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ELECTROMAGNETIC SIGNALING DEVICE

Filed Jan. 16, 1929

Fig. 2.

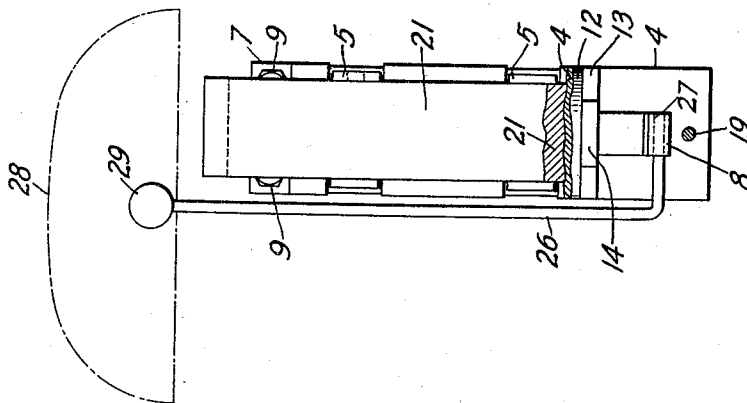
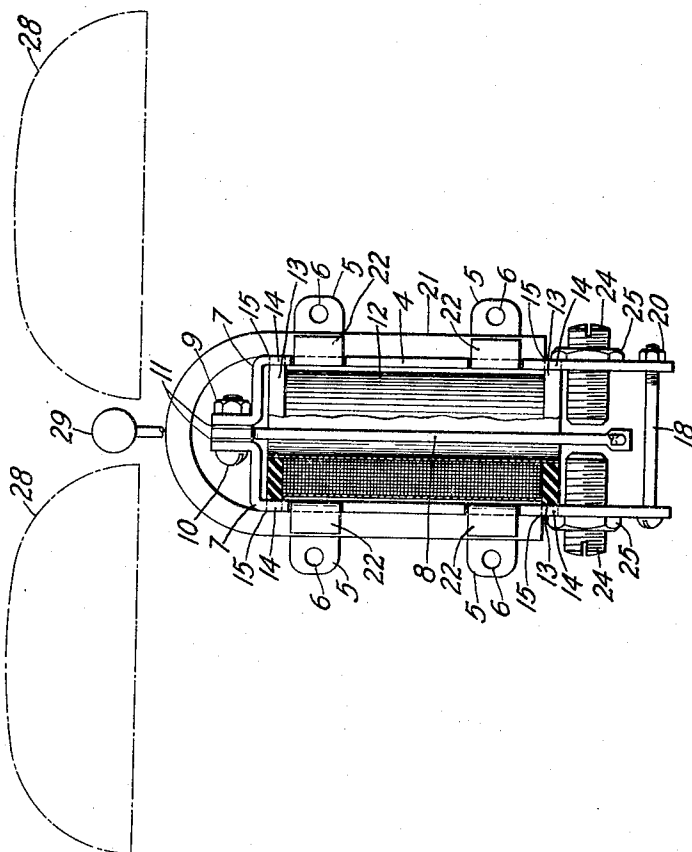


Fig. 1.



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ELECTROMAGNETIC SIGNALING DEVICE

Application filed January 16, 1929. Serial No. 332,824.

This invention relates to electromagnetic signaling device and in particular to ringers for telephones.

An object of this invention is to efficiently transform electrical signaling energy into sound energy through the use of gongs or other vibratory devices.

Another object of this invention is the production of an electromagnetic ringer with a minimum number of parts, which has high sensitiveness and which will hold its adjustment over a long period of time.

According to one feature of this invention a single operating coil is employed.

Another feature resides in the employment of a balanced magnetic circuit having an armature of the cantilever beam type fixed at one end and arranged within the operating coil, the stiffness of the armature being such as to offset the pull exerted by the magnetic flux. The permanent magnet is on opposite sides of the operating coil with its pole pieces on opposite sides of the free end of the armature. An extension from the armature carries a bell clapper which is placed between a pair of signal gongs in the well known manner.

With no current flowing through the winding of the energizing coil, the flux from the permanent magnet exerts a pull on the armature in either direction, the cantilever type armature being in a balanced neutral position between the pole pieces of the magnet. If desired, the stiffness of the armature may be slightly greater than is necessary to offset the pull exerted by the permanent magnet and therefore a very small flux generated in the armature by a current flowing through the energizing winding of the operating coil is sufficient to disturb the balance between the armature and the pole pieces causing movement of the armature and sounding of the gongs.

