Dec. 24, 1929. J. N. TODD, JR 1,740,911

CIRCUIT BREAKER

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Fig. 1.

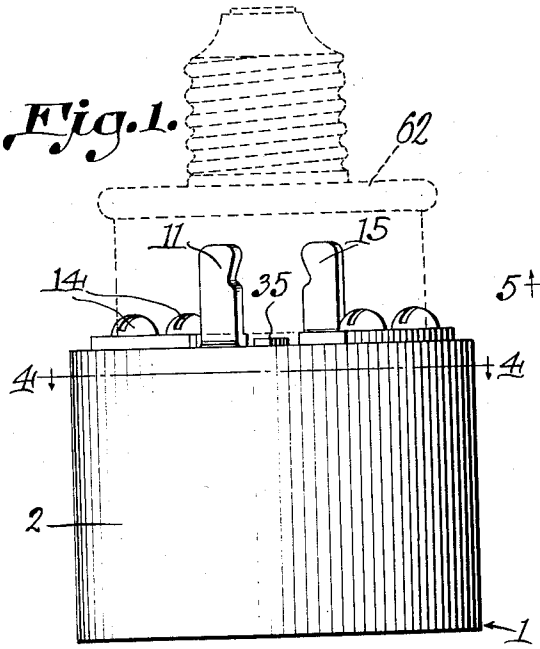


Fig. 2.

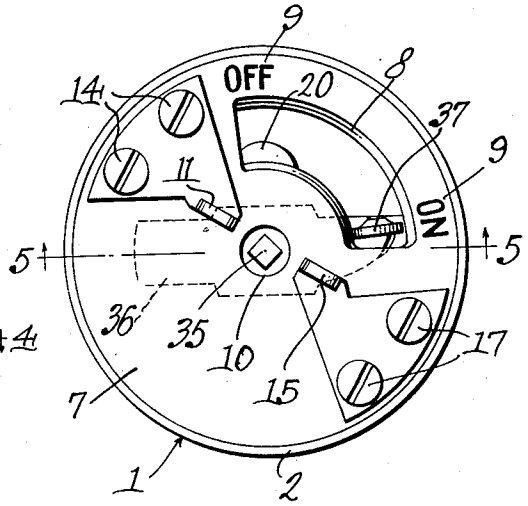


Fig. 3.

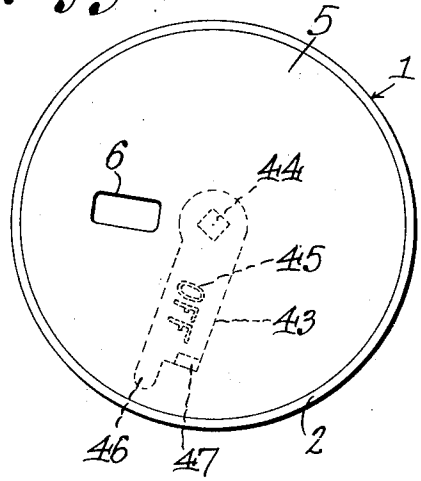
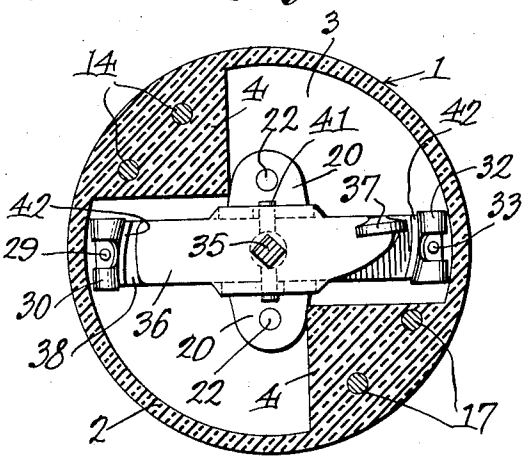


Fig. 4.



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Fig. 5.

