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NONPOSITIONAL LINE SIGNAL

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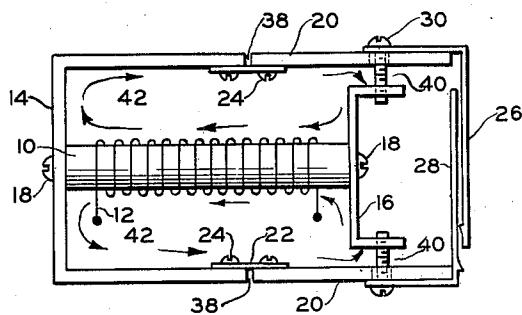


FIG. 1.

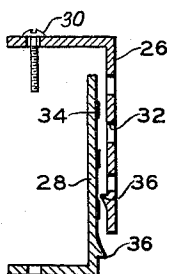


FIG. 2.

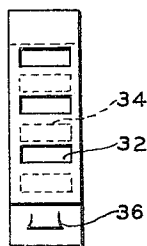


FIG. 3.

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NONPOSITIONAL LINE SIGNAL

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United States of America as represented by the
Secretary of War

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4 Claims. (Cl. 177-329)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

The invention relates to a non-positional drop or signalling device for use in telephone switchboards and similar equipment to indicate the receipt of an alternating current signal from a magnetto generator or the receipt of a direct current signal, as in common battery signalling systems.

Heretofore, the operation of electrically operated mechanical signals of this general class has depended, for the display of a visual signal, on the effect of gravity, thereby limiting the application of such devices to situations where the normal position of the signalling part is upright and rendering impossible their operation when placed horizontally, upside down, or in such position that gravity could not be utilized to effect its display when released.

It is therefore an object of this invention to provide an indicating device that, when actuated by an electric current, will operate in any position, thereby being made suitable for equipment used in rough open country or in rapidly moving and unstable locations, such as in mobile equipment.

It is also an object of the invention to provide an operative electrical indicator which is light in weight, small in size and simple and inexpensive to manufacture.

For a better understanding of the invention, reference is made to the following description of one device embodying the invention, the said description to be read in connection with the accompanying drawings, in which

Figure 1 is a plan view of a device embodying the invention, and

Figure 2 is a cross sectional view of one feature of the device shown in Figure 1, and

Figure 3 is a front view of the feature shown in Figure 2.

Referring to the drawing, a soft iron core piece 10, carrying a winding 12, is provided at either end thereof with a pair of U-shaped, forwardly extending, soft iron pole pieces 14, 16. These pole pieces 14, 16 are affixed to the core piece 10 by means of screws 18.

The rearward pole piece 14 is preferably of greater length than the forward pole piece 16, and is connected, at the ends thereof, to a pair of soft iron armatures 20 thru a pair of leaf springs 22. The springs 22 are preferably of phosphur

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bronze, and are affixed to the pole piece 14 and the armatures 20 by means of screws 24.

The armatures 20 extend forwardly of the ends of the pole piece 16 and carry a pair of shutters 26, 28 which are fastened to the armatures 20 in any well known manner. The heads of set screws 30 retain the armatures 20 and the shutters 26 in position against the pressure exerted by springs 22. The shanks of set screws 30 loosely fit into the apertures in shutters 26 and armatures 20 as indicated in Figs. 1 and 2. Shutters 26 and armatures 20 are slideable upon the shanks of set screws 30, since as is evident in Fig. 1 and Fig. 2, the apertures in shutters 26 and armatures 30 are larger than the screw shanks. Set screws 30 are also utilized to adjust the lengths of the air gaps 40 between the armatures 20 and the pole piece 16.

The forward shutter 26 is provided along its length with a plurality of transverse slots 32 and the rearward shutter 28 is provided with a plurality of transverse colored markings 34, the said slots 32 and marking 34 corresponding in size and number.

Referring now to Figures 2 and 3, the relative position of the shutters 26, 28 is shown when the indicating device is in its non-operated position. The slots 32 and the marking 34 are misaligned and the device, when normal, presents a solid color when viewed from the front.

As will be hereinafter pointed out, an incoming signal will cause relative movement of shutters 26, 28, whereby the slots 32 and the marking 34 will be aligned. The operated device will then display a color when viewed from the front, which display of color indicates that a signal current has been impressed on the line.

The shutters 26, 28 are provided on their opposing faces with a pair of notches 36, to hold the shutters in their operated position until released by the operator.

As heretofore stated, the core piece 10, the pole pieces 14, 16 and the armatures 20 are formed of soft iron, thereby forming parallel magnetic paths characterized by low residual magnetism. Two small air gaps 38 occur between the ends of the pole piece 14 and the armatures 20, and two adjustable air gaps 40 lie between the armatures 20 and the pole piece 16.

