

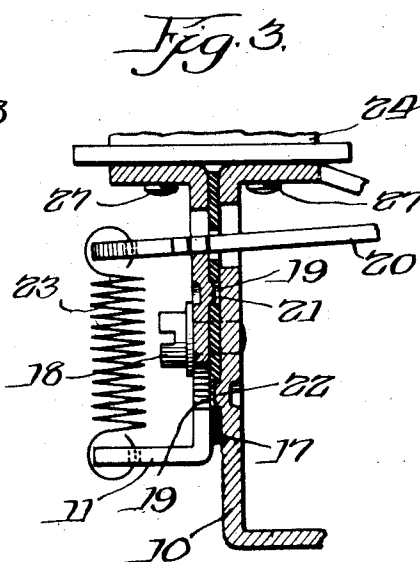
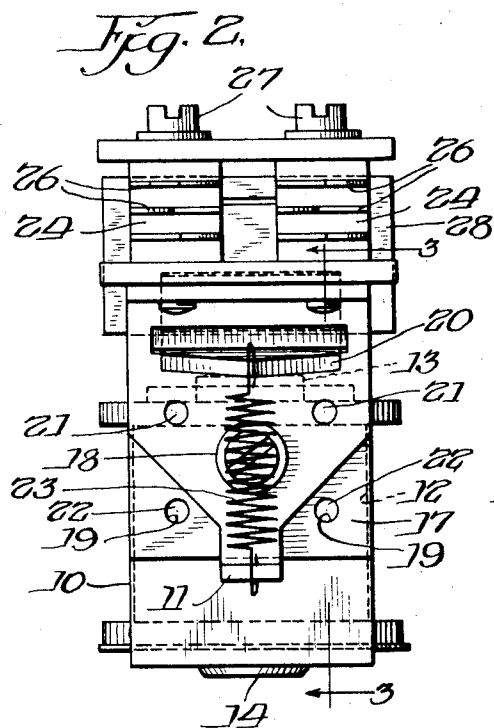
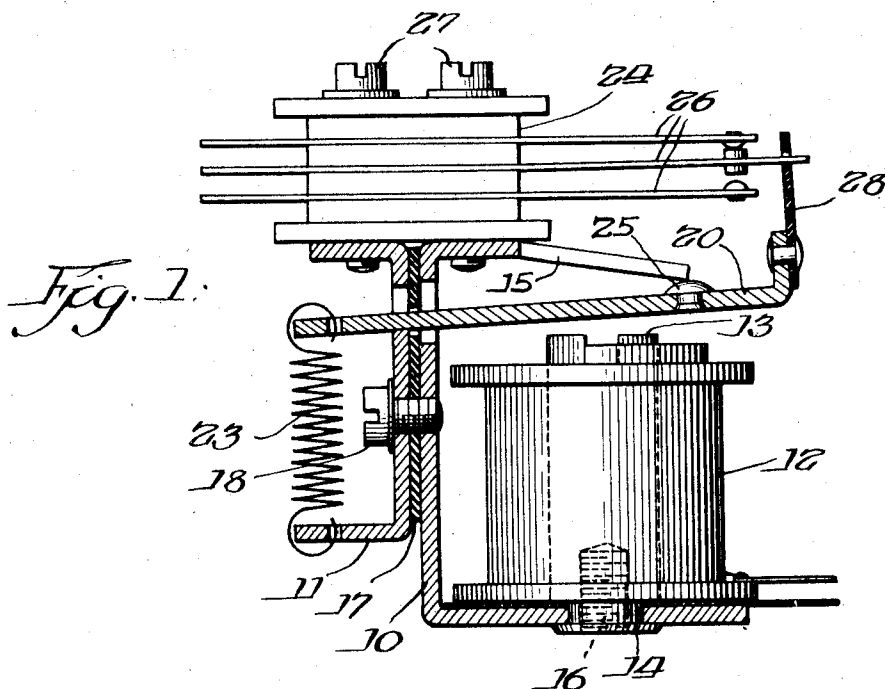
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RELAY

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RELAY

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Our invention relates to relays. It relates more in particular to a blade type relay construction wherein novel means is employed to control the reluctance of the magnetic path.

