

July 25, 1950

J. F. HOUDEK, JR
TELEPHONE SUBSTATION RINGER

2,516,214

Filed May 16, 1946

3 Sheets-Sheet 1

FIG. 1

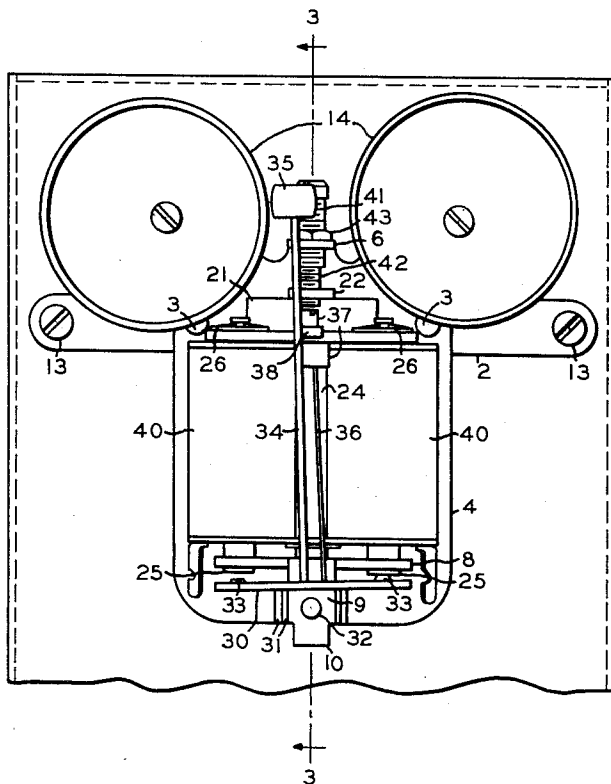


FIG. 3

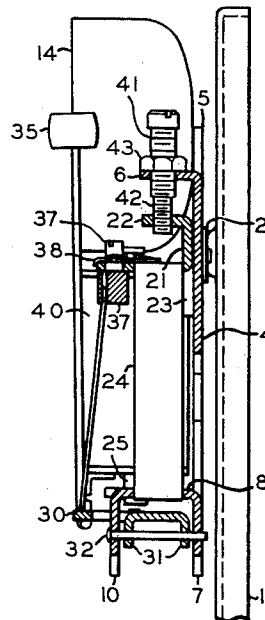
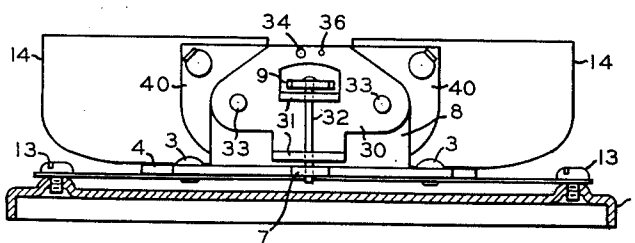


FIG. 2



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3 Sheets-Sheet 2

FIG. 4

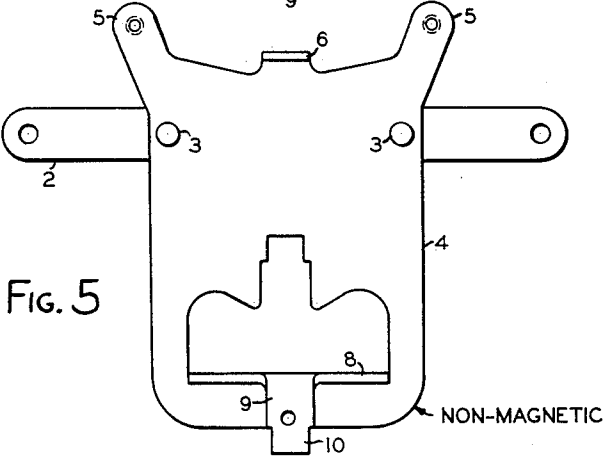
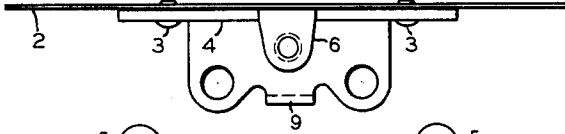


