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Kubiak et al.

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[54] **OVERCURRENT RELEASE OF ELECTRIC SWITCH IN PARTICULAR OF SWITCH BREAKER**

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[52] **U.S. Cl.** **337/71,** 337/7, 337/48

[51] **Int. Cl.** **H01h 71/16**

[58] **Field of Search** 337/7, 48, 50, 55, 337/71, 72

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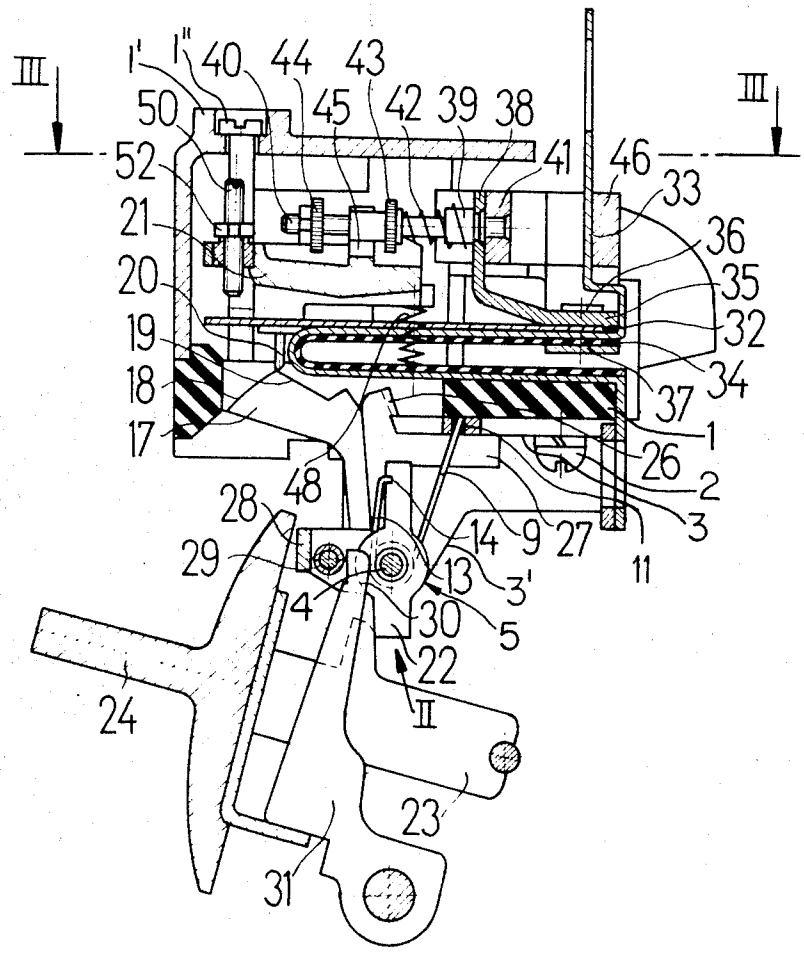
[57] **ABSTRACT**

A circuit breaker provided with a thermal and electromagnetic element has two levers and two torsion springs. The torsion springs are prestressed and exert on the levers oppositely-directed forces, whereby the force exerted by the first torsion spring on the first lever is greater than the force exerted by the second torsion spring on the second lever. The levers act as the force-transmitting members of the breaker.

