June 6, 1950 W. PFAFF ET AL 2,510,604

INTERLOCKING RELAY STRUCTURE

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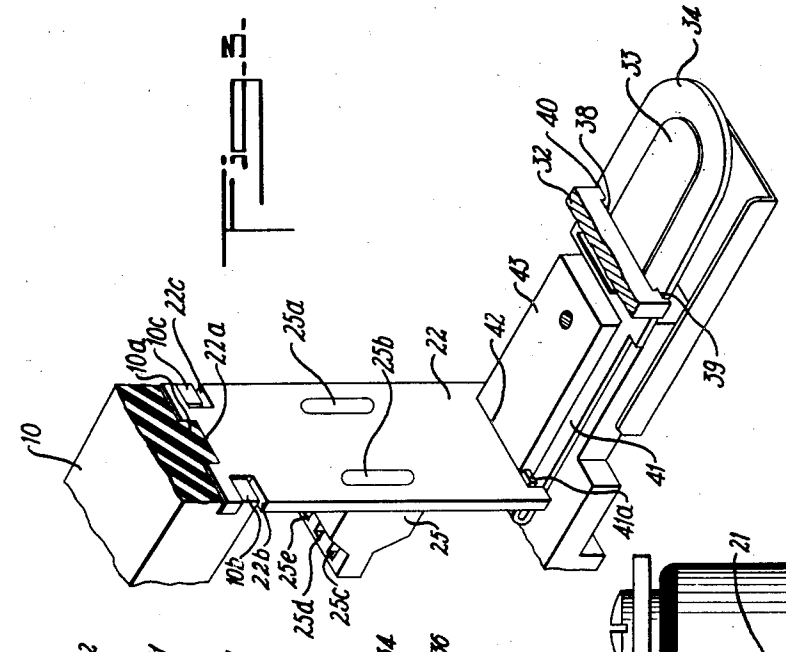


Fig. 3.

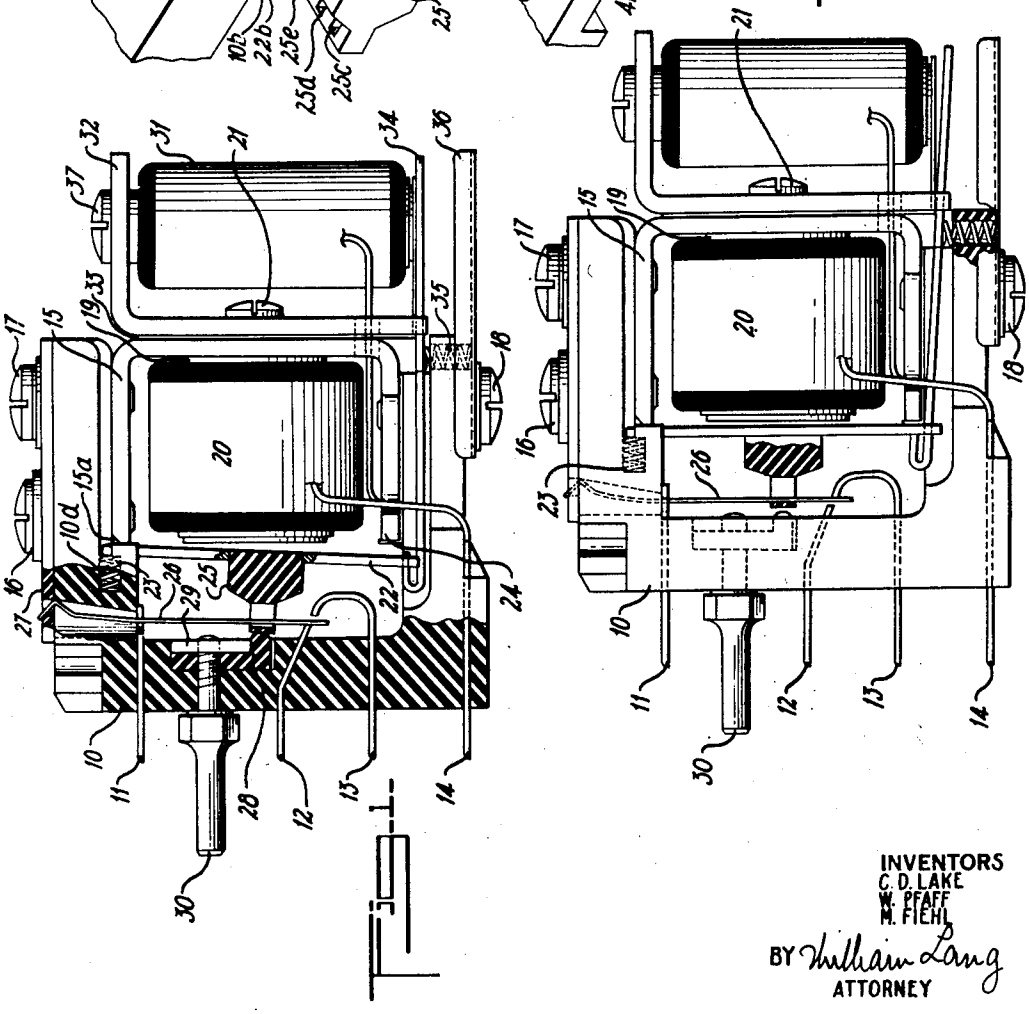


Fig. 2.