FIG. 7

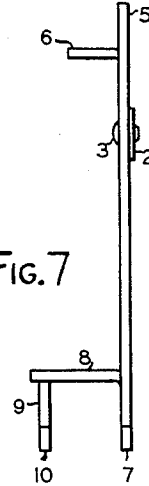


FIG. 6

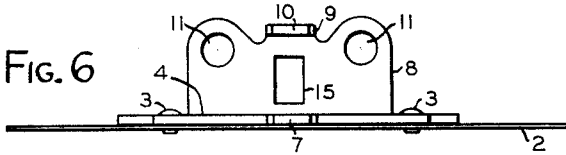


FIG. 8

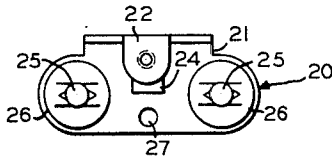


FIG. 9

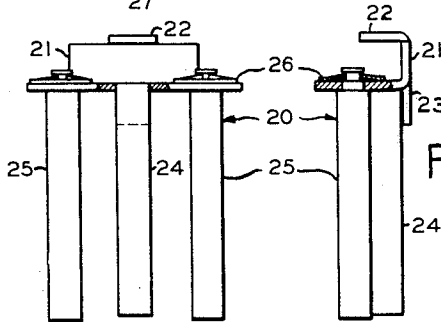
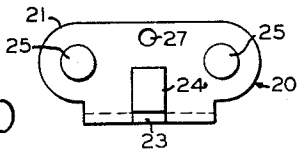


FIG. 11

FIG. 10



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3 Sheets-Sheet 3

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2,516,214

TELEPHONE SUBSTATION RINGER

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4 Claims. (Cl. 175—345)

1

This invention relates to telephone substation ringers. Its principal object is to provide a simple and reliable construction which permits ringers to be produced economically and to be readily adjusted to meet operating requirements.

A further object is to provide for a maximum interchangeability of parts between tuned and non-tuned ringers to facilitate the manufacturing of ringers of the two types.

A still further object is to provide a suitable mounting arrangement for ringers which transmits a minimum of clatter incident to armature operation while holding the ringer sufficiently rigid that the intended operation thereof, particularly if a tuned ringer, is not impaired.

One feature of the invention is that adjustment of the assembled ringer is accomplished by sliding the electromagnets and the polarizing magnet with respect to the armature.

Another feature is that the same basic assembly can be completed as a non-tuned ringer or as a tuned ringer, according to whether one armature assembly or another is employed.

Other objects and features of the invention will become apparent as the description progresses.

Of the accompanying drawings, Figs. 1 to 11 show a non-tuned ringer according to the invention, while Figs. 12 to 16 show a tuned ringer according to the invention.

Figs. 1 and 2 are respectively a top view and a rear view of the non-tuned ringer mounted on a supporting base plate.

Fig. 3 is a side sectional view of the device of Figs. 1 and 2 taken generally along line 3—3 of Fig. 1.

Figs. 4, 5, 6, and 7 are respectively a front view, a top view, a rear view, and a side view of the foundation assembly of the ringer shown in Figs. 1 to 3.

Figs. 8, 9, 10, and 11 are respectively a front view, a top view, a rear view, and a side view of the slidably adjustable magnet assembly, shown with the coils of the electromagnets removed.

Figs. 12 and 13 are respectively a top view and a rear view of a tuned ringer according to the invention.

Fig. 14 is a side sectional view taken generally along the line 14—14 of Fig. 12.

Figs. 15 and 16 are respectively a rear view and a bottom view of the armature-clapper assembly of the ringer of Figs. 12 to 14.

Referring first to Figs. 1 to 11, the non-tuned ringer illustrated therein will be described. This ringer may be further described as a biased ringer in that the armature is biased to stand normally

2

in association with one electromagnet, as shown. It includes the foundation assembly of Figs. 4 to 7 and parts mounted thereon. The foundation assembly comprises parts 2 and 4 secured together, as by rivets 3. Part 2 comprises a mounting strap of relatively thin and comparatively springy material, while part 4 is a non-magnetic foundation plate to which the other parts going to make up the ringer are attached.

