July 6, 1948. F. A. STEARN 2,444,476

ELECTRIC ANNUNCIATOR DROP

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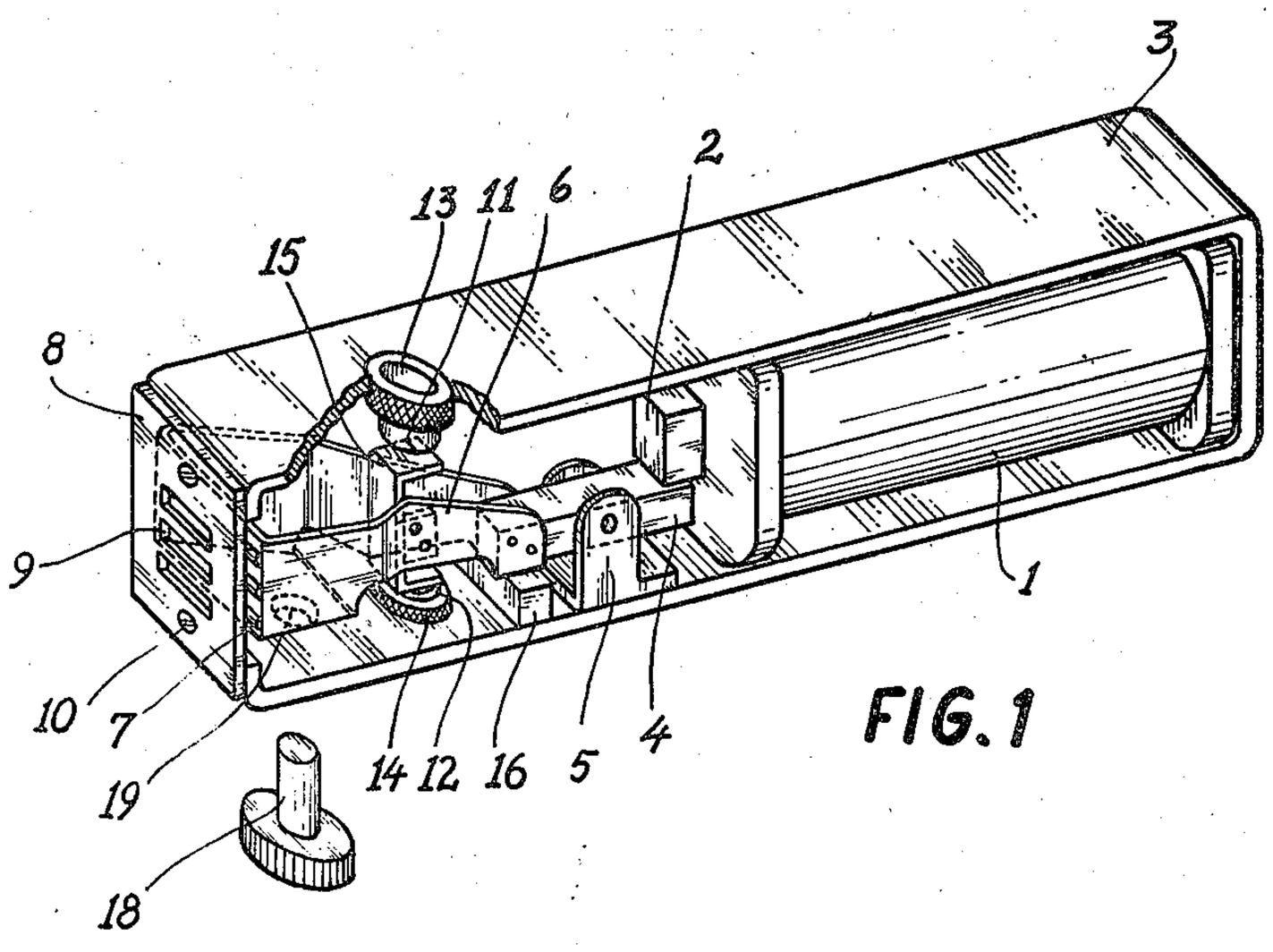

