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J. VALERIUS

ELECTRIC CUT-OUT

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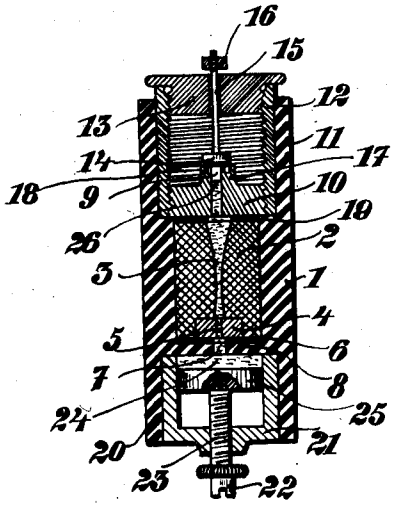
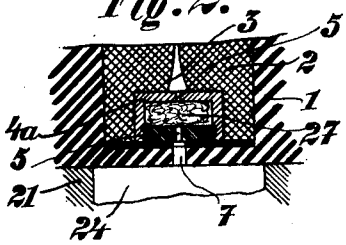


Fig. 1.

Fig. 2.



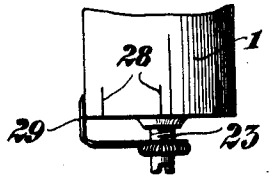


Fig. 3.

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ELECTRIC CUT-OUT.

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This invention relates to an electric cut-out in which in an insulating body between two metal contacts embedded in said body a thread of liquid metal, preferably of mercury, is arranged which electrically connects said contacts and which is narrowed so that it is capillary, the liquid metal vaporizing at the capillary point at excessive increase of the current, whereby the circuit is interrupted. The electric cut-out according to the invention differs from the electric cut-outs of known type in that a metal body having capillary connecting channels is mounted between the capillary bore of the insertion, which consists of highly refractory incombustible insulating material and is designed to receive the mercury thread, and the outflow orifice of the reservoir for the liquid metal. In this manner liquid metal is prevented from flowing accidentally from the reservoir through the capillary bores of the insertion or from being drawn along from the reservoir when the liquid metal at the capillary point vaporizes.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawing forming a part of this specification, with the understanding that while on the drawings one embodiment of the invention is disclosed, the invention is not confined to any strict conformity with the showing of the drawings, but may be embodied in any manner which does not make a material departure from the salient features of the invention.

In the drawings:—

Fig. 1 shows in longitudinal section the preferred form of construction of the improved electric cut-out.

Fig. 2 shows in longitudinal section on enlarged scale a modification of the cut-out shown in Fig. 1.

Fig. 3 shows in front elevation the front end of the cut-out shown in Fig. 1.

In the insulating body 1 an exchangeable insertion 2 of highly refractory incombustible insulating material is located which has a capillary bore 3 enlarged towards both ends. The lower end of the insertion 2 encloses a small metal cylinder 4 having a narrow bore 5 and it rests upon a cross partition 8 of the insulating body 1. The cross partition 8 has a bore 7 and a perforated packing disk 6 is inserted between 2 and 8. The insertion is pressed by means of a metal screw 10 upon the packing disk 6 or the cross partition 8. This metal screw 10 has a central bore 9 and it is screwed into an internally threaded metal tube 12 inserted in a hollow space 11 of the insulating body 1 above the insertion 2. A metal lid 13 is screwed into the upper end of tube 12 and secured against removal in any convenient manner not shown in the drawing. A movable rod 15 having a disk 14 at its lower end and knob 16 at the upper end traverses the lid 13. The upper end 17 of screw 10 is of shorter diameter than the remainder of the screw so that around the part 17 an annular space 18 is formed in the metal tube 12. Between the foot end of screw 10 and the insertion 2 a perforated packing disk 19 is inserted.

In the hollow space 20 in the insulating body 1 below the cross partition 8 a cup shaped metal body 21 is inserted. A screw 23 having a head 22 which serves as handle and carrying at its upper end a piston 25 fitting into the cup is screwed into the bottom of the cup 21. The piston 25 is secured against removal from the insulating body or from the cup.

After the lid 13 has been removed and after the screw 10 has been screwed out the space 24 above the piston 25 is filled with mercury in the factory where the cut-outs are made. The mercury is poured in through the bores 9, 3 and 7 whereupon with the aid of the screw 23, the head 22 of which is turned, the piston 25 is raised until the mercury has raised in the bore 9 up to the point 26. The metal cup 21 is now electrically connected with the metal lid 13 by a mercury thread.

The foot plate 14 of rod 15 rests upon the upper edge of the thin part 17 of screw 10. The lid is screwed on and the device is ready for transport and for use when the lid 13 has been secured against getting loose.

For use the cut-out is inserted in the circuit, for instance between the nut and screw of a plug contact so that on the one hand the metal cup 21 and on the other hand the metal lid 13 are supplied with current. The cut-out is generally in horizontal position and not in vertical position as shown in the drawing.

When the current increases excessively the mercury begins to vaporize at the narrowest point of the capillary bore 3 whereby the mercury thread above the capillary point

is thrown, in displacing the rod 15 in the bore 9 of the screw 10, into the annular space 18 surrounding the thin part 17 of the screw 10. The mercury collects in this space 18 and the circuit is interrupted between the two contacts 20, 13. The cut-out being in horizontal position the rod 15 remains in this new position and indicates thus the interruption of the current.

