

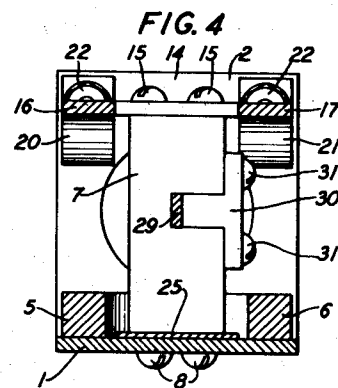
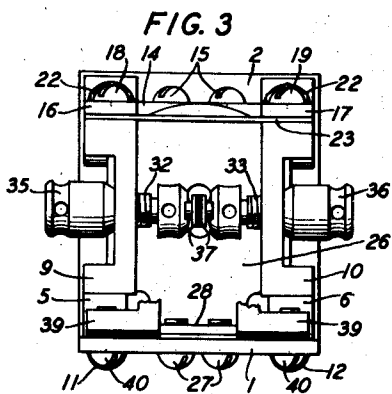
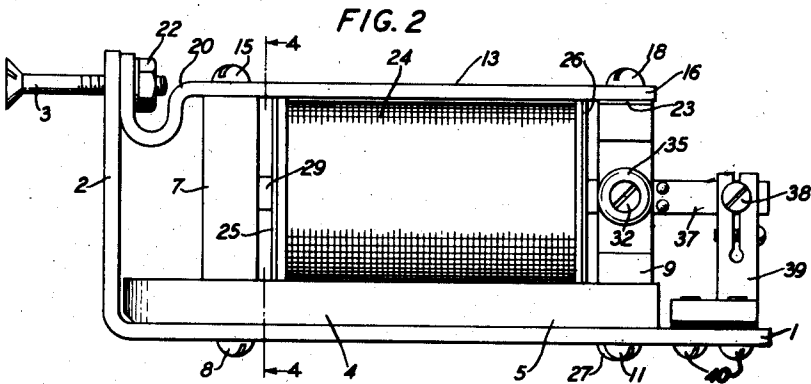
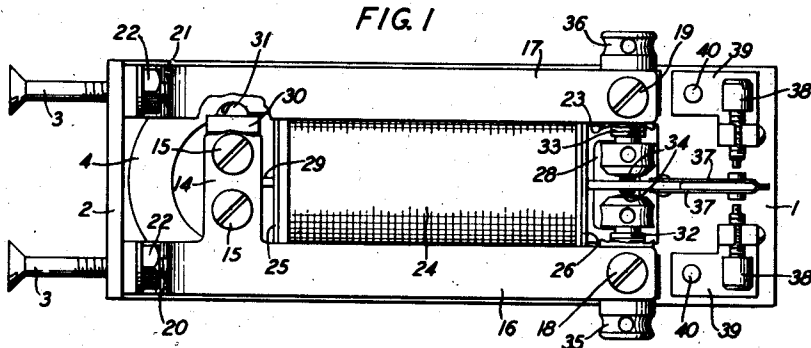
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E. J. PRATT

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POLARIZED RELAY

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2,153,641

POLARIZED RELAY

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6 Claims. (Cl. 175—339)

This invention relates to relays and more particularly to sensitive polarized relays for use in teletype switching systems.

The object of the invention is to provide a small polarized relay which will be of high magnetic efficiency and of high stability. This object is attained in accordance with the present invention by the provision of an H-shaped return pole-piece, the rear arms of which are bent to form feet which are held firmly against the relay mounting plate by nuts on the bolts by which the mounting plate is attached to a relay rack, the cross-bar of which is attached to a magnetic heel-piece supported on the mounting plate and the forward arms of which are secured to pole-screw blocks of magnetic material joining the ends of the forward arms of the return pole-piece to the poles of the permanent magnet. The forward arms of the return pole-piece are magnetically separated from the pole-screw blocks by thin shims of non-magnetic material to provide narrow fixed air-gaps in the magnetic circuit. This assembly of the mounting plate, permanent magnet, return pole-piece, heel-piece and pole-screw blocks affords a very rigid magnetic structure which is not susceptible to externally applied vibrations or vibrations incident to the operation of the relay, thus insuring stability of adjustment and operation. With this construction the pole-screw blocks may be of sufficient cross-sectional area to insure a high magnetic efficiency for the relay.

For a more complete understanding of the invention reference may be had to the following detailed description read in connection with the accompanying drawing in which:

Fig. 1 shows a top plan view of the relay;

Fig. 2 shows a side elevational view of the relay;

Fig. 3 shows a front elevational view of the relay with the contact screws omitted; and

Fig. 4 shows a vertical section as viewed along section line 4—4 of Fig. 2.