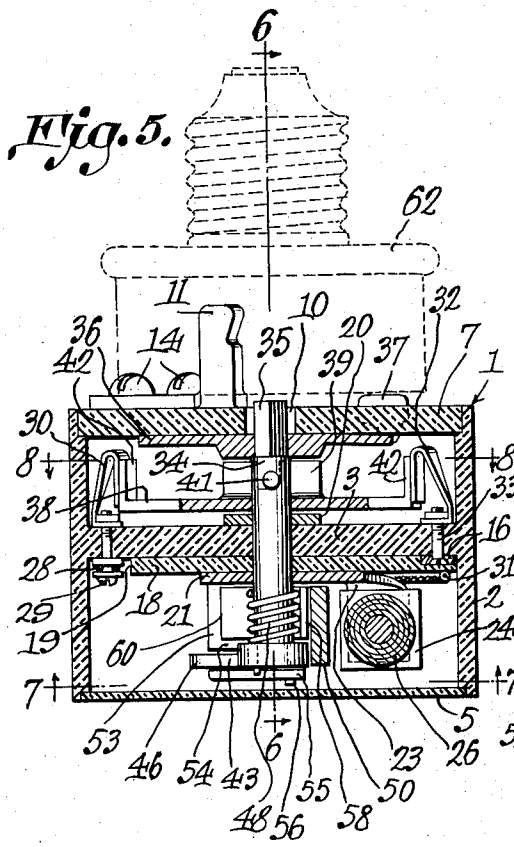


Fig. 6.

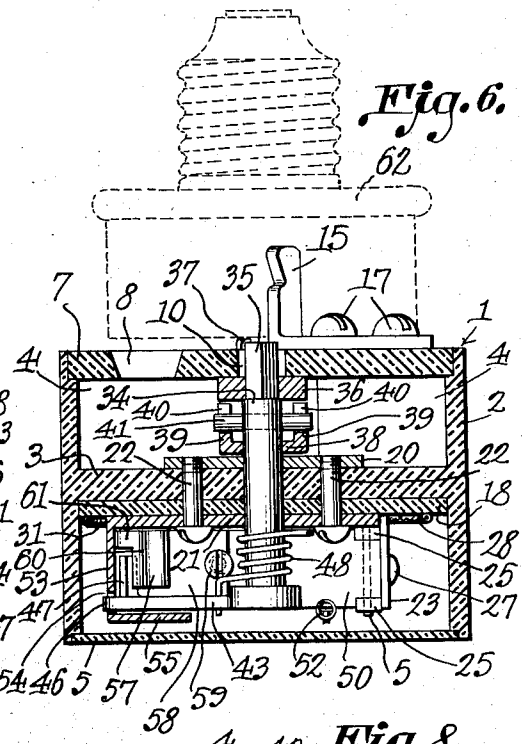


Fig. 7.

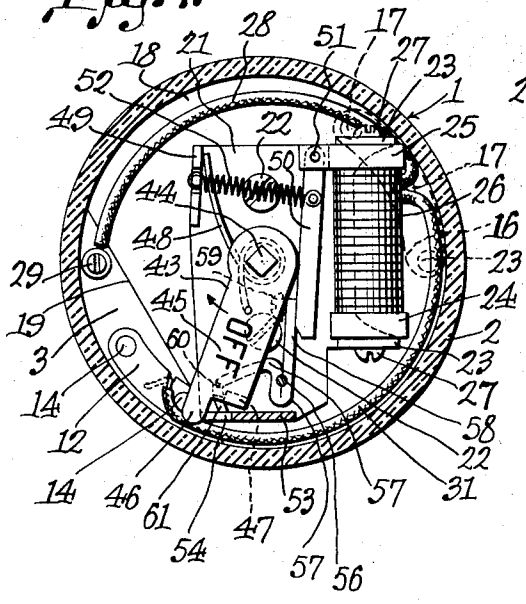
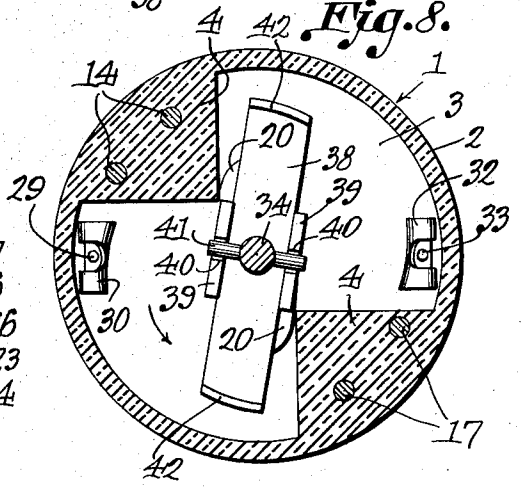


Fig. 8.



