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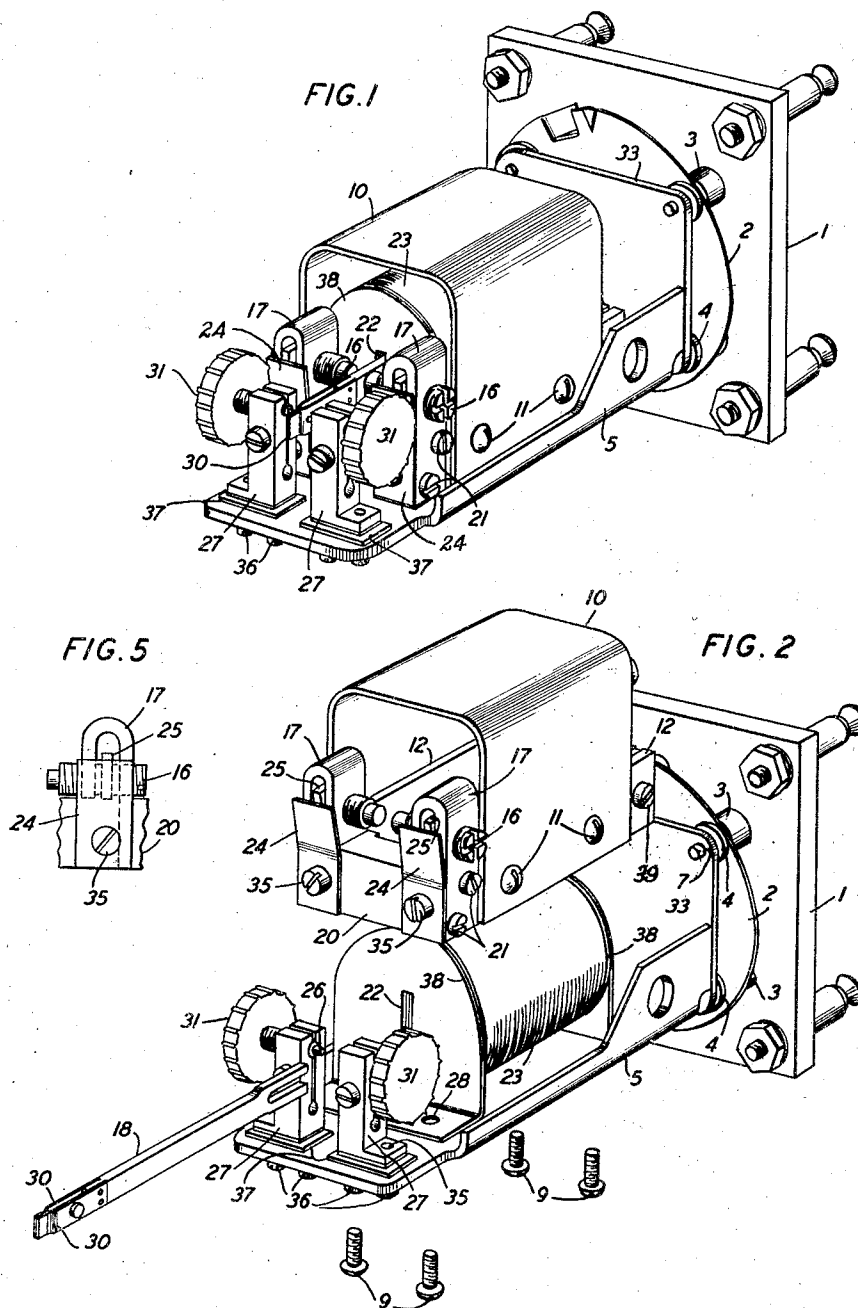
E. J. PRATT

