

July 5, 1932.

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1,866,147

TRANSFORMER RELAY

Filed Dec. 26, 1931

2 Sheets-Sheet 1

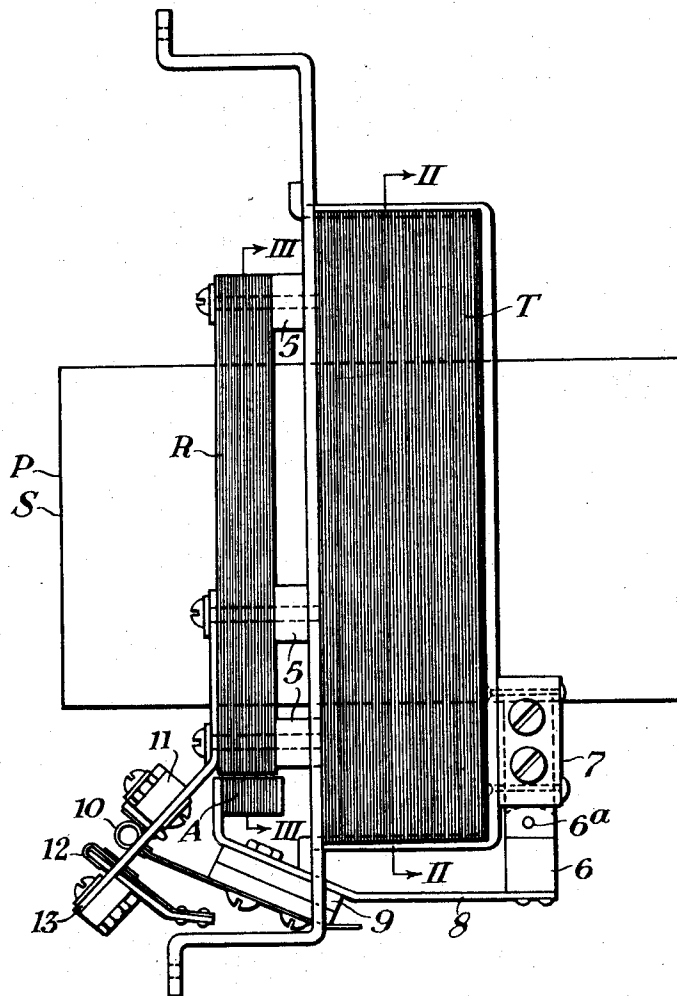


Fig.1.

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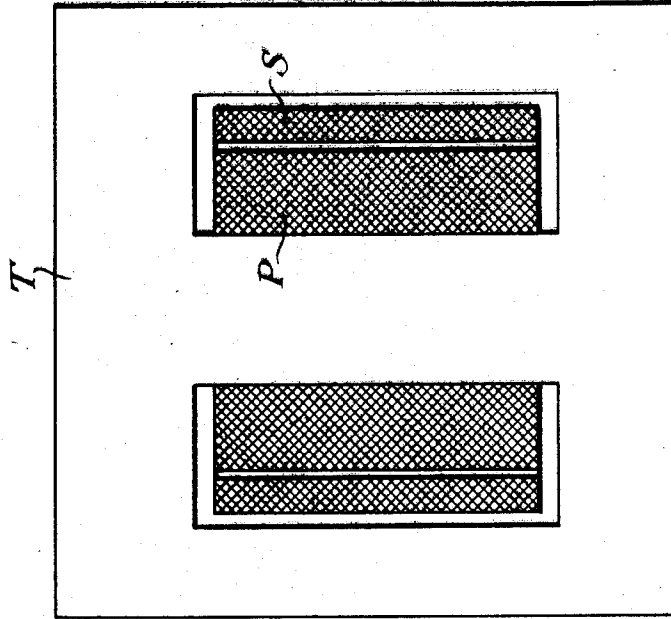


Fig. 2.

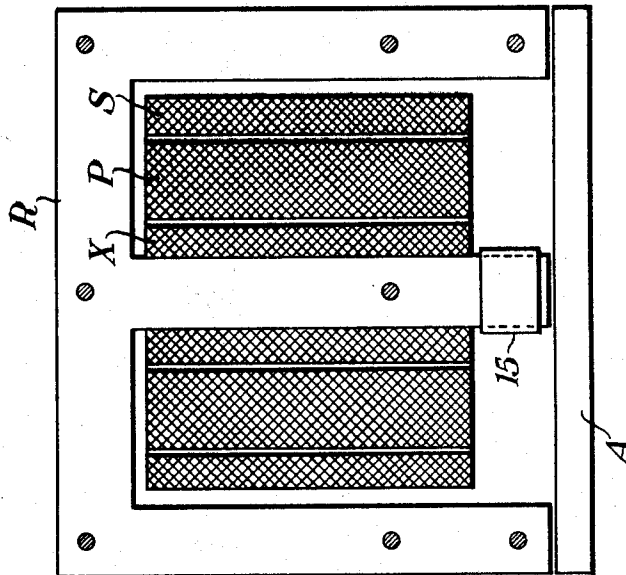


Fig. 3.

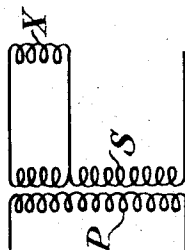


Fig. 4.

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TRANSFORMER RELAY

Application filed December 26, 1931. Serial No. 583,277.

