July 12, 1938. A. G. STEINMAYER ET AL 2,123,260

THERMAL TRANSFORMER CUT-OUT

Filed May 14, 1936 2 Sheets-Sheet 1

Fig. 1

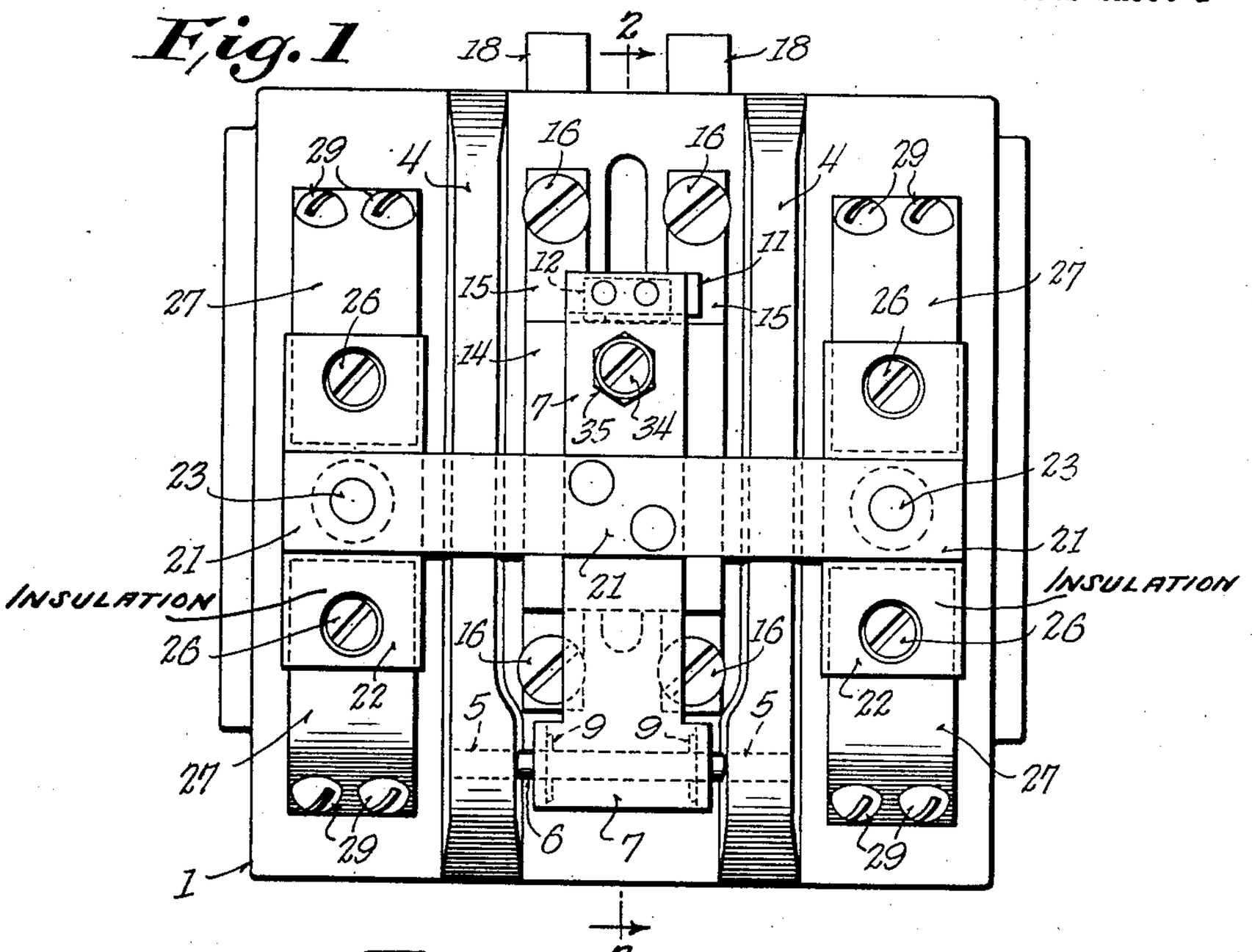

Fig. 2

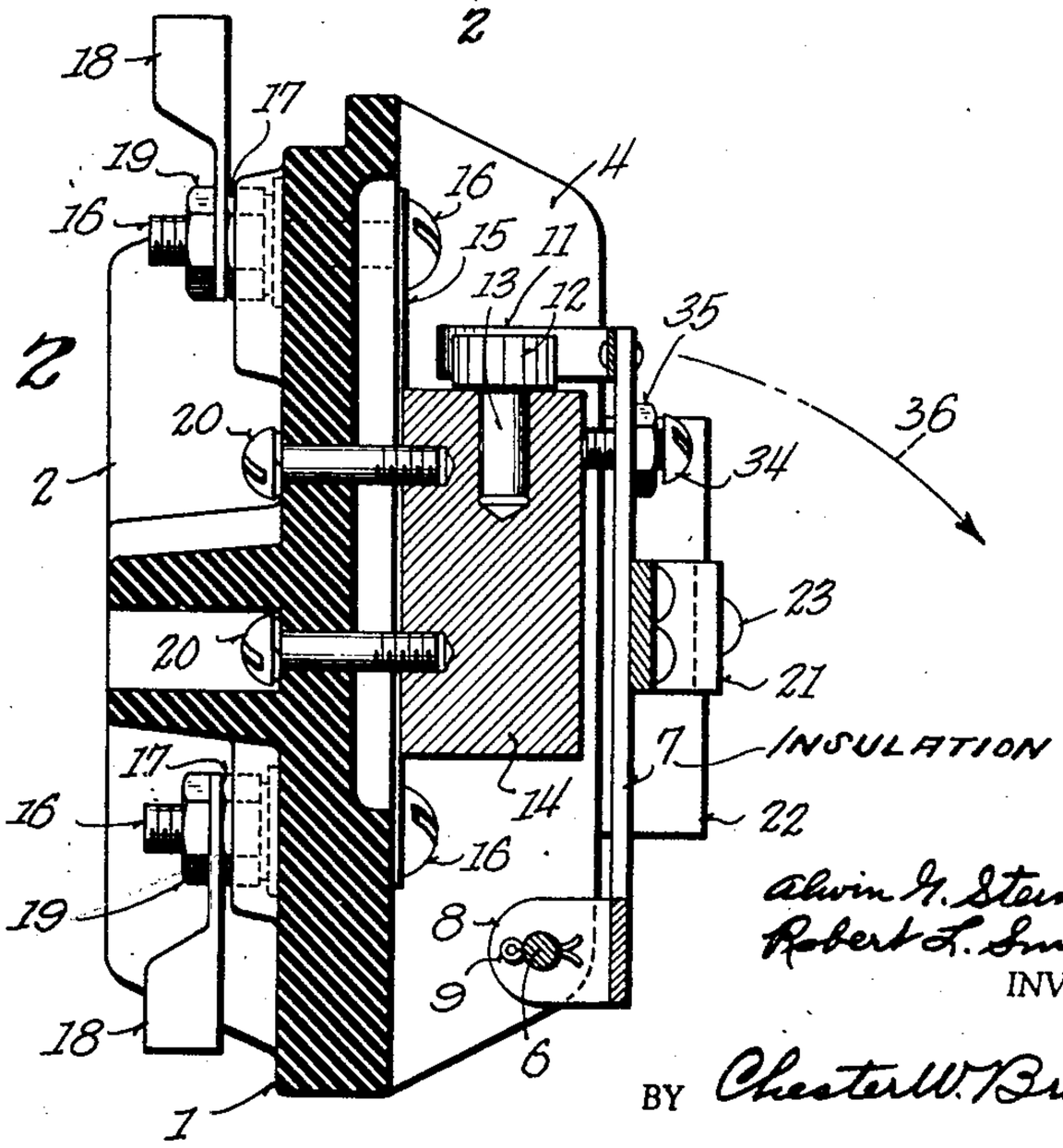