In Figs. 1 to 3, the complete ringer is shown mounted on base plate 1, which has raised bosses (Figs. 2 and 3), tapped to receive mounting screws 13. All parts of the ringer are thus held out of direct contact with base plate 1, such contact as exists between the ringer and base plate being by way of the comparatively thin and flexible mounting strap 2. Direct transmission of clatter, incident to the armature of the mechanism striking the ends of the electromagnets, and incident to the clapper striking the gongs, is materially reduced by this simple illustrated strap mounting.

Foundation plate 4 is provided at the front with arms 5, tapped to receive screws mounting gongs 14 respectively thereto. Tab 6 is turned up at the front of the structure and is tapped as shown best in Fig. 4 to receive adjustment screw 41.

The rear portion of plate 4 has a portion sheared and struck up therefrom to provide upstanding wall portion 8, supporting the rearwardly extending horizontal portion 9, ending in tab 10. A hole is provided through part 9 and through the underlying main portion of foundation plate 4 to receive pivot rod 32 for mounting armature 30.

The armature assembly of the device of Figs. 1 to 3 includes armature 30 which has upper and lower ears 31, pierced to receive pivot rod 32. The upper ear 31 is sheared and struck up from the armature, leaving an opening in the armature through which the rearwardly extending part 9 of foundation assembly 4 freely passes. Armature 30 is provided with non-magnetic core-engaging members 33, applied in the form of rivets. Their well-understood function is to reduce the tendency of the armature to "freeze" in either of its two extreme positions.

The rear end of clapper rod 34 is suitably upset to provide an enlarged portion through which it is secured to the armature, as by riveting. The clapper 35 is mounted on the front end of the rod 34 in a position to strike the gongs 14 alternately as the armature turns back and forth about pivot rod 32.

As previously noted, the non-tuned ringer is

3

illustrated as being of the biased type. To this end, it is provided with bias spring 36, comprising a round reed forced into a hole in armature 30, the front end entering an eccentric opening in adjusting member 37. Spring 36 thus exerts a normal force on the armature causing it to return to the illustrated position after every use thereof, whereby, when in normal position, it is not affected by current flow in a given direction.

One special advantage of the disclosed arrangement resides in the magnet assembly which is longitudinally adjustable as a unit to regulate the stroke of the armature. This magnet assembly includes electromagnets having cores 25 and windings 40, permanent bar magnet 24, and the common yoke 21 of magnetic material. This assembly is shown in four separate views, Figs. 8 to 11, with coils 40 removed from their cores 25. The coils 40, it may be explained, comprise separate spools slipped over cores 25 of the assembly shown in Figs. 8 to 11.

Referring particularly to Figs. 8 to 11, magnetic yoke 21 has a horizontal part, which overlies foundation plate 4 in assembled position, and a vertical part which is pierced to receive the shouldered front end of electromagnet cores 25. These cores may be held to part 21, as by the illustrated spring washers, or "speed nuts" 26, each of which has inwardly extending parts which snap into an annular groove in the reduced end portion of its core 25. Cores 25 are thus held yieldingly, whereby sliding of the assembly is not materially affected by minor displacement of the location of receiving holes 11 in the upstanding rear portion 8 of foundation plate 4.

The front end of permanent bar magnet 24 enters an accurately sized opening in the upstanding portion of yoke 21. This opening is produced by a shearing action which provides the rearwardly extending central tab 23, which underlies the front end of magnet 24. Parts 23 and 24 are held rigidly together as by welding.

Yoke 21 is provided with a front tab 22 which is tapped and threaded to receive the reduced forward portion 42 of stroke-adjusting screw 41. The main upstanding portion of yoke 21 is pierced at 27 to receive the reduced portion of rotatable bias-adjusting member 37.

