June 10, 1930. E. D. MEAD 1,763,003

ELECTROMAGNETIC DEVICE

Filed May 6, 1929

FIG. 3

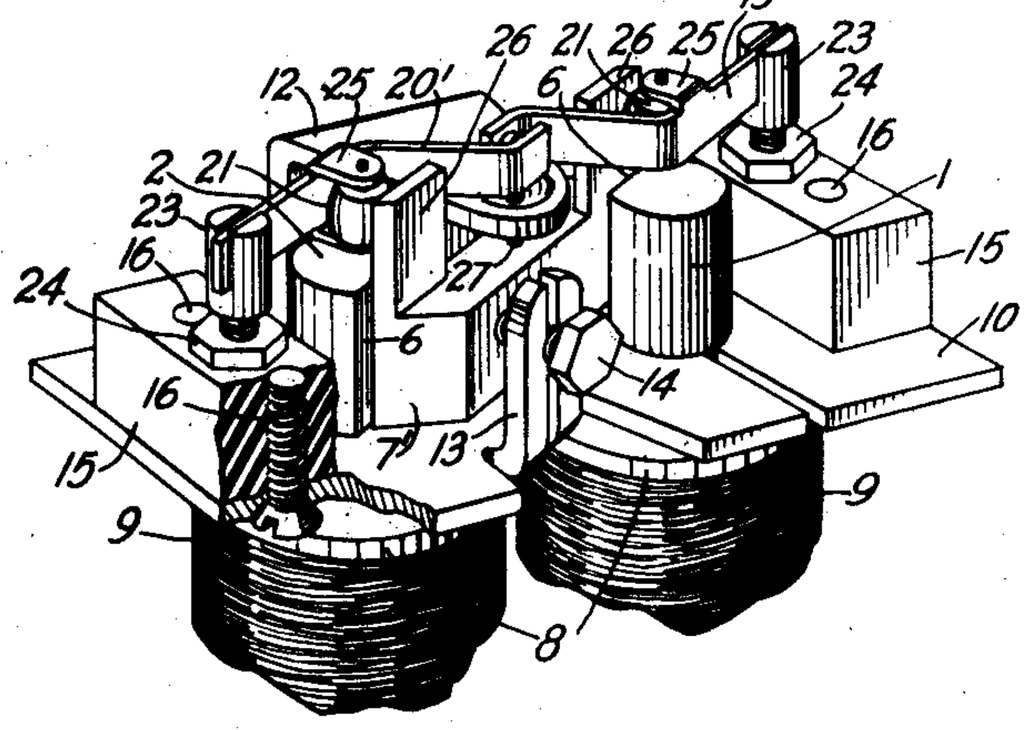


FIG. 1

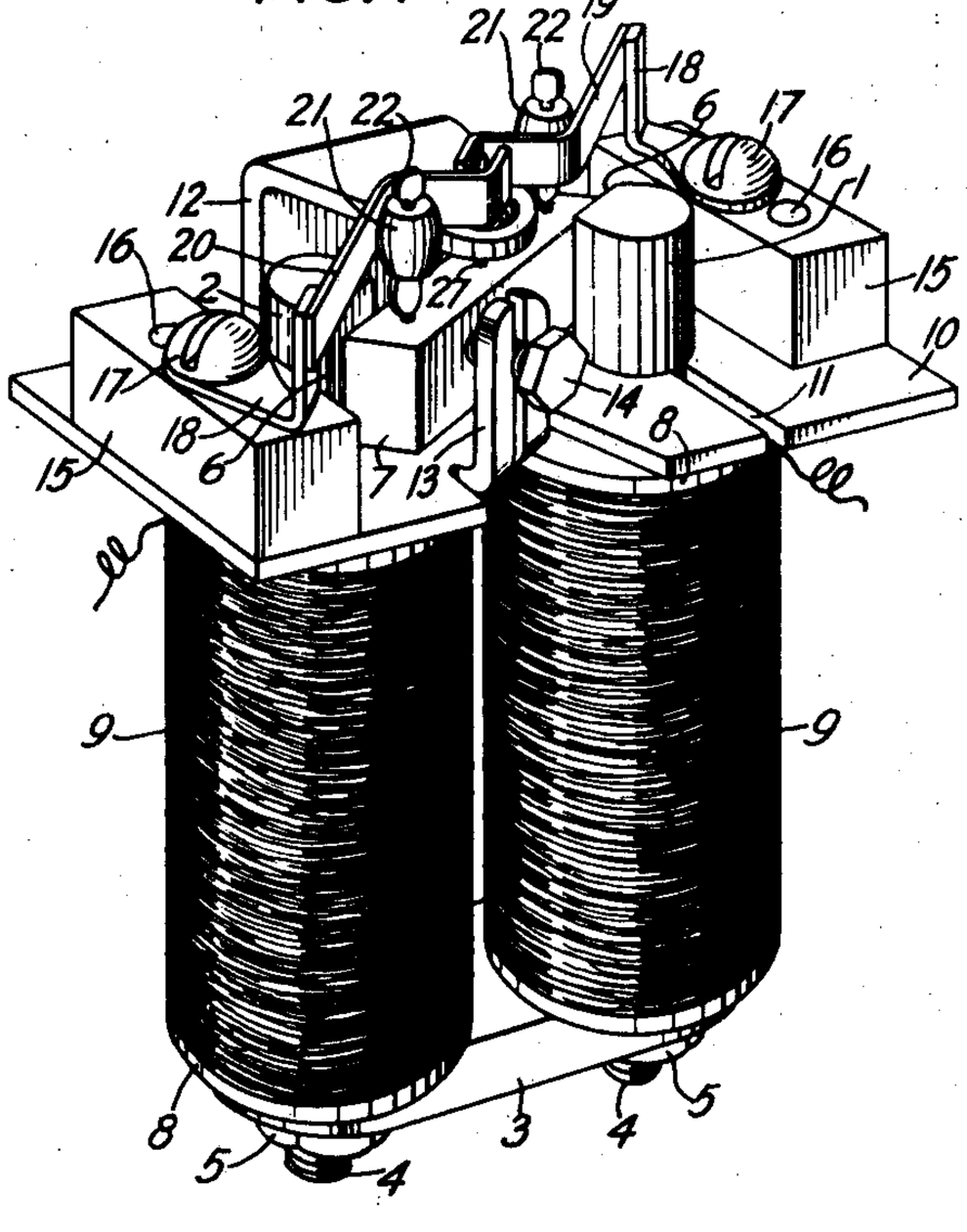
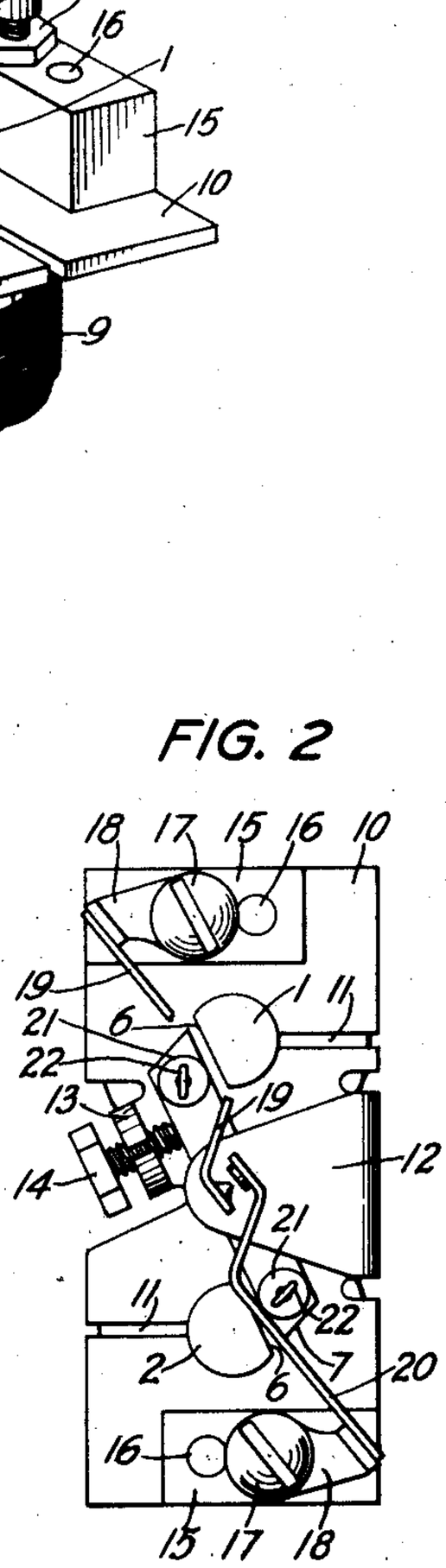


FIG. 2



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UNITED STATES PATENT OFFICE

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ELECTROMAGNETIC DEVICE

Application filed May 6, 1929. Serial No. 360,717.

This invention relates in general to electromagnetic devices and more particularly to a relay for responding to intermittent impulses of current. The object of the invention is the improvement in a relay structure whereby the response to impulses over either a long circuit having high resistance and considerable capacitance or over a short circuit is quick and reliable and the relay contacts are closed and opened positively without chattering.

In various electrical systems, particularly machine switching telephone systems, it is necessary to transmit impulses for controlling the functions of switching apparatus over long circuits which may comprise several miles of wire. An impulse responsive relay to function effectively in such a circuit must be sensitive and positive in action and must control its contacts in such a manner that they will not chatter and thus produce false controlling impulses in local circuits controlled thereby.

