Dec. 28, 1926. 1,612,363

L. DORFMAN

RELAY

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Fig. 1.

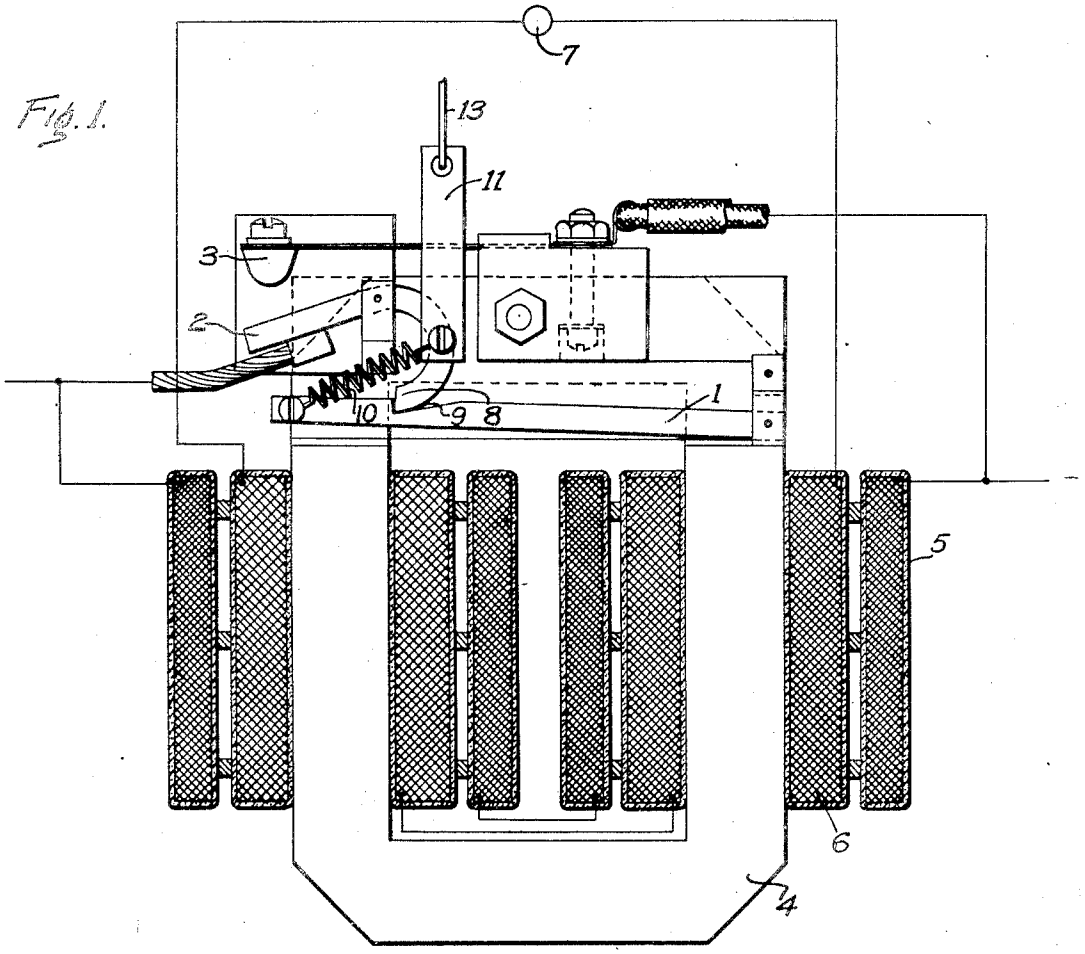


Fig. 2.

