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2,180,539

RELAY

Filed March 27, 1936

FIG. 1

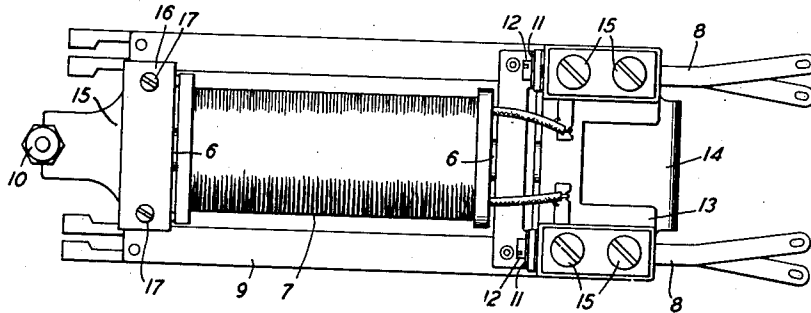


FIG. 2

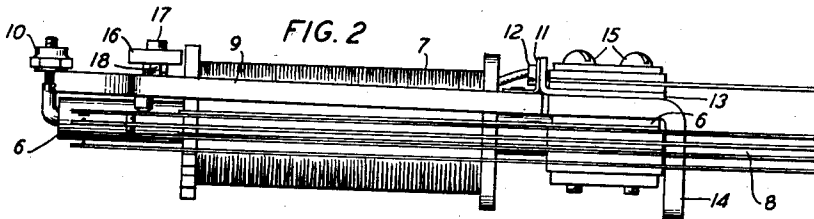


FIG. 3

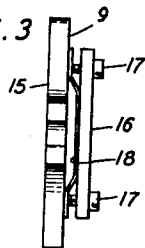


FIG. 4

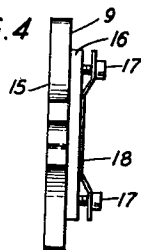


FIG. 5

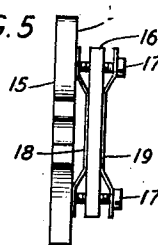


FIG. 6

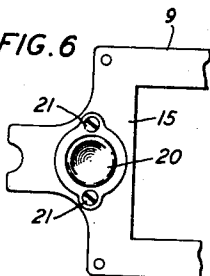


FIG. 7

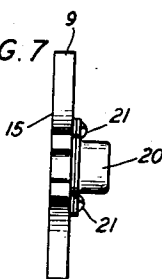
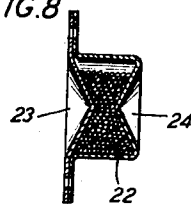


FIG. 8



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2,180,539

RELAY

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2 Claims. (Cl. 175-345)

This invention relates to relays and more particularly to relays for use in telephone circuits.

In electric circuits generally and in telephone circuits particularly, the electromagnetic relay is extensively employed and, in such circuits, the functions to be performed are numerous and varied. It is often very essential that a relay when energized or released shall positively make or break the circuits controlled thereby. If the relay contacts do not make solidly or break cleanly or, in other words, if the contacts have a tendency to chatter when they make or break, false operation in the circuits controlled thereby will result.

It is the object of this invention to improve the design of an electromagnetic relay so as to reduce the tendency of the contacts to chatter. This object is attained in accordance with the present invention by the provision of an inertia element on the free end of the armature which follows the movement of the armature and tends to press the movable contacts controlled by the armature against the fixed contacts at the instant the armature reaches the limit of its movement.

Specifically, in accordance with one embodiment of the invention the inertia element comprises a metal bar of non-magnetic material loosely supported on two-headed studs or screws near the free end of the armature and restrained in its movement relative to the armature by a spring member. When the armature is moved toward a fixed stop the bar, because of its inertia, continues to move in the same direction against the tension of the spring for a brief period after the armature engages the stop. The friction between the bar and the supporting studs or screws and the inertia of the bar tend to absorb the stored energy in the armature which otherwise would cause it to rebound from the fixed stop and cause the contacts operated thereby to chatter.

In accordance with a further modification of the invention, the inertia element comprises a small casing which is attached near the free end of the armature and which is filled with small pellets such as bird-shot. The casing is provided with sloping side walls to guide the pellets in their movement within the casing. When the armature moves toward a fixed stop the pellets continue to pack in the casing in the same direction as the movement of the armature for a brief period after the armature engages the stop thus tending, by the frictional engagement between the pellets and between the pel-

lets and the casing as they pack together, to absorb the energy in the armature which would otherwise cause it to rebound and cause the contacts operated thereby to chatter.

The invention will be more readily understood from the following detailed description taken in connection with the accompanying drawing in which:

Fig. 1 is a side elevational view of a well-known type of relay embodying one modification of this invention;

Fig. 2 is a top plan view of the relay shown in Fig. 1;

Fig. 3 is a detail view of the free end of the armature with the inertia element arranged to absorb the energy stored in the armature at the time the armature moves toward the relay core;

Fig. 4 is a similar view of the free end of the armature with the inertia element arranged to absorb the energy stored in the armature at the time the armature moves toward the back stop;

Fig. 5 is a similar view of the free end of the armature with the inertia element arranged to absorb the energy stored in the armature at the time the armature moves toward the core piece, or toward the back stop;

Figs. 6, 7 and 8 are details of a further modification of the invention, Fig. 6 being a side elevational view of the free end of the relay armature, Fig. 7 being an end elevational view of the free end of the armature, and Fig. 8 being a cross-sectional view of the modified inertia element.