Various means have been used in the past to control the reluctance of the magnetic path in blade type relays. In general, the means employed has involved the introduction of a non-magnetic material somewhere in the magnetic path, the exact dimensions of the break being determined experimentally and, as a general rule, remaining fixed. A common means employed is to introduce a brass washer between the core of the electromagnet and the metal frame on which it is mounted, and to fasten the core to the frame by non-magnetic fastening means, such as a brass screw. This structure, however, must be disassembled in mounting unless a separate mounting base is employed. The disadvantages of this structure are, in part, obviated by a structure wherein the core is staked onto the frame and tapped to accept a mounting screw, the magnetic circuit being broken at some other place to control reluctance. This makes possible the use of a so-called single screw mount, a desirable feature in this type of relay, and avoids the necessity of having to disassemble the relay for mounting purposes. Various expedients have been suggested with respect to introducing the non-magnetic material at a point other than between the core and frame, but the expedients suggested have not been entirely satisfactory. One practice is to break the magnetic circuit at the hinge joint of the frame and armature by using an armature or frame composed of a composite subassembly of two prefabricated parts, one part being magnetic and the other non-magnetic. For example, the armature may comprise a magnetic blade to which has been riveted a non-magnetic extension, and this non-magnetic extension engages the frame to which the core is attached, thereby introducing a non-magnetic part at the hinge joint. Practices such as those just outlined have the disadvantage that the construction, as a rule, is expensive, and it is impossible to make a change to vary the reluctance without entirely changing the construction of the relay, involving, of course, the production of new dies, jigs, methods of assembly and the like. It is, of course, a common practice to produce relays in which there is no break in the magnetic circuit of any kind, but this can be accomplished only by employing a material for the various parts in the magnetic circuit which has very low residual magnetism characteristics. Such materials are expensive and, hence, it is the

common practice, as pointed out, to employ relatively inexpensive materials and to control the reluctance by means such as suggested.

The principal object of our invention is the provision of an improved relay construction.

A further object is the provision of improved means for controlling the reluctance of the magnetic path, and to permit modification in the design, so far as the reluctance of the magnetic path is concerned, quickly and inexpensively.

In accordance with the general features of our invention, we produce a single screw mount, blade type relay from relatively inexpensive, readily available materials with an easily controlled break in the magnetic circuit by entirely dissociating the armature hinge from the frame. We accomplish this by utilizing a separate hinging member and place a simple, uniform design of non-magnetic plate between the separate hinging member and the mounting frame. This does not involve the production of a prefabricated, composite sub-assembly, with the result that changes in characteristics and design are readily made, particularly with respect to control or modification of the reluctance of the magnetic path.

Several advantages are obtained by the use of our construction, and other objects, features and advantages of our invention will be described in the specification. The drawing illustrates a preferred embodiment of the invention, and

Fig. 1 is a side elevational view, partly in section, illustrating a blade type relay embodying the features of our invention;

Fig. 2 is a side elevational view looking at the left side of the relay shown in Fig. 1; and

Fig. 3 is a fragmentary sectional view taken on the line 3-3 of Fig. 2, looking in the direction of the arrows.

Looking now to the details of construction of the embodiment of the invention shown in the drawing, our relay comprises a mounting frame 10 and hinge frame 11, secured together in a manner to be described and supporting all of the parts of the relay. The construction also provides for a so-called single screw mount as will be pointed out.