Referring to the drawing, an L-shaped base or mounting plate 1 is provided for mounting and supporting the relay structure, the short vertical arm or base 2 of which may be secured to the usual mounting rack by bolts 3 extending through holes near the upper edge of the arm 2 thereof. Supported on the upper face of the horizontal arm of plate 1 is a U-shaped permanent magnet 4 having its poles 5 and 6 extending toward the forward end of the plate. Positioned on the horizontal arm of the plate near its rear end and within the permanent magnet 4 is an upwardly

extending heel-piece 7 of magnetic material secured to the plate 1 by screws 8. Positioned on and extending upwardly from the poles 5 and 6 of the magnet 4 are two pole-screw blocks 9 and 10 of magnetic material which are held in position by screws 11 and 12 which extend through holes in the plate and in poles 5 and 6, and are secured into threaded holes in the lower ends of the blocks. The screws 11 and 12 thus serve also to clamp the permanent magnet to the plate 1.

The return pole-piece 13 of magnetic material is substantially H-shaped, its cross-bar member 14 being secured by screws 15 to the upper end of the heel-piece 7 and its forward or long arms 16 and 17 being secured by brass screws 18 and 19 to the upper ends of the pole-screw blocks 9 and 10, respectively. The rear or short arms 20 and 21 of the return pole-piece are bent downwardly and then upwardly, as most clearly shown in Fig. 2, with their upwardly extending ends forming feet which rest against the inner surface of the vertical arm 2 of the plate 1 and are provided with holes through which the relay mounting bolts 3 extend. Thus, when the relay structure is mounted on the relay rack and the nuts 22 on the bolts 3 are tightened, the rear arms of the return pole-piece, due to the slight resiliency of their bent portions, become firmly seated against the vertical arm 2 of the plate 1 and the entire relay structure is clamped firmly on the relay rack. The forward ends of the arms 16 and 17 of the return pole-piece 13 are magnetically separated from the upper ends of the pole-screw blocks 9 and 10 by an interposed shim 23 of non-magnetic material of suitable thickness to provide fixed air-gaps between the forward arms of the return pole-piece and the pole-screw blocks. By this construction a very rigid magnetic structure is provided.

Mounted on the plate 1 between the heel-piece 7 and the pole-screw blocks 9 and 10 is an operating coil 24 having a spool sleeve extending axially therethrough. The coil is supported at its rear end by an L-shaped bracket 25, one arm of which is secured in the usual manner to the end of the coil spool and the other arm of which is clamped by the screws 8 between the plate 1 and the bottom of the heel-piece 7. The coil is supported at its forward end by a similar L-shaped bracket 26, one arm of which is secured to the forward end of the coil spool and the other arm of which is secured to the plate 1 by screws 27 which extend through the plate and through the bracket into threaded holes in the clamping plate 28.

The armature 29 is clamped at its rear end in a notch in the heel-piece 7 by a T-shaped clamping member 30 secured to the side of the heel-piece by screws 31, as most clearly shown in Fig. 4, and extends freely through the axial sleeve of the coil spool for vibration in a plane parallel to the plate 1. The free end of the armature is movable between the inner ends of pole screws 32 and 33 which are provided with fine threads and are threaded through the pole-screw blocks 9 and 10, respectively. In order to preclude the possibility of the armature coming into direct contact with the pole screws, stop pins 34, 34 of brass or other non-magnetic material are secured to the armature as shown. The working air-gaps of the magnetic circuit of the relay may be adjusted by turning the pole screws 32 and 33, the adjustment being maintained by lock nuts 35 and 36 threaded upon the outer ends thereof. The cross-sectional areas of the pole-screw blocks 9 and 10 are such as to afford low reluctance paths therethrough, thus increasing the magnetic efficiency of the relay.

The extreme forward end of the armature is provided with contact carrying springs 37 riveted thereto which cooperate with adjustable contact screws 38 threaded through the upper bifurcated ends of terminal posts 39 which are insulatedly secured to the forward end of the plate 1 by screws 40.

The permanent magnet 4 has sufficient magnetic strength so that the pull exerted thereby upon the armature 29 is practically sufficient to counteract the stiffness of the armature which is, therefore, substantially in equilibrium. The polarizing flux through the magnetic circuit extends from one pole 5 of the permanent magnet to the pole-screw block 9 where it divides into two paths, one across the fixed air-gap through the non-magnetic shim 23, through the forward arm 16, cross-bar 14 and forward arm 17 of the return pole-piece 13, across the other fixed air-gap through the non-magnetic shim 23 and through the pole-screw block 10 to the other pole 6 of the permanent magnet and over a second path from the pole-screw block 9 into the pole screw 32, across the working air-gaps and the free end of the armature to pole screw 33 and thence through the pole-screw block 10 to the other pole 6 of the permanent magnet. It will be apparent that both the amount and the direction of the polarizing flux through the armature depends upon the position of the free end of the armature in the working air-gaps. When the armature is exactly midway between the pole screws, there is no polarizing flux through the armature in the direction of its length since it connects two points of equal magnetic potential, but as it moves toward one pole-piece the polarizing flux flows through the armature in a positive direction, whereas when it moves toward the opposite pole screw, the polarizing flux reverses and flows through the armature in a negative direction.