Due to the fact that such a small amount of electrical energy is required to cause the movement of the armature, a highly efficient and sensitive ringer is obtained through the use of a single operating coil. Ringers having single operating coils have been used heretofore but they have been inefficient

modifications of the commonly used two coil ringer. Others have had the armature rigidly attached to the operating coils with the operating coils pivoted so as to move with the armature. Such ringers are capable of handling a large amount of power but are obviously very inefficient at low energy levels.

Referring now to the drawing, Fig. 1 is a front view of a single coil ringer with a portion of the operating coil and spool shown in section.

Fig. 2 is a side view of the ringer with a portion of the magnet and frame broken away to show the connection of the clapper to the armature.

The relay frame 4 of magnetic iron is equipped with mounting lugs 5—5 provided with mounting holes 6—6 whereby the device may be attached to a suitable base. This frame has extensions 7—7 which serve as pole pieces of the device. The armature 8 is rigidly clamped between the pole pieces 7—7 by the nuts 9 threaded on screws 10, but is separated from the pole pieces by the non-magnetic shims 11—11. By the use of these shims high reluctance gaps are provided between the pole pieces and the armature, thereby providing magnetic poles and fixed air gaps where the armature is clamped in position. As a result of this construction, the effects of residual magnetism are largely overcome and the desired balanced magnetic circuit is retained with its advantages of high sensitivity.

The operating coil 12 is provided with spoolheads 13—13 of insulating material. These spoolheads are provided with extensions 14—14 which extend into and fit tightly within openings 15—15 in the side walls of the frame 4 thus supporting the operating coil 12 within the frame. The core of the operating coil 12 is hollow and is so dimensioned as to allow ample clearance for the operation of the armature 8 which passes through it.

A screw 18 passes through opening 19 in the side walls of the frame 4, below the operating coil 4 and on this screw is threaded the nut 20; the screw 18 and the nut 20 serving to hold the side walls of the frame 4 tightly against the spoolheads 13—13.

The U-shaped permanent magnet 21 serves to polarize the ringer. The magnet 21 passes around the operating coil 12 and is clamped to the frame 4 between the clamping lugs 22—22 and the mounting lugs 5—5. The frame 4, below the operating coil 12 has a threaded hole in each of its walls which are adapted to engage the threads of the adjusting screws 24—24 which are of magnetic material and which act as extensions to the pole pieces. The lock nuts 25—25, when the adjusting screws 24—24 are once adjusted, serve to lock these adjusting screws in position.

The bell clapper rod 26 has its lower end forced into the hole 27 in the free end of the armature 8 to make what is known as a drive fit. The two signal gongs 28—28 are arranged symmetrically on either side of the bell clapper 29. The support for these gongs is not shown.

The proportions and material of the armature 8 are so chosen that its stiffness to bending is made slightly greater than is necessary to offset the pull exerted by the permanent magnet 21 at the pole pieces 24—24. A very small flux generated in the armature 8 by a current flowing through the operating coil 12 is sufficient to disturb the balance between the armature 8 and the pole pieces 24—24 causing movement of the armature 8 and bell clapper 29 and resultant sounding of the gongs 28—28.

What is claimed is:

1. An electromagnetic device comprising an operating coil, an armature, a U-shaped permanent magnet and a two element support provided with integral clamping means for securing said permanent magnet in contiguous relation with each element of said support, with apertures in each element thereof which accommodate the spoolheads of said coil and maintain said coil in fixed relation with said permanent magnet and with flanges between which said armature is supported as a cantilever beam within said coil, said support constituting a magnetic path for the flux set up by said device and carrying adjustable pole pieces in operative association with the free end of said armature.

2. An electromagnetic device comprising an operating coil, an armature, a U-shaped permanent magnet, a two element support provided with clamping means for securing said permanent magnet in contiguous relation with each element of said support, with apertures in each element thereof which accommodate the spoolheads of said coil and maintain said coil in fixed relation with said permanent magnet, and with flanges between which said armature is supported as a cantilever beam within said coil, said support constituting a part of the magnetic circuit of said device and carrying adjustable pole pieces in operative association with the free

end of said armature and means associated with the free ends of said two element support for forcing the two elements of said support into close association with the spoolheads of said coil.

In witness whereof, I hereunto subscribe my name this 14th day of January, 1929.

DANIEL D. MILLER.