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Fig. 3

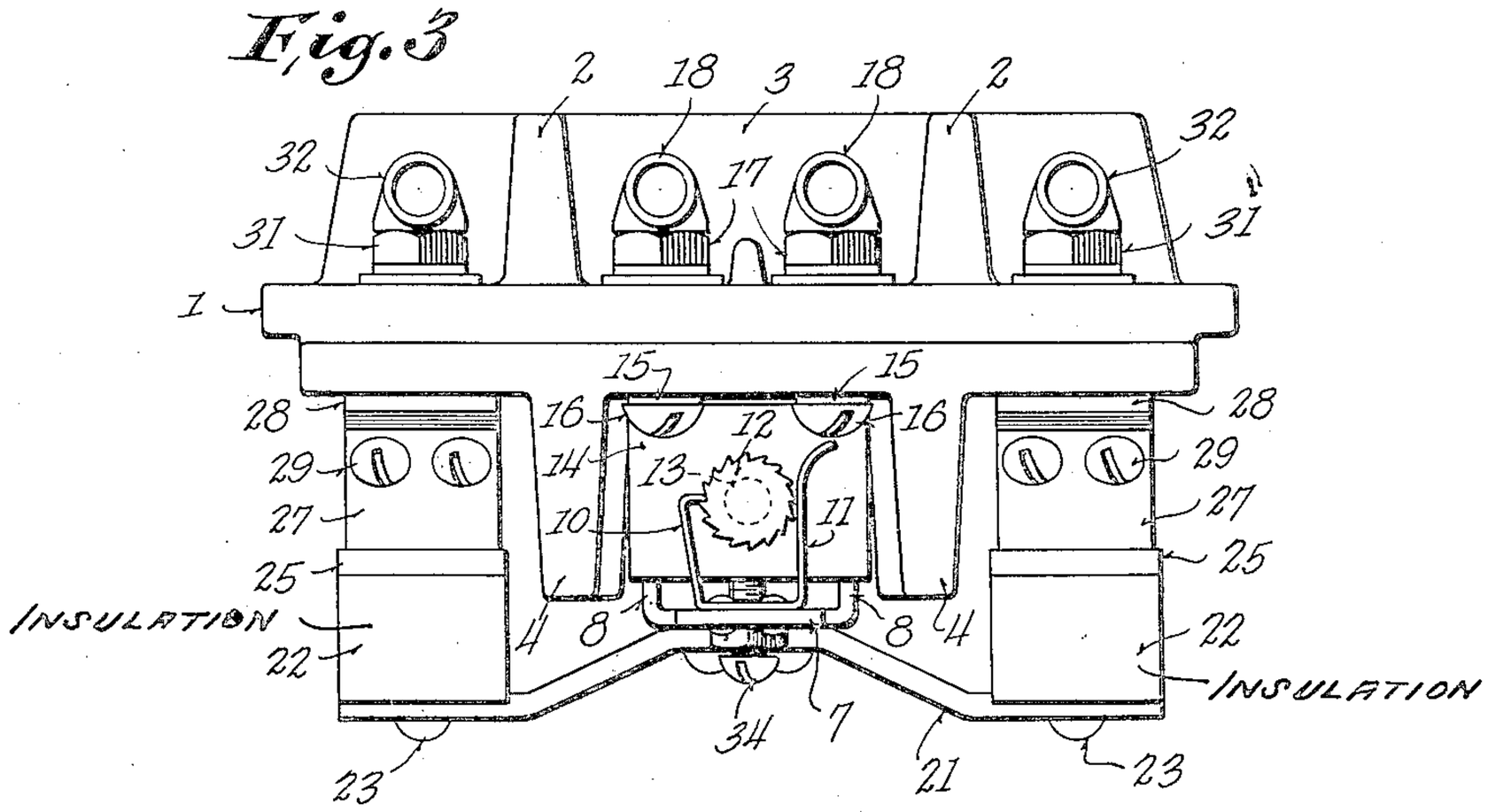
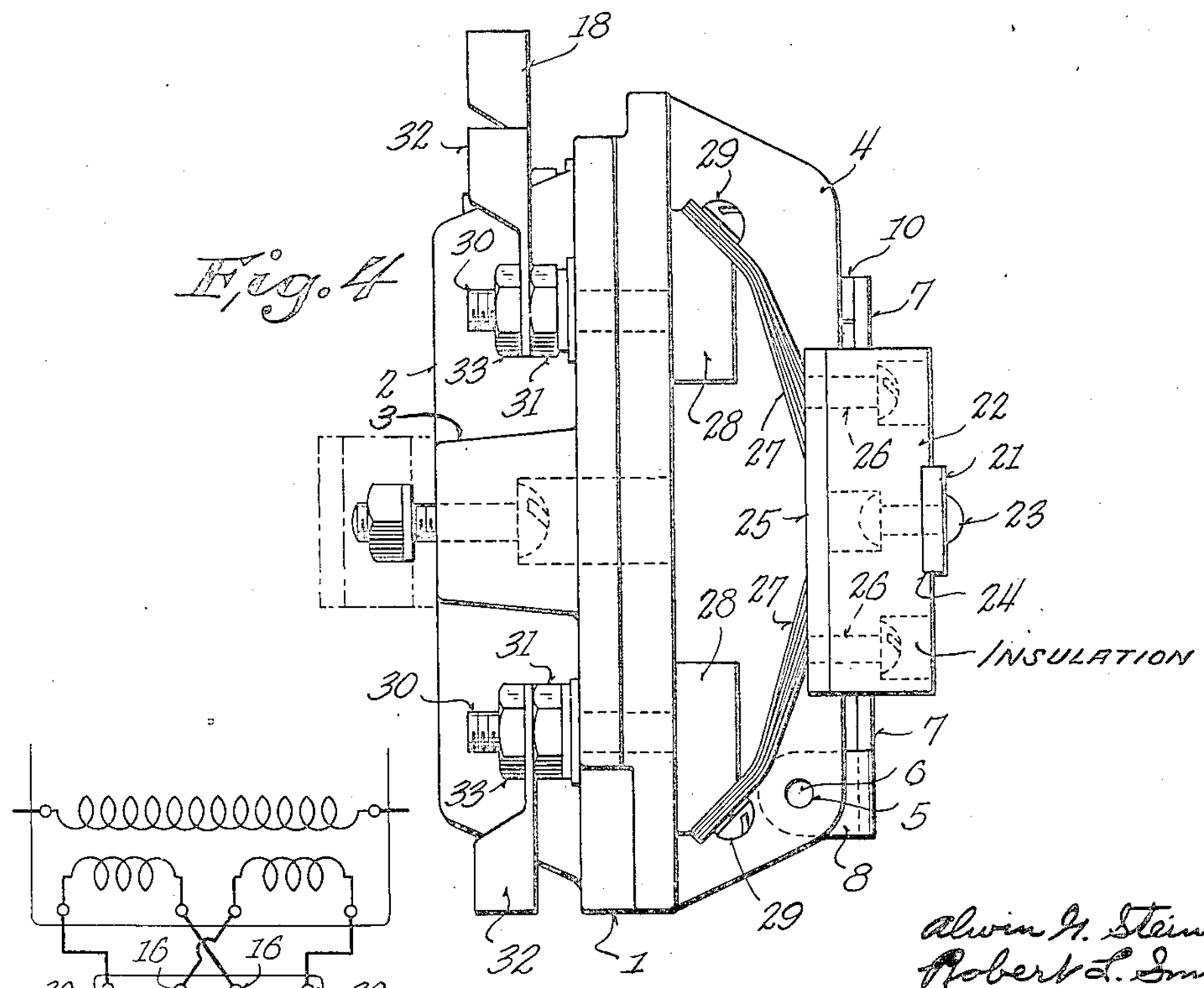