FIG. 1

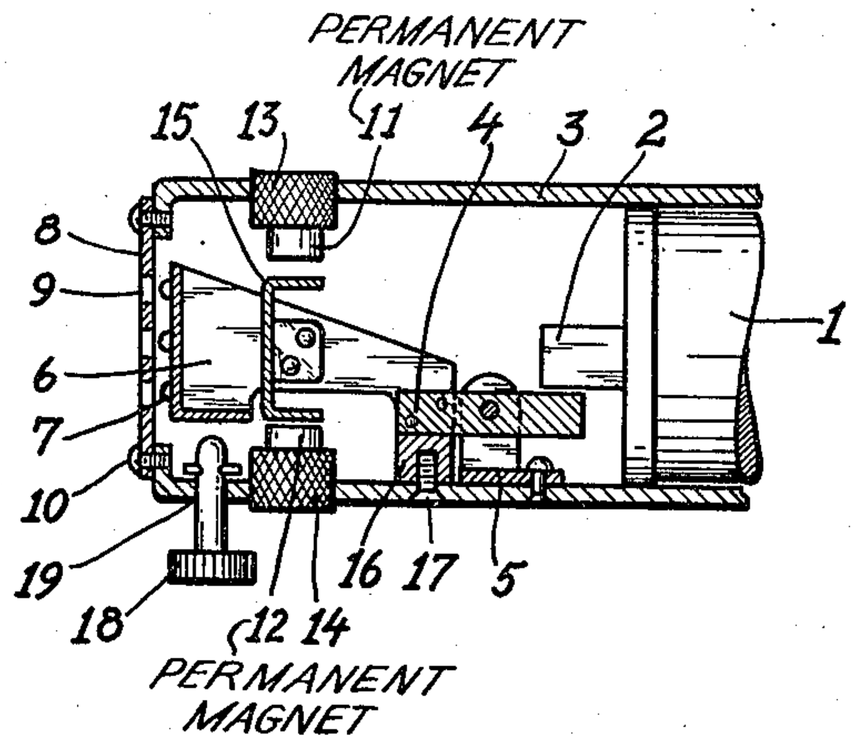

FIG. 2

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ELECTRIC ANNUNCIATOR DROP

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7 Claims. (Cl. 177—329)

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This invention relates to electromagnetic signalling devices such as switchboard drops and the like, and more particularly, to switchboard drops of the visual magnetic type.

Signalling devices of the general kind to which this invention relates have been in use for some time, and they usually comprise a target which in displayed position is visible through one or more windows conveniently placed in front of the operator. The target is mounted on a pivoted armature which may be attracted by an electromagnet when the latter is energized, and a restoring force such as gravity or a spring may be utilized to return the drop to its normal position after de-energization of the magnet. These drops are primarily useful where no action of the operator is desired in response, and are widely used on toll switchboards as self-effacing busy-indicators.

If it were desired to keep the device operated until the attention of the operator has been attracted, as in the case of call or clear-cut signals, then the armature would have to be designed so as to be in equilibrium both in normal and in off-normal position. The difficulty of meeting this requirement accounts for the fact that in such circuits use is still made predominantly of the more conventional type of drops, employing a shutter and a latch-type armature, which are bulkier than the self-contained units of the so-called visual type and generally require a correspondingly larger current for their operation.

It is therefore an object of the present invention to avoid the above-mentioned difficulties and to provide a compactly built, easily installed magnetic signalling device of the non-restoring type, adapted either to display or to conceal a visible target, in either the operated or the non-operated condition of the device, respectively.

In the accompanying drawing:

Fig. 1 is a perspective view of an embodiment of the present invention:

Fig. 2 is a fragmentary sectional elevation of the device shown in Fig. 1.

An electromagnet 1, having a core 2, is enclosed in an iron frame 3 and is connected to an associated energizing circuit (not shown). An armature 4, pivoted in a bracket 5 which is mounted on the frame 3, carries the target arm 6 having a plurality of movable targets 7 secured to its front portion. The arm 6 may be of aluminum or other suitable lightweight material. A front plate 8, provided with a plurality of windows 9, is fastened to the frame 3 by the screws 10. Two permanent magnets 11 and 12 are secured to the

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top and bottom portions of the frame 3 and are magnetically insulated therefrom by brass bushings 13 and 14. Aligned with the magnets 11 and 12 is a U-shaped magnetic latch member 15 which is rigidly attached to the target arm 6. An iron ledge 16, secured to the frame 3 by screws 17, is positioned underneath the left-hand end of armature 4 and serves to complete the magnetic circuit through the core 2 and frame 3 when the armature 4 is in its attracted position. Means are finally provided for the manual resetting of the armature 4 to its normal position, these means being schematically illustrated as a push button 18 slidable in a hole 19 of frame 3.

