Dec. 15, 1959 Z. R. SMITH 2,917,600

ELECTROMAGNETIC RELAYS

Filed April 17, 1958

Fig. 1.

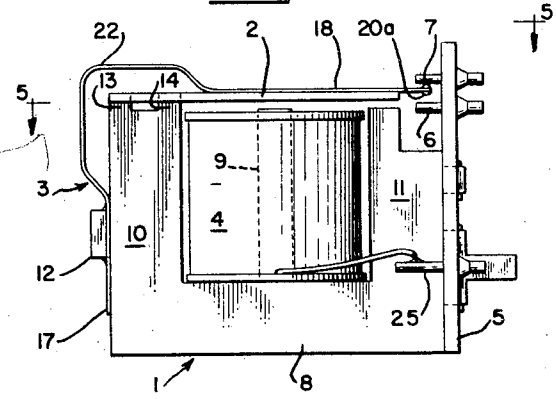


Fig. 2.

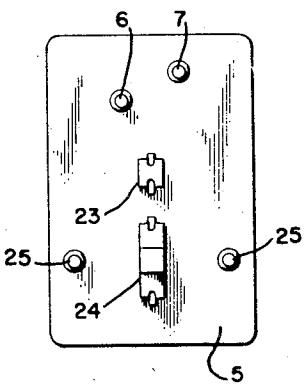


Fig. 3.

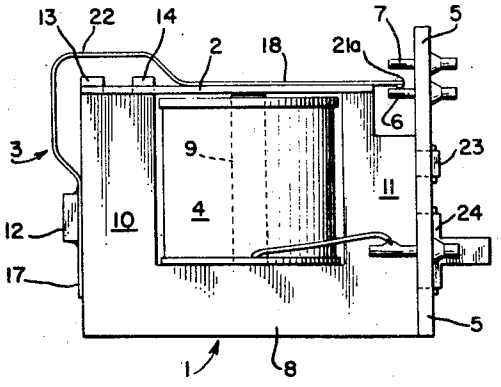


Fig. 4.

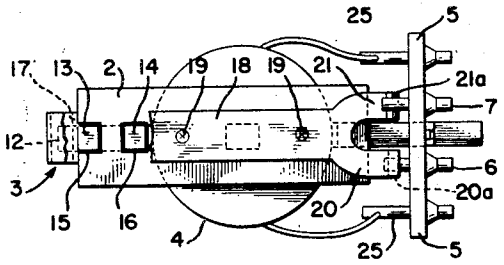


Fig. 5.

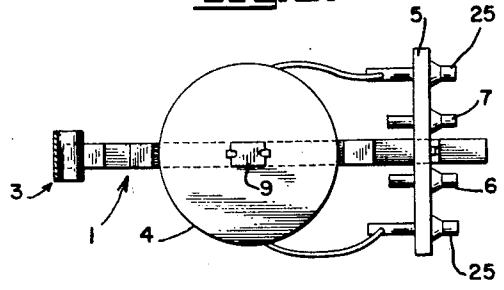
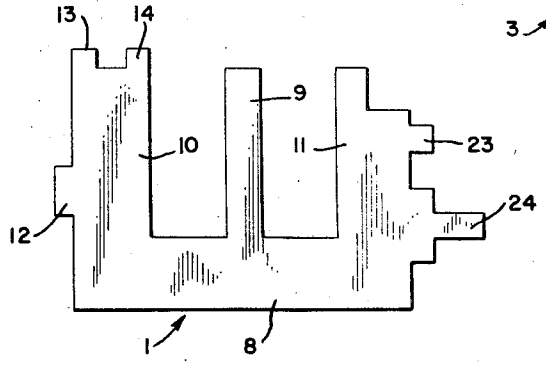


Fig. 6.



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United States Patent Office 2,917,600 Patented Dec. 15, 1959

2,917,600

ELECTROMAGNETIC RELAYS

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Application April 17, 1958, Serial No. 729,203

4 Claims. (Cl. 200—87)

This invention relates to electromagnetic relays and more particularly to a novel, highly simplified and extremely inexpensive relay construction.

It has heretofore been proposed, in constructing electromagnetic relays, to form the frame and the core for the actuating coil as an integral unit stamped or "blanked out" from magnetic sheet metal. Insofar as I am aware, however, prior art workers have never been able to take full advantage of this procedure in producing a relay which will be dependable and satisfactory in operation and yet will involve an absolute minimum of expense in manufacture.