In the complete assembly of the ringer, as is illustrated in Figs. 1 to 3, cores 25 of the magnet assembly shown in Figs. 8 to 11 are provided with coils 40, and bias-adjusting member 37 is applied. Member 37 has an enlarged portion which lies behind the principal upstanding part of yoke 21, and a reduced portion which passes forwardly through hole 27 (Figs. 8 and 10) in yoke 21. The reduced portion of member 37 is grooved annularly, as seen best in Fig. 3, to receive the arms of bifurcate spring member 38 which holds part 37 in its assembled position, and retains part 37 by friction in its desired rotational position of adjustment. The enlarged rear portion of bias-adjusting member 37 is provided with a longitudinal off-center opening receiving the forward end of bias spring 36. By a rotation of member 37 through 180 degrees, the front end of bias spring 36 is carried from an extreme left position of maximum bias tension to an extreme right position of minimum bias tension. Ordinarily, some intermediate position is employed.

In the complete assembly of the ringer, the rear end of cores 25 are received in openings 11 in upstanding portion 8 of foundation plate 4, and they may protrude somewhat to the rear of portion 8, as shown in Figs. 1 and 2. Additionally,

4

the rear end of bar magnet 24 is received in opening 15 (Fig. 6) in upstanding part 8, such opening being preferably rather accurately sized to serve as the principal rear guide for the slidable magnet assembly, keeping in mind that cores 25 of the electro-magnets are effectively articulated, with respect to each other and to the magnet, by the resilient mounting arrangement including retaining parts 26. It will be observed that the rear end of bar magnet 24 ends slightly short of the end of cores 25, whereby the bar magnet does not directly contact armature 30 in any position of stroke adjustment, whereby the intended movement of the armature cannot be interfered with incident to the sliding of the magnet assembly for stroke adjustment.

Accurate and readily controlled longitudinal positioning of the slidable magnet assembly, according to the armature stroke desired, is obtained by the illustrated compound stroke-adjusting screw having a threaded section 41 and a reduced threaded section 42. Section 41 is threadedly received in an opening in upstanding tab 6, formed integrally with foundation plate 4, while the reduced portion 42 is threadedly received in upstanding tab 22, formed integrally with magnet yoke 21 of slidable magnet assembly. Preferably, parts 41 and 42 are both threaded in the same direction; right-handed, for example. One of the parts, however, is provided with coarse, or steeply pitched, threads; the other part is provided with fine, or mildly pitched, threads. It is preferable that the larger section 41 be provided with the coarse threads, and that the smaller section 42 be provided with the fine threads.

With lock nut 43 loosened, stroke-adjusting screw 41 can be turned readily to cause it to travel bodily forwardly, or bodily rearwardly, according to whether the stroke is to be decreased or is to be increased. As the screw turns and travels in either direction, the sliding magnet assembly, by virtue of the finer threads on part 42 and in its cooperating tapped opening in part 22, travels in the same direction, but a lesser distance. A differential action is thus obtained which depends upon the difference in pitch of the threads between the two sections. This differential action permits a fine adjustment of stroke to be obtained. Another important advantage of the arrangement resides in its extreme simplicity, requiring only tapped and threaded parts to accomplish the purpose.

During adjustment, the rear end of the slidable magnet assembly is maintained in alignment with the remaining parts of the assembly by virtue of the alignment of screw 41 in its threaded openings. When the adjustment has been completed, lock nut 43 can be tightened against tab 6, locking the parts in their adjusted position and holding the rear end of the magnet assembly more rigidly in alignment independent of such looseness as there may be in the threaded parts. If desired, tab 6 may be inclined to the rear, causing screw 41, 42 to tend to slope downwardly toward the rear. With this arrangement, the inherent flexibility of the parts causes the horizontal portion of yoke 21 to closely hug the top surface of foundation plate 4, thereby keeping the parts tightly pressed together during, and after, adjustment.

Figs. 12 to 16, showing a tuned ringer according to the invention, will now be described.

Figs. 12 to 14 show the ringer of Figs. 1 to 3 modified to act as a tuned ringer. In Figs. 12 to

5

14, the armature assembly for the non-tuned ringer has been removed and replaced by the armature assembly shown in Figs. 15 and 16. Additionally, parts 37 and 38 have been removed, as they are not needed in the tuned ringer.

To remove the armature assembly from the ringer of Figs. 1 to 3, it suffices to remove pivot rod 32 and to withdraw armature 30, together with the attached parts 34 to 36 making up the armature assembly.

