May 3, 1938. F. A. ZUPA 2,115,836

ELECTROMAGNETIC SWITCHING DEVICE

Filed Oct. 6, 1934

FIG. 1

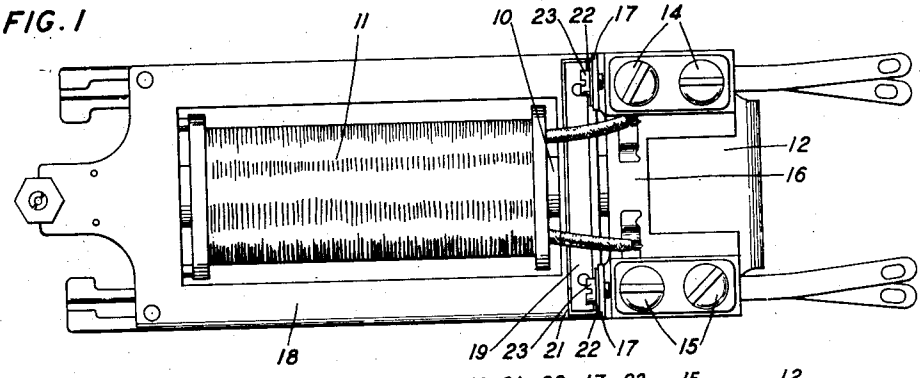


FIG. 2

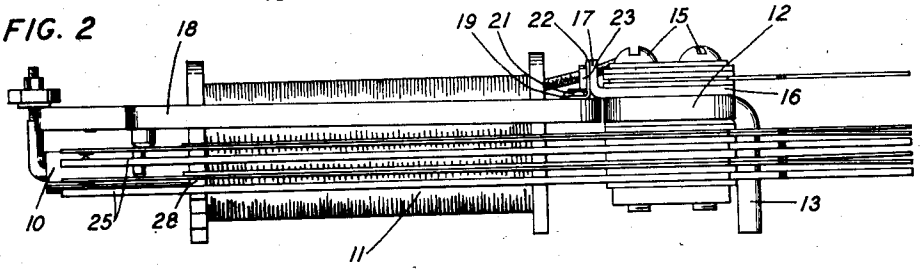


FIG. 3

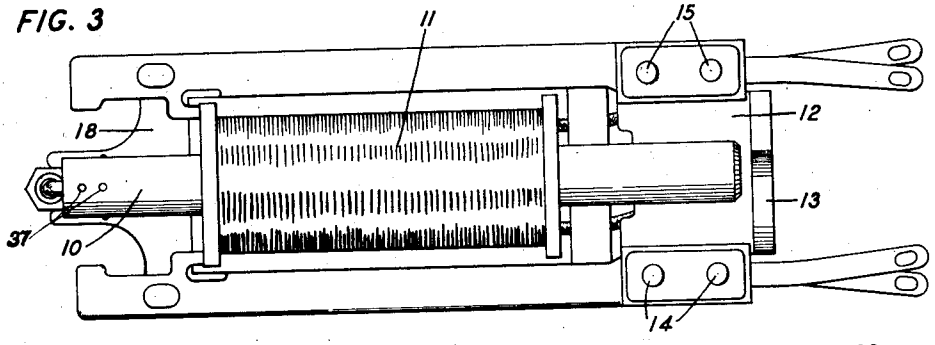


FIG. 5

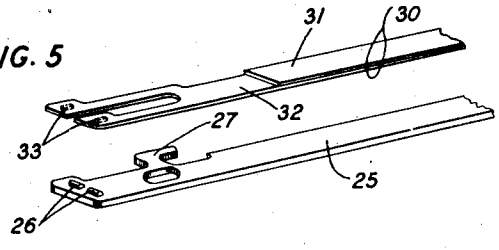
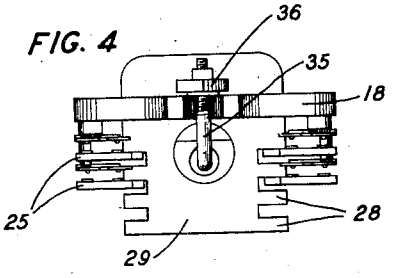


FIG. 4



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UNITED STATES PATENT OFFICE

2,115,836

ELECTROMAGNETIC SWITCHING DEVICE

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3 Claims. (Cl. 175—336)

This invention relates to electric switching devices and particularly to electromagnetic relays.