An object of the present invention is to devise a simplified relay construction employing a one-piece frame and core unit blanked out from magnetic sheet metal, with the remaining parts of the relay associated with such frame and core unit in a highly simplified fashion.

Another object is to provide, in combination in such a relay, a novel means for mounting the armature on the combination frame and core unit.

A further object is to provide a novel spring mounting arrangement for the armature of such relays, wherein a single spring member constitutes the armature mounting means and the movable contact means of the relay.

In order that the manner in which these and other objects are accomplished in accordance with the invention can be readily understood, reference is had to the accompanying drawings, which form a part of this specification, and wherein:

Fig. 1 is a side elevational view of a relay constructed in accordance with one embodiment of the invention, illustrating the same in de-energized condition;

Fig. 2 is an end elevational view of the relay of Fig. 1;

Fig. 3 is a view similar to Fig. 1, but illustrating the relay in energized condition;

Fig. 4 is a plan view of the relay of Fig. 1 with a portion of the armature and spring member broken away;

Fig. 5 is a horizontal section of the relay taken substantially on line 5—5, Fig. 1, and

Fig. 6 is a side elevational view of the combination frame and core member of the relay of Figs. 1–5.

Referring now to the drawings in detail, it will be seen that the embodiment of the invention here illustrated comprises a combination frame and core member indicated generally at 1, an armature 2, a spring member indicated generally at 3 and effective both to mount the armature and provide the movable contact means of the relay, an actuating coil 4, an insulating member 5 and fixed contact pins 6 and 7.

As seen in Fig. 6, the member 1 is of generally E-shaped configuration, including a base portion 8, a core portion 9 and two frame arms 10 and 11, the core portion 9 and arms 10 and 11 extending from base portion 8 at right angles thereto, with arms 10 and 11 being parallel to core portion 9 and spaced therefrom one on each side of the core portion. Since the member 1 is blanked out from sheet metal, it will be understood that portions 8–11 are all flat and all lie in the same plane.

At its side opposite core portion 9, frame arm 10 is provided with a lateral projection 12. At its tip, arm 10 includes two projections 13 and 14 extending away from base 8.

Armature 2 is a flat piece of magnetic sheet metal disposed across the ends of portions 9–11 of member 1 and lying in a plane at right angles to the plane defined by member 1. At one end, armature 2 is provided with an end notch 15, Fig. 5, and an aperture 16 spaced therefrom, the notch 15 and aperture 16 being of such size and so disposed as to engage over the projections 13 and 14, respectively, of frame arm 10.

The spring member 3 is a flat, thin, metal leaf spring comprising an end portion 17 extending along the outside edge of arm 10 and fixed thereto, in any suitable fashion, as by soldering. Portion 17 of spring 3 is provided with a rectangular opening embracing lateral projection 12 on arm 10 and thus serving to position portion 17 with respect to arm 10. The other end portion 18 of spring 3 extends along the top or outer surface of armature 2 and is secured to the armature, as by being staked thereto as indicated at 19, Fig. 4. The tip of portion 18 of spring 3 is bifurcated and projects beyond the corresponding end of armature 2, to provide spring contact arms 20, 21. At its tip, arm 20 is provided with a downwardly directed contact portion 20^a, adapted to engage contact pin 6. Similarly, the tip of arm 21 is provided with an upwardly directed contact portion 21^a, adapted to engage contact pin 7.

Portions 17 and 18 of spring 3 are joined by an intermediate portion 22 which constitutes resilient means tending to maintain the armature 2 spaced from the end of core portion 9, as in Fig. 1, but allowing the armature to be shifted bodily toward core portion 9 and into contact with the tip thereof, as in Fig. 3, in response to energization of coil 4. As seen in Fig. 1, intermediate portion 22 of spring 3 extends from portion 17 outwardly from arm 10, thence parallel to arm 10 to a right angle bend, thence parallel to and spaced above armature 2, and thence to the armature. Thus, the intermediate portion 22 of spring 3 can be said to surround the end portion of armature 2 associated with projections 13, 14, yet is spaced therefrom.

