sheet 1

Fig. 1



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Fig. 3

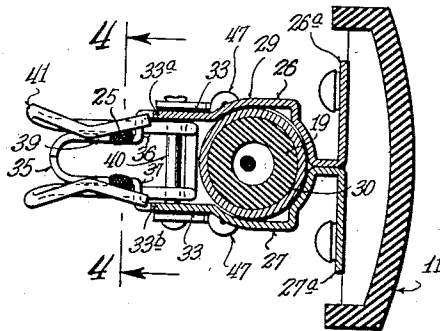


Fig. 4

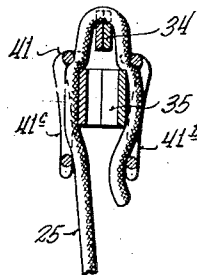
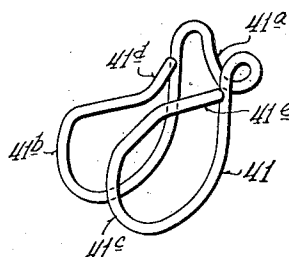


Fig. 5



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FUSE CUTOUT

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12 Claims. (Cl. 200—114)

This invention relates to expulsion type fuse cut-outs and has to do more especially with an improved mode of anchoring the terminal ends of the flexible conductive leaders of fuse-links designed for utilization in cut-outs of the aforementioned character.

It has been the general practice to anchor the terminal ends of such leaders by means of thumb-nuts, in the manner illustrated, for example, in my U. S. Patent No. 2,249,178; and that practice is satisfactory where the leader is of small or moderate diameter and a single such leader is employed. But where the fuse-link current rating is high—making it necessary to use a leader of rather large diameter, or two or more leaders in parallel—the thumb-nut method of anchoring often is not well adapted to the purpose. That is because of the inherent necessity in such cases of making the thumb-nuts of inordinately large dimensions.

The primary object underlying the present invention is to provide, in an expulsion type fuse cut-out, a terminal connector of modest dimensions which is operative to anchor the terminal ends of fuse-link flexible leaders of both small and relatively large diameter and likewise operative to anchor two or more such leaders in parallel—where the fuse-link comprises such a plurality of said leaders.

Another object is to provide in a fuse cut-out of the expulsion type a terminal connector as previously characterized to which the flexible leaders can easily be connected and from which easily disconnected, at will, and which can be depended upon to provide a secure and permanent connection to the leader or leaders until intentionally detached.

A further object is to effect a reduction in the cost of manufacturing fuse cut-outs of the drop-out type—especially fuse cut-outs of the housed drop-out type.

The invention contemplates the provision of a connector in the form of a resilient wire-gripping device which is capable of receiving and grippingly engaging flexible leaders of a wide range of sizes; and according to the preferred embodiment of the invention the wire-gripping device includes a resilient element comprising a length of spring wire which is so formed as to present a pair of opposing spring-arms interconnected by a hook portion which is formed to embrace a pin serving to secure the resilient element in place. The aforementioned spring-arms each co-operate with a lug or the like interposed therebetween which is operative conjointly with said spring-arms, indi-

vidually, to clamp a flexible leader and hold the same under tension while effecting an electrical connection therewith; and the arrangement is such that either one or two or even more than two leaders can be anchored to the connector simultaneously.

One of the important features of the invention resides in the fact that a formed resilient wire of a single size and configuration will serve for fuses of a wide range of current ratings—making it unnecessary to stock more than one size or to tool up for the production of more than one size.

Another important feature resides in a structural design which at one and the same time greatly simplifies assembly of the structure while providing very effective means for co-operating with the resilient wire element in the anchoring of the leader or leaders and in the matter of facilitating engagement of the leader or leaders with the connector—all of which spells manufacturing economy and operating convenience.

An additional feature of the invention consists in the provision of a bracket composed of sheet metal punchings, instead of a casting, which requires no machining other than punch press operations and which lends itself more readily and at much less cost than a casting to the meeting of several functional requirements.