In electrical systems generally, and in telephone systems particularly, the electromagnetic relay plays an important part and is one of the most extensively employed switching devices in communication systems.

To insure satisfactory functioning of the circuits of a telephone system and to guard against interruption of service, it is necessary that the relays employed in such systems be so designed as to operate at maximum efficiency at all times and be so constructed as to permit adjustment to be made in the field without undue disturbance to the relay as a whole. Two of the many elements which constitute a relay structure and upon a satisfactory design of which depends, to a major extent, the efficiency of a relay, are the contact springs and the magnetic circuit.

In contributing to the overall efficiency of a relay it is necessary that the contact spring be so designed as to be sufficiently stiff for tensioning purposes and to insure its return to normal after actuation by the armature and at the same time maintain a relative flexibility at its contact end. The magnetic circuit should be of such a nature as to produce a maximum air-gap flux for a given value of operating current; in other words, the leakage flux or that portion of the total core flux which does not cross the armature and consequently can not be utilized for producing traction should be reduced to a minimum.

It is the object of this invention to improve the design of electromagnetic relays so as to provide a relay of maximum efficiency and one whose parts may be readily adjusted.

This object is attained, in accordance with a feature of the invention, by the provision of a relay contact spring which has a greater stiffness throughout the major portion of its length than the contact carrying portion thereof and which is substantially chatterless.

Another feature of the invention resides in a particular design of armature back-stop which is so constructed and which cooperates with the relay core and armature in such a manner as to introduce no added or unnecessary leakage of the magnetic flux reaching the relay pole gap.

A further feature of the invention resides in a particular design of armature support which permits armature adjustments to be made without disturbance to the relay structure as a whole and which, while sufficiently flexible to permit the normal functioning of the armature, is adequately rigid to resist any forces which tend to move the armature abnormally.

These and other features of the invention which contribute to the overall efficiency of the relay will be readily understood from the following detailed description made with reference to the accompanying drawing in which:

Figs. 1, 2, 3 and 4 show, respectively, a top plan view, a side elevation, a bottom plan view and a front end view of a relay embodying the features of the invention; and

Fig. 5 shows a fragmentary perspective view of the contact springs utilized in the relay of this invention.

The relay core 10 is substantially cylindrical throughout its length and on an intermediate portion thereof supports the relay coil 11. The front portion of the core 10 or that portion immediately below the front cross-bar of the armature is flattened to provide a pole face of suitable area.

An L-shaped bracket comprising portions 12 and 13 is welded to the rear portion of the core 10. The depending portion 13 (as seen in Fig. 2) of the bracket serves as means for mounting the relay on a relay rack, the portion 12, extending the entire width of the relay, constituting a support for the spring pile-ups which are located on either side of the relay and secured to the bracket portion 12 by means of screws 14 and 15.

Interposed between the upper spring pile-ups and the bracket portion 12 is secured, also by means of the screws 14 and 15, a U-shaped bracket 16 provided with the integral upturned lugs 17 which extend in a direction at right angles to the longitudinal axis of the core 10. On the rear cross-bar of armature 18 there is clamped by means of a clamping member 19 and the rivets 20, a reed 21 which extends substantially across the entire length of the rear cross-bar of the armature. The reed 21 is provided with integral right-angular projections 22, which are in alignment with the projections 17 of the bracket 16 and which are secured thereto by means of screws 23 which pass through oblong holes in the reed elements 22. By virtue of the contour of the holes in the reed portions 22, the armature may be raised or lowered with respect to the core 10 by merely loosening the screws 23, adjusting the armature to the desired level and then tightening the screws 23. A longitudinal adjustment of the armature may also be made by loosening the screws 14, 15, moving the bracket 16 forward or backward, in accordance with the required adjustment, and then tightening the screws 14, 15,

the bracket being provided with oblong holes to permit it to be shifted without necessitating the removal of the spring pile-ups or in any other way disturbing the relay structure as a whole.

