Sept. 13, 1955 W. DE FLIGUÉ 2,717,978

MAGNETIC CIRCUITS FOR RELAYS

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Fig :1

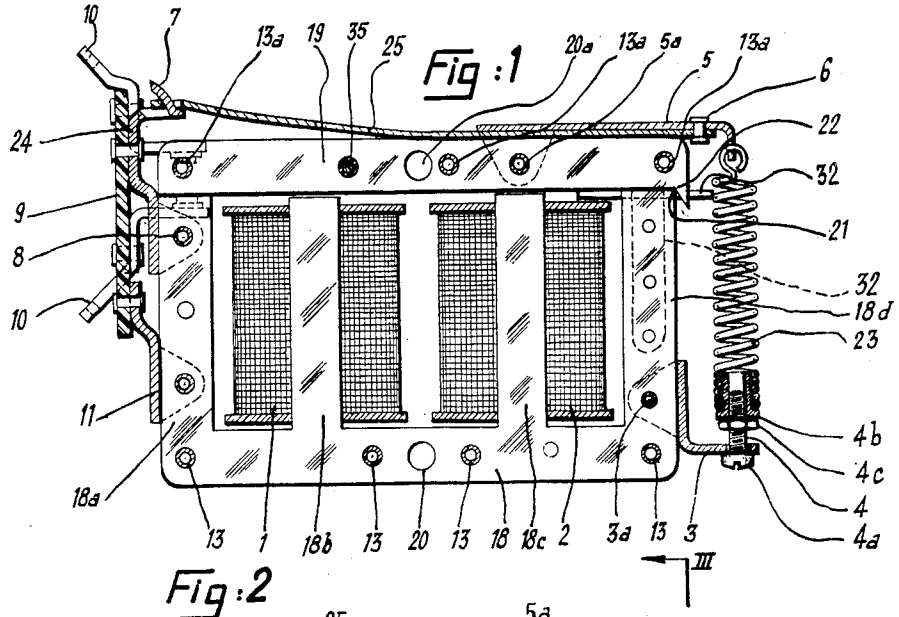
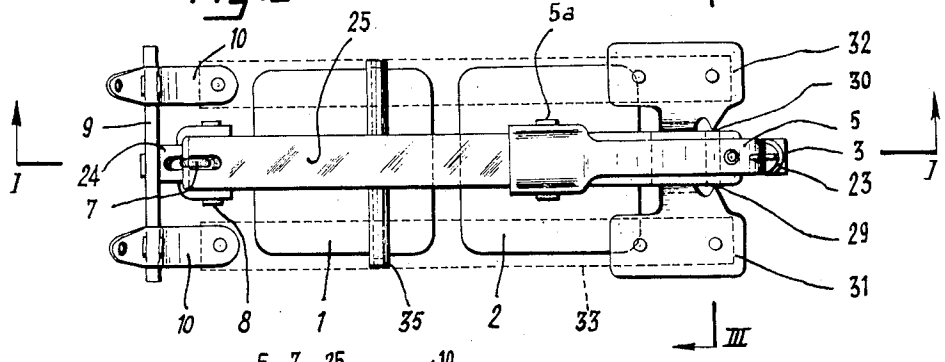


Fig :2



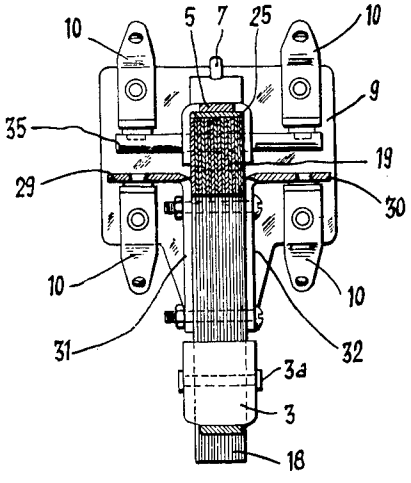


Fig :3

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MAGNETIC CIRCUITS FOR RELAYS

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Claims priority, application France March 19, 1948

5 Claims. (Cl. 317—198)

The present application is a continuation in part of my copending application Serial No. 80,511, filed March 9, 1949, now Patent No. 2,591,520.

The invention concerns electromagnetic relay devices of the type including a stationary core carrying energising means and a movable armature pivotally mounted on said core.

An object of this invention is to provide a relay device of easy construction which does not require elaborate machining and adjustment and which has therefore a low cost price.

A further object of this invention is to provide a relay device of long life, able to operate a very large number of times, with a negligible wear, even without maintenance or lubrication.

A still further object of this invention is to provide a relay device having its magnetic reluctance, when in unattracted position, reduced to a minimum and subject to only very slight friction when actuated.

Another object of this invention is to provide means for allowing pivotal displacement of the armature relatively to the core, while preventing lateral displacement of said armature.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawing in which like reference characters are employed to designate like parts throughout the same:

Fig. 1 is a longitudinal section of a relay according to the invention, along line I—I of Fig. 2.

Fig. 2 is a top plan view of this relay,

Fig. 3 is a section taken along line III—III of Fig. 2.

In the drawing, the relay comprises a comb-shaped core **18** formed with four branches or teeth **18***a*, **18***b*, **18***c* and **18***d* and bearing in its median portion a hole **20** designed to substantially increase the magnetic reluctance of said portion, thereby rendering the two halves of the core almost completely magnetically independent from one another. This core is laminated and the piled up sheets are secured by means of rivets **13**.

On the two inner branches **18***b* and **18***c* of the core are mounted energizing coils **1** and **2**.

This core cooperates with an armature **19** also laminated and also bearing, in its median portion, a hole **20***a* for increasing the magnetic reluctance of said portion. The piled up sheets of this armature are fitted together by means of rivets **13***a*.

