June 23, 1959 H. A. BREDEHOFT 2,892,187

SOUND OUTPUT CONTROL FOR TELEPHONE RINGERS

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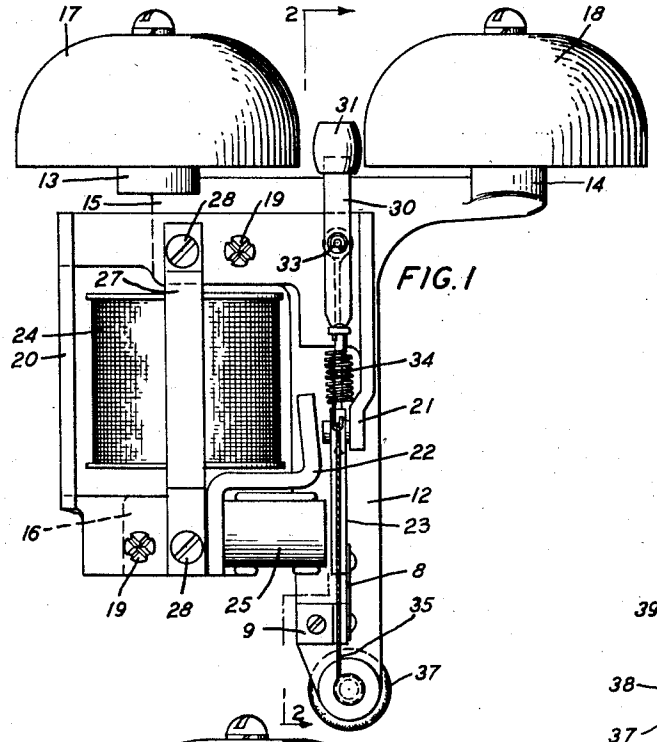

