

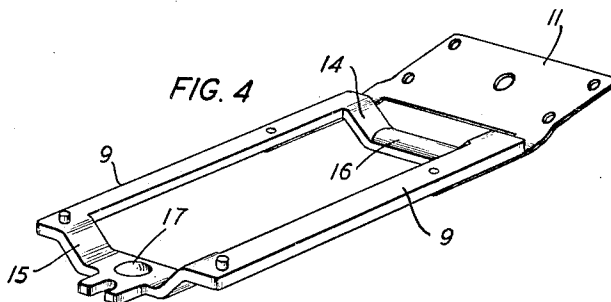
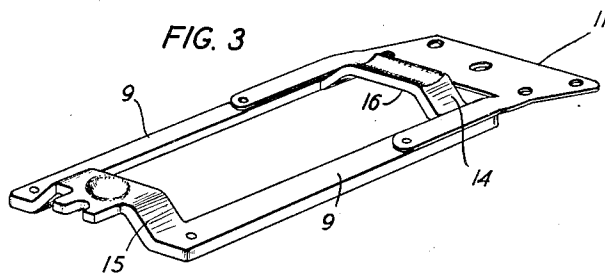
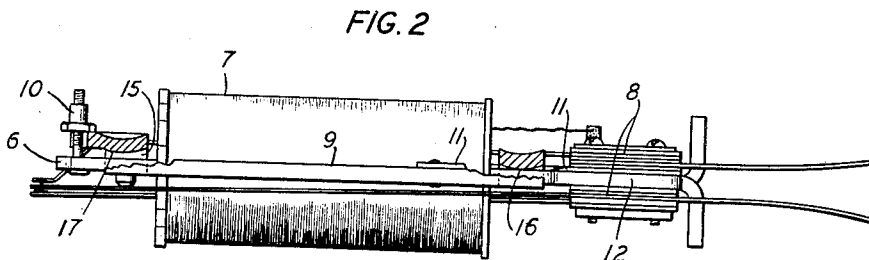
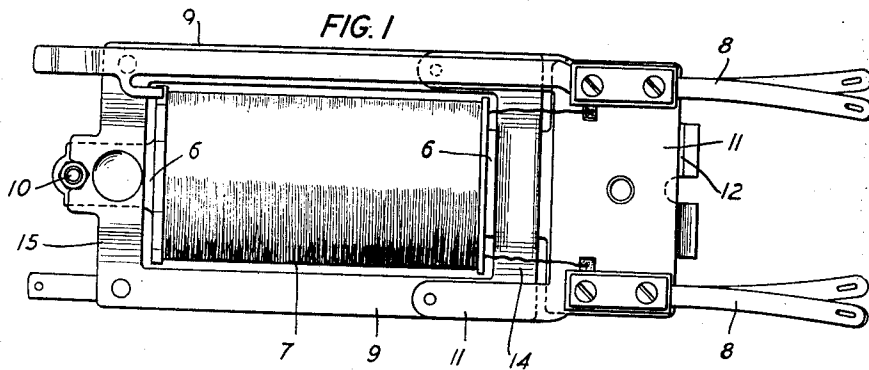
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ELECTROMAGNETIC SWITCHING DEVICE

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ELECTROMAGNETIC SWITCHING DEVICE

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5 Claims. (Cl. 175—336)

This invention relates to electromagnetic switching devices and particularly to electromagnetic relays of the slow-to-release type.

In electric circuits generally, and in telephone circuits particularly, the electromagnetic relay is extensively employed, and in such circuits the functions to be performed by the relay are numerous and varied. One of the common functions which the relay is called upon to perform is to maintain a circuit closed for a short interval of time after the current which energized the relay has been interrupted. Such a relay is known as a slow-to-release relay.

In order that such a relay may be designed to have uniform release characteristics, it is essential that the time constant of the relay holding coil and the time constant due to eddy currents in the relay magnetic structure have a high degree of uniformity. The uniformity of these time constants is largely dependent upon the constancy of the magnetic reluctance of the armature and core when in the close contact obtained when the relay is operated. It is therefore essential to the design of slow-to-release relays that uniformity of magnetic reluctance of the armature and core in the operated position be insured to obtain uniform release characteristics.

It is the object of this invention to improve the design of electromagnetic relays so as to insure uniform release characteristics thereof.

