May 28, 1929. C. G. KOPPITZ 1,714,675

OVERLOAD ACTUATED DEVICE

Filed Jan. 13, 1926

Fig. 2.

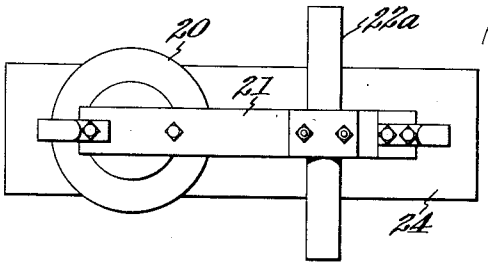


Fig. 4.

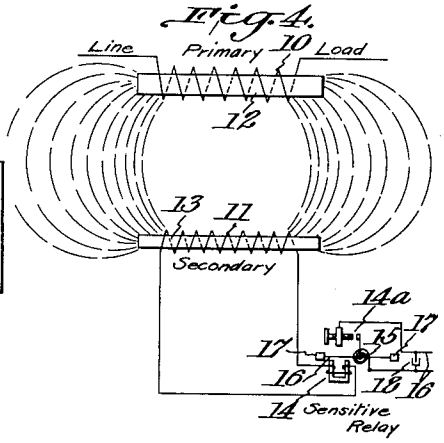


Fig. 1.

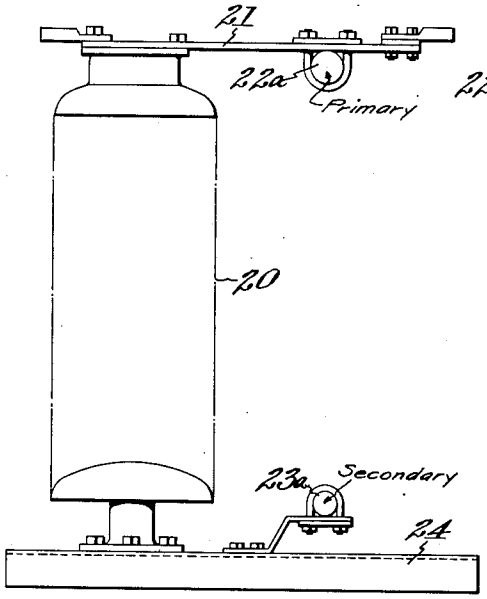
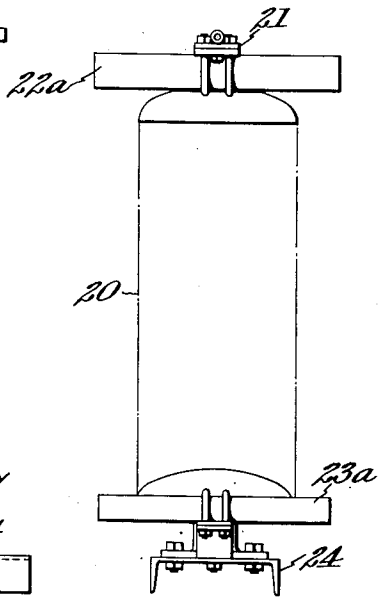


Fig. 3.



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UNITED STATES PATENT OFFICE.

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OVERLOAD-ACTUATED DEVICE.

Application filed January 13, 1926. Serial No. 81,115.

This invention relates to overload-actuated devices.

It has been customary heretofore to provide somewhat expensive series transformers to actuate the trip coils of circuit breakers intended for automatic operation.

It is the principal object of the invention to provide a simple and cheap overload-actuated device for the operation of high potential air-break switches.

For a full understanding of the invention reference is made to the accompanying drawings in which

Figs. 1, 2 and 3 are a plan view, side view and end view, respectively, of a construction embodying the invention; and

Fig. 4 is a more or less schematic representation of the principal part of the invention.

As indicated in Fig. 4, the arrangement comprises a primary winding 10 and a secondary winding 11 on open-ended cores 12 and 13, respectively, which preferably consist of laminations ordinarily used in transformer constructions. The two coils and cores thus constitute a transformer with extremely loose magnetic linkage.

The load current of the line passes through the primary winding 10 producing a flux in the air, a certain small proportion of which threads through the secondary core 13 thereby inducing a current in the secondary coil 11 the strength of which bears a certain proportion to the load current in the primary coil 10.