Insulating member 5 is in the form of a rectangular plate having openings through which extend two spaced, lateral projections 23, 24 on the outside of the frame arm 11. The member 5 is secured in place by staking the projections 23, 24 at the outer surface of member 5. Contact pins 6, 7 extend through suitable holes in member 5 and are staked or otherwise secured in place, so that portions of the pins 6 and 7 project at one side of member 5 for engagement by contact portions 20^a, 21^a. The pins 6, 7 also project from the other side of member 5 to allow electrical conductors to be connected to the contact pins. It will be understood that the third lead for the relay is soldered to the end portion 17 of spring 3 or to the frame 1 at any convenient point such as the end of projection 24.

The actuating coil 4 is constructed in the usual fashion as a cylindrical bobbin-wound coil and surrounds core portion 9, with one end of the coil being seated against base 8 of member 1. The coil is held in place on core portion 9 by staking the tip of portion 9, as shown in Fig. 5. The leads for coil 4 are connected to terminal pins 25 extending through and secured to member 5.

Armature 2 is held centered with respect to member 1 and contact pins 6, 7 by the engagement of notch 15 and aperture 16 with projections 13 and 14, respectively. The notch and aperture are of such size as to allow some clearance with respect to the projections, and the spring 3 serves to further retain the armature in place. The spring 3 has a normal shape such that the armature 2

is spaced from the tip of core 9, as seen in Fig. 1. Upon energization of coil 4, intermediate portion 22 of the spring member 3 is distorted, allowing armature 2 to shift bodily, under the magnetic force of attraction established by core 4 and member 1, thus carrying contact portion 20^a into contact with fixed contact pin 6. The movement of armature 2, after contact portion 20^a has engaged contact pin 6, is stopped by the engagement of the armature with the tip of frame 11 and that portion of the tip of frame 10 disposed between projections 13, 14.

What is claimed is:

1. An electromagnetic relay comprising an integral, flat frame and core member of magnetic sheet metal and having a base, a core portion extending from said base and a pair of frame arms extending from said base each on a different side and spaced from said core portion; an actuating coil surrounding said core portion and disposed between said frame arms; a flat armature of magnetic sheet metal extending across the ends of said core portion and said frame arms and disposed in a plane substantially at right angles to the plane of said core and frame member; a spring member of angular configuration having one end portion extending along and secured to one of said frame arms and the other end portion extending along and secured to said armature, an intermediate portion of said spring member being spaced from and extending along said one frame arm and said armature and constituting a resilient support for said armature, whereby said armature can shift bodily toward said core substantially without pivoting when said coil is energized and is urged resiliently away from said core when said coil is de-energized; an insulating member secured to the other of said frame arms; fixed contact means mounted on said insulating member, and movable contact means carried by said armature and disposed to cooperate with said fixed contact means.

2. A relay in accordance with claim 1 and wherein said armature is provided with at least one opening, said one frame arm includes a tip portion of such size as to be accommodated by said opening, and said spring member maintains said armature with said opening engaged over said tip portion, said tip portion being substantially longer than the thickness of said armature and joining said one frame arm at a transverse shoulder, said shoulder constituting stop means against which said armature engages upon energization of said actuating coil.

3. A relay in accordance with claim 1 and wherein

said other portion of said spring member extends for a major portion of the length of said armature and projects therebeyond, the projecting part of said other portion of said spring member being bifurcated to provide legs lying substantially in the plane of said armature, said fixed contact means including two contact elements spaced apart both in the direction of the plane of said frame and core member and in a direction transverse thereto, said two contact elements being disposed for engagement each with a different leg of the bifurcated portion of said spring member.

4. In an electromagnetic relay, the combination of a core of magnetic material; a frame member extending beside said core; a flat armature of magnetic material extending across the adjacent ends of said core and frame member; a flat spring member having a portion secured to said frame member, a second portion extending for a major portion of the length of said armature and secured thereto, and an intermediate portion constituting a resilient support for said armature, said intermediate portion including arms disposed substantially at right angles to each other and extending substantially parallel to but spaced from said frame member and said armature, respectively, said second portion of said spring member having a bifurcated end projecting beyond said armature, the legs of said bifurcated end constituting spring contact elements; an insulating member fixedly mounted at the side of said core opposite said frame member; a pair of fixed contact elements secured to said insulating member and spaced apart both in a direction parallel to the longitudinal axis of said core and a direction transversely thereto, said spring member supporting said armature in a position between said fixed contact elements with each leg of the bifurcated end of said spring member aligned with a different one of said contact elements; and an actuating coil surrounding said core, energization of said coil affecting bodily shifting of said armature toward said core against the resilient biasing action of the intermediate portion of said spring member.

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