July 22, 1958 J. F. HOUDEK, JR 2,844,767

TELEPHONE SUBSTATION RINGERS

Filed Sept. 29, 1954

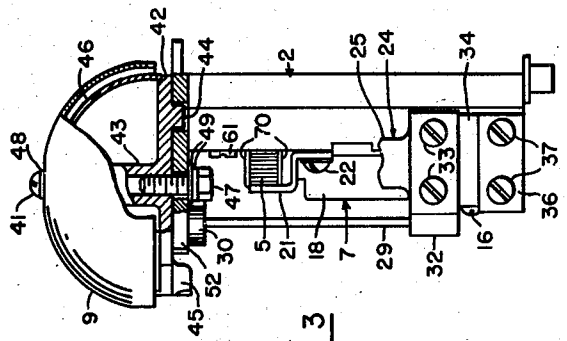


FIG. 3

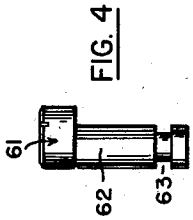


FIG. 4

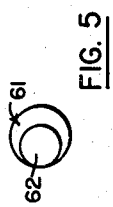


FIG. 5

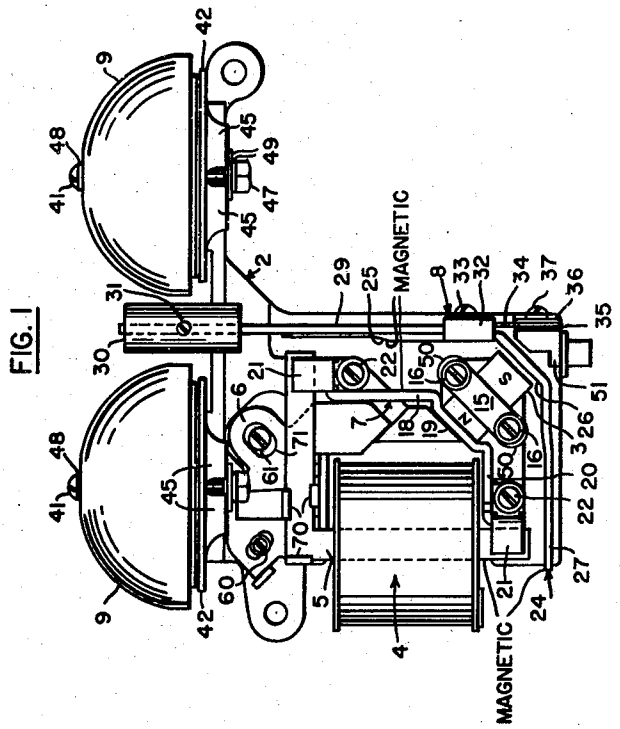


FIG. 1

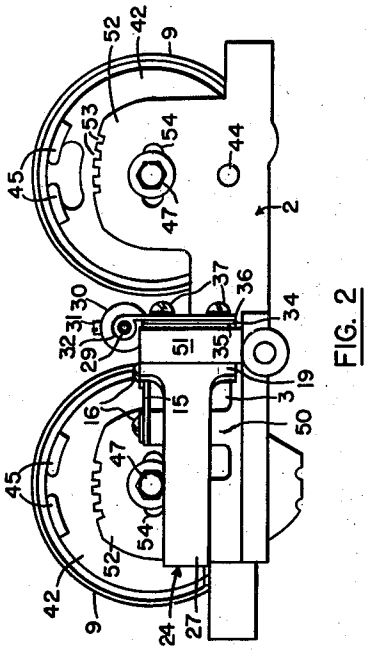


FIG. 2

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TELEPHONE SUBSTATION RINGERS

Joseph F. Houdek, Jr., Elmhurst, Ill., assignor to International Telephone and Telegraph Company, a corporation of Maryland

Application September 29, 1954, Serial No. 459,135

2 Claims. (Cl. 317—177)

The principal object of this invention is to provide an efficient tuned telephone substation ringer which is of compact construction and which may be readily adjusted for efficient operation at any desired one of the frequencies (say 16 to 66 cycles) used in frequency-selective party-line systems.

In known telephone ringers, compactness and basic efficiency have been secured by providing an armature which is suspended to move between pole extensions of a single electromagnet and polarized by a relatively short permanent magnet applied between one pole of the electromagnet and the suspension point of the armature, and efficiency has been improved by adding a magnetic shunt bar of limited cross section to the structure which provides a shunt path between the poles of the electromagnet of substantially less flux-carrying capacity than the core of the electromagnet, whereby the reluctance of the electromagnet is reduced, with a consequent increase in its electrical impedance, in that the air gaps in the magnetic path through the permanent magnet and the armature do not appear in the shunt path.