2,140,139

ELECTROMAGNETIC DEVICE

Filed Sept. 11, 1936

2 Sheets-Sheet 1



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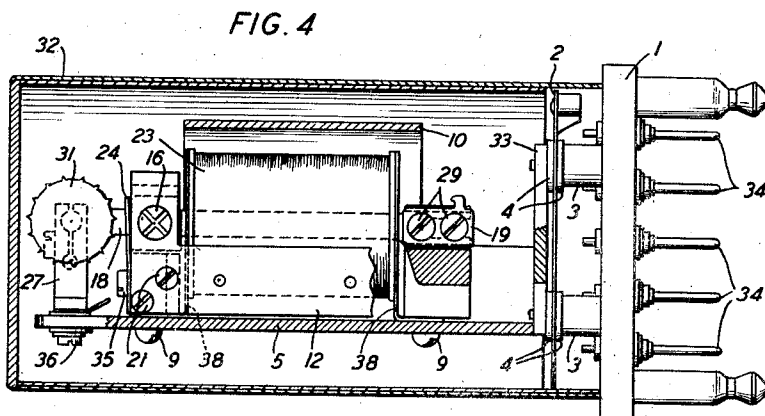
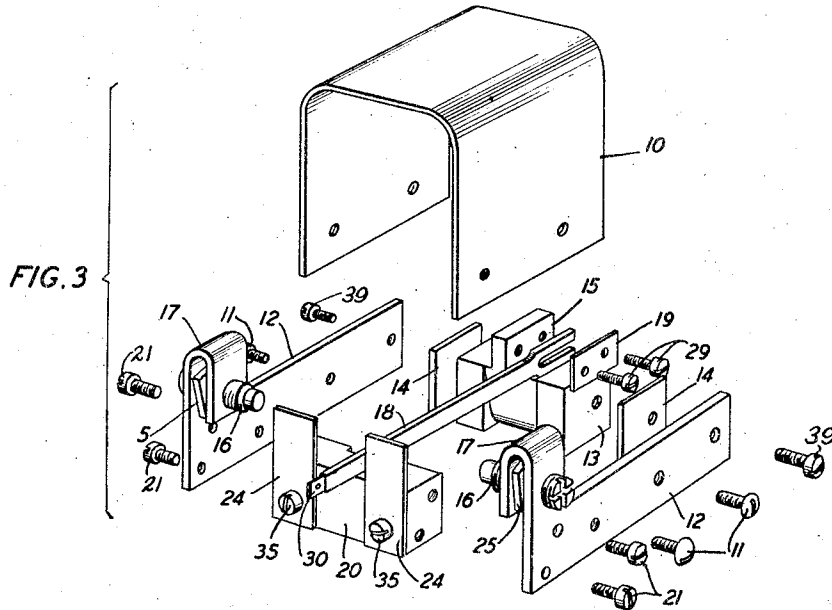
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## UNITED STATES PATENT OFFICE

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## ELECTROMAGNETIC DEVICE

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Application September 11, 1936, Serial No. 100,300

6 Claims. (Cl. 175—339)

This invention relates to switch telegraph apparatus and, particularly, to electromagnetic selective devices especially adapted therefor.

The present invention has for its salient object the provision of a materially simplified electro-responsive selecting device which is highly sensitive, is rugged in construction, and is capable of operating efficiently at high speeds.

One of the features of my invention is the use of a permanent magnet and associated pole-pieces which can be removed as a unit from the rest of the relay structure, thus facilitating the manufacture and assembly of the separate parts, reducing its cost of production and making it easier to maintain in service.

Another feature of my invention is a novel construction of the pole-pieces which are so formed as to include a spring pressing upon a locking nut that idles upon the pole screw so as to prevent said pole screw from losing its adjustment.

The above and other objects of the invention are attained in an electromagnetic device provided with a unitary magnet and pole-piece structure which is held to and can be removed from the remainder of the relay assembly by the manipulation of four screws located at the base of the relay frame. The permanent magnet is made of thin sheet stock to which are secured L-shaped pole-pieces. Within the space bound by the inner surface of the magnet is an energizing coil which encircles an armature of relatively small cross-section secured beyond the coil to a magnetic iron block supported on the rear of the magnet. The free end of the armature cooperates with the face of either leg of the pole-pieces to form a path for the magnetic flux between the armature and the pole-pieces when the armature is moved in response to the current flowing in the energizing coil. The return pole-pieces are formed with a U-bend through which a hole is tapped for the pole screw. The width of the U-bend is sufficient to permit a nut to be assembled on the pole screw without binding on the pole-piece. That is, the nut thus assembled does not interfere with the free turning of the pole screw. This nut projects beyond the edge of the pole-piece so that a steel spring which presses against the nut with considerable force will hold the nut in position, and the steel springs are made sufficiently strong to provide the pressure required for the necessary friction to hold the pole screw in adjustment.