In accordance with the present invention one embodiment of which has been illustrated by way of example, the relay comprises a substantially U-shaped magnetic circuit having a winding on each parallel leg thereof and an armature of slight inertia pivoted at its centre to a non-magnetic yoke supported upon the pole pieces. The armature is so pivoted as to swing between the pole pieces. The relay is provided with a pair of contact springs each mounted in a stud at either end of the yoke, one being disposed on one side of the armature and the other on the other side of the armature and with their free contact ends opposite each other in substantial alignment with the armature pivot.

When the armature is rotated to move its poles toward the pole pieces, each end thereof engages the spring adjacent thereto, whereby the two springs are moved toward each other into contact. Since both springs are moved, the movement of each spring is made less than would have been necessary if only one spring in the pair moved, thereby reducing the velocity of the spring travel. Also, since the springs both move toward each other due to the manner in which they are mounted with respect to each other and to the armature, there is a slight wiping action of their contacts, thereby insuring a firm chatterless engagement.

The invention will be more clearly understood by reference to the accompanying drawing, in which Fig. 1 is a view in perspective of an electromagnetic device embodying the invention; Fig. 2 is a top plan view showing the mounting of the contact springs; and Fig. 3 is a view in perspective of an electromagnetic device embodying a modified form of the invention.

Referring now to Figs. 1 and 2 in which the preferred form of the invention has been disclosed, the relay comprises a substantially U-shaped magnetic circuit having cores terminating at their forward ends in pole pieces 1 and 2 and joined at their rear ends by a heel-piece 3, to which the cores are united by the threaded portions 4 and nuts 5. The pole pieces are flattened as at 6 to form air-gaps with the pivoted armature 7 for completing the magnetic circuit. Mounted on each core is a spool 8 carrying a magnet coil 9, the two coils being connected in series to provide an energizing circuit for the relay.

Supported upon the forward ends of the cores and resting upon the upper heads of the spools 8 is a yoke 10 of non-magnetic material. The yoke 10 is provided with openings therein through which the pole pieces 1 and 2 extend, the openings being of such area and connected by slots 11 with the edges of the yoke so that the yoke when driven upon the pole pieces is held securely thereon. Extending upwardly and then inwardly from one edge of the yoke 10 is a bracket 12. Pivoted between the end of bracket 12 and the body of the yoke 10 an armature 7 is pivoted on the pin 27 and so disposed that its ends may oscillate toward and away from the pole pieces 1 and 2.

Extending upwardly from the edge of the yoke 10 opposite the bracket 12 is a slotted lug 13 through which is threaded the stop pin 14 for limiting the movement of the armature away from the pole pieces and for

adjusting the air-gaps between the ends of the armature 7 and the faces 6 of the pole pieces 1 and 2.

Attached at each end of the yoke 10 by screws 16 is a block of insulating material 15. The screws 16 are more clearly shown in the modification of Fig. 3. Attached to each insulating block 15 by a screw 17 is an angular lug 18, to one of which an offset contact spring 19 and to the other of which a similar contact spring 20 is welded, soldered or otherwise attached. The two springs 19 and 20 are mounted with their contact ends facing each other at a point approximately over the pivot pin 27 of the armature and are tensioned to normally lie out of engagement with each other.

On each end of the upper side of the armature 7 an insulating roller 21 is rotatably attached by a pin 22. Normally the springs 19 and 20 press upon the rollers 21 to cause the armature 7 to swing its ends away from the pole pieces until stopped by the stop pin 14. When the circuit through the coils 9 is closed the ends of the armature 7 are attracted toward the faces 6 of the pole pieces 1 and 2, whereby the rollers 21 carried by the armature move the free ends of the contact springs against their normal tension. Since the contact ends of the springs 19 and 20 are offset with respect to their points of attachment to the lugs 18, they are through the attraction of the armature 7 moved into engagement with each other, as will be clearly apparent by referring to Fig. 2. Not only are the contact ends brought into a firm engagement with each other, but due to the conformation of the springs a slight wiping action between the contacts results whereby the contact surfaces are kept free from dust particles. Since the two springs move toward each other into engagement the travel of each spring is reduced to half of the travel that would be necessary if one contact spring only were movable, as is the usual relay contact spring arrangement.

The armature 7 may be made very light so that it has very small inertia whereby the relay is very quick to make and break the contact between its contact springs and is exceptionally free from any tendency to cause a chattering of the contacts.

