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E. A. WATSON

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ELECTRIC SWITCH OR CIRCUIT BREAKER

Filed July 25, 1922

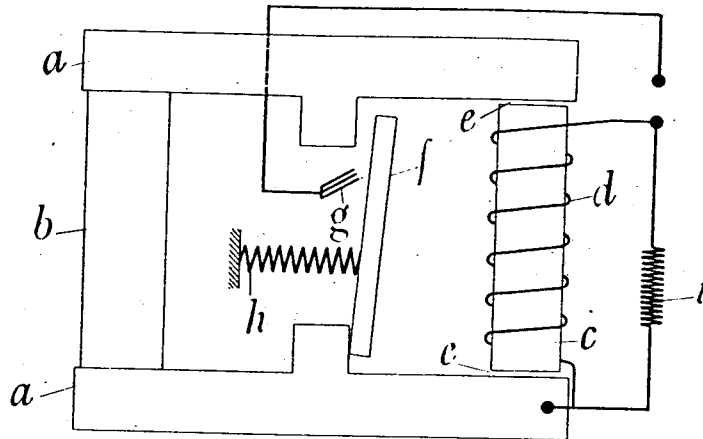


Fig. 1

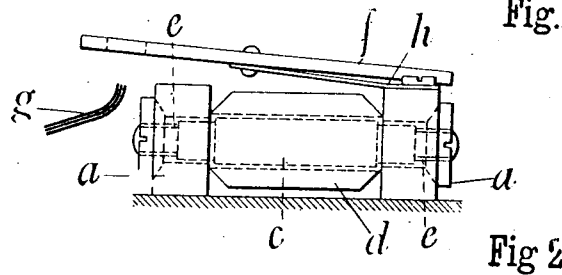


Fig. 2

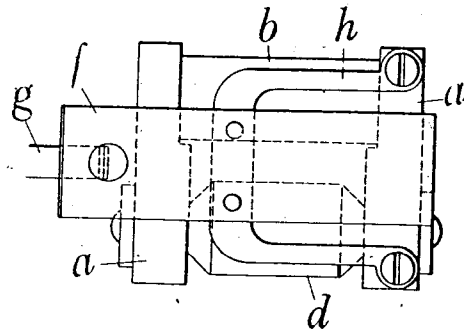


Fig. 3

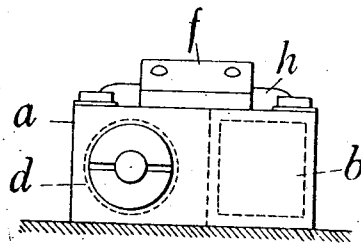


Fig. 4

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UNITED STATES PATENT OFFICE.

ERNEST ANSLEY WATSON, OF COVENTRY, ENGLAND, ASSIGNOR TO THE C. L. I. MANUFACTURING COMPANY LIMITED, OF BIRMINGHAM, ENGLAND.

ELECTRIC SWITCH OR CIRCUIT BREAKER.

Application filed July 25, 1922. Serial No. 577,451.

To all whom it may concern:

Be it known that I, ERNEST ANSLEY WATSON, a British subject, residing at Victoria Works, West Orchard, Coventry, in the county of Warwick, England, have invented certain new and useful Improvements Relating to Electric Switches or Circuit Breakers, of which the following is a specification.

This invention has for its object to provide an improved electric switch or circuit breaker of the type which is held closed by a permanent magnet and which automatically opens with reversal of current. The device is particularly adapted for use in the electric installations of motor vehicles, but is applicable to other purposes.

The invention comprises the combination with a permanent magnet fitted with pole pieces, of a movable switch-operating armature, and a fixed core with air gap or its equivalent carrying a winding, the core and armature being mounted in conjunction with the magnet pole pieces, and the arrangement being such that current in the reverse direction in the winding causes the armature to be released without exerting any demagnetizing action on the magnet.

Referring to the accompanying drawings:—

Figure 1 is a diagram illustrating the operation of a switch or circuit breaker constructed in accordance with this invention.