Fig. 1.

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INTERLOCKING RELAY STRUCTURE

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1 Claim. (Cl. 175—337)

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This invention relates to electromagnetic relays and more particularly to latching relays.

An object of the present invention is to provide a novel latch mechanism whereby the relay armature and the contacts actuated thereby may be latched in the position assumed when the armature is attracted by the magnet coil.

A further object is to provide a simple means for inactivating the latch so as either to effect the release of the latch or to permit normal operation of the relay.

A further object of the invention is to provide a relay structure that is readily fabricated by economical mass production methods.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawing, which discloses, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawing:

Fig. 1 is a partially sectioned view of the relay in the normal or unactuated condition.

Fig. 2 shows the relay in the actuated or latched position.

Fig. 3 is a cutaway perspective view showing the relationship of the parts.

The relay shown in the drawing is an improvement of the relay shown and described in the patent to Lake and Pfaff No. 2,282,066, granted May 5, 1942. The relay described herein has all of the advantages of the relay described in the aforementioned patent in addition to the advantages due to the latching means which constitutes the improvement over the prior art.

The many attempts of the prior art to positively eliminate any "bouncing" or chattering existing when the armature is attracted to the core of the magnet have been unsuccessful due, partially, to the inherent resiliency of the means employed to prevent such bouncing. The latching means forming the basis of this invention is a positive means which prevents the "bouncing" effect from taking place. This latching means constitutes a positive lock on the armature when it comes into contact with the core associated therewith with the lock being released when a second magnet is energized.

Referring to Fig. 1, 10 represents a U-shaped frame of insulating material having the contact

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members 11, 12, 13 and 14 moulded integrally therein. Within the frame 10 is mounted the yoke 15 by means of screws 16, 17 and 18. A flat magnet core 19 upon which is wound a coil 20 is symmetrically mounted within yoke 15 and secured thereto by means of a screw 21. A flat armature 22 is pivoted against the upper face of yoke 15, and confined by the configuration of the moulding 10, and by the yoke 15. It will be noted that the armature 22 is provided with a cut out portion 22*a* which straddles the rib 10*a* of frame 10, and that the further cut out portions 22*b* and 22*c* of armature 22 surround the moulded lugs 10*b* and 10*c* of frame 10. Thus when the frame 10 and the yoke 15 are assembled with the upper end of yoke 15 abutting the lugs 10*b* and 10*c* of frame 10 the armature 22 is confined. Two compression springs 23, only one of which is shown, contained in sockets 10*d* on both sides of rib 10*a* press the armature 22 against the face of the yoke 15, thus causing it to rock about the bevelled edge 15*a* of the yoke as a pivot when the relay is operated.

The flat armature construction has reduced wear to the point that it is negligible. The compression springs 23 bear against the armature and force it against the pivot point of the yoke 15 which diminishes the movement at the pivot point and as a result practically eliminates the oxidized deposit which has been called "red rust." The compression springs 23 by forcing the armature against the pivot point of the yoke 15 provides a perfect magnetic seal. The springs 23 also serve to provide an armature spring return which is independent of the use of the contact wires, thereby aiding the damper stop, which shall be discussed subsequently, in stabilizing the armature to prevent rebound against the contact wires when the magnet is deenergized.

The flat armature construction and the negligible wear previously mentioned, in conjunction with the action of the compression springs on the armature, insures maintaining a uniform air gap which is extremely important in high speed relay design. The ability to maintain a uniform air gap makes it possible to provide clearance between the armature and magnet core with the armature attracted against the residual element 24 and yoke at the end opposite the pivot. This clearance improves the drop out by permitting the arma-

ture to bow toward the core due to the magnetic force exerted by the energized coil. When the coil is deenergized, the bowed armature acts as a spring in itself to provide for faster return of the armature and return of the contact wires to the normal position.

The relay frame moulding provides two stops at the pivot end of the yoke which permits quick assembly by placing the yoke against the stops and against a gage which contacts the armature at the end opposite from the pivot. The U-shaped construction of the frame moulding permits fastening to both sides of the yoke to prevent loss of adjustment which may result from warpage of the moulded frame. During the assembly of the frame 10 and the yoke 15 the thin residual element 24 is inserted between the lower legs of the frame and the yoke, with the bent over portion of the residual element covering the face of the yoke 15.

