Oct. 26, 1948. W. H. CAMPBELL 2,452,034

ELECTRICAL DROP SIGNAL DEVICE

Filed Oct. 6, 1944

Fig. 1.

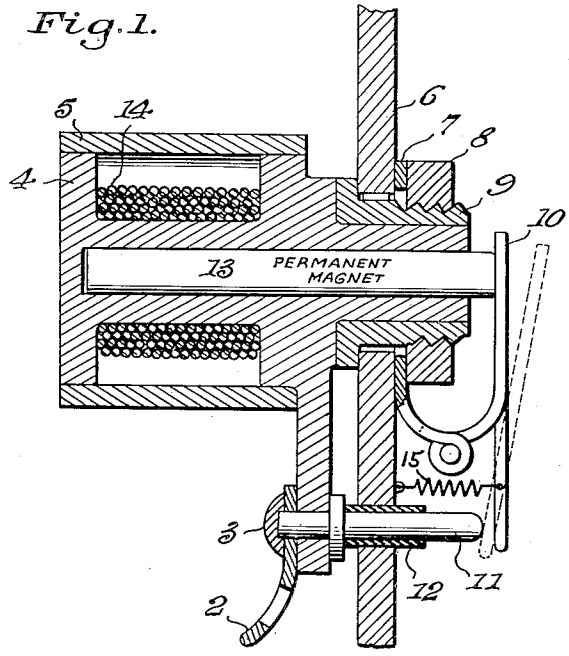



Fig. 2.

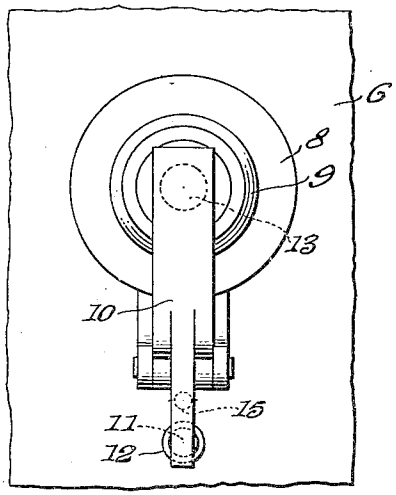
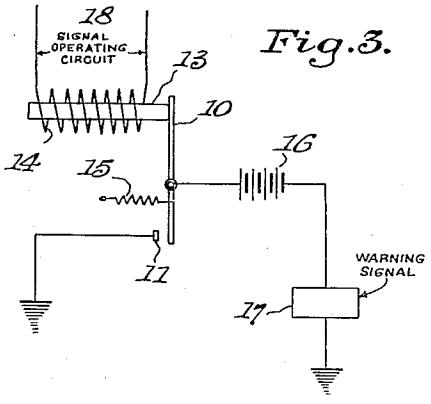



Fig. 3.




Inventor

Walter H. Campbell

By Lawrence Glassmen

ATTORNEY

Patented Oct. 26, 1948

2,452,034

# UNITED STATES PATENT OFFICE

2,452,034

## ELECTRICAL DROP SIGNAL DEVICE

Walter H. Campbell, Arlington County, Va.

Application October 6, 1944, Serial No. 557,543

7 Claims. (Cl. 177—329)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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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.

This invention relates to indicating devices, and more particularly to improvements in drop signal devices for indicating when a circuit has been activated or needs attention.

In connection with telephone switchboards, annunciators, and other apparatus employed in electrical communication and control systems it is necessary to provide means to indicate when a circuit has been activated. Many of the indicating devices heretofore have included a solenoid, which when energized, acts upon an armature to release a small pivoted plate to enable the latter to fall by gravity. In telephone apparatus, the solenoid is usually energized by the ringing circuit of an incoming call, and the plate is restored to its latched position either manually or when a circuit connecting plug is inserted in a jack. However, in applications providing automatic restoration, when the conversation has been completed and the ringing circuit is again placed into action, the plate will not fall due to the plug being still in the jack. This is objectionable as the operator has no indication of the completion of the conversation.

There is another type of indicator in which a small, low voltage neon lamp is placed across the field telephone circuit to indicate when the remote station is ringing. This type of indicator is objectionable in that constant attention must be paid to the switchboard, since indication is provided only while the remote station is actually ringing. Also, if two or more circuits are motivated at the same time, it is necessary for the operator to note and remember which particular circuits have been activated in order to permit him to handle these in sequence. In certain military operations it is necessary and very desirable to eliminate and prevent any audible signal or noise which might carry an appreciable distance. Consequently, a bell or a buzzer cannot be used; and likewise a visible signal is not desired.

Indicators heretofore provided are further objectionable in that they are complicated as to manufacture, bulky, insufficiently rugged, hard to repair, maintain, or replace, and difficult to construct for use under tropical conditions.

It is therefore an object of this invention to provide a drop signal device which is constantly capable of indicating the condition of line and requires a minimum of attention.

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A further object is the provision of a drop signal device which is of rugged construction, easy to manufacture and inexpensive.

These and other objects are attained by the novel construction hereinafter disclosed and illustrated in the accompanying drawing, forming a part hereof, and in which:

Figure 1 is a side elevational view, partly in section, of the device.

Figure 2 is a front view of the device.

Figure 3 is a simplified wiring diagram of the device.