3 Claims, 3 Drawing Figures



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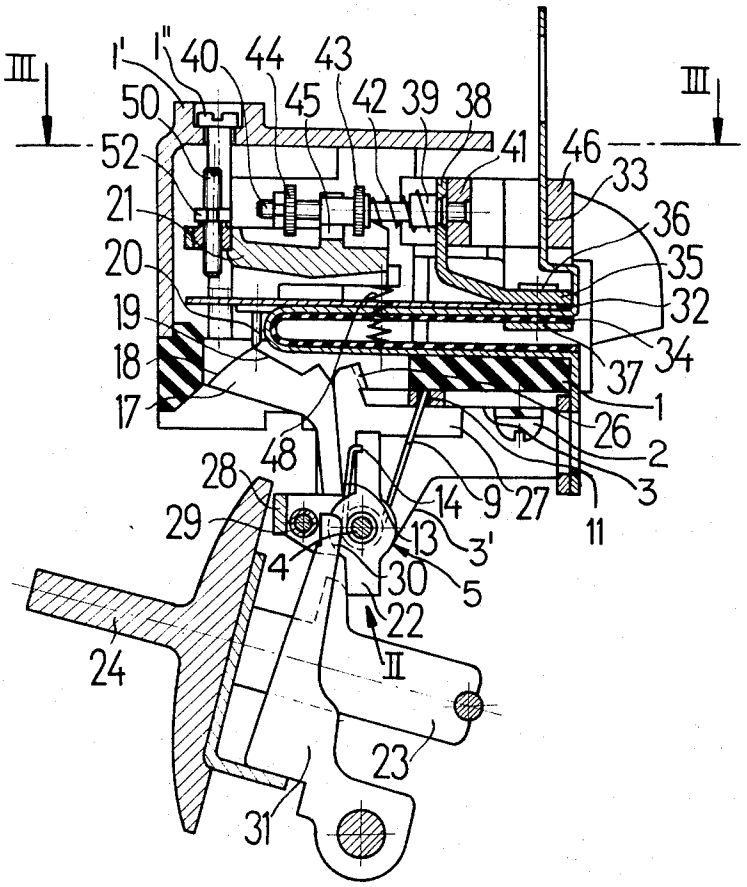

FIG.1

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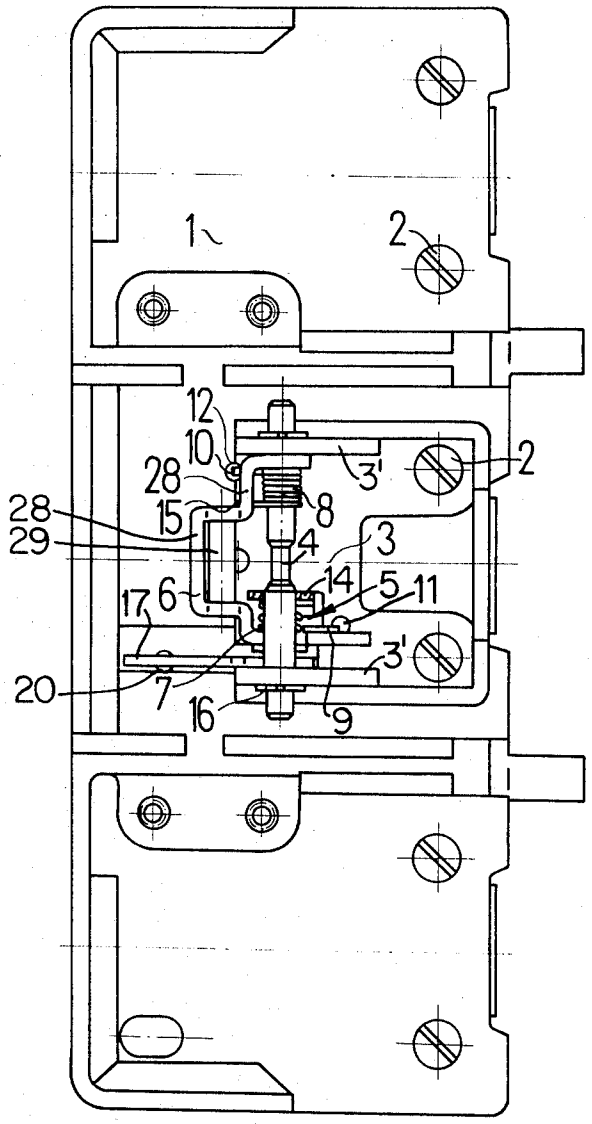