Fig. 4



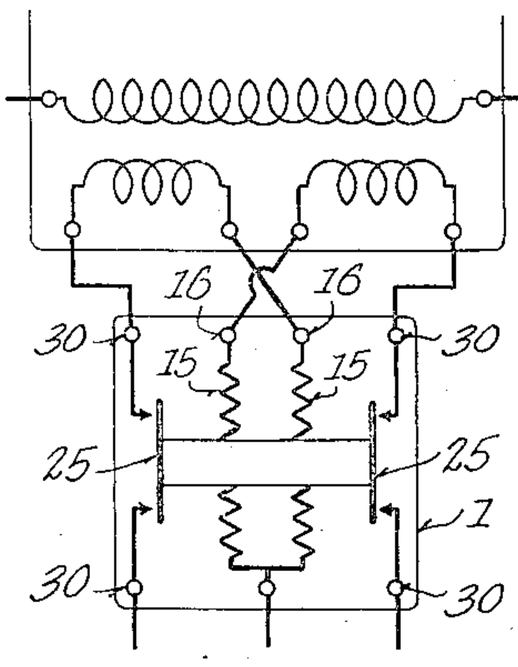


Fig. 5

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THERMAL TRANSFORMER CUT-OUT

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Application May 14, 1936, Serial No. 79,686

15 Claims. (Cl. 200—124)

This invention relates to thermal transformer cutouts.