Referring to the drawings, the drop signal device is shown to comprise a molded plastic body 4 provided with a metal bushing 9, to which it is keyed by depressions in the metal bushing during the molding of the part, a coil 14 is wound on a drum-like section of part 4, and a cylindrical cover 5 is placed about the coil space. This cylindrical cover can be heat sealed or retained by cement or lacquer in order to provide hermetical sealing for the coil with the leads brought through a slot in the bottom of the cover for production convenience, the apertures thereto being also sealed. These leads are soldered to two termination "birdies" located adjacent to a night alarm terminal.

The molded body 4 has at its center a cylindrical well in which is positioned a permanent magnet 13 in rod form retained in place by cement or lacquer. It is unnecessary to finish other than the pole face of the magnet rod, since the natural roughness of the rod, as fabricated, facilitates the retention in place by lacquer or cement. This also decreases the cost of construction. The assembled body can be mounted by inserting the end through the holes in the panel, slipping on the hinge plate 7, and tightening the retaining nut 8, which functions on the thread of bushing 9.

The armature or drop 10 is pivoted to the hinge plate 7 and is attracted by and normally retained in a vertical position by the effect of the permanent magnet core 13. When the coil is energized by current flowing in a signal-operating circuit 18, e. g. by ringing current of a telephone system, the current will nullify the effect of the permanent magnet 13, allowing the drop 10 to fall due to gravity since the drop pivot is off center in regard to the weight of the armature. A small spring 15 can be provided to constantly urge the drop to its lowered position, thereby accelerating and making more positive the dropping action. This action provides a positive and visual indication of the circuit having been activated. It

has advantages over other visual means since the activation of the drop can be observed even by feeling in the dark. It enables an operator to observe the activation of a plurality of circuits even when several circuits are activated at the same time.

Where desired a night alarm or other warning circuit containing battery 16 and warning signal 17 can be connected to the terminal determined by parts 2, 3, 11 and 12, so that when the drop armature 10 falls due to the activation of the circuit, the protruding end of the armature will make contact with the stud 11, thus grounding the circuit and completing the night alarm or other warning system.

The hinge plate 7, is a stamping having a cylindrical hole at one end and a protruding tongue bent in circular form for the retention of the pivot end. Similarly, the drop armature 10, is slotted on its lower end with the two external sectors of the slotted portions formed into circular retention members through which the hinge pin is placed and with the middle or third sector left as an extension to the armature drop so as to provide the contact-making surface to the night alarm terminal 11. On those applications where night alarm or similar facilities are not required the center sector of the armature 10 can be removed and the night alarm contact omitted.

The permanent magnet is preferably made of "Alnico," which in the form known as type I is made up of 63% iron, 20% nickel, 12% aluminum, and 5% cobalt, and has a retentivity of 7.3 and a coercivity of 430. However, other magnetic materials can be used if desired.

The nut 8 is knurled or it may be a hexagon nut, so that it can be easily and conveniently turned. In order to provide a visual signal at night, the end of the magnet 13, or the surface of member 9 immediately below the magnet 13, can be coated with a luminescent substance.

The above description is to be considered as illustrative and not restrictive of the invention of which modifications can be made without departing from the spirit and scope of the invention as set forth in the appended claims.

The invention having been described, what is claimed is:

1. A drop signal device comprising, a permanent magnet, a coil of wire encircling said magnet, an electrical circuit in which said coil is included, a pivoted armature attracted by and adapted to be held in a raised position by the magnet when said electrical circuit is open, said armature serving as a signal, a second electrical circuit, and a projection on said armature adapted to be included in said second electrical circuit when the armature is in a lowered position.

2. An electromagnetic device comprising a permanent magnet, a coil winding, leads for connecting the winding to a first electrical circuit, the winding being so positioned with respect to the magnet that when the winding is energized its flux substantially opposes that of the magnet, an armature adjacent to the magnet and caused to move toward the magnet and thus to its attracted position by flux from the magnet when the winding is not energized, the armature being biased away from the magnet and caused to be returned to its released position when the winding is energized, terminal means connected to a second electrical circuit in which at least a portion of the armature acts as a switch, the switch being closed and the armature forming a conductive part of the second circuit when the armature is in its released position, and the switch being open when the armature is in its attracted position.

3. An electrical signal comprising a permanent magnet, a coil winding, leads for connecting the winding to a first electrical circuit, the winding being so positioned with respect to the magnet that when the winding is energized its flux substantially opposes that of the magnet, an armature adjacent to the magnet and caused to move toward the magnet and thus to its attracted position by flux from the magnet when the winding is not energized, the armature being biased away from the magnet and caused to be returned to its released position when the winding is energized, the armature serving by its position to indicate the condition of energization of the first circuit, terminal means connected to a signal circuit in which at least a portion of the armature acts as a switch, the switch being closed and the armature forming a conductive part of the signal circuit when the armature is in its released position, and the switch being open when the armature is in its attracted position.

4. An electromagnetic device as described in claim 2, in which the first circuit does not include the armature.

5. A drop signal device comprising: a permanent magnet; a winding connected to a first electrical circuit, the winding and the magnet being so related that energization of the winding substantially reduces the effect of the permanent magnet; a signal armature which, by deenergization of the winding, is attracted by the magnet to a raised position thus indicating deenergization of the first circuit, and which, by energization of the winding, is caused to fall to a lowered position, thus indicating energization of the first circuit; switch means for controlling a signal circuit, the switch means including the armature and being opened and closed by movement of the armature in response to the condition of energization of the first circuit.

6. A drop signal device, as described in claim 5, in which the armature forms a conductive part of the signal circuit means when the armature is in its lowered position.

7. A drop signal device, as described in claim 5, in which the first circuit does not include the armature.

WALTER H. CAMPBELL.

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