Referring to the drawings which accompany this specification:

Fig. 1 is a vertical sectional view of a fuse cut-out illustrating a preferred embodiment of the invention;

Fig. 2 is a rear elevational view of the expulsion cartridge and appurtenant parts including the improved connector and the door on which the cartridge is mounted;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 1;

Fig. 4 is a section along the line 4—4 of Fig. 3; and

Fig. 5 is a perspective view of the formed spring wire clip constituting a major component of the improved connector.

The fuse cut-out illustrated is of the drop-out type and includes as principal parts a housing 10, door 11, expulsion cartridge 12, fuse-link 13, and a pair of spaced terminals 14 and 15, respectively.

The housing is of conventional design, consisting preferably of molded porcelain, being open at the front and bottom and closed at the top, sides, and back. A suitable bracket or brackets 16 for mounting the cut-out is secured to the housing. About midway of the housing, at the interior thereof, is a rib-like projection 10a, constituting

an integral part of the housing and serving as a barrier between terminals 14 and 15 for the suppression and prevention of flashovers therebetween.

Upper terminal 14 includes a connector lug 14a drilled to receive an incoming conductor wire and having a pair of binding screws 17, 17 for securing the wire to the lug. Suitable apertures through a sidewall of the housing (not shown) afford access for the incoming wires.

Terminal 14 also includes a pair of horizontally projecting and horizontally spaced arms 14b designed to receive between them the upper end of the expulsion cartridge, and a laminated leaf spring 18, the free end of which contacts and bears downwardly against the upper end of the cartridge for establishing electrical connection therewith.

Expulsion cartridge 12 comprises an elongated tube 19 of horn fibre or Bakelite lined with fibre, to the upper end of which is threaded a metal ferrule 20 which is externally threaded to receive a removable metal cap 21.

Fuse-link 13 is of conventional design and, as shown, comprises an upper terminal 22 including a button-head 23, a fusible section 24, and a long flexible leader 25 which projects out through the open lower end of the cartridge and is anchored in a manner hereinafter described. Button-head 23 is gripped between cap 21 and the upper surface of ferrule 20. The fuse-link is a replaceable element and is always designed to meet some predetermined time-current requirement. If it is intended to carry only a small current, the flexible leader 25 may be of correspondingly small cross-sectional area. If, on the contrary, the link is designed to carry a heavy current, the leader would necessarily have a correspondingly large cross-sectional area; or, alternatively, a plurality of flexible leaders in parallel may be provided—as is often the case.

The cartridge is intended to drop down and thus break the contact between cap 21 and spring 18 when the fuse-link blows and to that end it is slidably journaled in a bracket attached to the door 11 and comprising two formed complementary, right and left hand, sheet metal punchings 26 and 27. The latter have oppositely projecting flanges 26a and 27a which together form a base which is secured to the door by screws 28.

The formation and co-ordination of punchings 26 and 27 is such as to provide a sleeve at 29 embracing a bushing 30 which is secured to and encircles the exterior of cartridge tube 19. The cartridge is loose within sleeve 29 but normally is held up in the position wherein it is shown in Fig. 1 by mechanism which presently will be described. A rearwardly projecting lug 31 constituting an integral part of the bracket serves, in conjunction with an overlying portion 15b of terminal 15, as a stop against upward movement of the cartridge and door in opposition to the force of recoil which accompanies the blowing of the fuse-link. Lug 31 consists of two matching parts which are secured together by a rivet 32. At 33 is another rearwardly projecting integral portion of the bracket comprising two horizontally spaced flat parallel areas marked 33a and 33b (see Fig. 3) and the latter merge into a rearwardly extending arm 34 and a rearwardly extending lug 35. These latter are shown in cross-section in Fig. 4.

The conjunction between lug 35 and the portions of the bracket marked 33a and 33b (Fig. 3) is defined by shoulders 36 and 37. The formation

of lug 35 is shown to best advantage in Figs. 2 and 3.

The two matching parts of punchings 26 and 27 constituting arm 34 are secured together by a rivet 38.

A slot 39 extends transversely of the bracket, as viewed in Fig. 1, and defines the upper boundary of lug 35 and the lower boundary of arm 34.