It is an object of this invention to provide for the secondary circuit of a transformer, a thermally controlled cutout which will automatically open the circuit under a continued overload of predetermined value.

More specifically, it is an object of this invention to provide a cutout switch biased to open-circuit position and having a thermally controlled latch normally holding the switch in circuit-closing position, the latch being releasable under an overload of predetermined value and continued for a given period of time, thereby permitting the switch to open automatically.

A further object is to provide for the cutout switch a latch engaging a latching wheel normally subjected to rotative forces and held against rotation by a low-melting alloy which is subjected to heat generated by an overload in the secondary circuit of a transformer, whereby softening of the alloy will permit rotation of the latching wheel for releasing of the latch and automatic opening of the switch.

A still further object is to provide a transformer cutout unit which, if subjected to overload conditions, will automatically open either side or both sides of a secondary circuit and which may be reclosed without the necessity of renewal or replacement of parts.

It is also an object of this invention to provide a transformer cutout which is more efficient in operation, more economical to manufacture and install, and more facile in operation than protective devices heretofore provided.

In the drawings:

Fig. 1 is a view in front elevation of a cutout embodying this invention.

Fig. 2 is a sectional view in side elevation taken on the line 2—2 of Fig. 1.

Fig. 3 is an upper end view of the device shown in Fig. 1.

Fig. 4 is a view in side elevation of the device shown in Fig. 1.

Fig. 5 is a diagrammatic view illustrating the cutout in the secondary circuit of a transformer.

Like parts are identified by the same reference characters throughout the several views.

All live parts of the cutout herein disclosed are mounted upon a base 1 which is composed of suitable insulating material, such as porcelain. This base is provided upon one side at the rear with a pair of spaced parallel ribs 2 extending vertically across the base, and with a rib 3 extending across the base transversely of the ribs 2 and intermediate the ends thereof. The opposite side or front of the base 1 is provided with a pair of spaced, vertically extending parallel ribs 4, each of which is provided at the lower end with a bearing aperture 5 having a shaft 6 mounted therein.

Upon the shaft 6 is mounted a switch-operating arm 7. This arm comprises a flat strip of metal having at the lower end a pair of spaced ears 8 pivotally supporting the arm 7 on the shaft 6. Cotter pins 9 extending through the shaft 6 serve to retain the arm 7 against lateral movement.

As clearly shown in Figs. 2 and 3 and as may be observed in Fig. 1, the arm 7 is provided at its upper or movable end with a U-shaped member comprising a resilient latching finger 10 and a resilient latch-retaining or guiding finger 11. The latching finger 10 is provided with a lug engaging the teeth on the ratchet or latching wheel 12. The guiding finger 11 engages the opposite side of the wheel 12 and holds the latching finger 10 in engagement with the wheel.

The ratchet wheel 12 is provided with a stub shaft 13 imbedded in a heat-absorbing block 14 preferably composed of metal having a high melting point and provided with a shaft-receiving aperture containing a quantity of low-melting alloy metal. The low-melting alloy metal, when solidified, will hold the shaft 13 against rotation and when soft, will permit rotation thereof.

The block 14 is mounted upon a pair of spaced conducting strips 15 and is secured to the base 1 by means of bolts 20. The strips 15 are secured to the base 1 by means of the bolts 16 extending through the base and by means of the nuts 17. The bolts 16 serve as terminal posts to which wire terminals 18 are secured by means of the nuts 19.

The arm 7 has secured thereon intermediate its ends, a bridge 21 which extends laterally of the arm and beyond the ribs 4 on the base 1. Each end of the bridge 21 carries a block of insulating material 22 which is secured to the bridge by means of a rivet 23 and against rotative movement on the rivet by means of the slot 24 which receives the bridge.