The relay disclosed in the drawing consists of the well-known essential parts, a core 6, an energizing coil 7, spring pile-ups 8, armature 9 and back stop nut 10. The armature 9 is provided with reed hinges 11 riveted to the rear end thereof and secured by screws 12 to the member 13 which is clamped by the screws 15, together with the spring pile-ups and rear end of the core 6, to the bracket 14.

The armature 9 is of substantially rectangular shape having its two side members joined together at their free ends by a bridge member 15 which engages the front end of the core 6 when the coil 7 is energized and which engages the back stop nut 10 when the coil is deenergized.

As disclosed in Figs. 1 to 5, inclusive, an inertia element 16 which may, for example, be of non-magnetic material such as brass, is slidably secured to the bridge member 15 of the armature 9 by the screws 17. The element 16

is arranged to slide on the screws 17 in the direction of the armature movement but is restrained in its movement relative to the armature by its frictional engagement with the screws 5 and by the phosphor bronze leaf spring 18. The leaf spring is provided with a bifurcation on each end by means of which it is maintained in position on the screws 17. As disclosed in Figs. 1 to 3, inclusive, the leaf spring is interposed between the inertia element 16 and the bridge 15 of the armature and thus tends to normally maintain the element 16 against the underside of the heads of screws 17.

When the relay armature 9 is attracted toward the end of the core 6 by the energization of the coil 7 the inertia element 16 moves with the armature and when the armature bridge member 15 strikes the core 6, thus preventing further movement of the armature in that direction, the inertia element 16 because of its inertia tends to continue moving in the same direction and, due to its frictional engagement with the screws 17 and its pressure against the armature imparted through the interposed leaf spring 18, tends to press the armature firmly against the core 6 thus preventing its rebound from the core. The leaf spring 18 also serves the further purpose of preventing the inertia element from pounding against the armature. By thus preventing the rebounding of the armature when it strikes the core 6 the chattering of the contacts operated by the armature with respect to the fixed contacts with which they cooperate is obviated and a clean make of the contacts is insured.

Should the relay be provided with contacts which are closed only upon the retraction of its armature, to guard against the chattering of the relay contacts when the relay is released and closes the relay contacts, the inertia element 16 would be attached to the armature in the manner disclosed in Fig. 4 with the leaf spring 18 interposed between the element 16 and the heads of the supporting screws 17. In this case when the coil 7 of the relay becomes deenergized and the armature 9 moves away from the core 6 under the influence of the contact springs, the inertia element 16 moves in the direction of the armature travel and because of its inertia, continues to move in the same direction after the armature strikes the back stop nut 10. However, because of its frictional engagement with the screws 17 and the pressure exerted against the heads of these screws through the leaf spring 18, the armature 9 is held firmly against the back stop nut 10 thus preventing its rebound. By thus preventing the rebounding of the armature when it strikes the back stop nut 10 the chattering of the contacts operated by the armature with respect to the fixed contacts with which they cooperate is obviated and a clean make of the contacts is insured.

In case the relay has both make and break contacts the inertia element 16 would be mounted on the armature as disclosed in Fig. 5 with a leaf spring 18 interposed between the element and the armature and a second leaf spring 19 interposed between the element and the heads of the supporting screws 17. In the manner previously described the inertia element 16 would then tend

to prevent the rebound of the armature when it strikes the core 6 or when it engages the back stop nut 10.

In the modification of the invention illustrated in Figs. 6 to 8, inclusive, the inertia element 20 comprises a casing secured by screws 21 to the bridge member 15 of the armature 9 and partially filled with small metal pellets 22. The casing is formed in two sections, the base section 23 having a central conical portion and the cover section 24 being cup-shaped and also having a central conical portion. When the casing is assembled for mounting on the armature the apices of the conical portions extend toward each other as disclosed in Fig. 8 with the space between them partially filled with metal pellets 22 which, for example, might be bird-shot.

This inertia element functions as follows: When the armature 9 is attracted toward the core 6 the pellets follow as a mass the movement of the armature until the armature strikes the core at which time the pellets will tend to continue to move in the same direction. Since, however, they are restrained by the conical portion of the base 23 of the casing they will be caused to slide over each other thus packing together and due to their frictional engagement with each other and with the wall of the casing absorb the energy stored in the armature and press the armature firmly against the core. The tendency of the armature to rebound from the core is thus materially reduced. When the armature is retracted from the core upon the deenergization of its coil and travels toward the back stop the pellets pack against the conical wall of the cover portion 24 of the casing after the armature strikes the back stop nut 10 and in the same manner reduce the tendency of the armature to rebound from the back stop.

From the foregoing it will be apparent that simple and efficient means is provided for reducing if not indeed entirely eliminating the rebound of the relay armature when it reaches the limit of its travel in either direction thereby eliminating the chattering of the contacts operated by the armature.

What is claimed is:

1. In an electromagnet having a core and an armature cooperating with said core, an inertia element supported on the free end of said armature for absorbing the energy stored in said armature to prevent the rebound thereof when it engages said core, said element comprising headed studs carried by said armature, a bar slidably supported on said studs and a leaf spring having bifurcated ends engaging said studs for positioning said bar with respect to said armature.
2. In an electromagnet having a core, an armature cooperating with said core and front and back stops for limiting the movement of said armature, an inertia element supported on the free end of said armature for absorbing the energy stored in said armature to prevent the rebound thereof when it engages either said front or said back stops, said element comprising headed studs carried by said armature, a bar slidably supported on said studs and a pair of leaf springs engaging said studs for positioning said bar on said studs.

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