The induced secondary current is conducted to a sensitive relay 14 including a contact make and break device 14^a for energizing a special circuit 16. The arrangement is generally such that the contact device is operated to close the circuit 16 when a predetermined current flows in the primary coil 10, the current flow in the circuit 16 operating to energize a trip coil of an automatic switch. The application of a trip coil is well understood and does not form part of this invention. It is also immaterial, so far as the present invention is concerned, whether one or a plurality of auxiliary relays is employed between the relay 14 and a trip coil. It may be stated, however, that the use of auxiliary relay mechanism is necessary inasmuch as the sensitive relay 14 can handle only a very small current, insufficient to operate a trip coil directly.

The magnetic circuit of the sensitive relay 14 must have a very low retentivity. The construction found satisfactory for this purpose includes a substantially closed magnetic circuit, i. e. a circuit having only very small air gaps, essential for high sensitivity, the circuit being formed by iron of low retentivity of the order of 4% silicon steel.

The amount of energy delivered by the secondary is, of course, small, being limited considerably by the characteristics of the steel composing its core. As material for the core of the secondary may be used low silicon steel, but I prefer 4% silicon steel or other alloys having the desired characteristics at such low densities as are met with in the secondary core.

The relay found most satisfactory consists of the jewel pivot type with the usual current-conducting spiral springs 15, the armature 16 consisting of a plain, flat leaf of steel approximately .014″ thick using an air-gap of approximately .005″. To insure a reliable operation, it is advisable to make the armature 16 relatively unresponsive to vibrations. To this end weights 17 are added on opposite sides of the pivot support to provide the necessary inertia to the moving parts. A suitable condenser 18 is preferably connected across the circuit-closing contacts.

In Figs. 1–3, 20 represents an insulator carrying the high-tension line 21 in which the primary 22 is located a short distance away from the insulator. The secondary 23 is mounted on the cross arm 24 supporting the insulator 20 and substantially in vertical alignment with the primary, the cores 22^a and 23^a extending approximately at right angle to the line. The arrangement in Figs. 1–3 is to merely indicate the relative position of the primary and secondary, the detail of construction being shown in Fig. 4.

It has been found that with 1500–2000 ampere-turns on a primary having a core 24″ long and 3—3½″ square cross-sectional area, and with a distance of 60″ between centers of primary and secondary, sufficient energy could be induced in the secondary to operate the sensitive relay.

The proximity of the iron base and the iron hardware of the insulating column has very little influence due principally to the direction of the magnetic flux relatively to the iron parts.

By the arrangement and disposition of

parts, series transformers of the usual type, including oil-filled tanks and expensive bushings are made unnecessary.

I claim:

1. A system for operating an overload actuated device on high-tension lines, comprising a primary winding in series with the line, a secondary winding removed from the primary winding, open-ended cores extending through the windings and a sensitive relay connected to the secondary for energizing the circuit to the overload device.

2. A system for operating an overload actuated device on high-tension lines, comprising a primary winding in series with the line, a secondary winding removed from the primary winding, open-ended cores extending through the windings and a sensitive relay connected to the secondary for energizing the circuit to the overload device, said relay having a core of low rententivity and an armature in close proximity to the core.

3. Device according to claim 2 in which the core of the relay has a rententivity of the order of 4% silicon steel.

4. Device according to claim 1 in which the core of the secondary has magnetic characteristics of the order of low silicon steel.

5. Device according to claim 1 in which the core of the secondary has magnetic characteristics of the order of low silicon steel and the magnetic characteristics of the core of the secondary correspond to those of 4% silicon steel.

6. Device according to claim 1 in which the sensitive relay is provided with means to make it relatively unresponsive to vibrations.

7. A system for operating an overload actuated device on high tension lines comprising the combination with an insulator for carrying the line of a transformer having a primary winding in series with the line, of a secondary winding, open ended cores extending through the said windings and supported substantially at the top and bottom respectively of said insulator, and a sensitive relay connected to the secondary for energizing the circuit to the overload device.

8. Device according to claim 7 in which the cores are mounted substantially in vertical alignment at right angle to the line.

9. An electric transformer for cooperative association with a high tension line comprising a primary winding in series with the line, a secondary winding spaced from said primary winding and adapted to operate a sensitive relay for protection of said high tension line, and open-ended cores extending through said windings.

10. The structure as in claim 9 wherein the open-ended cores comprise straight bars.

In testimony whereof, I affix my signature.

CARL G. KOPPITZ.