Portions 33a, 33b and shoulders 36, 37 form, conjointly, a partly enclosed chamber across which extends a pin 40 which is headed over at both ends. Pin 40 serves as an anchorage for a formed wire clip 41 (detailed in Fig. 5) and also as a pivotal support for a depending arm 42.

Arm 42 is a formed sheet metal punching including two uprights, 42a and 42b of identical configurations but bent oppositely to form complementary right and left-hand members as depicted in Fig. 2. These terminate at their lower ends in horizontal, rearwardly projecting extensions 42c, 42d, respectively, which are interconnected by a tie section 42e—see Fig. 1.

Traversing the rear ends of extensions 42c and 42d and supported thereby is a pin 43 on which is mounted a coil spring 44 and a flipper arm 45. The latter extends forwardly from pin 43 and its free end is biased downwardly by spring 44.

Flexible leader 25 passes underneath and in contact with the lower surface of flipper arm 45 and is anchored at its extremity by the connector which comprises wire clip 41, lug 35 and arm 34. The fuse-link is normally pulled taut, holding the flipper arm in its "up" position, as shown, against the opposition of spring 44, and the latter, together with the flipper arm, functions to quickly expel the lower portion of the fuse-link whenever fusible section 24 is ruptured by the passing therethrough of a predetermined fault current.

Uprights 42a and 42b have a pair of shoulders—one of which is indicated at 46 in Fig. 1. These shoulders are disposed at opposite sides of the cartridge and underly the two extremities of a pin 47 which extends transversely through bushing 30. Said shoulders, conjointly with said pin, thus function normally to hold the cartridge in its elevated position against the opposition of spring 18 and the force of gravity.

Projecting forwardly from terminal 15 and attached thereto by means of screw 48 is a double pair of contact spring fingers 49 arranged to grippingly receive between them the bracket comprising sheet metal punchings 26 and 27. This provides electrical connection between terminal 15 and said bracket and thence with leader 25. One of the incoming wires is connected to lug 15a in the manner previously described with reference to terminal 14 and a continuous conductive path is thus normally established between the incoming and outgoing wires through terminals 14 and 15 and the fuse-link—which path is intended to be interrupted by the blowing of the fuse, and further interrupted by the immediately ensuing downward movement of the cartridge and consequent breaking of contact between cap 21 and spring 18.

Door 11 is provided at its lower end with a pair of laterally projecting trunnions 50 which are designed to engage a pair of hinge castings 51 attached to the housing. Said hinge castings take the form of hooks at their free ends, into the bights of which trunnions 50 are normally disposed. The door is rotatable downwardly about

its trunnions from the closed position in which it is shown in Fig. 1 and carries with it cartridge 12. Opening the door, by swinging it downwardly about its trunnions disengages the cartridge from contact spring 18 and from contact fingers 49—thus breaking the circuit at two points. After being fully opened, the door, with cartridge attached, can be lifted out of engagement with hinge castings 51 and thus withdrawn from the housing.

The cartridge is retained in its "up" position, as shown in Fig. 1, by virtue of the fact that leader 25 secures the depending arm 42 in the position illustrated wherein shoulder 40 is effective as a latch acting on pin 41. When the fuse blows leader 25 is no longer so effective and, in consequence, the cartridge drops, causing arm 42 to rotate clockwise (as viewed in Fig. 1) about pin 40. Following such an occurrence the cut-out must be re-fused, and for that purpose the door is pulled open and withdrawn, causing the cartridge to disengage the aforementioned contact springs. Cap 21 is then removed and the upper remnant of the fuse-link withdrawn; and leader 25 is disengaged from its anchorage. A new fuse-link is thereupon inserted and the cap replaced and the leader anchored—the cartridge being moved to its "up" position and latched by arm 42. Following insertion of a new fuse-link, the door is replaced and closed, thus re-establishing the circuit.

