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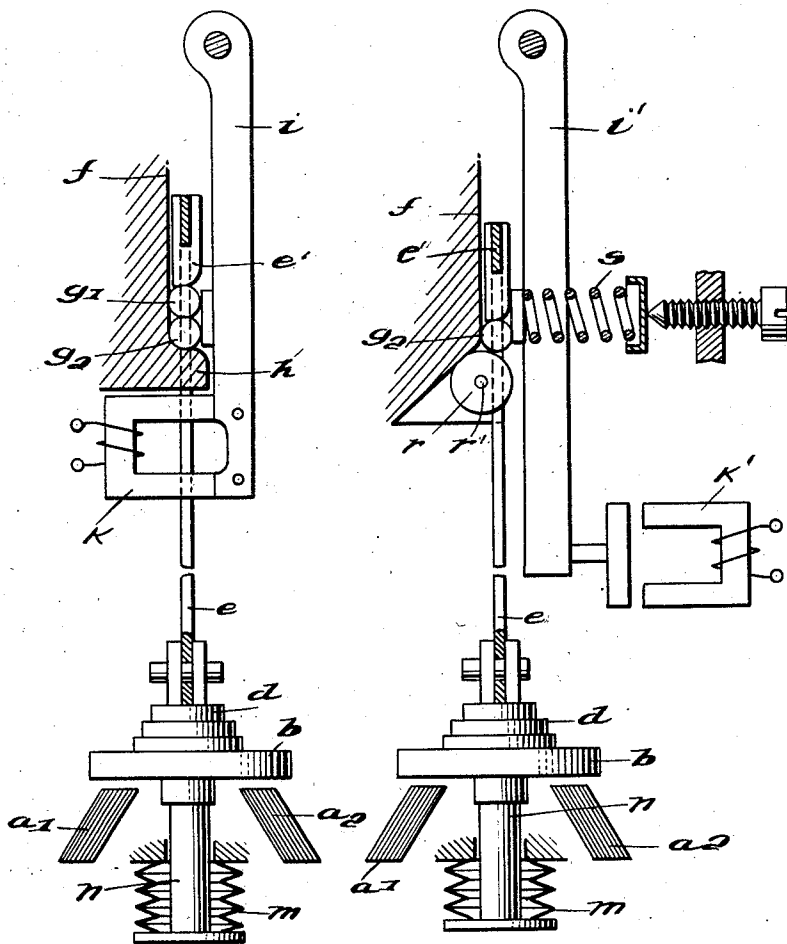
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CIRCUIT CLOSER

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Fig. 1.

Fig. 2.



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CIRCUIT CLOSER

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6 Claims. (Cl. 200—87)

This invention relates to a circuit closer and particularly to a sensitive and quick-acting circuit closer for use in the protection of contact rectifiers against damage by excessive currents or reverse currents.

Protective devices employed in rectifier engineering have included "short-circuiters" comprising a normally open switch spring-biased towards closing and latched against closing, the latch being released by an electromagnet to permit closing of the switch to short the leads from the transformer feeding the main rectifier contacts, thereby resulting in actuation of the protective circuit breakers.

Objects of the present invention are to provide circuit closers which are sensitive and quick-acting, the circuit closers being biased to closed position by springs and latched open by mechanisms which exert but little force in opposition to that developed by the closing springs, whereby the latching mechanism may be released by relatively light electromagnets. More specifically, an object is to provide a circuit closer including a contact on a spring-tensioned rod, a roller on a rolling abutment at a slight angle to a plane normal to the path of movement of the rod, a latch member normally retaining the roller on the abutment, and an electromagnet for actuating the latch member to permit the roller to slip from the abutment.

These and other objects and the advantages of the invention will be apparent from the following specification when taken with the accompanying drawing in which Figs. 1 and 2 are schematic diagrams of circuit closers embodying the invention.

In the drawing, the reference characters a_1 , a_2 identify the fixed contacts of a normally open switch having a cooperating movable contact b supported on and separated by insulation d from a slide rod e . The rod e is guided for vertical movement by a body f forming a part of the structural assembly of a contact rectifier, and the fixed contacts are connected electrically with the conductors from the transformer feeding the main contacts of one phase of the rectifier. In the case of a three phase rectifier, a shorting switch is provided for each phase and the sets of fixed contacts are preferably arranged in a triangle.