In a tuned ringer, the preferred practice is to suspend the armature on a reed which is of a stiffness according to the frequency to which the ringer is to respond, and to weight the armature or its attached clapper stem inversely according to frequency. Efficiency of operation moreover requires that the angle of movement, or stroke, of the armature be capable of regulation inversely according to the frequency to which the ringer is tuned.

According to the invention, the foregoing principles of compactness and efficiency are retained in a structure in which the air gap between the tractive pole faces of the electromagnet and the armature is readily adjustable to permit a greater or lesser armature stroke. Moreover, symmetry of armature traction is secured by associating one pole of the permanent magnet with substantially the magnetic mid-point of the electromagnet, through association with an intermediate portion of the shunt bar, whereby flux from that pole reaches both pole faces of the electromagnet over similar parallel paths. With the other pole of the permanent magnet closely associated with the suspension point of the armature, alternating flux through the permanent magnet causes both air gaps to act similarly to induce armature movement.

Further, according to the invention, compactness with operating efficiency is retained by employing an L-shaped electromagnet core having a winding on one arm and an L-shaped armature rectangularly arranged, with the shunt bar and the permanent magnet disposed within the rectangle, and with the clapper stem extending along one of the sides of the rectangle which is formed by an arm of the armature. The air-gap adjustment according to desired stroke is accomplished by sliding the core of the electromagnet along the diagonal of the rectangle which extends between the armature bend and the core bend, end extensions of the shunt bar closely overlapping the core extremities to maintain magnnetic continuity.

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

The accompanying drawings, comprising Figs. 1 to 5 show a tuned ringer embodying the principles of the invention.

Figs. 1 and 2 show respectively a top view and an end view of the device.

Fig. 3 is a side view of the device with the coil removed and portions broken away to illustrate the adjustable gong mounting feature.

Figs. 4 and 5 show respectively a side view and an end view of the stroke-adjusting stud.

The ringer disclosed in the drawings comprises a frame which may be die cast of any suitable non-magnetic material. The frame is essentially a spider-like, integral formation consisting of a central portion, two substantially parallelly disposed arms projecting at right angles from the upper and lower ends, respectively of the central portion, and a pair of shelf-like integral projections 52. As clearly indicated in Fig. 1, the projections 52 of the frame occupy different horizontal planes. The parallel arm portions of the frame are joined by one arm of a generally L-shaped core 5 having a coil 4 slidably mounted thereon to occupy the space between the arms of the frame.

The coil 4 is provided with the usual coil terminals to enable it to be incorporated in a ringer circuit.

The core 5 preferably consists of a plurality of laminations and is rigidly secured together by tabs 70, of slide plate 6 which may be formed of any suitable non-magnetic material. As indicated in Figs. 1 and 2, the tabs 70 are integral projections of plate 6.

The magnet assembly consisting of plate 6, core 5, and coil 4 is slidably secured to the frame by integral raised guide portions, of frame 2, and by means of screw 60 passing through an elongated opening in 6 to threadedly engage frame 2.

The shunt bar 7, which is of magnetic material, is affixed to the frame by means of screws 22. This element, which is formed generally in an L-shape, is clearly shown in Fig. 1. Bar 7 consists of two arms 18 and 20, interconnected by portion 19, terminating in extensions 21 which overlappingly engages the extremities of core 5.

As shown in Fig. 1, a rectangular shaped permanent magnet 3 is secured to the frame between posts 50 by a non-magnetic plate 15 and screws 16. The north pole of magnet 3, for example, abuts portion 19 of shunt bar 7 while its south pole is associated with portion 26 of armature 24.

The armature assembly 8 adapted to vibrate under control of coil 4 is pivotably mounted on raised portion 51 of frame 2.

As indicated in Fig. 1, armature 24 of assembly 8, is of a generally L-shaped configuration having tractive arms 25 and 27 interconnected by an enlarged portion 24 which is associated with magnet 3.

Reed 34 and clapper-rod bracket 32 are secured to the lower portion of tractive arm 25 (Figs. 1 to 3) by means of screws 33. Clapper rod 29 is rigidly secured into the circular portion of 32, as by knurling or welding. Rod 29 is provided with clapper 30 for striking the gongs 9 alternately, the clapper being slidably secured to rod 29, as by the indicated set screw 31, to facilitate tuning of the armature assembly. Reed 34 is secured at its lower end to portion 51 of frame 2, between spaced blocks 35 and 36 by means of screws 37.

