March 14, 1933. J. S. GARVIN 1,901,443

SIGNALING DEVICE

Filed Dec. 4, 1929

FIG. 1

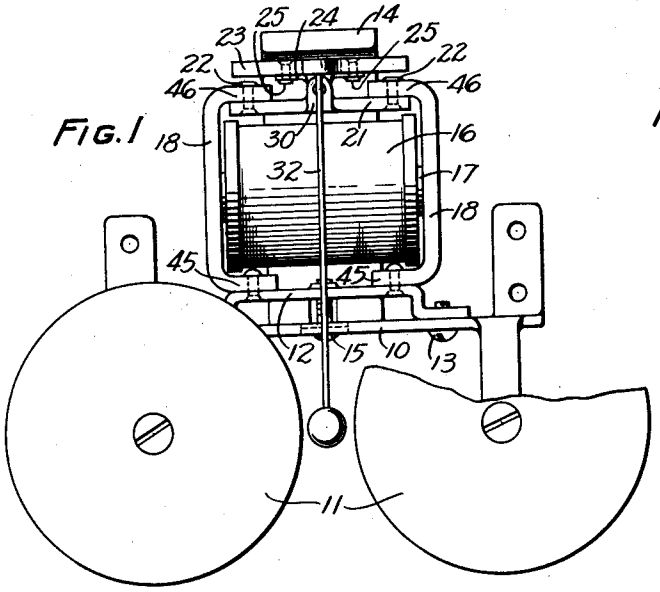


FIG. 2

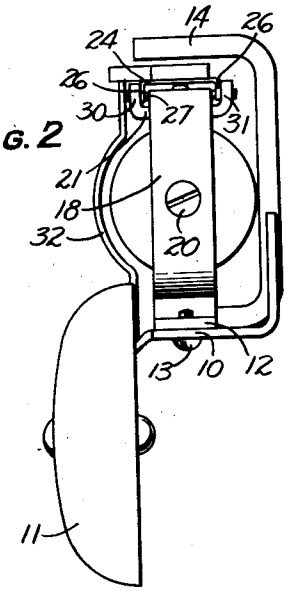


FIG. 3

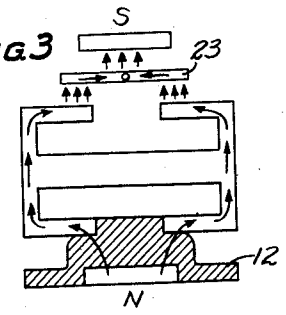


FIG. 4

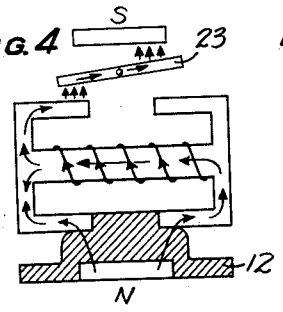


FIG. 5

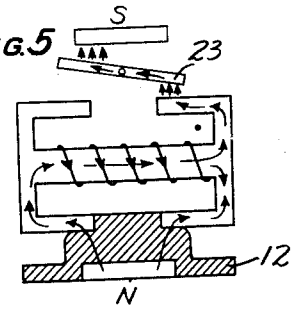


FIG 6

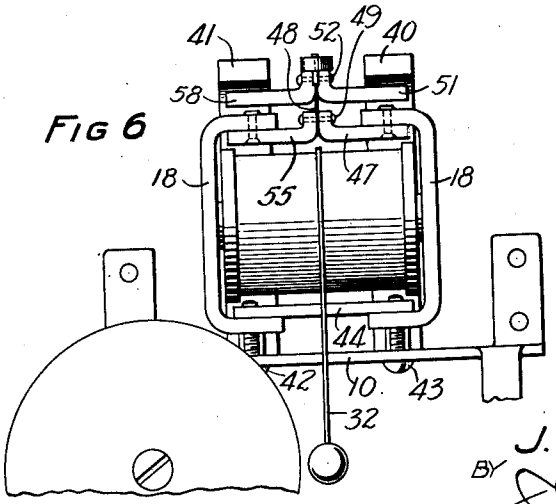
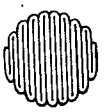


FIG. 7



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UNITED STATES PATENT OFFICE

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SIGNALING DEVICE

Application filed December 4, 1929. Serial No. 411,459.