FIG. 1

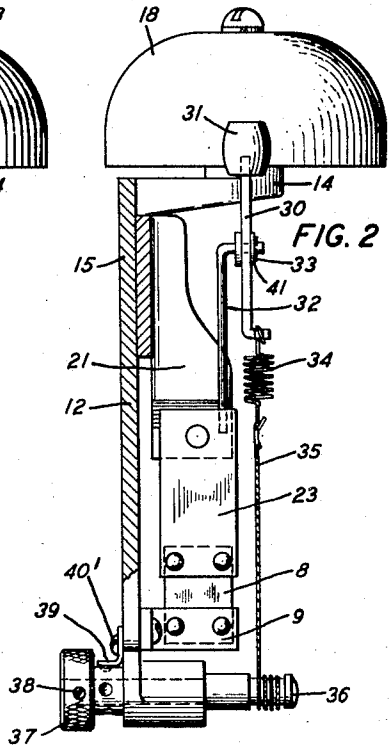

FIG. 2

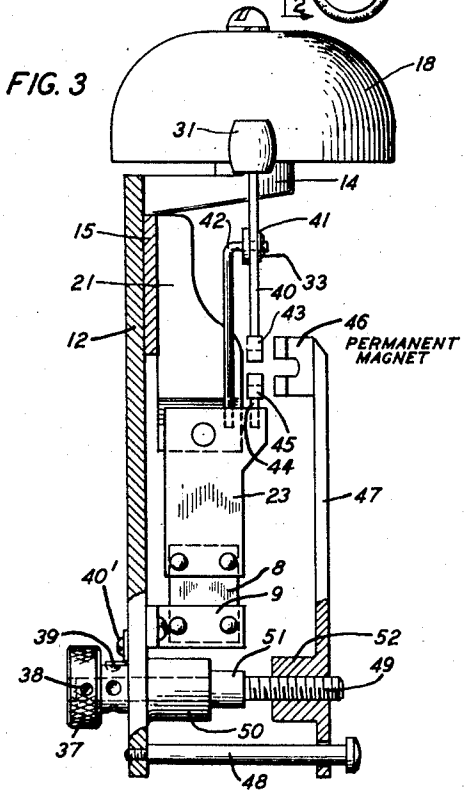

FIG. 3

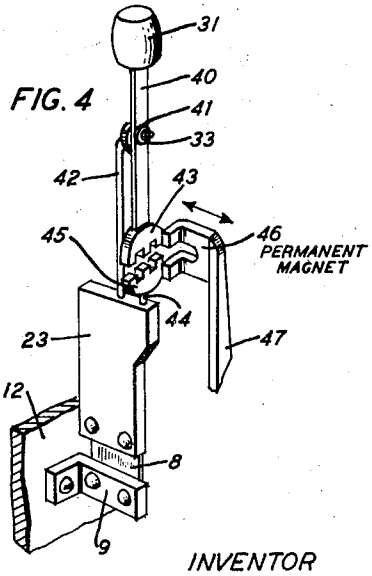

FIG. 4

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SOUND OUTPUT CONTROL FOR TELEPHONE RINGERS

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2 Claims. (Cl. 340—397)

This invention relates to audible signaling devices of the percussion type and particularly to sound regulators for use in controlling the sound output of telephone ringers.

The telephone ringer in common usage includes a pair of gongs and an electromagnetically controlled clapper suitably mounted and disposed relative thereto for striking the gongs. The intensity of the sound signal emitted by signaling devices of the percussion type, and particularly by the telephone ringer, is known to be a measure of the energy with which the gong is struck by the clapper which, in turn, is determined to some degree by the stroke of the ringer armature which controls the movement of the clapper.

Attempts have been made heretofore to provide subscriber-controlled means for regulating the sound output of the telephone ringer and, in general, such attempts involve arrangements which require adjusting the spacing between gongs and, in some cases, adjusting the armature stroke in accordance with the gong spacing. While such devices function satisfactorily, they necessitate more or less complicated mechanisms for moving the gongs, which mechanisms contribute to the cost of the ringer and require additional maintenance.

It is the object of this invention to provide a simple, practicable and otherwise improved system of sound control for telephone ringers which obviates the need for adjustable armature stops and/or relatively movable gongs, and which is particularly adaptable to subscriber operation.

This object is attained in accordance with a feature of the invention by pivotally mounting the clapper rod on the electromagnetically controlled armature and adjustably controlling the energy transmitted from the armature to the clapper through the medium of a variable coupling between the clapper rod and the armature, the strength of which may be varied, at will, by the subscriber.

More particularly, and in accordance with one embodiment of the invention, the clapper rod is pivotally mounted on the ringer armature at a point intermediate its (the rod's) extremities and, through the medium of a variably tensionable spring, a force is applied to one end of the clapper rod, the line of application of which coincides with the longitudinal axis of the clapper rod and passes through the pivot point thereof. Manually operable means is made available to the subscriber for adjusting the spring tension so that when the tension is low there will be little energy transmitted to the gongs by the armature and as the tension is increased the coupling is increased and the gongs are struck with greater force and the sound output is correspondingly increased.

In a second embodiment of the invention, the clapper assembly or support consists of two magnetically coupled sections, one of which is fixed to the ringer armature and the other is pivotally mounted thereon. The two rod sections are in alignment and their juxtaposed ends terminate in magnetic iron pole-pieces effecting an air-gap; a permanent magnet is manually positioned variably with respect to the pole-pieces or iron details to vary the magnetic flux in the air-gap and to correspondingly control the strength of the coupling. As the permanent magnet is brought closer to the iron details or pole-pieces the flux in the air-gap increases, causing an increase in the coupling between the clapper rod and the armature and therefore in the ability of the armature to transmit energy to the ringer gongs. Conversely, as the distance between the permanent magnet and the pole-pieces increases, the air-gap flux decreases and the clapper rod-armature coupling decreases causing less energy to be transmitted from the armature to the gongs and a corresponding sound signal of less intensity.

