July 28, 1942. K. W. PFLEGER 2,291,410

RELAY

Filed Oct. 2, 1940

FIG. 1

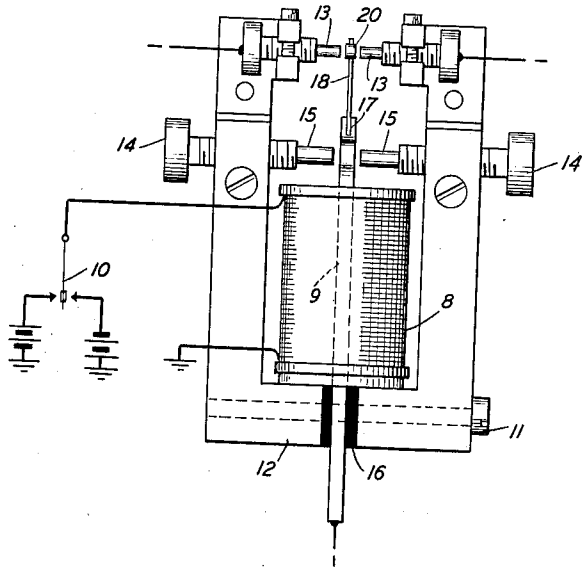


FIG. 2

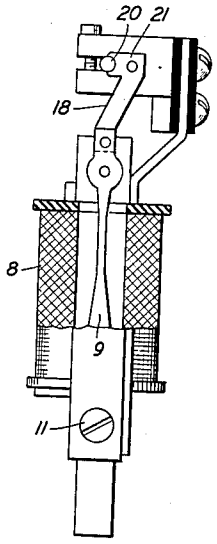


FIG. 3

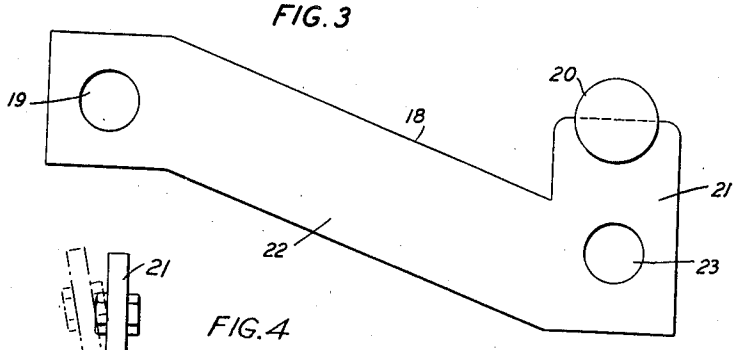
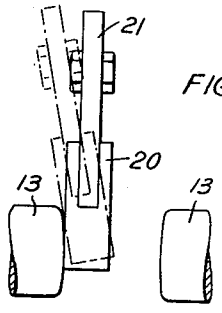


FIG. 4



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2,291,410

RELAY

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Application October 2, 1940, Serial No. 359,322

4 Claims. (Cl. 200—87)

This invention relates to electromagnetic relays and more especially to electromagnetic relays of the high speed polar type such as are used in telegraph repeaters.

One of the problems of such relays is a tendency of the movable contacts to rebound from the fixed contact or contacts with which they cooperate; this rebounding is commonly known as chatter and may manifest itself in a series of rebounds in the nature of a vibration.

In accordance with the present invention, this tendency to rebound is eliminated or reduced by offsetting the contacts with respect to the center line of the spring bearing the contacts or by mounting the contacts on a diagonally extending arm or offset portion of the spring. This results in a twisting or frictional engagement of the movable contact with the fixed contact and the energy of motion is used up in internal work in distortion and twisting of the spring rather than in causing a rebound of the contacts. Either single or double springs may be employed, that is, the invention may be utilized with double springs of the type shown in Cummings Patent 1,624,476, granted April 12, 1927, or with contacts mounted on a single spring such as disclosed in applicant's copending application Serial No. 359,881, filed October 5, 1940.

The nature and details of the improvement may be more conveniently further described by reference to the accompanying drawing disclosing one embodiment of the invention in which:

Fig. 1 is a top view of semidiagrammatic nature of an otherwise standard type of polar relay having the improvements of the present invention incorporated therein;

Fig. 2 is a cross-section taken from Fig. 1 in a direction longitudinal to the armature and just to one side thereof;

Fig. 3 is an enlarged side view of the contact spring; and

Fig. 4 is a diagram on a greatly enlarged scale showing the manner in which the movable armature contact 20 engages the fixed contact with a rolling, sliding, or eccentric motion.