This invention relates to signaling devices and more particularly to electric ringers of the polarized type such as are used extensively in telephone systems.

It is the object of this invention to provide an improved type of ringer which is simple and compact of construction and which effects a quickly acting highly sensitive signaling device with the use of a minimum number of parts.

One of the chief characteristics of an efficient telephone ringer is that it be designed so as to present a relatively high impedance to voice frequency currents and at the same time be highly sensitive to low frequency ringing currents. It is also desirable that the magnetic circuit embodied in such a device be such as to permit a maximum value of flux set up by the ringing current to be effective in actuating the ringer armature.

These desirable characteristics have been attained in this invention by the use of a folded laminated core for the ringer magnet which is instrumental in presenting a high impedance to currents within the voice frequency range, and by superposing on the magnetic circuit effected by the magnet core a polarizing flux in such a manner as to render that portion of the magnetic circuit in which the ringer armature is located of a relatively low reluctance, thereby permitting a maximum value of flux set up by the operating current to be effective in actuating the ringer armature.

The invention will be readily understood from the following detailed description made with reference to the accompanying drawing in which Fig. 1 is a side elevation of a ringer structure embodying the features of this invention;

Fig. 2 is an end view of the ringer shown in Fig. 1;

Figs. 3, 4 and 5 are schematic representations illustrating the flux paths set up by the permanent magnet and the electromagnet employed in the ringer;

Fig. 6 is a side elevation of a modified form of the ringer shown in Fig. 1; and

Fig. 7 is a cross-section of the magnet core showing the folded laminations.

Referring now to Figs. 1 and 2, a mounting bracket 10 is shown as the chief support for the ringer structure and is provided with two depending portions which serve as gong posts on which the gongs 11 are mounted. A non-magnetic element 12 is secured to the bracket 10 by means of a set of screws such as 13. A U-shaped permanent magnet 14 has one end clamped between the non-magnetic element 12 and the mounting bracket 10 and secured in place by means of a screw 15 which passes through the bracket 10, permanent magnet 14 and the non-magnetic element 12 and effects a rigid mounting for the permanent magnet.

The electromagnet having its axis at right angles to the axis of the permanent magnet 14, consists of the coil 16 and the core 17 to each end of which a pole piece 18 is secured by means of a screw such as 20. Each pole piece 18 terminates in oppositely disposed polar extensions 45 and 46, each pair of extensions 45 and 46 being continuously under the influence of opposite poles of the polarizing magnet 14. A non-magnetic element 21 bridges the polar extensions 45 and 46 of the pole pieces 18 and is secured thereto by means of the rivets 22. The upper end of each rivet 22 is ground to present a smooth surface to the armature 23 and serves as a means for preventing sticking of the armature to the polar extensions. The armature 23 is mounted on a bracket-like element 24 by means of the rivets 25, the element 24 being provided with two flanges 26 having circular holes centrally located therein to permit the insertion of shaft 27, the ends of which are housed in circular holes in the flanged portions 30 and 31 of the non-magnetic element 21.

The clapper rod 32 is staked in a projection of armature 23 and is bent or bellied to clear the magnet spool.

The ringer just described results in a simple, compact and rigid construction in which the number of structural elements has been reduced to a minimum.