The novelty of this device resides, in part, in the connection for anchoring the flexible leader—which connection includes the formed spring-wire clip 41, a perspective view of which is shown in Fig. 5. Midway of its length the clip is bent to form a hook at 41a, which embraces pin 49 (see Figs. 1 and 3). Two resilient arms 41b and 41c, respectively, are formed U-shape, in part, merging into forwardly projecting (Fig. 1) ends 41d, 41e which terminate in slot 39. Said arms are resilient laterally and, before the leader is attached to the connector, they somewhat overlap lug 35. Each arm can be forced away from lug 35 by pressing the leader between the arm and said lug; and by reason of the stiff resiliency of the clip the leader is tightly gripped, and is sharply bent at the upper edge of lug 35, as clearly illustrated in Fig. 2.

After gripping the leader between one arm of the clip and one side of lug 35 it is passed around arm 34 (see Fig. 4), pulled taut and then pressed between the other arm of the clip and the other side of lug 35. Thus the leader is anchored very securely by means of a connector of modest dimensions which is capable of accommodating leaders of all sizes commonly used on fuse-links. Moreover, the connector illustrated and described will easily accommodate a plurality of leaders in parallel—which, as previously pointed out, are frequently provided on fuse-links. When a fuse-link having a plurality of leaders is employed, instead of the single leader shown, it is preferable to divide the leaders between the two sides of lug 35, and it generally is unnecessary in that event to pass them around arm 34 and to reinsert them in the connector, as is preferably done in the case of a single leader.

Fuse cut-outs of the character illustrated are used very extensively and, consequently, are a volume production item. Accordingly, a reduction in manufacturing cost of a small amount per unit results in a large aggregate saving, and any such reduction which can be effected without detracting from the quality of the product is

worthy of accomplishment. The improvement herein described is of that nature because, in addition to the advantages mentioned at the outset, the sheet metal bracket is cheap to produce—entailing only punch press and simple riveting operations—and the spring-wire clip, likewise, can be produced on a quantity basis at a very small cost. The design of the bracket and appurtenant parts is such as to facilitate assembly; and the net result is a product in all respects as durable and workable as its more costly predecessors.

What is claimed is:

1. In a fuse cut-out, a terminal connector comprising a bracket including a lug, and a spring-wire clip comprising a pair of resilient arms situated adjacent said lug and at either side thereof, said arms being disposed each in shearing relation to edges of said lug, individually, and co-operative with said edges to releasably grip a flexible conductor.

2. In a fuse cut-out, a terminal connector including a lug, and a spring-wire clip having an anchored mid-section and a pair of resilient extremities disposed at opposite sides of said lug, each of said resilient extremities being co-operative with said lug to releasably grip a flexible conductor at two points each disposed relative to the other on opposite sides of said lug.

3. In a fuse cut-out, housing structure including a door, a bracket carried by said door, said bracket comprising a pair of complementary formed sheet metal punchings constituting, jointly, a sleeve having an integral laterally projecting portion including a lug, a wire clip anchored to said bracket and having a pair of coiled resilient arms situated at opposite sides of said lug, said arms each having an extremity disposed in shearing relation to an edge of said lug, an expulsion cartridge mounted in said sleeve, and a fuse-link in said cartridge, said fuse-link having a flexible leader extending out of one end of said cartridge and releasably anchored by said wire clip and lug.

4. In a fuse cut-out, a housing open at the front and bottom, a door forming a closure for said front, said door being hinged at the bottom, a pair of spaced terminals within said housing, a bracket attached to the inside of said door and projecting rearwardly therefrom, an expulsion cartridge normally bridging said terminals, a fuse-link extending through said cartridge and having a flexible leader projecting out of one end thereof, said bracket comprising a pair of complementary formed sheet metal punchings constituting, jointly, a sleeve encircling said cartridge and functioning as a bearing therefor in which said cartridge is slidable longitudinally, said bracket including, as an integral part thereof, a rearwardly extending lug formed by said punchings, jointly, and a wire clip anchored to said bracket at its midportion, said wire clip including a pair of coiled resilient arms situated at either side of said lug and co-operative therewith to releasably engage and anchor said flexible leader.