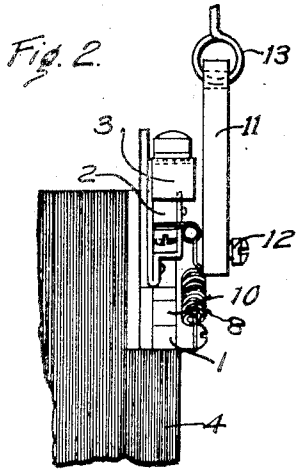
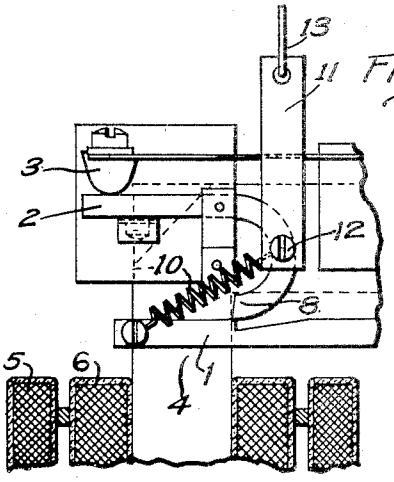


Fig. 3.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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RELAY.

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My invention relates to relays and particularly to electromagnetic relays.

One object of my invention is to provide an electromagnetic series cut out relay for series lighting circuits.

A further object of my invention is to provide a combined relay and transformer in which the increased magnetic flux in the core of the transformer resulting from a change in its external circuit, is utilized to actuate a contact member that may be used, for instance, to disconnect the transformer from the circuit.

A further object of my invention is to provide a combined relay and transformer for a series lighting circuit in which the relay is arranged to short-circuit the transformer when the associated lamp burns out.

In a series lighting system, to which my invention is applicable, it is customary to provide transformers connected in series with a source of power, the secondary windings of the transformers being connected to lamps. In case a lamp burns out, thereby open-circuiting the secondary winding of the transformer, the core of the transformer becomes saturated. This is due to the fact that a regulator is provided to maintain the current through the series of transformers substantially constant. The primary current in each transformer is ordinarily the sum of the load and exciting currents. But when the lamp burns out, the entire current is available as exciting current, and the transformer core becomes saturated. This condition results in a non-sinusoidal magnetizing current. Some of the higher harmonics produced are of sufficient magnitude to cause inductive interference with adjacent telephone circuits. It is desirable to avoid such interference and this may be accomplished by the utilization of my invention.

In accordance with my invention, a combined relay and transformer is provided wherein the primary winding of the transformer is automatically short-circuited in case the associated lamp burns out. The contact members of the relay are latched in the closed position until the lamp is replaced.

In accordance with an important feature of my invention, the operating armature for the relay contact members is mounted directly upon the core of the transformer. When the lamp burns out, the increase of magnetic flux in the core of the transformer operates the armature and closes a circuit in shunt to the primary winding. The armature and the movable contact members are mechanically interlocked in such manner that when the contact members are operated, they are latched in this position by the armature until manually released.

For a clearer understanding of my invention, reference may be had to the accompanying drawings wherein

Figure 1 is a side elevational view of a device constructed in accordance with my invention;

Fig. 2 is a detail view of the relay armature and contact members; and

Fig. 3 is a detail view showing the relay contact members in the latched position.

The relay comprises a pivoted armature 1 controlling contact members 2 and 3. The armature 1 is mounted upon the core 4 of a transformer having primary and secondary windings 5 and 6. The primary winding 5 is connected in series with a source of power (not shown), and is shunted by the contact members 2 and 3 of the relay. The secondary winding 6 of the transformer is connected to a translating device, such as a lamp 7 of the incandescent filament type.

As shown more clearly in Fig. 2, the armature 1 is positioned in a notch or recess in the laminated core 4. One end 8 of the contact member 2 is adapted to cooperate with a notch 9 in the armature 1. A spring 10 holds the portion 8 of the contact member 2 normally in frictional engagement with the armature 1. When the armature 1 is attracted sufficiently to overcome the friction and restraining force of the spring 10, the contact member 2 is disengaged from the notch 9 and engages the contact member 3, as shown in Fig. 3. In this position of the contact members, the upper surface of the armature 1 engages the portion 8 of the contact member 2, thereby locking the contact members in engagement.