The electromagnet includes a usual type of coil 12 and core 13, the core 13 having an extension 14 which extends through a circular aperture in the frame. Utilizing the material in the core, the magnet structure is staked or riveted to the frame by a suitable tooling operation. In the drawing, we show a riveted construction in order to illustrate clearly the manner in which the parts are held together, but the more conventional method

of attachment is by staking, as those skilled in the art understand, this involving, in effect, a riveting operation but confined to only two, three or more points around the periphery of the opening in the frame 10. A tapped hole 16 is provided in the lower end of the core 13 for receiving a screw utilized for the so-called single screw mount.

Disposed between the hinge frame 11 and the mounting frame 10 is a bridging plate 17 which has the function of controlling the reluctance of the magnetic circuit. The bridging plate may be, or more properly, will usually be of non-magnetic material such as fiber or brass, but where desired it may comprise magnetic material such as steel, as will be explained hereinafter. The hinge frame 11 is secured to the mounting frame by a single non-magnetic screw 18, and, to prevent rotation of the parts around the axis of the screw 18, we utilize "half punches" in the two frame members which project into holes punched in the plate 17. Looking at Fig. 3, the holes in the plate 17 are shown at 19, and projections 21 and 22 are shown in the members 11 and 10, respectively, these projections resulting from the half punches previously referred to. An armature 20 extends through generally aligned openings provided in the mounting frame 10, the plate 17 and the hinge plate 11, but the parts are so constructed and arranged that the armature engages only the plate 11, thus providing a hinge for the armature which is dissociated from the mounting frame 10 and core 13. A stop 15, which may be integral with the mounting frame 10, engages a non-magnetic rivet 25 carried by the armature. This rivet, preferably of brass, is positioned so that its underside will not engage the magnet core 13.

The remaining portions of the relay are substantially conventional. An armature return spring 23 is secured to the extending end of the armature 20 and to an upturned tail piece forming a part of the hinge plate 11. A so-called stack 24 carrying spring contact members 26 is secured to right angular, oppositely directed extensions of the hinge frame 11 and mounting frame 10, as clearly illustrated in Fig. 1. The only essential with respect to the mounting of the stack is that care be taken to prevent magnetically bridging the hinge frame and mounting frame. This can be accomplished by the use of non-magnetic mounting screws 27 if a magnetic stack header is used, or by the use of all non-magnetic bridging members. The armature carries a non-conducting contact engaging and actuating member 28.

The operation cycle of the relay of our invention is conventional. When the coil 12 is energized, the armature 20 is attracted to the core 13, causing the contacts in the stack to either make or break in an opposite sense to their positions as shown in Fig. 1. When the coil is de-energized, the armature is pulled by spring 23, and returned to the position shown in Fig. 1. Due to the introduction of the non-magnetic plate 17 in the manner shown, there is very little residual magnetism and the return speed is controlled substantially entirely by the mechanical construction including the strength of the spring and the like.

It will be understood that the showing of the stack, springs, contacts forming a part thereof, and control of the spring contacts by movement of the armature is entirely illustrative, and an entirely different type of contact control mechanism may be employed without departing from the features of our invention. So far as the control of reluctance of the magnetic path is con-

cerned, the feature to which our invention is directed, very definite advantages are obtained. One advantage is that the parts are entirely standard, and may be employed independently of the degree to which the magnetic path is required to be broken in a particular relay. The reluctance of the magnetic path may be controlled entirely by control of the material used for the plate 17 and the thickness thereof. We have found that ordinary fiber material available in sheet form is suitable for the purpose. If another material is to be employed, it is simply necessary to form stampings of this material, using, in most instances, the same dies, and maintaining all of the other parts of the relay exactly in the standardized form. Changes can, therefore, be made in the control of the reluctance of the magnetic path at any time in the production. Sub-assemblies, such as the armature, mounting plate, coil and core assembly, stack assembly and the like which may already have been produced in the usual manufacturing schedule can be employed, and merely assembled with the plate 17.