FIG. 2

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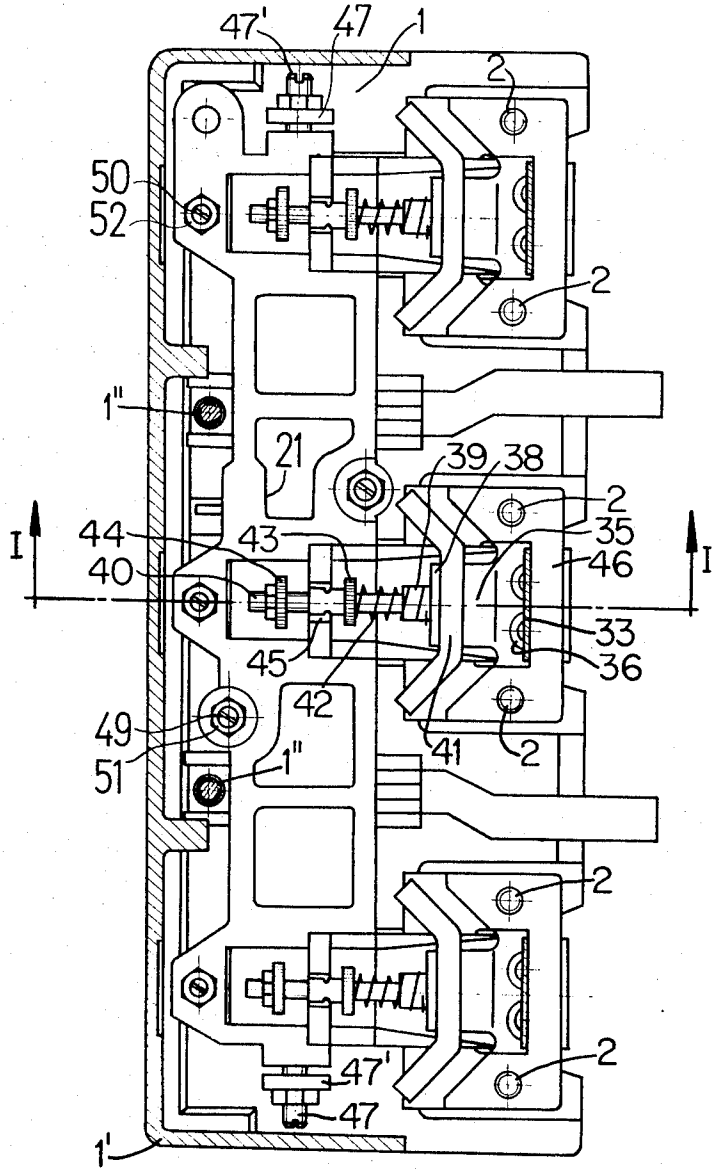

FIG. 3

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OVERCURRENT RELEASE OF ELECTRIC SWITCH IN PARTICULAR OF SWITCH BREAKER

Field of the Invention

The invention relates to the overcurrent release of an electric switch and more particularly, to a switch breaker.

BACKGROUND OF THE INVENTION

The release devices of low-voltage circuit breakers have a thermal element, electromagnetic element, and a mechanism with a shaft in which a lever is rotatably mounted together with a torsion spring. The lever is provided with a long and a short arm, the latter carrying a roller.

When the circuit breaker is open circuited, the torsion spring holds the long arm of the lever away from a boss on a movable rod. During setting of the circuit breaker, a tooth of a lock-releasing lever presses the roller mounted in the short arm of the lever with great force and rotates its lever in the direction opposite the bias of the torsion spring.

A drawback of this release device consists in that, the lock releasing lever, when disengaging, must overcome the force exerted by the torsion spring in order to shift the roller. This delays the disconnection of the circuit breaker.

OBJECT OF THE INVENTION

The object of the invention is the development of such a circuit-breaker release mechanism which is capable of shortening the operating time of the circuit breaker and enables calibration of its mechanism without other parts of the circuit breaker.

SUMMARY OF THE INVENTION

This object has been achieved in a mechanism in which the support is provided with a common shaft on which two levers and two torsion springs are rotatably mounted. The springs are arranged so that they are tensioned and exert oppositely directed forces on these two levers.

The force exerted by the first torsion spring on the first lever is greater than the force exerted by the second torsion spring on the second lever.