The spring pile-ups comprise the contact spring combinations, each spring of the combination being separated by an insulator in accordance with usual practice, and are secured to the bracket portion 12 by means of screws 14 and 15 as previously mentioned. The passive or stationary contact spring 25 is relatively thick and carries on its free end two contact elements 26 disposed at right angles to the longitudinal axis of the spring. A lateral projection 27 on the spring 25 abuts against a projection, such as 28, on the front spool-head 29, the projections 28 serving as spacers for the springs 25 which are normally tensioned against the spool-head projections.

The companion active or movable contact spring 30 is made up of two relatively thin spring elements or blades 31 and 32 spot-welded together, the element 32 being of greater length than that of the element 31. The portion of element 32 which extends beyond the end of element 31 constitutes the contact carrying portion of the spring and is bifurcated to provide a split spring, each portion affected by the bifurcation carrying a contact element 33 disposed at right angles to the transverse axis of the spring 30. The split spring and its associated contacts constitute a parallel contact arrangement which minimizes the danger of faulty contact.

The particular construction of spring 30 results in a contact spring having a greater stiffness throughout the major portion of its length than the contact carrying portion thereof, thereby insuring the desirable characteristic of flexibility at the contact portion while maintaining the necessary tension for returning the spring to normal after its actuation together with the actuating armature. It is also to be noted that the thickness of the spring 30 at any point on its length is no greater than the combined thicknesses of the two blades 31 and 32. This spring construction, therefore, not only provides the necessary tension for controlling its return movement and the desired flexibility at the contact bearing end, but does so without sacrificing any space allotted to the contact springs.

The back-stop utilized in this construction comprises an L-shaped pin 35 having one end thereof protruding from the front end of core 10 and the other portion extending at right angles thereto and threaded to accommodate the nut 36. The front edge of the armature 18 is slightly concave to permit the pin 35 to pass the armature and to provide the necessary armature bearing surface for the nut. This type of construction permits the front edges of the core 10 and armature 18 to be in substantial alignment thereby reducing the leakage paths which are common to arrangments heretofore employed in which the core, to provide mounting space for the back-stop, extended beyond the front end of the armature. This arrangement reduces leakage flux to a minimum and permits substantially all of the core flux to cross the armature air-gap and therefore to be utilized for producing traction.

The front end of the core 10 may be bored to permit the insertion of the pin 35 which may then be staked into position as generally indicated by the holes 37 (Fig. 3).

What is claimed is:

1. In an electromagnetic switching device, relatively movable armature and core members whose forward ends are in substantial alignment and means for regulating the relative movement of said members, said means comprising a pin protruding longitudinally from the forward end of said core and extending at right angles thereto beyond the forward end of said armature and a nut adjustably carried by said pin in operative association with said armature.

2. In an electromagnetic switching device, an armature and means for mounting said armature on said device, said means comprising a reed clamped to said armature and having two upturned flanges, an adjustable bracket mounted on said device and having two upturned flanges in alignment with the flanges of said reed and means for clamping said aligned flanges together.

3. In an electromagnetic switching device, an armature and means for mounting said armature on said device, said means comprising a reed clamped to said armature and having two upturned flanges, a bracket adjustably mounted on said device and having two upturned flanges in alignment with the flanges of said reed, said reed flanges being adjustable relative to said bracket flanges and means for clamping said reed to said bracket by way of their respective flanges.

FRANK A. ZUPA.