The armature assembly of Figs. 15 and 16 is next placed in the position shown in Figs. 12 to 14 and is held operatively in that position through the medium of its rearwardly extending reed 104, clamped between spacer blocks 108, Fig. 13, 15, clamped in turn between parts 109 and 110 by screws 111.

Referring particularly to Figs. 15 and 16, armature 101 is formed, with the outline shown in Fig. 15, of flat stock having a thickness as shown in Fig. 16. Aperture 105 in the armature is for the purpose of receiving upper tab 9 attached to foundation plate 4. Flat reed 104 is maintained in assembled position with armature 101 by being riveted between rearwardly extending tabs 106, there being one such tab for each half portion of the armature.

In the manufacture of the armature, a piece is first punched having the general contour desired for the finished product, but with the lower arms (below aperture 105) far enough apart that retaining tabs 106 may be turned up therefrom. Then the portion of the armature lying above, and alongside, aperture 105 is bent edgewise to bring the inner faces of the formed tabs 106 close enough together to snugly receive reed 104 as illustrated.

Reed 104 and tabs 106 are pierced to receive retaining rivets 107. Clapper rod 102 is upset and secured to armature 101 as discussed hereinbefore in connection with parts 30 and 34. Rod 102 is provided with clapper 103 for striking the gongs 14; alternately, the clapper being slidably secured on rod 102, as by the indicated set screw, to facilitate tuning of the armature assembly after installation in the ringer.

It is well known that a tuned ringer must respond to but a single one of several frequencies incident to selecting the desired station on a called telephone party line. For example, frequencies of approximately 16, 25, 33, 50, and 66 cycles may be used on the same telephone party line. A ringer for use at any station on such line must be tuned accordingly. In the illustrated construction, reed 104 may have a thickness (varying for example from .010 inch to .022 inch) corresponding to the particular frequency for which it is to be tuned, or to a frequency band within which it is to be tuned to a particular frequency. The reeds for all frequencies, or frequency bands, may be of the same length and width. Armature 101 may be formed with the tabs 106 slightly closer together than the thickness of the thickset reed, the insertion of such reed causing a slight spreading. A reed of certain intermediate thickness may just fit between tabs 106, while the thinner reeds fit loosely between the tabs until rivets 107 are inserted and tightened, which operation draws the tabs together to result in the desired assembly.

Reed 104 is pierced at the rear end to receive the shanks of screws 111. These screws are passed through parts 110, 108, and 104, and are threadably engaged in locating block 109, which

6

bears against the side portions of parts 10 and 7 (see Figs. 6 and 7), whereby it is located laterally. It is located longitudinally of the ringer by being slid forwardly into engagement with the shoulders in which parts 10 and 7 end.

Clamp plate 110 is similarly located in order that the rear end of reed 104 be held firmly in its predetermined position located by parts 109 and 110. Clamp plate 110 is substantially thinner than locating block 109, and the combined thickness of reed 104 and of the two spacer blocks 108 is somewhat less than the width of locating tabs 7 and 10. Accordingly, when screws 111 are drawn up tightly, clamp plate 110 is thereby bent inwardly to assume the illustrated bowed appearance as parts 104, 108, and 109 are brought tightly together. By this arrangement, reeds of the several required thicknesses may be accommodated; the part 110 being bowed more or less, according to the thickness of the reed.

To provide a ringer tuned to any desired frequency, an armature assembly having a reed 104 of suitable thickness is selected, and a clapper 103 having a suitable mass is selected and placed approximately in the location shown in Figs. 12 and 14. The magnet assembly is next adjusted longitudinally, by stroke-adjusting screw 41, 42, to provide a preliminary stroke gap according to the frequency in question. Then, with operating current flowing through the windings, the location of clapper 103 on clapper rod 102 is adjusted to the point giving the most vigorous response, whereupon the set screw is tightened firmly to hold the clapper in that location. Commercial tolerances in thickness of the reed material necessitate providing clappers 103 of varying weights for any frequency to which the ringer may be tuned. Therefore, the clapper first selected may have to be replaced by one of a different mass to secure the desired tuning adjustment.