Figures 2, 3, and 4 are respectively side elevation, plan and end view of a switch or circuit breaker adapted for use in the electric installation of motor vehicles and other like purposes.

In carrying the invention into effect as shown, a pair of flat bars *a* forming pole pieces and arranged parallel with each other, are connected at one end by a permanent bar magnet *b*, and at the other by a core *c* carrying a winding *d*. The core may be made in two coaxial parts forming a narrow air gap at its centre, or as shown it has an air gap *e* arranged at one or both ends. The gaps may be filled with non-magnetic material, such as brass.

At an intermediate position across the edges or faces of the pole pieces *a* is mounted an iron armature *f* serving as a movable switch contact and adapted to co-operate with a fixed contact *g*. The armature is attached to one of the pole pieces by means

of a hinge or flexible support, such as a flexible blade, plate or other spring *h*. The spring tends to move the armature away from the pole piece and open the switch. When the armature is pressed into contact with both pole pieces (thereby closing the switch) it is held by the action of the magnet, the armature presenting a path of lower reluctance for the magnetic flux than the above mentioned core and air gap. Current flowing through the winding *d* after the closing of the switch produces a magnetic flux opposite to that of the magnet but as the armature provides a common path for the two fluxes there is no demagnetizing effect on the magnet, and the flux due to the current in the winding assists that due to the magnet in holding the switch closed.

In the event of a reversal of current in the winding, the flux due to the reversed current is in the same direction as that of the magnet. The flux passing through the armature therefore diminishes, and when a sufficient reverse current flows in the winding the armature is released and moved by the spring for opening the switch. For actuating the armature by hand any convenient provision can be made. For example a finger piece may be attached directly to it, or it may be engaged by a slidable finger operated plunger situated adjacent to the free end of the armature.

A switch or circuit breaker as above described is of very simple construction, and possesses the special property that the current in either direction through the winding has no demagnetizing effect on the permanent magnet.

The invention is not limited to any particular arrangement of the parts provided the operating conditions are as above described. Also the constructional details may be varied as required. Further the invention is applicable to a variety of uses in which automatic opening of a switch or circuit breaker under pre-determined conditions is required.

For the purpose of introducing an automatically varying time element in the opening action of the device, the winding *d* may be shunted by a resistance *i* made of material having a high temperature coefficient of resistance. At first the current flowing through *i* may be relatively large, but as

the temperature increases an increasing proportion of current passes through d until the circuit is opened.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In electric switches or circuit breakers, the combination of a permanent magnet, a pair of pole pieces having one pair of ends in conjunction with the magnet, a magnetizable core in conjunction with the other pair of ends of the pole pieces and separated therefrom by air gaps, a winding on said core, an armature arranged to coact with the pole pieces at a position intermediate to the permanent magnet and the core carrying the winding, the armature when pressed into contact with the pole pieces being adapted to close an electric circuit and held by opposing fluxes produced by the permanent magnet and a current flowing in the winding, and means for automatically moving the armature away from the pole pieces and opening the circuit when due to a reversal of current in the winding the flux in the armature is sufficiently diminished, substantially as described.

2. In electric switches or circuit breakers, the combination of a permanent bar magnet, a pair of pole pieces arranged parallel with each other and having one pair of ends in conjunction with the magnet, a magnetizable core in conjunction with the other ends of the pole pieces and separated therefrom by air gaps, a winding on said core, an armature, located across the pole pieces at a position intermediate to the magnet and core, a spring blade serving as a hinge connection between the armature and one of the pole pieces and tending to move the armature away from the pole pieces, and a contact member with which the armature co-operates for closing an electric circuit, the armature after having been pressed on to the pole pieces being held by opposing fluxes produced by the permanent magnet and the current in the said winding, and released when due to reversal of current the flux through the armature is sufficiently diminished, substantially as described.

In testimony whereof I have signed my name to this specification.

ERNEST ANSLEY WATSON.