The two levers are so situated and shaped that a long arm of the first lever rests on the boss of a movable rod, and the short arm of this lever has a length such that it is situated in the path of the circuit-breaker handle.

The second lever has a lug on its long arm, which is in the path of the long arm of the first lever. On the short arm of the second lever there is provided a roller which blocks the tooth of the lever adapted to trip the lock of the circuit breaker.

DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a cross-section (taken along line I — I of FIG. 3) of the release mechanism;

FIG. 2 is a view of the release mechanism from the side (arrow II of FIG. 1); and

FIG. 3 is a sectional view (along Line III — III of FIG. 1) of the mechanism.

SPECIFIC DESCRIPTION

The switch or circuit breaker of the present invention comprises an insulating body (FIGS.1 – 3) which extends over the length of the housing 1′ (FIGS.1 and 3) to which it is secured by screws 1″ (FIGS.1 and 3).

Screws 2 (FIGS.1 and 2) attach a support 3 from below to the insulating body 1, the support 3 having a pair of downwardly extending legs 3′ (FIGS.1 and 2) in which a shaft 4 (FIGS.1 and 2) is mounted.

The shaft 4 carries two bent levers 5, 6 through which the shaft passes and which are independently rotatable on the shaft 4 as best seen in FIGS.1 and 2. A pair of torsion springs 7 and 8, likewise mounted on the shaft 4, have legs engageable with the levers 5 and 6, respectively, and other legs received in holes of the support 3 as will be apparent hereinafter so that a torque is applied by each spring to the respective lever.

The leg 9 (FIGS.1 and 2) of spring 7, for example, engages in a hole 11 of the support 3 (FIG.1) while the other leg 13 of the torsion spring 7 engages an arm 14 of the first lever 5, partly broken away in FIG.2.

A leg 10 (FIG.2) of the second spring 8 is received in a hole 12 of the support 3 while another leg 15 (FIG.2) rests on the short arm 28 of the second lever 6.

The torsion springs 7 and 8 are prestressed and exert counterdirected forces (about the shaft 4 as seen in FIG.1) on the levers 5 and 6 such that the force applied by the torsion spring 7 to the first lever 5 is greater than the force applied by the torsion spring 8 to the second lever 6.

The first lever 5 has a long arm (FIGS.1 and 2) which is provided at its free end (FIG.1 with an arcuate portion 18 corresponding to the arc of a circle with a radius drawn from the axis of rotation of this lever, i.e. the axis of shaft 4. The lever arm 17 is provided with an undercut 19 (FIG.1) limited by a segment which is tangential to the circle describing a boss 20 or pin (FIGS.1 and 2) of a movable trip bar 21 during its rotation.

The trip bar 21 (see especially FIGS.1 and 3) is mounted by pivot arrangements 47′ in a pair of trunnions rising from the plate 1 and best seen in FIG.3. Thus the trip bar 21 can swing about an axis parallel to the shaft 4 and perpendicular to the plane of the paper in FIG.1.

The short arm 22 of lever 5 (best seen in FIG.1) has a length such that it lies in the path along which a member 23 of a handle 24 of the circuit breaker is movable (FIG.1). The circuit breaker handle has been removed to reveal the overlying structure as viewed in FIG.2. The second lever 6 (FIGS.1 and 2) has a long arm 25 on which is provided a lug 26 (FIG.1) in the path of the long arm 17 of lever 5 and is formed with an abutment 27 (FIG.1).

The lever 6 is also provided with a short arm 28 (FIGS.1 and 2) in which a roller 29 is fixed. The roller 29 holds down a tooth 30 (FIG.1) of lever 31, the latter forming a switch latch that releases the lock of the circuit breaker (see FIG.1).

On the other side of the insulating body 1 (i.e. above the body 1), there are provided three thermal and electromagnetic elements (FIG.3). The thermal elements consist of thermal metal (bimetallic) strips 32 (FIG.1), a heater 33 (FIGS.1 and 2) and an insulating pad 34 between two arms of the heater 33 and together with thermal metal strips 32 are permanently fixed to a frame 35 (FIGS.1 and 3) by means of rivets 36 and rectangular pads 37 (FIG.1).