This object is attained in accordance with a feature of the invention by incorporating in the relay design an armature and core construction which will insure uniformity of the magnetic reluctance thereof when the armature and core are in engagement.

Specifically, the relay armature is provided at one end with a cylindrical embossment and at the other end with a spherical embossment, so that when the relay is operated, the armature makes line contact with the core at one end and point contact at the other end. Since a straight line and a point outside the line determine a plane, it follows that the armature will assume an even and stable bearing upon the core when the relay is operated even though the pole surfaces on the core are not in the same plane due to commercial variations or distortions in the core. The embossments are made integral portions of the armature and have large radii of curvature so as to guarantee against the introduction of high reluctance air-gaps in the magnetic circuit. The same relation may be obtained by embossing the pole surfaces of the core, one pole surface having a spherical embossment and

the other pole surface having a cylindrical embossment, the corresponding pole surfaces of the armature being flat.

The invention will be readily understood from the following detailed description made with reference to the accompanying drawing in which:

Fig. 1 is a top plan view of a well known type of relay embodying the features of this invention;

Fig. 2 is a side elevation of the relay shown in Fig. 1;

Figs. 3 and 4 are perspective views of the armature employed in the structure shown in Figs. 1 and 2 and show the upper side and under side, respectively, of the armature.

Applicant has elected to show his invention as applied to the well known flat type relay, but it will be apparent that the principle of design is equally well adapted to other types of relays.

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 armature adjusting device 10. The armature 9 is provided with a reed-type hinge 11 which rests on the bracket 12 formed integrally with the core 6 and secured thereto by means of screws 13 which also serve to secure the spring pile-ups 8 in the position on the bracket. It is believed unnecessary to enter into any further description of the general construction of the relay except to say that it may be equipped with a copper sleeve to impart to the relay additional slow-to-release characteristics.

The armature 9 is substantially rectangular in shape having its two side pieces joined together at their ends by the integral bridge pieces of cross-bars 14 and 15. The rear cross-bar 14 is provided with a cylindrical embossment 16, and the front end piece 15 with a spherical embossment 17. The radii of curvature of these embossments are made relatively large so that the effective or equivalent air-gaps introduced by their use are practically negligible thereby insuring against high reluctance in the magnetic circuit at the points of contact between armature and core.

By virtue of the armature embossments, the armature, at its rear end, makes line contact with the core at the point generally indicated by the numeral 18 (Fig. 2) and point contact with the front end of the core when the armature is in its operated position. The result obtained by this construction is greater uniformity of release characteristics in the slow-to-release relay. This is apparent when it is considered that the spheri-

cal and cylindrical surfaces on the armature, within comparatively large variations of alignment between the core and armature on the assembled relay, will make the same kind of contact with the corresponding pole surfaces of the core.

Heretofore, uniform magnetic reluctance in slow-to-release relays was dependent upon an accurate alignment of flat pole surfaces, which, from the viewpoint of practicability, was impossible of attainment. Such surfaces required precise machining of both the core pole surfaces and corresponding armature surfaces and necessitated an accurate assembly of these parts and a stabilized adjustment thereof which would not be disturbed while the relay was in service. Applicant's embossed armature obviates the necessity for such precision requirements and assures a uniformity of reluctance in the magnetic circuit even though there may be large variations in alignment of the armature and core.

What is claimed is:

1. An electromagnetic device comprising fixed and movable members, one of said members being provided at one end with a cylindrical projection and at the other end with a spherical projection whereby, upon energization of said device, said members make line and point contact with each other.

2. An electromagnetic device comprising fixed and movable members, one of said members being provided with cylindrical and spherical projections of large radii of curvature whereby, upon energization of said device, said members make line and point contact of low magnetic reluctance with each other.

3. An electromagnetic device comprising a movable armature and a stationary core, said armature being provided with cylindrical and spherical embossments, whereby, upon energization of said device, said armature makes line and point contact with said core.

4. An electromagnetic device comprising a movable armature and a stationary core, said armature being provided with cylindrical and spherical embossments of large radii of curvature, whereby, upon energization of said device, said armature makes line and point contact of low magnetic reluctance with said core.

5. An electromagnetic device comprising a movable armature and a stationary core and means for insuring a uniform engagement of said armature and core when said device is energized, said means comprising cylindrical and spherical embossments on said armature.

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