The paths of the operating flux generated by current traversing the coil 24 pass out the forward end of the armature 29, across the two working air-gaps in parallel into the pole screws 32 and 33, pole-screw blocks 9 and 10, across the fixed air-gaps through the shim 23, thence through the forward arms 16 and 17 and cross-member 14 of the return pole-piece 13 and through the heel-piece 7 to the rear end of the armature.

Due to the rigid assembly of the magnetic circuit elements of the relay with respect to each

other and to the mounting plate, a relay of high stability and magnetic efficiency is obtained. While a particular type of sensitive relay having the improved magnetic circuit of this invention has been herein disclosed and described, it is to be understood that the invention in its broader aspects is not limited to any one type or form of relay, but is applicable wherever one or more of the advantages stated can be obtained.

What is claimed is:

1. An electromagnetic device comprising a mounting plate having a right-angled base portion, a permanent magnet mounted on said plate, a return pole-piece extending parallel to said magnet and to said plate and having offset feet for attachment to the base portion of said plate, a heel-piece secured between the rear end of said return pole-piece and said plate, blocks of magnetic material secured between the poles of said magnet and the forward end of said return pole-piece, pole screws adjustably mounted in said blocks, and an armature secured at one end to said heel-piece with its free end positioned between the inner ends of said pole screws.

2. An electromagnetic device comprising a mounting plate having a right-angled base portion, a permanent magnet mounted on said plate, an H-shaped return pole-piece extending parallel to said magnet and to said plate, the rear arms of which are bent at right angles for attachment to the base portion of said plate, a heel-piece secured between the cross-bar portion of said return pole-piece and said plate, blocks of magnetic material secured between the poles of said magnet and the ends of the forwardly extending arms of said return pole-piece, pole screws adjustably mounted in said blocks, and an armature secured at one end to said heel-piece with its free end positioned between the inner ends of said pole screws.

3. An electromagnetic device comprising a mounting plate having a right-angled base portion, a permanent magnet mounted on said plate, an H-shaped return pole-piece extending parallel to said magnet and to said plate, the rear arms of which are bent at right angles in the form of semi-circular loops for attachment to the base portion of said plate, a heel-piece secured between the cross-bar portion of said return pole-piece and said plate, blocks of magnetic material secured between the poles of said magnet and the ends of the forwardly extending arms of said return pole-piece, pole screws adjustably mounted in said blocks, and an armature secured at one end to said heel-piece with its free end positioned between the inner ends of said pole screws.

4. An electromagnetic device comprising a mounting plate having a right-angled base portion, a permanent magnet mounted on said plate, an H-shaped return pole-piece extending parallel to said magnet and to said plate, the rear arms of which are bent at right angles for attachment to the base portion of said plate, a heel-piece secured between the cross-bar portion of said return pole-piece and said plate, blocks of magnetic material secured between the poles of said magnet and the ends of the forwardly extending arms of said return pole-piece, a shim of non-magnetic material interposed between said blocks and the forward arms of said return pole-piece to provide fixed air-gaps, pole screws adjustably mounted in said blocks, and an armature secured at one end to said heel-piece with its free end positioned between the inner ends of said pole screws.

5. An electromagnetic device comprising a mounting plate, a permanent magnet mounted

thereon, a return pole-piece extending parallel to said magnet and to said plate, a heel-piece having a notch in one side thereof secured between the rear end of said return pole-piece and said plate, blocks of magnetic material secured between the poles of said magnet and the forward end of said return pole-piece, pole screws adjustably mounted in said blocks, an armature, the rear end of which is positioned in the notch of said heel-piece and the free end of which is positioned between the inner ends of said pole screws, a T-shaped member, the stem portion of which is positioned in said notch in engagement with the rear end of said armature, and screws extending through the head of said member into said heel-piece for clamping said armature firmly to said heel-piece.

6. An electromagnetic device comprising a mounting plate having a right-angled base portion, a permanent magnet mounted on said plate, an H-shaped return pole-piece extending parallel to said magnet and to said plate, the rear arms of

which are bent at right angles for attachment to the base portion of said plate, a heel-piece having a notch in one side thereof secured between the cross-bar portion of said return pole-piece and said plate, blocks of magnetic material secured between the poles of said magnet and the ends of the forwardly extending arms of said return pole-piece, pole screws adjustably mounted in said blocks, an armature, the rear ends of which is positioned in the notch of said heel-piece and the free end of which is positioned between the inner ends of said pole screws, a T-shaped member, the stem portion of which is positioned in said notch in engagement with the rear end of said armature, and screws extending through the head of said member into said heel-piece for clamping said armature firmly to said heel-piece.

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