The invention will be better understood from the following detailed description when read with reference to the accompanying drawings, in which:

Figs. 1 and 2 are front and side views, respectively, of a telephone ringer which includes that embodiment of the invention wherein the coupling between armature and clapper rod is stiffness controlled by tensioning means;

Fig. 3 is a side view of a telephone ringer which includes that embodiment of the invention wherein the coupling between the armature and clapper rod is stiffness controlled by magnetic means; and

Fig. 4 is a fragmentary perspective view of the ringer disclosed in Fig. 3 and illustrates, particularly, the elements of the armature-clapper coupling involved therein.

In the several drawing figures the invention is disclosed as embodied in a ringer structure of the type disclosed in H. A. Bredehoft and M. S. Richardson Patent 2,590,500 of March 25, 1952, and includes an irregularly-shaped frame, which may be die-cast of aluminum, or of any other suitable material, having a central post **12**, two substantially parallel arms **15** and **16** projecting at right angles from the upper and lower ends, respectively, of the post **12** and a pair of integrally formed gong posts **13** and **14** on each of which is suitably mounted a gong, such as gongs **17** and **18**, respectively.

A unit-type pole-piece **20** is fixed to the frame arms **15** and **16** by means of self rivets **19**. The pole-piece element is disclosed more clearly in Fig. 4 of the drawings of the above-identified Bredehoft-Richardson patent. It terminates in extremities **21** and **22** which are so relatively disposed as to define an air-gap in which an armature **23** is adapted to vibrate under the joint control of the magnet coil **24** and a small cylindrical permanent magnet **25**. The armature **23** is mounted on a bracket **9** by means of a spring hinge **8**, the bracket being secured to the frame in any suitable manner and the hinge **8** to the bracket and armature preferably by rivets.

The coil **24** is mounted on a laminated core structure which, together with a silicon steel shunt **27**, is secured to the frame pieces **15** and **16** by screws **28**.

The structure thus far described constitutes essentially the magnetic and electrical elements of the ringer and forms no part of the present invention. The above-identified Bredehoft-Richardson patent contains a full description of these elements and their interrelationship, which description need not be repeated here.

The clapper rod **30**, which supports the clapper **31** at its upper end, is pivotally mounted on a relatively stiff rod **32** (Fig. 2) which is staked to the armature **23** at its (the armature's) upper end. A suitable pivot bearing is indicated at **33**. The lower end of the clapper rod **30** is formed to accommodate, in fixed relation, one end of a coil spring **34** the other end of which has fixed thereto one end of a cord **35** of silk or other suitable material. The cord **35** has its other end wound around a shaft or trunnion **36** which is housed in a cylindrical sleeve formed integral with the frame. A thumb wheel **37** is fixed to the outer end of the trunnion **36** by means

of a screw 38 and provides means for manually rotating the trunnion to vary the pull on the cord 35 and to correspondingly vary the tension of spring 34. The shank of thumb wheel 37 is provided with a series of small closely spaced cavities or indentations which cooperate with a stop 39 in maintaining the trunnion in any position to which it may be rotated. The stop 39 is fixed to the frame by means of a screw 40'.

When the tension in the cord 35 is low, little energy is transmitted to the gongs by the armature 23 incident to the latter's vibratory action which results from the energization of coil 24 by ringing current. Consequently, the gongs 17 and 18 will be struck relatively weak blows by the clapper 31 and the resulting sound signals will be of relatively low intensities. When the trunnion 36 is turned counterclockwise (Fig. 1) by the thumb wheel 37 to increase the tension in spring 34 and cord 35, the coupling between the armature and clapper rod will be strengthened and the gongs will be struck more powerful blows resulting in a greater sound output from the ringer.

It is to be noted that in tensioning the cord 35 a variable force is applied to the clapper rod 30 in a direction parallel to the longitudinal axis thereof and on a line which passes through the pivot point 33. When the tension is light the elastic coupling of clapper rod 30 to the armature extension 32 is one of very low stiffness and any increase in this tension increases the stiffness of the coupling and therefore enables more energy to be transmitted to the gongs by the armature.