To bring the cut-out back to the normal state it is turned approximately to a vertical position so that the rod 15 drops upon the upper edge of the thin extension 17 of screw 10. The screw 23 is screwed up until the mercury displaced by the piston 25 has risen in the bore 9 of screw 10 and begins to lift rod 15. At this instant the screwing in of screw 23 is stopped or the screw is even slightly screwed back so that the mercury level stands approximately at the point 26. The mercury level must always stand somewhat below the upper edge of bore 9 so that the mercury does not flow over into the annular space 18 when it begins to be heated by the current which flows through; the chamber 24 is of such a size that the quantity of mercury stored in the same is sufficient for a determined number of short-circuits. At each short-circuit the inner width of the capillary bore 3 is enlarged in a very slight measure but even after the determined number of short-circuits this inner width is still so narrow that the cut-out could serve for further short-circuits. As however the enlargements of the inner width of the capillary bore 3 is uncertain it is advisable to prevent the recharging of the cut-out with mercury by any unauthorized person. With this object in view the lid 13 is locked so that it cannot be screwed out of tube 12 and so that space 24 is not accessible. If the capillary bore 3 should have been widened excessively the insertion 2 could be exchanged in the factory against a new one. The expenses are evidently much lower than in the case that the capillary bore is arranged directly in the insulating body so that this insulating body would have to be exchanged entirely or for its most essential parts. The fine bore 5 in the metal body 4 serves to prevent that accidentally, during transportation of the cut-out, mercury flows over from the space 24 into the bore 9 and from there into the annular space 18. This object is attained in even a more thorough manner when the fine bore 5 of the metal body 4 between the bores 7 and 3 does not extend straight but is undulated or in zig-zag. A still better effect is obtained if for the metal body 4 a hollow metal body 4^a (Fig. 2) is substituted in which an asbestos stopper 27 is arranged which lets the mercury pass only at a determined pressure which occurs also at the turning of the screw. This asbestos stopper prevents with greater security than the metal body 4 (Fig. 1) that at the vaporizing of the mercury in the capillary bore 3 any mercury be drawn along from the reservoir to be projected through the bore 9 of the screw 10 into the annular space 18. Notwithstanding the use of a metal body with capillary connecting channels between the capillary bore 3 of the insertion 2 and the non-capillary outflow openings 7 of the store space 24 the danger of short-circuits in these connecting channels is excluded, as the total cross section of the metal body is still sufficient for the passage of the excessively increased current.

As the space 24 is not influenced by the vaporization of the mercury in the capillary bore 3 the quantity of mercury in space 24 will not vary even at short-circuits. This is important for the re-establishment of the cut-out as for each re-establishment a rotation of the screw 23 for one and the same predetermined angle is required. A scale 28 (Fig. 3) on the outer surface of the insulating body 1 and a hand 29 on the screw are therefore arranged to indicate the quantity of mercury in space 24. The scale may however be on the screw and the hand on the insulating body or on the metal cup 21.

I claim:—

1. An electric cut-out comprising in combination an insulating body, two metal contacts embedded in said insulating body, a thread of liquid metal narrowed to a capillary point in said insulating body and connecting said metal contacts, an insertion of highly refractory insulating material having a capillary bore for said thread of liquid metal, a reservoir for the liquid metal having an outflow orifice, and a metal body having a capillary channel inserted between said outflow orifice of the reservoir and said capillary bore of the insertion.

2. An electric cut-out comprising in combination an insulating body, two metal contacts embedded in said insulating body, a thread of liquid metal narrowed to a capillary point in said insulating body and connecting said metal contacts, an insertion of highly refractory insulating material having a capillary bore for said thread of liquid metal, a reservoir for the liquid metal having an outflow orifice, and a metal body having a capillary channel inserted between said outflow orifice of the reservoir and said capillary bore of the insertion, and a tubular pressure screw acting upon the end of the insertion opposite the said metal body for pressing said insertion against said metal body and said metal body against the outflow orifice of said reservoir.

3. An electric cut-out comprising in combination an insulating body, two metal contacts embedded in said insulating body, a thread of liquid metal narrowed to a capil-

lary point in said insulating body and connecting said metal contacts, an insertion of highly refractory insulating material having a capillary bore for said thread of liquid metal, a reservoir for the liquid metal having an outflow orifice, and a metal body having a capillary channel inserted between said outflow orifice of the reservoir and said capillary bore of the insertion, a tubular pressure screw acting upon the end of the insertion opposite the said metal body for pressing said insertion against said metal body and said metal body against the outflow orifice of said reservoir and a thin extension on the inner end of said tubular pressure screw so that an annular space is formed around this extension which is designed to collect the liquid metal forced through the bore of the screw when a short-circuit occurs.

4. An electric cut-out comprising in combination an insulating body, two metal contacts embedded in said insulating body, a thread of liquid metal narrowed to a capillary point in said insulating body and connecting said metal contacts, an insertion of highly refractory insulating material having a capillary bore for said thread of liquid metal, a reservoir for the liqud metal having an outflow orifice, and a metal body having a capillary channel inserted between said outflow orifice of the reservoir and said capillary bore of the insertion, a tubular pressure screw acting upon the end of the insertion opposite the said metal body for pressing said insertion against said metal body and said metal body against the outflow orifice of said reservoir and a thin extension on the inner end of said tubular pressure screw so that an annular space is formed around this extension which is designed to collect the liquid metal forced through the bore of the screw when a short circuit occurs, a scale on the insulating body and a hand on the screw to ensure the accurate rotation of the screw for refilling the capillary bore of the insertion with liquid metal in order to make the cut-out ready for use.

In testimony whereof I affix my signature.

JOHANN VALERIUS.