The number of materials which can be employed for the production of the plate 17 is extensive, including substantially all of the non-magnetic metals, various fibrous materials, plastics, laminated paper, or the like. Substitutions are readily made also for the reason that the material from which the plate 17 is produced need not be structurally strong as would be the case if the magnetic path were broken by means heretofore utilized for the purpose. It is, of course, obvious that the means for securing the hinge plate 11 to the mounting plate 10 may be modified to fit into a changed manufacturing method or to accommodate the construction to the utilization of different types of materials for the plate 17, should substitution require modification of structure. In any case, however, the plate 17 may still comprise a standard, flat stamping such as shown.

While our invention looks particularly to the construction of an improved relay wherein a break is introduced into the magnetic circuit including the magnet core, armature and mounting frame, it is not so limited.

When producing a heavily loaded relay, our invention has the advantage that the bridging plate 17 may be formed of steel or other suitable magnetic material and an advantage secured thereby. In a heavily loaded relay, the restoring force is invariably high. This high restoring force will result in retracting the armature even though there may be some residual magnetism present. The use of a bridging plate formed of magnetic material, under the circumstances discussed, results in the provision of a more completely closed circuit and is, therefore, more efficient on the heavily loaded relay. Thus, we may employ a non-magnetic plate 17 on relays where the restoring force is not great and secure a definite advantage in avoiding residual magnetism but with some slight loss of efficiency on actuation of the armature; while in the case of the heavily loaded relay, having a relatively high restoring force, we may use a magnetic bridging plate with the advantage of a useful power increase on energization. This may be accomplished while still using the same mechanical structure in each instance.

Those skilled in the art will understand that we may make other changes in the plate 17. We may, for example, provide laminations, some of which are magnetic and some non-magnetic and

in this, as well as other ways, secure various properties and characteristics of relays without substantial change in structure.

Structurally, it will be observed that we provide two generally L-shaped frame portions, the upstanding leg portions of which bear projections extending into apertures in a plate, opposite surfaces of which are engaged by the leg surfaces carrying said projections, so that the two frame portions are spaced by the said plate. The armature is fulcrumed on the hinge frame 11, and the upper ends of the upstanding leg portions may comprise a support for a stack of contacts.

We have described our invention in considerable detail in order that those skilled in the art may fully understand the same. The scope of the invention, however, is defined by the claims.

What we claim as new and desire to protect by Letters Patent of the United States is:

1. In a relay of the character described, a mounting frame of magnetic material comprising essentially a horizontal portion, and an upstanding vertical portion, an electromagnet secured to said horizontal portion, a hinge frame of magnetic material having a vertical portion disposed parallel to but spaced from said upstanding portion of the mounting frame, a non-magnetic plate disposed between said two frame sections, non-magnetic means supporting said hinge frame to the upstanding portion of the mounting frame with said non-magnetic plate between them, said hinge frame, non-magnetic plate and upstanding portion having generally aligned apertures, and an armature extending through said apertures but out of contact with

said mounting frame, whereby to provide an armature hinge.

2. In a relay of the character described, a pair of generally L-shaped frame members both formed of magnetic material, each having a leg bearing projections, an apertured plate spacing said frame members, said projections extending into said apertures, means securing said frame members together, an electromagnet carried by one of said frame members, and an armature fulcrumed on the other of said frame members.

3. In a relay of the character described, a mounting frame of magnetic material having a horizontal portion and upstanding vertical portion, an electromagnet carried by the horizontal portion, a hinge frame of magnetic material comprising a vertical portion in a plane parallel to the plane of said upstanding portion of the mounting frame, a reluctance controlling plate disposed between said hinge frame and said upstanding portion of the mounting frame, means securing the said frames together so as to clamp said plate between them, and an armature hinged to said hinge frame and out of contact with said mounting frame, said hinge frame, reluctance controlling plate and upstanding portion of the mounting plate having generally aligned apertures providing a slot through which the armature extends, the slot in said upstanding portion, however, being of larger cross section than the slots in the hinge frame and reluctance controlling plate whereby said armature is maintained out of contact with the mounting frame.

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