It is customary, following the tuning operation, to adjust the sensitivity of the ringer to the end that the ringer shall operate reliably responsive to the minimum current likely to be supplied thereto of the frequency for which it is tuned; and shall fail to respond to the maximum current likely to be supplied thereto at any other frequency. This sensitivity adjustment is readily accomplished by turning screw 41, 42 to thereby vary the air gap between armature 101 and cores 25 of the electromagnets, such air gap being determinative of the stroke of the armature. The sensitivity varies inversely with the stroke.

When the stroke adjustment for sensitivity has been accomplished, the eccentrically mounted gongs 14 may be rotated to such a position that they are struck with about equal force by clapper 103 during operation of the ringer, the striking of either gong being accomplished by a slight overthrow, permitted by the flexibility of clapper rod 102, following the striking of the concerned core 25 by armature 101.

Attention is called to the fact that parts such as 33 (used on armature 30) are not required on armature 101, for reed 104 can be depended upon to return the armature reliably to its illustrated neutral position.

I claim:

1. In an electromagnetic device, two electromagnets, an armature, a foundation structure, means for adjustably mounting the magnets for longitudinal movement on the foundation structure, the foundation structure comprising a flat non-magnetic plate having an intermediate sec-

tion thereof struck up and formed to provide an upstanding portion and a further portion supported thereon and turned rearwardly to overlie the rear portion of the plate, said overlying portion and the portion overlaid thereby cooperating to turnably support the armature therebetween, with the armature having an opening therethrough freely receiving said further portion of the foundation structure, with the armature thus extending around and beyond the said further portion of the foundation structure.

2. In an electromagnetic device, two electromagnets, an armature, a foundation structure, means for adjustably mounting the front end of the magnets for longitudinal movement of the magnets on the foundation structure toward and away from the rear end thereof, the foundation structure comprising a flat non-magnetic plate having an intermediate section thereof struck up and formed to provide an upstanding portion and a further portion supported thereon and turned rearwardly to overlie the rear portion of the plate, said upstanding portion having openings therethrough receiving the rear end of said magnets respectively to support and guide such end thereof incidental to the said movement of the magnets, said overlying portion and the portion overlaid thereby cooperating to turnably support the armature therebetween in operative relationship with the rear end of said magnets, with the armature having an opening therethrough freely receiving said further portion of the foundation structure, with the armature thus extending around and beyond the said further portion of the foundation structure.

3. In an electromagnetic device, a plate-like foundation structure, two electromagnets and an intermediate permanent magnet secured together at the front end of each to comprise an E-shaped magnet structure, an upstanding armature located at the rear of the foundation structure and extending thereacross, means for adjustably mounting the front end of the magnets for longitudinal movement on the foundation structure toward and from the armature, the foundation structure comprising a flat non-magnetic plate having an intermediate section thereof struck up and formed to provide an upstanding portion and a further portion supported thereon and turned rearwardly to overlie the rear portion of the plate, said upstanding portion having three openings therethrough associated respectively with the middle portion and the two end portions of the armature receiving the rear end of said magnets to support and guide such end thereof incidental to the said move-

ment of the magnets, said overlying portion and the portion overlaid thereby cooperating to turnably support the armature therebetween for movement about a vertical axis, with the armature having an opening therethrough freely receiving said further portion of the foundation structure, with the armature thus extending around and beyond the said further portion of the foundation structure.

4. In an electromagnetic device, two electromagnets, an upstanding armature, a foundation structure, means for adjustably mounting the magnets for longitudinal movement on the foundation structure toward and from the end portions respectively of the armature, the foundation structure comprising a flat non-magnetic plate having an intermediate section thereof struck up and formed to provide an upstanding portion and a further portion supported thereon and turned rearwardly to overlie the rear portion of the plate, said upstanding portion being perforated to receive said magnets and to guide the said movement thereof, said overlying portion and the portion overlaid thereby cooperating to turnably support the armature therebetween along the vertical median line thereof, with the armature having an opening therethrough freely receiving said further portion of the foundation structure, with the armature thus extending around and beyond the said further portion of the foundation structure.

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