Assume that an alternating signal current from a telephone line (not shown) is impressed upon the winding 12. The resultant induced magnetic field, depending upon the momentary direction of the impressed alternating current, will follow

the path indicated by the arrows 42 (Figure 1). As the momentary direction of the alternating current changes, the path of the magnetic flux would be reversed as indicated by arrows (not shown) pointing in the opposite direction from the arrows 42.

This rapid change of direction of magnetic flux is possible due to the fact that the device has been formed of soft iron characterized by having very low residual magnetism. Due to the fact that the air gaps 38 are small, and due to the further fact that the air gaps 40 are in parallel arrangement, the resistance of the entire magnetic path is small. The set screws 30 enable the air gaps 40 to be adjusted for optimum length for different operating conditions.

It may thus be seen that this device is operative upon application of alternating current as well as application of direct current. The ends of pole piece 16, momentarily magnetic north poles, would attract the adjacent armature 20, momentarily magnetic south poles. As the direction of the alternating current reverses, the polarities will correspondingly change and the armatures 20 will again be attracted by the pole piece 16. Although there may be a momentary slight chatter when alternating current is used, the notches 35 become engaged almost immediately, locking the shutters 26, 28 in place and causing the colored markings 34 to be viewable through the slots 32, thus indicating to the operator that a signal has been impressed upon the line.

Any suitable means may be used to unlock the shutters in order to return the device to its non-operative position. In current commercial telephone practice, a plug is inserted into a jack in order to complete a listening circuit when a signal is indicated on a switchboard. These jacks are provided with an extra spring arm to return the presently used gravity drop to position. With a simple modification, this extra arm may be adapted to insert a wedge of proper contour between shutters 26, 28, thereby unlocking the device and allowing it to return to its nonoperated position.

The device above described represents but one embodiment of the invention, and it is obvious that many modifications and changes may be made. The full scope of the invention is pointed out in the following claims.

What is claimed is:

1. A non-positional signal device comprising electromagnet means, armature means actuated upon the energization of said electromagnet means by a signal current and indicating means comprising a pair of shutters mounted in constant parallel relationship on said armature means, at least one of said shutters being actuatable by said armature means.

2. A non-positional signal device comprising a magnetizable core piece a coil positioned about said core piece, a forwardly extending magnetizable pole pieces affixed to each end of said core piece the rearward pole piece being of greater length than the forward pole piece a pair of forwardly extending magnetizable armatures fixed to the ends of the rearward pole piece through a pair of non-magnetic leaf springs, whereby the forward pole piece is spaced from the forward ends

of said armatures by a pair of air gaps in parallel arrangement, a pair of set screws disposed through the ends of said armatures and threadably connected to said forward pole piece, whereby the lengths of said air gaps may be adjusted, a pair of overlapping parallel shutters fixed to the forward ends of said armatures and substantially at right angles thereto, a plurality of transverse markings arranged along the forward face of the rearward one of said shutters, and a plurality of transverse slots corresponding in number and size to the said markings formed in the forward of said shutters and normally misaligned with said markings, and a pair of locking notches formed on the opposing faces of said shutters whereby the said shutters may be locked in operative position.

3. A non-positional signal responsive indicating device comprising a magnetizable core piece having a winding disposed thereabout, a pole piece positioned at either end of said core piece, a pair of armatures resiliently connected to the ends of one of said pole pieces, the free ends of said armatures being spaced from the ends of the other pole pieces and being within the magnetic field generated about said other pole piece, and indicating means carried by the free ends of said armatures whereby movement of said armatures will be translated into movement of said indicating means.

4. A non-positional signal responsive indicating device comprising a core piece, a coil positioned about said core piece, a forwardly extending pole piece affixed to each end of said core piece, a pair of forwardly extending armatures fixed to the ends of the rearward pole piece through a pair of nonmagnetic leaf springs, whereby the forward pole piece is spaced from the forward ends of said armatures by a pair of air gaps in parallel arrangement, a pair of set screws disposed through the ends of said armatures and threadably connected to said forward pole piece, whereby the lengths of said air gaps may be adjusted, a pair of overlapping parallel shutters fixed to the forward ends of said armatures and substantially at right angles thereto, a plurality of transverse markings arranged along the forward face of the rearward one of said shutters, and a plurality of transverse slots corresponding in number and size to the said markings formed in the forward of said shutters and normally misaligned with said markings, and a pair of locking notches formed on the opposing faces of said shutters whereby the said shutters may be locked in operative position.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
Re. 15,584	Lincoln	Apr. 24, 1923
735,953	Dean	Aug. 11, 1903
914,235	Brown	Mar. 2, 1909
1,318,792	Newell	Oct. 14, 1919
1,998,072	Blake et al.	Apr. 16, 1935
2,245,493	Nothe	June 10, 1941
2,388,449	Sundt et al.	Nov. 6, 1945