The slide e is of frame or yoke form at its upper end and includes a cross-frame or bar e' which rests upon the supporting roller g_1 superposed upon abutment roller g_2 supported on the inclined upper surface of an extension h at the base of the guide body f . The lower face of the bar e' may be formed as a knife edge contacting the roller g_1 or, as shown, it may be rounded off. The rollers are held against the vertical face of the guide body f by a latch member i which is a one-arm lever forming the armature of an electromagnet k which is normally energized so long as the rectifier is operating correctly, for example is energized by the rectifier output voltage.

The slide e is biased downwardly by a spring m acting upon the lower extension n of the slide e . The spring m is preferably formed of a stack of domed spring plates which may be telescoped or, as shown, may be arranged

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in pairs of oppositely facing domed members, and is supported below and clear of the fixed contact members.

The inclination of the top surface of the extension h to a plane normal to the vertical path of movement of the slide e is about 0.5° to 1.2° , whereby the horizontal component of the pressure exerted on the roller g_2 by the vertical pull of spring m is relatively small and may be readily overcome by the armature i and electromagnet k . A larger angle of inclination would of course require a heavier electromagnet to retain the switch in open position.

Upon de-energization of the electromagnet, the armature i swings away to permit the rollers to drop from the extension h , and the switch closes when the rod e is pulled down by the spring m to engage the bridge contact b with the fixed contacts a_1 and a_2 . The abutment roller g_2 rolls downwardly and outwardly along the slightly inclined surface of the fixed extension h . The supporting roller g_1 supporting the bar e' then has in effect an abutment consisting of a downwardly and outwardly abutment roller g_2 , and will roll to the right with a rotation opposite to that of the abutment roller g_2 . Thus the roller detent means will provide an extremely quick-acting release with small friction components upon de-energization of the electromagnet.

As shown in Fig. 2, the fixed extension h is replaced by an abutment roller r upon which supporting roller g_2 is normally retained by a latch i' which is urged towards the guide body f' by an adjustable spring s . The shaft r' of abutment roller r is of course mounted in the guide body outside of the path of movement of the slide e . In this embodiment, the electromagnet k' is normally de-energized and must be energized by some appropriate control circuit to overcome the force of spring s when the switch is to be closed. Upon energization, the rolling and downwardly inclined abutment for the supporting roller g_2 is provided by the abutment roller r arranged for rotation about an axis offset from the longitudinal travel of the slide rod. Thus the supporting roller g_2 has an effective abutment comprising the periphery of an offset rolling surface. Since the abutment roller r is offset, an effective inclination is obtained by the periphery of the roller. Thus this embodiment will similarly provide an extremely quick-acting release upon energization of the magnet.

I claim:

1. A circuit closer comprising a pair of normally-open fixed contacts, a movable contact adapted to bridge said fixed contacts, a slide rod connected to said movable contact and adapted to move axially at right angles to the plane of said fixed contacts, spring means urging said movable contact in a direction to cause engagement of the same with said fixed contacts, a guide body guiding said slide rod during its axial movement, and means normally latching said slide rod against switch closing movement by said spring means; said latching means including an abutment on said guide body, said abutment having a rotary periphery, a supporting roller superposed upon said abutment, an extension on the end of said slide rod supported by said supporting roller, a latch retaining said roller upon said abutment, and electromagnetic means for releasing said latch, said roller rolling downwardly upon said rolling abutment with a direction of rotation opposite thereto.

2. A circuit closer as defined in claim 1, wherein said abutment comprises an inclined extension on said guide body, and an abutment roller supported by said extension and supporting said supporting roller superposed thereon.

3. A circuit closer as defined in claim 2, wherein said inclined extension has a downward inclination of the order of 1.2° to a plane normal to the path of movement of said slide rod.

4. A circuit closer as defined in claim 3 wherein said

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extension on said slide rod has an inclined surface cooperating with said supporting roller.

5. A circuit closer as defined in claim 3 wherein said extension on said slide rod has a knife-edge surface cooperating with said supporting roller.

6. A circuit closer as defined in claim 1 wherein said abutment comprises an abutment roller journaled on said guide body offset inwardly toward the guide body from the longitudinal motion of travel of said slide rod, said abutment roller having a larger diameter than that of said supporting roller.

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