A more thorough understanding of the invention will be had from the following description,

taken in conjunction with the accompanying drawings wherein,

Fig. 1 is a perspective view of a preferred form of construction embodying the invention;

Fig. 2 is an "exploded" view of Fig. 1 particularly showing the movable magnet assembly;

Fig. 3 is an "exploded" perspective view of the parts comprising the magnetic unit;

Fig. 4 is a partially sectional side elevation of the relay structure showing the cover in place; while

Fig. 5 is a detailed front view of one of the pole-pieces, showing its mode of construction and the means used to maintain the pole screw of the relay in a given adjustment.

Referring now to the drawings in which the numeral designations refer to the identical elements shown in each of the figures, there is shown a relay frame having a base 5 of brass or other non-magnetic material to the front end of which are secured the bracket members 27 by screws 36. The bracket members are insulated from the base 5 by insulating plates 37. Each bracket member carries in its upper end a terminal screw 26 provided on its inner end with a contact point and on its outer end with a finger wheel 31 of insulating material. By means of the finger wheels the terminal screws may be adjusted to regulate the separation between the contact points and the contact springs 30 carried by the free end of the armature 18.

The rear end of the base 5 is bent upwardly at right angles to form a back plate 33 which is provided with threaded holes 7 by means of which the relay may be attached to any suitable support such as the support 1. The support 1 is of insulating material and is provided with terminal plugs 34 by which electrical connections may be made to the coil terminals and contacts of the relay and also with holes registering with holes 7 of back plate 33. Interposed between the back plate 33 and support 1 is the end plate 2 of a cover 32 also provided with holes which register with the holes 7 in the back plate 33. The back plate 33, cover plate 2 and support 1 are secured together by screws which pass through the aligned holes therein and through spacing washers 3 and 4. The washers 4 are of insulating material whereby the cover plate 2 is effectively insulated from the relay.

The magnet structure, as disclosed assembled in the upper portion of Fig. 2 and disassembled in Fig. 3, comprises a front base block 20 of brass and a rear base block 13 of magnetic material joined by two L-shaped return pole-pieces 12.

The pole-pieces are secured to the front base block by screws 21 and to the rear base block 13 by brass screws 39. The pole-pieces are separated from the rear base block 13 by interposed  
5 brass shims 14 which constitute magnetic air-gaps. Secured to the outer faces of the pole-pieces 12 by screws 11 is a U-shaped permanent magnet 10 made of sheet magnet steel. The rear block 13 is provided with an ear 15 between which  
10 and the clamping plate 19 the end of armature 18 is secured by screws 29.

The forward upwardly extending arm of each of the pole-pieces 12 is turned inwardly and downwardly to form a U-bend 17 of sufficient width to  
15 embrace a locking nut 25. Threaded through the two portions of the U-bend and through the embraced nut 25 is a pole screw 16. For engagement with each of the locking nuts 25 a stiff steel spring 24 is provided, each spring 24 being  
20 secured at one end to the front face of base block 20 by a screw 35. When either of the pole screws 16 is turned to provide the required air-gap between the face of the armature 18 and the face of the pole screw, the spring 24 presses  
25 with a predetermined pressure against locking nut 25 mounted on the pole screw which is in turn pressed against the threaded surface of the screw. This prevents the pole screw from turning one way or the other under the influence of  
30 vibration or other field conditions impracticable to control and thereby tends to cause the pole screw to be retained in its original adjustment.

The magnet coil 23 is mounted on a holder comprising two end supports 38 each provided  
35 with threaded apertures 28 and joined by a tubular sleeve 22 through which the armature 18 may freely pass.