A pin 11 is pivoted to the contact member 2 at 12. When the pin 11 is raised, as, for instance, by means of a hook 13, the contact member 2 is unlatched and permitted to return to the position shown in Fig. 1. Suitable means, such as a cord, may be attached to the hook 13 and used to reset the relay

from the exterior of the casing in which the transformer is enclosed. The frictional engagement between the armature 1 and the contact member 2 serves to maintain the said members in the position shown in Fig. 1 until the magnetic flux in the core 4 again attains such value as to attract the armature 1.

The present invention is particularly applicable to series lighting systems in which the primary winding 5 is connected in series with the primary windings of a number of other like transformers. Across the secondary winding of each transformer is connected a lamp 7. The voltage drop across each primary winding is relatively small. In case the one of the lamps 7 burns out, however, the secondary winding 6 becomes open-circuited. Since the primary current remains constant, the core 4 becomes saturated, thereby attracting the armature 1 and actuating the contact member 2 into engagement with the contact member 3 as shown in Fig. 3. When the contacts are thus engaged, the primary winding of the transformer is short-circuited and the transformer is cut out of service. This eliminates any inductive interference and permits the continuation of satisfactory operation of the other lamps in the system. Although the transformer is short-circuited, the contacts are latched in the closed position by the armature 1, as clearly shown in Fig. 3, until the contacts are disengaged by raising the member 11.

It will be apparent that I have provided a relatively simple device for the described purpose that is rather novel in several respects. A considerable economy is effected by combining the relay and transformer structure, yet this is accomplished without any detrimental effect upon the operation of either the relay or the transformer.

I do not consider that my invention is limited to the precise construction shown and described. In particular, the relay armature may be combined with different types of transformers and may be used in other types of distribution systems. Accordingly I do not wish the invention to be limited in scope except as set forth in the appended claims.

I claim as my invention:

1. A relay comprising a magnetizable core, a plurality of inductively related windings on said core, a movable armature and a contact member controlling one of said windings and controlled by said armature, said armature and contact member being so arranged that the contact member is locked in the actuated position by said armature.

2. A relay comprising a magnetizable core, primary and secondary inductively related windings on said core, a movable cooperating armature adjacent said core, and a contact member actuated and latched by said armature.

3. A relay comprising a magnetizable core, primary and secondary inductively related windings on said core, an armature mounted on the core and contact members controlled thereby, said contact members short-circuiting one of said windings.

4. A relay comprising a pivoted armature provided with a notch, a movable contact member having a portion cooperating with said notch, and means operative upon the actuation of said armature to disengage said portion from said notch to permit the actuation of said movable contact members, said contact member and armature being so arranged that the contact member is locked in the actuated position by said armature.

5. In combination with the core of a transformer, inductively related windings thereon, a movable member and actuating and latching means therefor controlled by the magnetic flux in said core.

6. In combination with a magnetizable core, inductively related windings thereon, contact members and actuating and latching means therefor controlled by the magnetic flux in said core.

7. In the combination with the closed magnetizable core of a transformer, primary and secondary windings upon said core, an armature mounted in a recess in said core in shunt relation to a portion of the magnetic circuit, and contact members controlled by said armature.

8. A series transformer for lighting circuits comprising a core, primary and secondary windings thereon, contact members adapted to short-circuit one of said windings and means mounted on said core to be responsive to a change of flux therein for operating said contact members.

9. A series transformer for lighting circuits comprising a core, primary and secondary windings thereon, a lamp connected to the secondary winding, an armature mounted upon said core and contact members controlled by said armature, said contact members short-circuiting the primary winding of said transformer.

10. A series transformer for lighting circuits comprising a core, primary and secondary windings thereon, a lamp connected to the secondary winding, an armature mounted upon said core, contact members controlled by said armature, said contact members short-circuiting the primary winding of said transformer, and means for latching the contact members in the closed position.

In testimony whereof, I have hereunto subscribed my name this first day of October 1924.

LEO DORFMAN.