My invention relates to electrical devices of the type known as transformer relays, and has for an object the provision of a device of this kind which will operate at high efficiency both as a transformer and as a relay.

I will describe one form of device embodying my invention, and will then point out the novel features thereof in claims.

In the accompanying drawings, Fig. 1 is a view showing in side elevation one form of transformer relay embodying my invention. Fig. 2 is a sectional view on the line II—II of Fig. 1, looking in the direction indicated by the arrows. Fig. 3 is a sectional view on the line III—III of Fig. 1, and also looking in the direction indicated by the arrows. Fig. 4 is a diagrammatic view showing one means for energizing an auxiliary winding X forming part of the device shown in the preceding views.

Similar reference characters refer to similar parts in each of the views.

Referring first to Figs. 1, 2, and 3, the device comprises a transformer core T, and a relay core R, disposed in parallel relation and separated by non-magnetizable spacers 5. The transformer core T is of the shell type, whereas the relay core R is E-shaped with its open end at the bottom.

A primary winding P encloses the middle leg of each core T and R, and a secondary winding S also encloses each of these middle legs. As shown in the drawings, the secondary winding is located outside of the primary winding, but this specific arrangement is not material to my invention.

Coacting with the open end of the relay core R is an armature A. This armature is attached to a strap 8, which in turn is fixed to an armature support 6 pivotally mounted at point 6^a in a bracket 7. This bracket may be attached to the transformer core T. The strap 8 carries a block 9 of insulating material, which in turn supports a contact finger 10. This finger coacts with a front contact member 11 and a back member 12, which members are supported on a strap 13 which as here shown, is attached to the relay core R. In accordance with usual practice, when the armature A is attracted to the poles of the

relay core R, front contact 10—11 is closed and back contact 10—12 is open. When the armature is released so that it falls away from its poles, the back contact 10—12 will close and the front contact 10—11 will open.

The device as thus far described is not highly efficient, because when the relay armature A is open, it is difficult to cause enough magnetic flux to pass through the relay core to close this armature without highly saturating the closed magnetic circuit of the transformer core. This results in high losses and low transformer efficiency, as well as inefficient operation of the relay. To avoid these difficulties, I have provided the device with an auxiliary winding X, which encloses the middle leg of the relay core R, but does not enclose any part of the transformer core T. As shown in Fig. 4, this auxiliary winding X may be supplied with alternating current from a portion of the secondary winding S, the auxiliary winding being so connected that the voltage thus supplied thereto opposes the voltage induced in this winding by the primary winding P.

Since the transformer primary P and the auxiliary winding X both enclose the middle leg of the relay core R, a voltage is induced in the auxiliary winding by transformer action when the primary winding P becomes energized. This induced voltage is of low magnitude, particularly when the armature A is opened, since only a small amount of the transformer flux passes through the relay core, but it is nevertheless appreciable, and it increases when the air gap in the relay core is reduced by the closing of the armature. As stated hereinbefore, the voltage applied to the auxiliary winding by the secondary winding S opposes the voltage induced in the auxiliary winding by transformer action. The net result is that the energy used by the relay is reduced to a minimum and yet enough pull is exerted to close the armature A. When the maximum tractive effort is required, that is, when the armature A is open, the energy used by the relay is greatest, because the voltage induced in the auxiliary winding is lowest at that time. When the armature is closed, and a much smaller

tractive effort is needed, the voltage induced in the auxiliary winding becomes greater and also more nearly 180° out of phase with the secondary voltage, thus lowering the resultant impressed voltage and the current taken by the auxiliary winding. The rise in the impedance of the auxiliary winding due to shortening the air gap when the armature closes, decreases still further the current taken by this winding. The electrical losses are thus kept at a minimum, and just sufficient energy is used to hold the armature closed and maintain adequate contact pressure.

15 If desired, a ferrule of electro-conductive material may be placed so as to enclose a portion of the middle leg of the relay core R, as indicated at 15 in Fig. 3, for the purpose of reducing the noise incident to the operation of the relay.

Although I have herein shown and described only one form of transformer relay embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

30 1. A transformer relay comprising a shell type transformer core and an E-shaped relay core, a primary and a secondary winding each enclosing the middle leg of each core, an auxiliary winding enclosing the middle leg of said relay core only, means for supplying said auxiliary winding with a voltage which opposes the voltage induced therein by said primary winding, and an armature co-

40 2. A transformer relay comprising a closed transformer core and an open relay core, a primary and a secondary winding each enclosing a portion of both of said cores, an auxiliary winding enclosing a portion of said relay core but no part of said transformer core, means for supplying said auxiliary winding with a voltage which opposes the voltage induced therein by said primary winding, and an armature coacting with the open end of said relay core.

50 3. A transformer relay comprising a shell type transformer core and an E-shaped relay core, a primary and a secondary winding each enclosing the middle leg of each core, an auxiliary winding enclosing the middle leg of said relay core only, means for supplying said auxiliary winding with voltage from said secondary winding which opposes the voltage induced therein by said primary winding, and an armature coacting with the open end of said relay core.

60 4. A transformer relay comprising a closed transformer core and an open relay core, a primary and a secondary winding each en-

closing a portion of both of said cores, an auxiliary winding enclosing a portion of said relay core but no part of said transformer core, means for supplying said auxiliary winding with voltage from said secondary winding which opposes the voltage induced therein by said primary winding, and an armature coacting with the open end of said relay core.

In testimony whereof I affix my signature.
SELDEN B. AYLSWORTH.

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