With reference to Figs. 3 and 4 it will be observed that, except for the elements involved in the sound regulator of the embodiment of the invention disclosed therein, the ringer structure disclosed is substantially identical to that of Figs. 1 and 2. Similar parts of the two groups of figures therefor are given the same designations and the description thereof heretofore made with reference to Figs. 1 and 2 applies equally well to Figs. 3 and 4 and will not be repeated.

The clapper rod 40 supports the clapper 31 at its (the rod's) upper extremity and is pivotally mounted at 41 to an armature extension rod 42 which is staked or otherwise fixed to the armature 23 as shown. The lower end of the clapper rod 40 terminates in a magnetic iron pole-piece 43. A second pole-piece 45 is rigidly supported on armature 23 by the rod 44 in such a position that the pole-pieces 43 and 45 occupy the same plane. The pole-pieces 43 and 45 are semiannular discs having juxtaposed serrated edges which are in such close proximity as to effect a small air-gap.

A permanent magnet 46, which is substantially U-shaped, is supported on the upper end of an adjustable arm 47 and is adapted to ride to and fro on a slide rod 48 under the influence of a screw shaft 49 as it is rotated in either direction by the manipulation of the thumb wheel 37 by the subscriber. The frame 12 is provided with a cylindrical boss or hub 50 which is suitably bored to accommodate the screw shaft 49. A shoulder 51 is fixed to the shaft 49 and abuts the inner edge of the hub 50 to prevent the shaft 49 from moving axially to the left when the thumb wheel 37 is rotated. The shank of the thumb wheel abuts the outer surface of the frame 12 and prevents axial movement of the shaft to the right when the thumb wheel is rotated.

The arm 47, near its lower end, is suitably apertured to accommodate the slide bar 48 which is screw-ended for fixing it to the frame. The arm 47 also is provided with an internally threaded boss or hub 52 which accommodates the threaded end of shaft 49. As the thumb wheel 37 is rotated the shaft 49 rotates and causes the arm 47 to move laterally on the rod 48 in one or the other direction depending upon whether the thumb wheel is rotated clockwise or counterclockwise. As the arm 47 is thus moved, the spacing of the permanent magnet 46 relative to the pole-pieces 43 and 45 is increased or decreased.

As the permanent magnet is brought closer to the pole-pieces the magnetic flux in the gap increases causing an increase in the coupling between the clapper rod and the armature. As the magnet is moved away from the pole-pieces the magnetic flux in the gap decreases causing a decrease in the armature-clapper rod coupling. The energy transmitted by the armature to the clapper rod and, therefore, to the gongs is a measure of the strength of the armature-clapper rod coupling, which varies with variations in the air-gap flux. Through the thumb wheel 37, screw 49 and arm 47 the flux in the air-gap, and thus the effective stiffness of the clapper assembly, may be manually controlled by the subscriber.

Since the energy transmitted to the clapper determines the force with which the ringer gongs are struck, the sound output of the ringer varies in accordance with the flux in the air-gap effected by the pole-pieces 43 and 45.

Although two specific embodiments of the invention have been shown and described, it will be understood that they are but illustrative and that various modifications may be made thereon without departing from the scope and spirit of the invention.

What is claimed is:

1. In a telephone ringer, the combination of a vibratile armature, a clapper rod comprising a pair of magnetically coupled aligned sections arranged in spaced relation, one of said sections fixed to said armature and bearing a pole-piece, the other of said sections pivotally mounted on said armature and bearing a pole-piece, said pole-pieces being relatively disposed to define an air-gap, and manually operable means for adjusting the magnetic coupling of said sections comprising a permanent magnet and means for variably positioning said permanent magnet relative to said air-gap.

2. In a telephone ringer, a clapper assembly including a clapper, and means operative to move said clapper assembly, said clapper assembly comprising a clapper-bearing section pivotally mounted on the operative means and in an aligned cooperative relation to a fixed section also mounted on the operative means, pole-pieces terminating the cooperating portions of said sections to effect an air-gap, and means subjecting said air-gap to a magnetic flux to couple said pole-pieces.

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