The entire magnet structure comprising the various parts as above described and as shown in  
40 detail in Fig. 3 is assembled into a unit structure as shown in the upper portion of Fig. 2 by the sets of screws 21, 11, and 39 passing through the apertures of each pole-piece 12, but the armature 18 is not attached. The magnet structure  
45 is then lowered into place to surround the coil 23, the four tapped holes (not shown) in the lower surfaces of the front and rear base blocks 20 and 13 registering respectively with the four apertures 28 of the coil supports 38 and cooperating apertures in base 5. Both the coil supports  
50 and the magnet unit are then secured to the base 5 by the screws 9. The armature 18 is then inserted through the sleeve 22 and is secured to the ear 15 by the screws 29. The pole screws 16  
55 are then turned against the pressure of the springs 24 communicated to the lock nuts 25 to provide pole face separation between the armature and the pole screws and contact adjustment is then made between the armature contacts 30 and the terminal screws 26 by turning  
60 the finger wheels 31. A cylindrical cover 32 may be provided with projections that fit into the notchings of cover plate 2 to completely enclose the relay.

When for any reason it becomes necessary to  
65 inspect the relay or possibly to replace the magnet unit by another, it is only necessary to remove the armature from the coil sleeve 22 by loosening the screws 29 and remove the screws 9  
70 which hold the magnet unit to the frame after which the unit may be lifted from the relay base and replaced in the manner already described.

What is claimed is:

1. In an electromagnetic device, the combination with an energizing coil having an armature extending therethrough, of a removable magnetic  
5 structure comprising two pole-pieces each formed with a U-bend having apertures therein, pole-screws threaded through said apertures, a nut disposed within each of said bends and assembled on each of said pole-screws, and means for  
10 applying pressure to each of said nuts to hold each of said screws in an adjusted position.

2. In an electromagnetic device the combination with a supporting base, an energizing coil and an armature extending therethrough, of a  
15 unit magnetic structure comprising two L-shaped pole-pieces, a rear block, a front block, non-magnetic shims, means for securing said rear block to the rear end of said pole-pieces with one of said shims intermediate each two adjoining surfaces, means for securing said front  
20 block to said front end of said pole-pieces, a U-shaped member adapted to inclose said energizing coil secured to the outer surfaces of said pole-pieces, means for clamping said armature to said rear block, and means for removably  
25 securing said unit magnetic structure to said supporting base.

3. In an electroresponsive device, a pole-piece formed with a U-bend, aligned tapped apertures  
30 through said U-bend, an adjusting screw threaded through said apertures, a nut assembled on said screw and disposed within said U-bend, and means for applying pressure to said nut to hold said screw in any adjusted position.

4. In an electroresponsive device, a magnetic  
35 structure having pole-pieces formed with U-bends, aligned tapped apertures through each of said U-bends, an adjusting screw for each bend threaded through its respective apertures, a nut assembled on each of said screws and disposed  
40 within each of said U-bends, and a spring for each nut supported on said magnetic structure for applying pressure to said nut for holding its associated screw in any adjusted position.

5. A relay device comprising a non-magnetic  
45 chassis having a base portion and a back portion, an energizing coil mounted on said base portion, a magnetic structure including a U-shaped permanent magnet adapted for attachment to the upper surface of said base and removable as a  
50 unit therefrom, said magnetic structure in combination with the upper surface of the base of said chassis being adapted to surround the winding surface of said coil, and an armature connected to said magnetic structure and extending  
55 through said energizing coil to form with said magnetic structure the complete magnetic circuit of said relay device.

6. A relay device comprising a non-magnetic  
60 chassis having a flanged base and a rectangular back plate integral therewith for the support of said device, an energizing coil mounted on said base portion, a magnetic structure attachable to and removable from said base portion as a unit to inclose with said base the winding surface of  
65 said coil, said magnetic structure comprising a front block, a rear block, L-shaped pole-pieces attached to said blocks, and a U-shaped permanent magnet attached to said pole-pieces, and a reed armature extending through said energizing  
70 coil and secured to the rear block of said magnetic structure.

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