Mounted on each block 22 is a metal circuit-closing plate 25 which is secured to the block by means of bolts 26. Thus the circuit-closing plate 25 is insulated from and carried by the bridge 21. The circuit-closing plates 25 serve as circuit-closing switch members connecting the resilient brush contacts 27. The brush contacts are mounted upon terminal blocks 28 and secured thereto by means of bolts 29. Each terminal

block 28 is provided with a threaded stud 30 extending through the base 1 and secured thereto by means of a nut 31. Mounted on each stud 30 is a line terminal 32 secured to the stud by means of a nut 33.

From the foregoing, it will be observed that the circuit-closing plates 25 will be maintained in contact with the brush contacts 27 through the bridge 21, arm 7, latch 10 and ratchet wheel 12 which is held against rotation in the block 14.

As is illustrated in Fig. 5, corresponding ends of the conducting plates or strips 15 are connected to the neutral line of the secondary and that the other corresponding ends of the conducting strips 15 are each connected to a secondary winding of the transformer. Obviously to secure interruption of the secondary circuits under given conditions, the conducting plates 15 should be composed of metal having a known characteristic resistance to a current flowing therethrough, thereby generating a predetermined quantity of heat over a given period of time.

It will also be seen, from Fig. 3, that each circuit-closing plate 25, by reason of its contact with a pair of brush contacts 27, closes a circuit through one of the secondary windings. Thus a circuit will be established passing through each of the conducting plates 15 and, when an overload occurs in that circuit, the corresponding conducting plate 15 will be heated and its heat will be transferred to the block 14.

In order to secure a definite time lag in the heating effect of the plates 15 upon the block 14, the latter should have a predetermined cubical content requiring a given flow of current for a given period of time to raise its temperature to the melting point of the alloy therein. In this way, the cutout will open under a given overload which has continued in either or both of the secondary windings during a predetermined period.

If a predetermined overload occurs for a given period of time, the temperature of the block will ultimately reach a point where the low-melting alloy metal in the block 14 will be softened to such extent, that the brush contacts 27 will force the arm 7 about its pivot and cause the ratchet wheel 12 to rotate until the latch 10 is released from the ratchet wheel. After the arm 7 is thus freed for rotation on its bearing, the circuit-closing plates 25 will be moved from the brush contacts 27 and thereby open the circuits through the secondary of the transformer.

The curved arrow 36, shown in Fig. 2, indicates the direction of movement of the arm 7 as it swings about the shaft 6 when the circuits are being opened. Preferably, the cutout should be mounted as illustrated in Figs. 1, 2 and 4, thereby utilizing the force of gravity to swing the circuit-closing plates 25 completely out of contact with the brush contacts 27.

As will be clearly seen in Figs. 1 to 3, inclusive, the arm 7 is provided with a stop bolt 34 having a locknut 35 for securing the bolt against rotation. The bolt 34 serves as a means for limiting the circuit-closing movement of the arm 7. The limit of this movement is determined by the engagement of the bolt 34 with the block 14.

The cutout herein disclosed is adapted to open a secondary circuit after carying an overload for a relatively long period of time and is not intended to open such circuit under short circuit conditions, this being the function of fuses. However, we are aware of the fact that this invention may be adapted for opening a circuit under short circuit conditions and therefore, it is not to be understood that the claims are to be limited to the specific use of the device as herein disclosed.

From the foregoing, it will be apparent that we have disclosed for cutout switches a novel thermally controlled latch adapted to hold the switch in circuit-closing position during normal current demands and to release the switch for movement to open-circuit position after a predetermined overload in an electrical circuit has continued during a given period of time. It will also be apparent that the embodiment of the invention herein disclosed provides a novel cutout in which the efficienty of the device is not affected during circuit-opening operations or by overload conditions and in which no replacement of parts is required after a circuit has been opened.

Obviously, this invention provides a cutout which may be manufactured at a relatively low cost, which will operate at comparatively no expense, and which may be serviced in a minimum period of time and with only such skill as may be necessary to reclose the switch after the low-melting alloy metal in the block 14 has solidified.