In its fundamental features of construction the specific relay disclosed in the present application may be similar to that disclosed in the patent to Cummings 1,624,476, granted April 12, 1927, or Curtis 1,680,667, granted August 14, 1928; it may be considered as an improvement upon relays of the type disclosed in those patents.

The relay consists of an electromagnet comprising an energizing coil 8 through which armature 9 extends. The coil 8 may and does in practice consist of one or up to several windings which may be connected to different sources, such as line current sources, polarizing current sources, etc., but is conventionally illustrated as being connected to a source of positive and negative battery over a line or other conductor, which may be of any length, to an armature 10 of an impulse originating relay which supplies impulses to vibrate the armature 9. The armature 9 is clamped by means of a screw 11 or any other suitable means between magnetic members of a permanent magnet structure 12. The armature 9 vibrates between adjustable insulated contacts 13 and is limited in motion by adjustable stop screws 14 which also are composed of magnetic material and terminate in pole-pieces 15 through which the flux to operate the armature flows into the armature structure. The armature is generally clamped between non-magnetic shims 16. Some relays have a thin stop member between the armature and the pole-piece to prevent sticking of the armature to the pole-piece. So far as described the construction is conventional and known.

A description will now be given of the novel features constituting the improvements to which this specification is primarily directed.

In the end of the armature upon the center line thereof there is sawed or otherwise produced a slot 17 in which the contact bearing spring 18 is riveted, bolted or otherwise positioned. The contact bearing spring 18 is shown in enlarged form in Fig. 3 and contains a hole or opening 19 for its attachment in the slot 17. The contact buttons 20 may be arranged to make contact with the fixed contacts 13 somewhat eccentrically with a rolling or sliding motion and are mounted on an arm 21 which, in turn, is carried by a diagonally extending portion 22. An opening 23 may be utilized to carry a small bolt or rivet to provide additional weight eccentrically mounted which assists in causing the frictional or rolling engagement of the contacts which tends to eliminate or reduce rebound. From another viewpoint, the spring will undergo some twisting before a rebound takes place and the rebound may, therefore, be delayed until the holding force tending to hold the contacts together is great enough to prevent the rebound. Furthermore, the kinetic energy of the moving parts is dissipated by internal work in the contact spring and this also tends to reduce rebound and chatter. The spring may be constructed of a nickel-silver alloy and the contact buttons 20 may be composed of any of the usual contact metals or alloys. The

principles of the invention are applicable to non-polar relays as well as polar relays and may be applied to the front contacts of relays as well as the back or release contacts thereof.

Fig. 4 illustrates the manner in which the spring member 21 flexes and causes the movable contact 20 mounted upon the spring member to engage a fixed contact with a sliding, rolling or eccentric motion. Of course, the parts in Fig. 4 are upon a greatly enlarged scale and no attempt has been made to illustrate them in correct proportions. It is well known that in a relay of this type the distance between the fixed contacts 13 is ordinarily so adjusted and the thickness of the contact button or member 20 is so proportioned that the maximum movement of the movable contact in passing from engagement with one fixed contact to engagement with the other fixed contact is no more than a few thousandths of an inch. As shown in Fig. 4 the attractive force of the pole-pieces 15 pulls the armature over to such an extent that a slight flexing of the spring member 21 takes place which causes the contact 20 to engage a fixed contact with a sliding motion. The conjoint results of the flexing of the spring and the friction resulting from this sliding motion tend to reduce undesired movements of the movable contact 20 away from the contact 13 with which it is at the moment engaged. These undesired movements are generally known as "chatter." Reduction of this undesired chatter is one of the principal features of the invention.

What is claimed is:

1. A high speed relay of the type in which an armature carries contacts mounted on a spring member, characterized in that the mass of the spring is eccentrically mounted with respect to the plane of motion of the center of the armature.

2. A relay having an armature carrying a movable contact which works to and from a fixed contact, contact surfaces upon said movable and fixed contacts formed to engage one another eccentrically with respect to the plane of motion of the center of gravity of the armature and with a rolling motion.

3. A relay having an armature carrying a spring, a contact mounted upon said spring to make engagement with a fixed contact, the mass of said spring being unsymmetrically related to a plane drawn through the path of movement of the center of mass of the armature.

4. A relay having an armature carrying a contact bearing element, a contact mounted upon said element adapted to make contact with a fixed contact, said element being flexible and having a mass eccentrically mounted with respect to the plane through said contact parallel to the motion of said armature.

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