When the right-hand end of the armature 4 is attracted by the core 2, upon energization of the electromagnet 1, the targets 7 are aligned with the windows 9 and are thereby visible to the operator. At the same time, the left-hand end of armature 4 rests on the ledge 16 and the lower end of latch member 15 preferably just clears the top of permanent magnet 12. Preferably the armature carrying the target arm 6 and latch member 15 is pivoted at a point close to the center of gravity of the combined structure. In this manner the energizing current of the electromagnet mainly has to overcome the force of the upper permanent magnet 11 which is of predetermined strength, to display the signal. Although the restoring button 18 is illustrated as being manually operable, any known automatic resetting mechanism which can be initiated by the operator may be used to return the device to normal. In such an event, again, the restoring force is principally determined by the field strength of the lower permanent magnet 12; thus relatively small forces may be employed for this purpose. While only one embodiment of the invention has been illustrated, it should be obvious to those skilled in the art that many modifications and adaptations thereof may be made without departing from its scope. Thus, some of its advantages might be realized even if one of the permanent magnets were omitted. Also, while the magnets 11 and 12 have been shown as bar magnets, they could obviously be magnets of horseshoe or other suitable shape and could be arranged so that the member 15 completes an all-iron magnetic circuit when in the corresponding position. Likewise, the pole pieces 11 and 12 could be the ends of a single permanent magnet having, for instance, an extra leg common to both magnetic paths. It is with these and similar equivalents in mind that the scope of the present invention has been defined in the appended claims.

What is claimed is:

1. An electromagnetic signalling device comprising an electromagnet, an energizing circuit for said magnet, an armature displaceable between a normal and an attracted position, signal means operable in one of said positions of the armature, magnetically susceptible means secured to said armature, and a permanent magnet magnetically insulated from the electromagnet and positioned for magnetic cooperation with said susceptible means in one of said positions of the armature.

2. An electromagnetic signalling device comprising an electromagnet, an energizing circuit for said magnet, an armature displaceable between a normal and an attracted position, signal means operable in one of said positions of the armature, magnetically susceptible means secured to said armature, and two permanent magnets magnetically insulated frm the electromagnet positioned for respective magnetic cooperation with said susceptible means in said two positions of the armature.

3. An electromagnetic signalling device comprising an electromagnet, an energizing circuit for said magnet, an armature pivotable between a normal and an attracted position, one or more targets secured to said armature, an apertured member having one or more windows positioned to be aligned with said targets in attracted position of the armature, a member of magnetic material, non-magnetic means for securing said member to said armature, and two permanent magnets positioned for respective magnetic cooperation with said magnetic member in said two positions of the armature.

4. A device as set forth in claim 3, an iron frame surrounding said electromagnet and said armature, and non ferrous means for mounting said permanent magnets on said iron frame in magnetically insulated relation thereto.

5. An electromagnetic signalling device comprising an electromagnet, an energizing circuit for said magnet, a frame of magnetic material surrounding a sufficient portion of said magnet to provide a substantially closed magnetic path therefor, an armature pivotably secured to said frame and displaceable between a normal and an attracted position, a non-ferrous arm carried by said armature, one or more targets secured to said arm, an apertured member secured to said frame and having one or more windows positioned to be aligned with said targets in attracted position of the armature, a ferro-magnetic member secured to said arm, and two permanent magnets mechanically secured to said frame and positioned for respective magnetic cooperation with said ferro-magnetic member in said two positions of the armature.

6. A device as set forth in claim 5, comprising an iron ledge secured to said frame and positioned underneath the end of the armature remote from the electromagnet so that said end rests on the ledge in the attracted position of the armature.

7. A device as set forth in claim 5, comprising an iron ledge secured to said frame and positioned underneath the end of the armature remote from the electromagnet so that said end rests on the ledge in the attracted position of the armature and simultaneously said ferrous member just clears the lower of said two permanent magnets.

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