We claim:

1. A cutout comprising an insulating base, a pair of terminals mounted on said base and each including a resilient contact brush in insulated relation to and inclined toward the other brush, a movable circuit-closing plate engaging said brushes to close a circuit therethrough, an insulating block on said plate, an arm pivotally carried by said base and connected to said block in insulated relation to said plate, a latch connected to said arm, a rotatable catch engaged by said latch, a low-melting material supported by the base and normally holding the catch against rotation, and electric heating means for softening said material.

2. A cutout comprising an insulating base, a pair of terminals mounted on said base and each including a resilient contact brush in insulated relation to and inclined toward the other brush, a movable circuit-closing plate engaging said brushes to close a circuit therethrough, an insulating block on said plate, an arm pivotally carried by said base and connected to said block in insulated relation to said plate, a latch connected to said arm, a rotatable catch engaged by said latch, a low-melting material supported by the base and normally holding the catch against rotation, and electric heating means for softening said material, said arm extending in a vertical direction about its pivotal connection with said base when held in circuit-closing position.

3. A cutout comprising an insulating base, a pair of terminals mounted on said base and each including a resilient contact brush in insulated relation to and inclined toward the other brush, a movable circuit-closing plate engaging said brushes to close a circuit therethrough, an insulating block on said plate, an arm pivotally carried by said base and connected to said block in insulated relation to said plate, a latch connected to said arm, a rotatable catch engaged by said latch, a low-melting material supported by the base and normally holding the catch against rotation, and electric heating means for softening said material, said arm extending in a vertical direction about its pivotal connection with said base when held in circuit closing position and being biased to move to open-circuit position upon rotation of said catch.

4. A cutout comprising an insulating base, a pair of terminals mounted on said base and each including a resilient contact brush in insulated relation to and inclined toward the other brush, a movable circuit-closing plate engaging said brushes to close a circuit therethrough, an insulating block on said plate, an arm pivotally carried by said base and connected to said block in insulated relation to said plate, a latch connected to said arm, a rotatable catch engaged by said latch, a low-melting material supported by the base and normally holding the catch against rotation, and electric heating means for softening said material, said arm extending in a vertical direction about its pivotal connection with said base when held in circuit-closing position, said brushes biasing said arm toward open-circuit position.

5. A cutout comprising an insulating base, a pair of terminals mounted on said base and each including a resilient contact brush inclined toward the other brush, a movable contact plate pivotally supported by said base and insulated from said terminals when in open-circuit position, a latch secured to and insulated from said plate, a rotatable catch engaged by said latch, a low-melting alloy supported on said base and normally holding said catch against rotation, and electric heating means subjecting said alloy to heat generated by said means.

6. A cutout comprising an insulating base, a pair of terminals mounted on said base and each including a resilient contact brush inclined toward the other brush, a movable contact plate pivotally supported by said base and insulated from said terminals when in open-circuit position, a latch secured to and insulated from said plate, a rotatable catch engaged by said latch, a low-melting alloy supported on said base and normally holding said catch against rotation, and electric heating means subjecting said alloy to heat generated by said means, said plate extending in a vertical direction about its pivotal connection with said base when held in circuit-closing position.

7. A cutout comprising an insulating base, a pair of terminals mounted on said base and each including a resilient contact brush inclined toward the other brush, a movable contact plate pivotally supported by said base and insulated from said terminals when in open-circuit position, a latch secured to and insulated from said plate, a rotatable catch engaged by said latch, a low-melting alloy supported on said base and normally holding said catch against rotation, and electric heating means subjecting said alloy to heat generated by said means, said plate being biased to move to open-circuit position upon rotation of said catch.

8. A cutout comprising an insulating base, a pair of terminals mounted on said base and each including a resilient contact brush inclined toward the other brush, a movable contact plate pivotally supported by said base and insulated from said terminals when in open-circuit position, a latch secured to and insulated from said plate, a rotatable catch engaged by said latch, a low-melting alloy supported on said base and normally holding said catch against rotation, and electric heating means subjecting said alloy to heat generated by said means, said brushes biasing said plate toward open-circuit position.

9. An automatic cutout comprising an insulating base, a pair of spaced terminals, a movable contact-supporting member having a contact insulated therefrom and connecting said terminals, a rotatable catch supported by said base, a low-melting alloy supported by said base and normally holding said catch against rotation, electric heating means subjecting the said alloy to heat generated by said means, and a latch secured to said member and comprising a latching finger engageable with one side of said catch and a guiding finger engageable with the other side of said catch.