The modified form of the invention shown in Fig. 3 is similar to the form of the invention just described with the exception of the arrangement of the contact springs 19′ and 20′ and armature 7′. The springs 19′ and 20′ are each welded, soldered or otherwise secured in the slotted ends of studs 23, which are screwed into the insulating blocks 15 and locked therein by lock-nuts 24. Each spring is provided with a pair of lugs 25, between which is pivoted a roller 21 of insulating material. For engagement with the roller 21 of each spring the pivoted armature 7′ is provided at each end with an upwardly extending member 26. This relay functions in the same manner as the relay previously described.

What is claimed is:

1. In an electromagnetic device a magnetic circuit comprising a core terminating in a pole-piece and a pivoted armature oscillatable toward and away from said pole-piece, a pair of contact springs one disposed on either side of the pivot of said armature, said springs extending toward each other with their free contact ends disposed opposite each other, and means operable through the oscillation of said armature to move the contact ends of both said springs toward each other into engagement.

2. In an electromagnetic device a magnetic circuit comprising a core terminating in a pole-piece and a pivoted armature oscillatable toward and away from said pole-piece, a pair of contact springs one disposed on either side of the pivot of said armature, said springs extending toward each other with their free contact ends disposed opposite each other, and means operable through the oscillation of said armature to move the contact ends of both said springs toward each other into a wiping engagement.

3. In an electromagnetic device, a magnetic circuit comprising a substantially U-shaped core and a pivoted armature oscillatable between the pole pieces of said core, a pair of contact springs, one disposed on either side of said armature, said springs extending toward each other with their free contact ends disposed opposite each other, and means operable through the oscillation of said armature to move the contact ends of both said springs toward each other into engagement.

4. In an electromagnetic device, a magnetic circuit comprising a substantially U-shaped core and a pivoted armature oscillatable between the pole pieces of said core, a pair of contact springs, one disposed on either side of said armature, said springs extending toward each other with their free contact ends disposed opposite each other, and means operable through the oscillation of said armature to move the contact ends of both said springs toward each other into a wiping engagement.

5. In an electromagnetic device, a magnetic circuit comprising a substantially U-shaped core and a light pivoted armature oscillatable between the pole pieces of said core, a pair of contact springs one disposed on either side of said armature, said springs extending toward each other with their free contact ends disposed opposite each other, and means operable through the oscillation of said armature to move the contact ends of both said springs toward each other into engagement.

6. In an electromagnetic device a magnetic circuit comprising a substantially U-shaped core and a pivoted armature oscillatable between the pole pieces of said core, a pair of contact springs one disposed on either side of said armature, said springs extending toward each other with their free contact ends disposed opposite each other, and rollers interposed between the ends of said armature and said springs for moving the contact ends of both said springs toward each other into engagement through the oscillation of said armature.

7. In an electromagnetic device a magnetic circuit comprising a substantially U-shaped core and a pivoted armature oscillatable between the pole pieces of said core, a pair of contact springs one disposed on either side of said armature, said springs extending toward each other with their free contact ends disposed opposite each other, and rollers mounted upon the ends of said armature for engaging said springs for moving the contact ends of both said springs toward each other into engagement through the oscillation of said armature.

8. In an electromagnetic device a magnetic circuit comprising a substantially U-shaped core and a pivoted armature oscillatable between the pole pieces of said core, a non-magnetic yoke supported upon the core through which said pole pieces extend, said armature being pivoted at its center to said yoke, insulating blocks mounted upon the ends of said yoke, a contact spring supported by each block, said springs extending toward each other with their free contact ends disposed opposite each other, and means operable through the oscillation of said armature to move the contact ends of both said springs toward each other into engagement.

9. In an electromagnetic device a magnetic circuit comprising a substantially U-shaped core and a pivoted armature oscillatable between the pole pieces of said core, a non-magnetic yoke supported upon the core through which the pole pieces extend, a bracket formed integrally with said yoke between which and the body of said yoke said armature is pivoted to oscillate freely, insulating blocks mounted upon the ends of said yoke, a contact spring supported by each block, said springs extending toward each other with their free contact ends disposed opposite each other, and means operable through the oscillation of said armature to move the contact ends of both said springs toward each other into engagement.

10. In an electromagnetic device a magnetic circuit comprising a substantially U-shaped core and a pivoted armature oscillatable between the pole-pieces of said core, a non-magnetic yoke supported upon the core through which the pole-pieces extend, a bracket formed integrally with said yoke between which and the body of said yoke the armature is pivoted to oscillate freely, insulating blocks mounted upon the ends of said yoke, a contact spring supported by each block, said springs extending toward each other with their free contact ends disposed opposite each other, and rollers mounted upon the ends of said armature for engaging said springs for moving the contact ends of both said springs toward each other into engagement through the oscillation of said armature.

In witness whereof, I hereunto subscribe my name this 1 day of May, 1929.

EDWARD D. MEAD.