The bent arm **38** (FIG.1) of frame **35** carries a pilot sleeve **39** (FIGS.1 and 3) at the end of which a pin **40** is mounted. The armature **41** of the electromagnetic element is provided at the end of pin **40.** The armature **41** rests upon the bent arm **38** of frame **34** and is held in place by a coil spring **42** and a nut **43** threaded onto the threaded part of pin **40** (FIGS.1 and 3). A nut **44** is also provided on this pin **40.** The armature of the electromagnetic element is designed to act upon the trip bar **21** while exerting a pressure on the arm **45** of the rod (FIG.1). Frame **35** and core **46** of the electromagnetic elements (FIGS.1 and 3) are attached to the insulating body **1** via the screws **2** mentioned earlier (FIGS.1 and 2).

A spring **48** (FIG.1) is provided between the body **1** and the trip bar **21** to provide the restoring force when the latter is shifted. The trip bar **21** (FIGS.1 and 3) also is provided with a long bolt **49** and three short bolts **50,** the long bolt **49** being used to position the movable rod with respect to the trip bar **21** (FIG.3). The short bolts **50** are used to establish equal distances between bimetallic elements **32** and the closest part of the trip bar **21.** Bolts **49** and **50** are provided with locking nuts **51** and **52** to retain them after they have been set.

The shaft **4** is held between the legs **3'** of the support **3** by means of split rings **16** (FIG.2).

When the handle **24** of the circuit breaker (FIG.1) is shifted into its lower extreme position, the lever **23** of this handle rotates the short arm **22** of lever **5** until the long arm **17** of this lever is engaged by pin **20** of the trip bar **21** (FIGS.1 and 2). This motion stresses the torsion spring **7** and rotates the second lever **6** in the same sense. When member **26** of lever **6** (rotating in the clockwise sense in FIG.1 engages the support **3,** the roller **29** on this lever **6** assumes a position blocking the tooth **30** of lever **31** and preparing for release of the latch. Now, when the handle **24** is returned to its upper extreme position, the circuit breaker is switched on. Should any disturbance in the power network arise, the thermal or electromagnetic means rotate the trip bar **21** and withdraw the pin **20** from engagement with arm **17.** The torsion spring **7** then swings this arm in the opposite sense to its original displacement until the second lever **6** is entrained and the circuit breaker released. The roller **29** is withdrawn from the path of the tooth **30** and the lever **31** is therefore permitted to rotate to release the lock. The circuit breaker connections are interrupted.

We claim:

1. A circuit breaker release mechanism comprising:

a support;

a shaft mounted on said support,

a first lever and a second lever journaled for rotation on said shaft, each of said levers having a pair of arms;

first and second torsion springs acting upon said first and said second lever respectively in opposite senses and with a greater force on said first lever than the force on said second lever;

a rod mounted on said support for at least limited angular displacement about an axis, said rod being operatively connected to circuit-breaking means for opening and closing a circuit in accordance with the position of said rod; and

a breaker resetting handle mounted on said support, one arm of said first lever engaging said rod and the other arm of said first lever lying in the path of said handle, one arm of said second lever lying on the path of said one arm of said first lever and the other arm of said second lever being provided with a roller cooperating with a switch latch of the breaker whereby said first spring is stressed upon actuation of said handle to bias said first lever against said rod and disengagement of said rod from said first lever effects displacement of said second lever to release said switch latch.

2. The mechanism defined in claim **1** wherein said one arm of said second lever is formed with a boss adapted to rest upon an abutment of said support, said latch including a latching lever controlled by said roller and having a tooth deflected thereby, said boss being so constructed and arranged that a straight line passes through the axis of said roller and the axis of said shaft when said boss engages said abutment and substantially coincides with the force-action line of said tooth upon said roller.

3. The mechanism defined in claim **1** wherein said one arm of said first lever is provided with an arcuate extremity having a center of curvature at the axis of said shaft and a notch formed with a segment tangential to the arcuate path of a portion of said rod engageable by said first lever.

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