10. A cutout comprising an insulating base, a pair of terminals mounted on said base and each including a resilient contact brush inclined toward the other brush, a movable contact plate pivotally supported by said base and insulated from said terminals when in open-circuit position, a latch secured to and insulated from said plate, a rotatable catch engaged by said latch, a low-melting alloy supported on said base and normally holding said catch against rotation, and electric heating means subjecting said alloy to heat generated by said means, said latch comprising a latching finger engageable with one side of said catch and a guiding finger engageable with the other side of said catch.

11. A cutout comprising an insulating base, a pair of terminals mounted on said base and each including a resilient contact brush in insulated relation to and inclined toward the other brush, a movable circuit-closing plate engaging said brushes to close a circuit therethrough, an insulating block on said plate, an arm pivotally carried by said base and connected to said block in insulated relation to said plate, a latch connected to said arm, a rotatable catch engaged by said latch, a low-melting material supported by the base and normally holding the catch against rotation, and electric heating means for softening said material, said arm extending in a vertical direction about its pivotal connection with said base when held in circuit-closing position, said latch comprising a latching finger engageable with one side of said catch and a guiding finger engageable with the other side of said catch.

12. An automatic cutout comprising an insulating base having a pair of relatively spaced substantially parallel ribs and lateral base portions extending from the ribs, a pair of spaced resilient brush contacts on each of said base portions, a pair of contact plates each connecting one of said pair of brush contacts, an insulating block secured to each of said plates, a bridge member connected to each block in insulated relation to said plates and spanning the space between said ribs, an arm secured intermediate its ends to an intermediate portion of said bridge member and pivotally mounted at one end on said ribs in insulated relation to said brushes, a latch on the free end of said arm and comprising a latching finger and a guiding finger spaced therefrom, a heat-absorbing block between said ribs and supported by said base, a rotatable catch having a hub portion embedded in said block, said block including a low-melting alloy normally holding said catch and hub against rotation, said catch being disposed between and engaged by said fingers, and means for electrically heating said block.

13. An automatic cutout comprising an insulating base having a pair of relatively spaced substantially parallel ribs and lateral base portions extending from the ribs, a pair of spaced resilient brush contacts on each of said base portions, a pair of contact plates each connecting one of said pair of brush contacts, an insu-

lating block secured to each of said plates, a bridge member connected to each block in insulated relation to said plates and spanning the space between said ribs, an arm secured intermediate its ends to an intermediate portion of said bridge member and pivotally mounted at one end on said ribs in insulated relation to said brushes, a latch on the free end of said arm and comprising a latching finger and a guiding finger spaced therefrom, a heat-absorbing block between said ribs and supported by said base, a rotatable catch having a hub portion embedded in said block, said block including a low-melting alloy normally holding said catch and hub against rotation, said catch being disposed between and engaged by said fingers, means for electrically heating said block, and an adjustable stop on said arm engageable with said block.

14. An automatic cutout comprising an insulating base having a pair of relatively spaced substantially parallel ribs and lateral base portions extending from the ribs, a pair of spaced resilient brush contacts on each of said base portions, a pair of contact plates each connecting one of said pair of brush contacts, an insulating block secured to each of said plates, a bridge member connected to each block in insulated relation to said plates and spanning the space between said ribs, a latch connected to said bridge and comprising a latch finger and a guiding finger, said bridge being movably supported by said base in insulated relation to said brushes and being biased to open-circuit position by said brushes, a heat-absorbing block supported by said base, a rotatable catch having a hub portion embedded in said block, said block including a low-melting alloy normally holding said catch against rotation, said catch being engaged by and between said fingers, and means for electrically heating said block.

15. An automatic cutout comprising an insulating base, a switch-operating arm pivotally carried by said base, engageable contact means carried by said base and said arm, said members being in insulated relation to said arm and including contact brushes, a heat-absorbing block carried by said base, a rotatable catch having a hub embedded in said block, said block including a low-melting alloy normally holding said catch and hub against rotation, a latch carried by said arm and including a latch finger engaging one side of said catch and a guiding finger engaging the other side of said catch, said arm being biased toward open-circuit position.

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