A stirrup 25 of insulating material is moulded to armature 22 with tenons 25*a* and 25*b* projecting through holes in the armature to secure it. The stirrup 25 is provided with holes 25*c*, 25*d* and 25*e* through which pass the contact wires 26, only one of which is shown, consisting of paired wires having a V bend therein. These wires are retained by an apertured plate 27 slidably mounted beneath screws 16 and 17 so as to provide an adjustable tension for the contact wires.

As is shown in Fig. 1, in the normal position of the armature 22, the stirrup 25 rests against the resilient bumper 28. This bumper is confined in a pocket in the frame 10 by the nut 29 secured by the threaded shouldered pin 30.

The provision of a damper stop for the armature which consists of a material having a very low bounce factor has eliminated contact bounce caused by the rebound of the armature. In this position of the armature the stirrup 25 is not bearing on the contact wires 26 which in this position are elastically supported by the apertured plate 27 and the contact members 11 bearing on the same side of the contact wires 25 and by the contact members 12 bearing on the opposite side. By sliding the plate 27 beneath the screws 16 and 17 the pressure between the contact wires 35 and the stationary contact members may be varied.

The addition to the basic relay structure just described to effect the latching and unlatching of the armature 22, consists of the latch magnet coil 31, the latch yoke 32, the residual element 33, the integral latch and armature combination 34, the spring 35 and the guard 36. The latch yoke 32 is secured to the coil 20 by means of the screw 21 with the residual element 33 compressed between the two yokes. The latch magnet is secured to the latch yoke 32 by means of screw 37. The residual element 33 has a perpendicular bend therein so that it can pass over the bottom of the notch 38 in the end of the latch yoke 32, such as shown in Fig. 3, and over the face of the core. The latch armature member 34 has notches which mesh loosely with the tongue on the end of the latch yoke 32 formed by the notch therein so that when the yoke and latch are assembled in the relay together with the spring 35 in the position shown in Fig. 1 and Fig. 2 the latch is resiliently confined and upon energization of the latch coil 31 is caused to rock about the face of the yoke 32 acting as a pivot. The latch member is provided with a thin elongated portion 41 having the end thereof folded back upon itself. This elongated portion 41 extends through and beyond the notch 42 formed in the free end of armature 22. This notch provides tongues which straddle the portion 43 of the moulding 18 and the elongated portion of the latch. When the armature 22 is in the normal position, such as shown in Fig. 1, the folded back end of the latch 33 bears on the bottom of the notch 42 in the armature 22 because of the bias action of spring 35. When the armature 22 is attracted by the energization of core 19 it moves to the right so that the folded over end of latch 33 can move upward to allow the face 41*a* of the latch to abut the face of armature 22, such as shown in Figs. 2 and 3, and thus latch it. Subsequent energization of the latch coil 31 rocks the latch away from armature 22 to restore the armature to its original open position. If the core 20 and the latch coil 31 are energized simultaneously the relay will not latch and will function as a non-latching relay.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claim.

What is claimed is:

An electromagnetic relay comprising first electromagnet having a coil, a core, a flat armature member and a yoke, the yoke of said first electromagnet having a pair of legs and a base member thereby forming a U-shaped yoke, the core of said first electromagnet secured to the base of said yoke and positioned parallel to said pair of legs, said coil wound about said core, the free end of one of said pair of legs having a beveled face, insulating contact controlling means secured to said armature, a U-shaped insulating supporting structure having a shouldered portion in the face of the free end of one of the arms thereof, said shouldered portion having a pair of sockets containing a like number of compression springs, the open side of said U-shaped insulating structure and said U-shaped yoke facing each other whereby said beveled face is in close proximity to said shouldered portion, said armature positioned perpendicular to said core with one end thereof movably confined between said beveled face and said shouldered portion, said armature being biased against said beveled face by said springs to provide a perfect magnetic seal therebetween, a damper stop having a low bounce factor secured to said supporting structure, said stop adapted to cooperate with said insulating means whereby the contact bounce caused by the rebound of said armature is eliminated, a second electromagnet comprising an inverted L-shaped yoke, a core and a coil associated therewith, and a flat armature member, the long side of said L-shaped yoke spaced from the base of said U-shaped yoke by a non-magnetic residual element and secured thereto, the core of said second electromagnet secured to said L-shaped yoke and positioned perpendicular to the core of said first electromagnet, the armature of said second electromagnet disposed perpendicular to the core associated therewith and to the armature of said first electromagnet, said armature of said second electromagnet being spring biased intermediate the ends thereof and pivoted about a face of said L-shaped yoke, latching means integral with said armature of said sec-

ond electromagnet and comprising a folded back portion, the free end of said armature of said first electromagnet riding on the top of said folded back portion, said latching means positively locking the armature of the first electromagnet when said first electromagnet is energized, means releasing the locking effect upon said armature of said first electromagnet by energizing said second electromagnet.

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