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UNITED STATES PATENT OFFICE

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CIRCUIT BREAKER

Application filed June 16, 1927. Serial No. 199,291.

The device forming the subject matter of this application is a circuit breaker, and the invention has, as one of its objects, the provision of a circuit breaker which cannot easily be handled in an improper way by inexperienced persons. Another object of the invention, and a more specific one, is to provide a circuit breaker wherein the parts cannot be held forcibly in closed circuit position when there is an over-load in the circuit. Another object of the invention is to provide a circuit breaker which will open abruptly and positively. A further object is to supply a device of the class described which will be compact in form, and so simple as to withstand hard use.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed, without departing from the spirit of the invention.

In the drawings:—

Figure 1 shows in side elevation, a device constructed in accordance with the invention;

Figure 2 is a top plan wherein the plug connection has been removed;

Figure 3 is a bottom plan;

Figure 4 is a section on the line 4—4 of Figure 1;

Figure 5 is a section on the line 5—5 of Figure 2;

Figure 6 is a section on the line 6—6 of Figure 5;

Figure 7 is a section on the line 7—7 of Figure 5;

Figure 8 is a section on the line 8—8 of Figure 5, the switch being open.

Although the device may be disposed in any desired way with respect to the horizontal, it will be supposed that the article is arranged as shown in Figures 1, 5 and 6, of the drawings, the terms "above", "below", and the like, being selected accordingly.

In carrying out the invention, there is provided a casing 1, formed of insulating material, the casing including a tubular shell 2 supplied intermediate its ends with a partition 3. Quadrantal lugs 4 upstand from the partition 3 and are joined to the partition and to the shell 2 as indicated in Figures 4 and 8. A first closure 5 is secured in the lower end of the shell 2, and the closure 5 is provided with a hole 6 which shows in Figure 3 of the drawings. A second closure 7 is seated in the upper end of the casing 1 on the lugs 4. The closure 7 has a curved slot 8 (Figure 2), and there are indicating marks 9 on the closure 7, at the ends of the slot 8, the closure 7 being provided with a central opening 10.

A connecting finger 11 is mounted on the closure 7. An anchor plate 12 is disposed below the partition 3. Securing elements 14 join the finger 11 with the anchor plate 12 and extend through the closure 7, the lugs 4, and the partition 3. An electrical connection, thus, is established between the connecting finger 11 and the anchor plate 12. A similar finger 15 is mounted on the closure 7. An anchor plate 16 is located beneath the partition 3. Securing elements 17 join the finger 15 with the anchor plate 16, the securing elements 17 extending through the closure 7, the lug 4, and the partition 3. The securing elements 17 join the connecting finger 15 electrically with the anchor plate 16.

An insulating disk 18 rests against the lower surface of the partition 3. The disk 18 covers the anchor plate 16, as shown in Figure 7. The insulating disk 18, however, is cut away, as shown at 19 in Figure 7, to expose part of the anchor plate 12.

An anchor strip 20 is placed on top of the partition 3. A base plate 21 abuts against the lower surface of the insulating disk 18. Securing devices 22, such as screws, connect the base plate 21 with the anchor strip 20, and extend through the insulating disk 18 and the partition 3, as shown best in Figure 6. There are ears 23 on the base plate 21, and the heads 24 and 25 of an electromagnet 26 are secured as indicated at 27, to the ears 23 on the base plate. One end 28 of the winding of the electromagnet 26 is in electrical engagement with a bolt 29 mounted in the partition 3 and

holding an upstanding spring switch member 30 on the partition 3, as shown, for instance, in Figure 5. The other end 31 of the winding of the electromagnet 26 is bound between the anchor plate 12 and the partition 3. A spring switch member 32 is disposed diametrically opposite to the switch member 30 and is held on the partition 3 by a bolt 33, the said bolt being engaged with the anchor plate 16.