Each shelf-ledge like section 52 (Fig. 3) carries similar gong assemblies consisting of a circular base member 42, having a projecting stub shaft 44 which is adapted for rotation in a suitable aperture in the frame sections 52 (Figs. 2 and 3). A gong support post 43 projects from the other side of base 42 and has its longitudinal axis

offset with respect to the longitudinal axis of shaft **44** so that as the gong mounting is rotated on shaft **44** the spacing between gongs **9** is increased or decreased depending upon the direction in which the assembly is rotated. Base **42** is provided with a circular ledge portion which is engaged by the rim of resonator **46** which is rigidly secured to post **43**. Gong **9** is mounted on post **43** in telescopic relation to its associated resonator **46** and is secured to post **43** by means of a screw **41** which passes through an aperture in gong **9**, through lock washer **48**, into a suitably tapped hole in post **43**. The gong assemblies are rotatably secured to frame sections **52** by means of screws **47** passing through elongated openings **54** (Fig. 2) of sections **52**, through washers **49**, into a suitably tapped hole in **42**. The circular base members **42** are provided with integral tab portions **45** which cooperate with notches **53** of sections **52** to increase or decrease the spacing between gongs as will be hereinafter described.

To provide a ringer tuned to any desired frequency a reed **34** of suitable thickness is selected, and a clapper **30** having a suitable mass is selected and placed approximately in location shown in Figs. 1 and 3. Reed **34** is provided with elongated openings (not shown) which permits the armature **8** to be moved to provide equal operating air gaps. The magnet assembly is next adjusted to provide a preliminary stroke gap according to the frequency in question. This is readily accomplished by loosening lockscrew **60** and then rotating stud **61** until the desired setting is obtained whereupon locking screw **60** may be retightened.

As shown in Figs. 4 and 5, shaft **62**, of stud **61**, is eccentrically located and upon rotating the stud its head portion engages the edge of elongated opening **71** of plate **6** to move the magnetic assembly, angularly as viewed in Fig. 1 up and to the left. The motion of the assembly is guided by raised integral guide portions of frame **2**. Stud **61** passes through an aperture in frame **2** and is secured thereto by a spring washer or a "speed nut" (not shown) which engages under-cut portion **63** to prevent its withdrawal.

After the preliminary gap adjustments are made and with the gongs **9** moved out of engagement with clapper **30** a low voltage (at the desired frequency) is applied to the winding to adjust for maximum sensitivity. This is done by locating clapper **30** on clapper rod **29** at the point giving the most vigorous response, whereupon screw **31** is tightened firmly holding the clapper in position. With the low voltage applied to the winding the eccentrically mounted gongs **9** are rotated to a position that they are struck with equal force by clapper **30**.

The adjustment of the space relationship between gongs **9** and clapper **30** is readily accomplished by loosening screw **47** and inserting a tool, such as a screw-driver blade between tabs **45** to engage one of the notches **53** and then rotating the tool until the desired adjustment is obtained whereupon screw **47** is retightened.

Following the sensitivity adjustment the ringer is further adjusted with full ringing current applied to the winding as to interference, balance, and tone. This adjustment is readily accomplished by readjusting the magnet assembly to vary the air gap between armature **24** and core **5** and readjusting the location of the gongs.

I claim:

1. A polarized electromagnetic device including a winding, a magnetic core for the winding, and an armature, with operating air gaps between armature and core, the core and armature being cooperatively arranged in the general form of a rectangle, means for suspending the armature for a turning movement about an intermediate portion thereof to shorten either said gap while lengthening the other, a magnetic shunt bar and a permanent magnet located within the rectangle, the shunt bar shunting the core, the permanent magnet extending from an intermediate portion of the shunt bar to a point close to the said intermediate portion of the armature to polarize the armature with respect to the core, the armature and the core each comprising a generally L-shaped portion with the operating air gaps being located at diagonally opposed corners of the said rectangle, means for guiding the core for movement along the armature-core diagonal of the rectangle to regulate the length of the said operating air gaps, the shunt bar slidingly overlapping the extremities of the core to maintain uniform shunting of the core in its several adjustment positions.

2. A polarized electromagnetic device including a winding, a magnetic core for the winding, and an armature, with operating air gaps between armature and core, means for suspending the armature for a reciprocal movement to shorten either said gap while lengthening the other, a magnetic shunt bar shunting the core, a permanent magnet extending from an intermediate portion of the shunt bar to a point close to a portion of the armature to polarize the armature with respect to the core, means for guiding the core for movement toward and away from the armature to regulate the length of the said operating air gaps, means for maintaining the shunt bar and permanent magnet fixed during any such adjustment movement of the core, the shunt bar slidingly overlapping the extremities of the core to maintain uniform shunting of the core in its several adjustment positions.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,844,767 July 22, 1958

Joseph F. Houdek, Jr.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 2 and 12, and in the heading to the printed specification, lines 3 and 4, name of assignee, for "International Telephone and Telegraph Company", in each occurrence, read -- International Telephone and Telegraph Corporation --.

Signed and sealed this 18th day of November 1958.

(SEAL)

Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents

UNITED STATES PATENT OFFICE

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