Reference is now made to Figs. 3, 4 and 5. In these figures the magnet core and polar extensions are shown as integral parts to simplify the schematic. The small rectangles N and S indicate the north and south

poles respectively of the permanent magnet 14 (Fig. 1). Fig. 3 shows the path of the permanent magnet flux when uninfluenced by flux set up by the operating coil. Fig. 4 shows the path of the polarizing flux and the flux set up by the operating coil during the application of one-half cycle of ringing current thereto and the resulting attraction on the armature. Fig. 5 shows the path of the polarizing flux and the flux set up by the operating coil during the application of the second half of the same cycle of ringing current thereto and the consequent actuation of the armature.

The non-magnetic element 12 is so positioned in the magnetic circuit with respect to the armature 23 as to effect a greater reluctance in that portion of the path thereby causing the flux set up by the operating winding to traverse the path of least reluctance which includes the armature 23. In this manner a maximum value of the alternating current flux is utilized in causing the actuation of the armature. This arrangement of parts results in a highly sensitive and efficient ringer.

In analyzing Fig. 4 it is evident that the portion of the alternating current flux that tends to traverse the lower left-hand portion of the polar extension is opposed by the polarizing flux emanating from the north pole of the permament magnet. When the current in the operating winding changes direction a like condition is set up in the lower right-hand portion of the other pole piece as shown in Fig. 5. This fact coupled with the greater reluctance of the path including the non-magnetic element 12 renders a maximum value of the alternating current flux effective in that part of the magnetic circuit which includes the armature. A highly sensitive and efficient ringer is produced accordingly.

The modified form of ringer disclosed in Fig. 6 differs from the ringer shown in Fig. 1 only in the use of two permanent magnets 40 and 41 in place of the single magnet 14, and the manner in which the armature is mounted. To enter into a detailed description of the complete structure of this ringer is believed unnecessary since it would merely entail a repetition of a major part of the description hereinbefore presented. The following description will be confined to the structural differences only, between the two ringer structures.

The permanent magnets 40 and 41 are interposed between the lower polar extensions of the pole pieces 18 and the mounting bracket 10 and secured in that position by means of screws 42 and 43 which also pass through the non-magnetic element 44.

The equivalent of the non-magnetic element 21 of Fig. 1, is shown composed of two parts 55 and 47 in Fig. 6, each secured to the upper polar extensions of pole pieces 18 and provided with flanges between which one end of a reed 48 is clamped and made secure by means of the rivet 49. The armature also consists of two parts 58 and 51 having flanges between which the other end of the reed 48 is secured by means of the rivet 52. The clapper rod 32 is staked to a projection on the flange associated with the armature piece 58. This construction serves as a reed type mounting for the armature and is readily adaptable to the ringer structure shown in Figs. 1 and 2.

The Figures 3, 4, and 5 are equally applicable to the modified form of ringer, the only change necessary being the replacement of the north and south poles of magnet 14 by a pair of north poles and a pair of south poles respectively, representing the permanent magnets 40 and 41. The magnetic circuits effected in the modification are substantially the same as in the preferred form and the results produced similar.

What is claimed is:

1. A polarized electromagnetic device comprising a coil, a core on which said coil is mounted provided at each end with two polar extensions, the extensions of one end being poled oppositely to the extensions of the other end of said core upon the energization of said coil, a permanent magnet having each pole thereof bridging a pair of oppositely poled core extensions and an armature interposed between one pole of said permanent magnet and a pair of oppositely poled core extensions.

2. An electromagnetic ringer comprising a coil, a core upon which said coil is mounted provided at each end with a U-shaped polar extension, a permanent magnet for each of said polar extensions, the poles of which encompass the extremities of said polar extensions, a two-element non-magnetic bridging element bridging corresponding extremities of said polar extensions and provided with upturned flanges, a two-element armature having flanges similar to and in alignment with the flanges of said bridging element, a clapper rod supported by said armature and a flexible reed clamped between the flanges of said bridging element and of said armature for supporting said armature at its midpoint between corresponding poles of said permanent magnets and corresponding extremities of said polar extensions.

In witness whereof, I hereunto subscribe my name this 2nd day of December, 1929.

JOHN S. GARVIN.