The numeral 34 marks a shaft journaled in the anchor strip 20, in the partition 3, in the insulating disk 18, and in the base plate 21. The shaft 34 has a squared upper end 35 which is accessible through the opening 10 in the closure 7. An operating lever 36 is mounted intermediate its ends on the squared part 35 of the shaft 34, the lever 36 being supplied with a finger piece 37 which moves in the curved slot 8 of the closure 7.

The shaft 34 extends through a bridge 38 having, intermediate its ends, upstanding wings 39 in which there are seats 40 receiving the ends of a cross pin 41 in the shaft 34, the construction being such that bridge 38 is connected to the shaft 34 to swing when the shaft is rotated. The bridge 38 has upstanding ends 42 which are adapted to cooperate with the spring switch members 32 and 30. An arm 43 is mounted on the squared lower end 44 of the shaft 34, the arm 43 carrying a mark 45 which, when the arm is swung around far enough (Figure 3) is visible through the hole 6 in the first closure 5. The arm 43 has a reduced end 46 located in the same plane with the arm, the arm being provided at its free end with an upstanding projection 47 located at right angles to the arm. The lower portion of the shaft 34 is surrounded by a torsion spring 48, one end of the spring being mounted in the arm 43, and the other end of the spring abutting, as shown in Figure 7, against a wing 49 that extends downwardly from the base plate 21.

The numeral 50 designates an armature pivotally mounted at 51 on the head 25 of the electromagnet 26, the armature being responsive to the head 24 of the electromagnet, when the electromagnet is energized. The armature 50 is retracted by a draw spring, one end of the spring 52 being connected to the armature 50, and the other end of the spring being connected to the wing 49, as shown in Figure 7.

The plate 21 has a depending flange 53 in the side of which there is a notch 54, the flange 53 being provided with a lip 55 (Figure 6) which is disposed parallel to the plate 21. A pivot element 56 is mounted in the lip 55 and in the base plate 21. An angular latch 57 is mounted to swing on the pivot element 56. One arm 58 of the latch 57 is loosely connected by means of a screw 59 or the like, with the armature 50. The latch 57 includes a hook-shaped keeper 60 wherewith the projection 47 on the arm 43 is adapted to engage, the keeper 60 having a reduced finger 61 which abuts against the flange 53, to limit the movement of the latch 57 under the action of the armature 50, when the armature responds to the pull of the retractile spring 52.

The connecting fingers 11 and 15 are adapted to be received removably, in a well known way, in a plug connector 62 which is threaded for engagement with an electric lamp socket (not shown). The diameter of the plug connection 62 is such that it covers the slot 8 and the finger piece 37 on the operating lever 36. The utility of this feature will be made manifest hereinafter.

The shaft 34 may be rotated by means of a key (not shown) applied to the squared end 35 of the shaft, or the shaft may be rotated by means of the finger piece 37 on the operating lever 36, the finger piece moving in the slot 8 of the closure 7. When the shaft 34 is rotated as aforesaid, the ends 42 of the bridge 38 come into contact with the yieldable switch members 30 and 32. The torsion in the spring 48 is increased, and the arm 43 swings around until its projection 47 engages automatically with the hook-shaped keeper 60 on the angular latch 57, the latch being connected to the armature 50, loosely, through the instrumentality of the screw 59, the spring 52 constituting both a retracting means for the armature 50, and a means for holding the angular latch 57 in such a position that the projection 47 on the arm 43 will automatically engage with the keeper 60 of the latch 57, as aforesaid. When the projection 47 on the arm 43 has been engaged with the keeper 60 on the latch 57, the shaft 34 is prevented from rotating reversely, responsive to the torsion spring 48, and the ends 42 of the bridge 38 are held engaged with the switch members 30 and 32, as shown in Figure 5 of the drawings.