5. A connector comprising a supporting member including a lug, a pin carried by said supporting member, and a wire clip anchored to said pin and having a pair of resilient extremities disposed at opposite sides of said lug, each of said resilient extremities being individually co-operative with said lug to releasably grip a flexible conductor at two points each disposed relative to the other on opposite sides of said lug.

6. A connector comprising a supporting member including a wire-gripping portion, and a wire clip anchored at its mid-portion to said member, said clip having a pair of resilient arms the extremities of which are disposed adjacent opposite sides of said wire-gripping portion and are each movable independently of the other and co-operative with said opposite sides of said wire gripping portion for individually and releasably gripping a flexible conductor.

7. A connector comprising a supporting member including a wire-gripping portion, and a wire clip having a hook-shaped mid-portion, a pin carried by said supporting member and engaging said hook-shaped mid-portion for anchoring said clip, said clip including a pair of resilient arms situated at opposite sides of said wire-gripping portion, each of said arms having an extremity disposed in shearing relation to said wire-gripping portion for releasably gripping, in co-operation with said portion, a flexible conductor.

8. A connector comprising a supporting member, a lug projecting from said supporting member, an arm parallel to and adjacent said lug and projecting from said supporting member, a pin carried by said supporting member, and a wire clip having its mid-portion anchored to said pin, said clip having a pair of coiled resilient portions the extremities of which are disposed in shearing relation to edges of said lug, individually, said resilient portions being situated at opposite sides of said lug, the arrangement being such that a flexible conductor can be threaded between one of said resilient portions and said lug and thence around said arm and between the other of said resilient portions and said lug, said resilient portions together with said lug and arm being operative conjointly, to firmly anchor the flexible conductor.

9. In a fuse, an insulating support, a pair of spaced terminals carried by said support, an expulsion cartridge normally bridging said terminals, structure pivotally supporting said cartridge upon said insulating support to facilitate rotational movement of said cartridge into and out of engagement with said terminals, a fuse-link within said cartridge and normally inter-connecting said terminals, said fuse-link including a flexible conductive leader projecting from one end of said cartridge, a lug integral with and rearwardly extending from said cartridge supporting structure, and a spring fastener carried by said cartridge-supporting structure externally of said cartridge and comprising mutually divergent resilient portions said divergent resilient portions bearing directly against said leader and

holding said leader in a shearing relationship with said lug and establishing electrical connection between said leader and one of said terminals.

10. In a fuse, an insulating support, a pair of spaced terminals carried by said support, an expulsion cartridge normally bridging said terminals, structure pivoted upon said insulating support and having a sleeve in which said cartridge is slideable lengthwise to disengage at least one of said terminals, said sleeve having a lug integral therewith and rearwardly extending therefrom, a pivoted arm depending from said sleeve and having a shoulder operative to latch said cartridge in closed-circuit position, a fuse-link within said cartridge having a flexible conductive leader projecting from one end of the cartridge and embracing said arm in a manner to retain said arm in a position wherein it is effective to maintain said cartridge latched in its aforementioned closed-circuit position, and a spring fastener carried by said sleeve externally of said cartridge and comprising mutually divergent resilient portions disposed in a shearing relationship with the edges of said lug, said flexible leader being received and gripped between said divergent resilient portions and said lug to establish electrical connection between said leader and one of said terminals while at the same time maintaining said leader in embracing relation to said arm, the effectiveness of said arm as a latching means being dependent upon the continuing integrity of said fuse-link.

11. In a fuse cutout, a terminal connector for anchoring a flexible conductor including a lug and comprising a single piece of resilient wire bent to form a spring wire clip, said wire clip being anchored at its mid-section and having a pair of resilient arms disposed at opposite sides of and in shearing relation to said lug, said resilient arms being cooperative with said lug to releasably grip a flexible conductor at two points each disposed relative to the other on opposite sides of said lug.

12. A connector comprising a supporting member including a wire gripping portion, and a single piece of resilient wire bent to form a wire clip, said wire clip being anchored to said member and having a pair of resilient arms, said resilient arms each being positioned adjacent to and overlapping an edge of said portion and being operative individually to press a flexible conductor against said edge portion in a gripping relationship therewith.

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