Contrary to conventional relay devices which comprise various members, such as pivots, subject to considerable wear, the invention provides for pivoting means only subject to negligible friction and of high strength.

This pivoting means is constituted by two cooperating angular portions **21** and **22** belonging respectively to the core **18** and to the armature **19**. The angular portion **21** is merely the top right-hand edge (on Fig. 1) of the branch **18***d*, while the angular portion **22** is formed by a protrusion on the lower face of the armature, at the right-hand end thereof. The "convex" angular portion

21 fits into the "concave" one **22**. Thus the pivoting axis coincides with the vertices, in permanent contact, of the two angular portions.

In order to ensure this permanent contact, the armature is resiliently urged in a resultant direction roughly parallel to the bisector of the angles of contact. To this end, two resilient members are provided to act in substantially perpendicular directions: a return spring **23** acting parallelly to the branch **18***d* of the comb-shaped core **18** and a resilient blade **24** acting, through a metal strip **25**, in a direction roughly parallel to the armature.

The return spring **23** is connected at one end to a clamp-member **3**, through a screw-and-nut system **4** allowing adjustment of the tension of the spring. This adjustment can be effected by screwing more or less the screw **4***a* into a nut **4***b* in the form of a threaded sleeve coaxial with the coil spring **23**. This sleeve **4***b* bears an outer threading of same pitch as that of the coil spring, but its outer diameter, slightly larger than the inner diameter of the spring, allows the sleeve **4***b* to be "forced" into the spring, so that the coils of the spring slightly widen when the sleeve **4***b* is screwed into the spring **23**. This disposition does not permit unscrewing of the coaxial sleeve **4***b* from the spring **23**, since the coils of the spring tend to wind up, more and more closely, around the threads of the sleeve **4***b*. A check-nut **4***c* is provided for preventing self-disadjustment. This clamp-member **3** is secured at **3***a* to the foot part of the branch **18***d* of the core **18**. The other end of the spring is connected to another clamp-member **5** secured to the armature at **5***a*.

The clamp-member **5** is riveted at **6** to the strip **25**. The latter which is resilient in the plane of displacement of the armature but which has great lateral rigidity, is hooked at **7** to the blade **24**. It should be noted that this blade which is clamped to the branch **18***a* at **8**, is so shaped as to form a stop limiting the upward displacement of the armature **19**.

This blade **24** is fast with a plate of insulating material **9** carrying two pairs of contact studs **10**. The plate **9** is further secured to the branch **18***a* through a clamp **11**.

The contact strips **33** of the relay are shown in dotted line only in Fig. 2 for clearness sake. These strips are actuated from the armature by means of a small rod **35**, preferably of insulating material, extending across the armature and designed to be applied on these strips.

In order to prevent lateral displacement of the armature **19**, side abutments **29**, **30** are provided. These abutments in the form of sharp protrusions located in the vicinity of the pivoting axis of the armature, are integral with the top flanges of angle-irons **31**, **32** which are secured to the branch **18***d*. These flanges are perforated and the contact strips **33** are secured thereto with insertion of a proper insulator (not shown).

The relay device which has just been described operates in the following manner:

When current flows through the energising coils, the armature **19** is attracted and swings about the pivot formed by the angular portions **21**—**22**.

As specified above, these two angular portions are held fitted together by means of the return spring **23** on the one hand and of the strip **25** and the blade **24** on the other hand. This strip makes up for any looseness which may occur longitudinally of the armature, owing to the resiliency of the blade **24**.

Lateral displacement of the armature (i. e. displacement in the plane of Fig. 2) is hindered by the lateral rigidity of the strip **25** and almost entirely prevented, in the pivotal zone, by the two side abutments **29**, **30** which offer a very slight clearance and are located in the vicinity of the pivoting axis, so as to reduce to a minimum

friction during angular displacements of the armature when the relay device operates.

It should be noted that, as a portion of the armature is always in contact with the core (at the pivotal zone), the magnetic reluctance, when the armature is not in attracted position, is at a minimum.

It should further be noted that, as the point of the armature on which the spring **23** exerts its pull, is very near the pivoting axis, this spring can be selected of a strong and tough type without thereby unduly increasing the attractive force to be exerted on the armature. It is well known that such springs, besides their toughness, need not be accurately determined.

It is obvious that the number of energising coils can be different from two, according to the design of the relay device.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

What I claim is:

1. An electromagnetically-operated relay device comprising a stationary core having a free end and a pivotal end, said pivotal end including an angular portion with a vertex edge, an armature associated with said core and having a free end movable between a position remote from the free end of said core and a position proximate thereto and a pivotal end including an angular portion with a vertex edge, said two angular portions being adapted to fit together with the respective edges in contact with each other whereby the armature is pivoted on the core about an axis substantially coinciding with said edges, resilient means connected to said core and acting on said armature for urging the pivotal end thereof into

contact with the pivotal end of said core, and further resilient means connected to said core and secured to said armature in all positions thereof and acting on said armature longitudinally thereof in the direction from the pivotal end of said armature towards the free end of said core, whereby the lines of action of said two resilient means on the pivotal end of said armature are substantially perpendicular to each other.

2. A relay device as claimed in claim 1, wherein the further resilient means includes a resilient member secured to the core in the vicinity of the free end thereof and a connecting member between said resilient member and said armature.

3. A relay device as claimed in claim 2, wherein the resilient member is so shaped as to form an abutment for the free end of the armature in the remote position thereof.

4. A relay device as claimed in claim 2, wherein the connecting member is a thin metal strip, the flat faces of which are perpendicular to the direction of displacement of the armature.

5. A relay device as claimed in claim 4, wherein the thin metal strip extends over and longitudinally of the armature from a point in the vicinity of the free end thereof to a point in the vicinity of the pivotal end thereof.

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