The circuit through the device comprises the finger 11, the securing elements 14, the anchor plate 12, the end 31 of the winding of the electromagnet 26, the end 28 of the winding of the electromagnet, the bolt 29, the spring switch member 30, the bridge 38, the spring switch member 32, the bolt 33, the anchor plate 16, the securing elements 17, and the finger 15, the fingers 11 and 15 being received in the plug connection 62.

In case of an over-load, the head 24 of the electromagnet 26 attracts the armature 50, the tension in the spring 52 being increased, the screw 59 transmitting motion from the armature 50 to the latch 57, by way of the arm 58, the latch being tilted on its fulcrum 56, and the keeper 60 on the latch being disengaged from the projection 47 on the arm 48. The shaft 34 now rotates, responsive to the spring 48, and the ends of the bridge 38 are disengaged from the switch members 30 and 32, the arm 43 coming to

rest in contact with the edge of the wing 49 shown in Figure 7. The indicating marks 9 of Figure 2 of course serve to advise the operator as to whether the circuit is opened or closed, the position of the finger piece 37 on the operating lever 36, being noted in connection with the marks at 9. The mark 45 on the arm 43 appears at the opening 6 in the bottom closure 5, and, thus, from the bottom of the device, the operator can ascertain at a glance, whether the circuit is opened or closed.

Because the plug connection 62 covers the curved slot 8, the finger piece 37 on the operating lever 36 is inaccessible when the fingers 11 and 15 are engaged in the plug connection. As a result, the device cannot be reset until the cause of the over-load has been corrected. If the cause of the over-load has not been corrected, the circuit will be opened as soon as the fingers 11 and 15 are inserted again into the plug connection 62, and because the finger piece 37 is concealed and covered by the plug connection, the operator cannot reach the finger piece 37 and hold the circuit closed notwithstanding the overload.

The device is simple in construction, compact, and is enclosed in a casing of insulating material. The cross piece 41 in the shaft 34 is received somewhat loosely in the seats 40 that are formed in the wings 39 of the bridge 38. The result is that the shaft 34 is well in motion, before swinging movement is transmitted to the bridge 38, and, as a consequence, the bridge is moved abruptly and promptly to open position with respect to the switch members 30 and 32, there being no sticking or dragging between the ends 42 of the bridge 38 and the switch members 30 and 32.

What is claimed is:—

1. In a device of the class described, a casing, over-load switch mechanism in the casing, means for closing the over-load switch mechanism at the will of an operator, said means comprising a part accessible from without the casing, a member for bringing the switch mechanism into a circuit, and a detachable connection between said member and the switch mechanism, said member being of such size as to render the aforesaid part of the closing means inaccessible.

2. In a device of the class described, a casing, having an opening, over-load switch mechanism in the casing and including fingers projecting from the casing, a plug connection receiving the fingers, means for closing the switch mechanism and including a finger piece movable in the opening, the plug connection being of such size as to render the finger piece inaccessible.

3. In a device of the class described, a shaft supported for rotation, an arm on the shaft, an electromagnet, an armature responsive to the magnet, a latch loosely connected to the armature, the latch cooperating with the arm, to hold the shaft against rotation, means for supporting the latch pivotally, means for rotating the shaft when the latch is disengaged from the arm, a spring connected to the armature and constituting both a retracting means for the armature and a means for holding the latch yieldingly in position to engage the arm, and switch mechanism carried by the shaft.

4. In a device of the class described, a casing provided intermediate its ends with a partition, a shaft journaled in the partition, spring means for rotating the shaft, a bridge on the shaft, switch members cooperating with the bridge, the switch members and the bridge being located on one side of the partition, and tripping means disposed on the opposite side of the partition, the tripping means comprising an electromagnet in circuit with the switch members, an armature responsive to the magnet, a latch operated by the armature, and an arm on the shaft and cooperating with the latch releasably to hold the shaft against rotation.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature.

JOHN NORTON TODD, JR.