Mar. 5, 1929. J. K. DELANO 1,703,926

LOUD SPEAKING TELEPHONE RECEIVER

Original Filed May 26, 1923

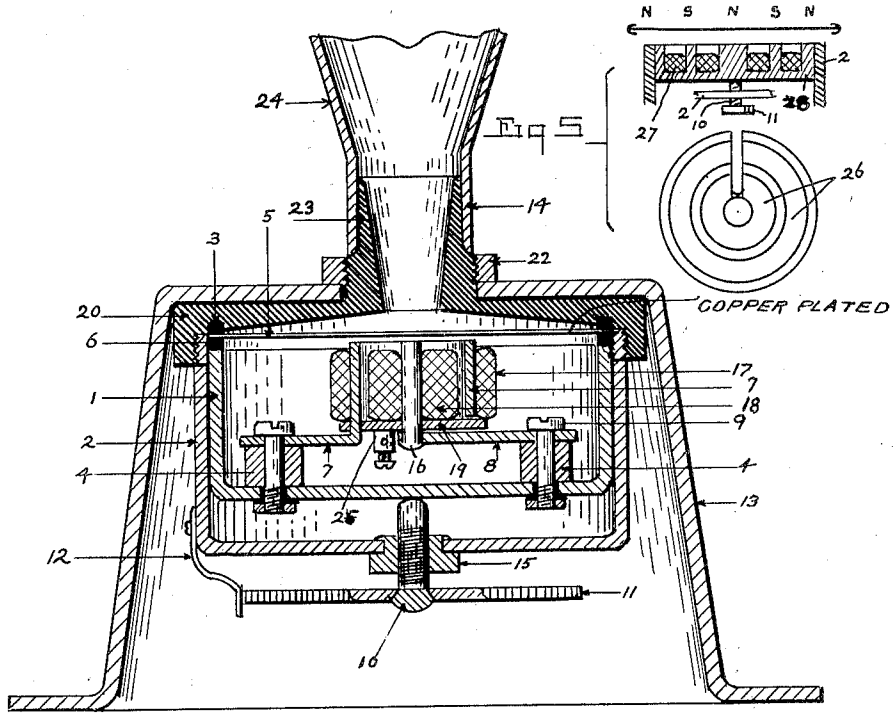


Fig 1

Fig 5

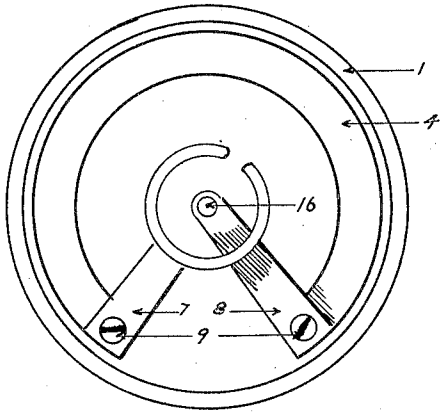


Fig 2

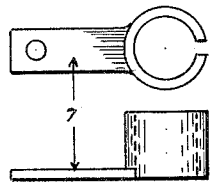


Fig 3

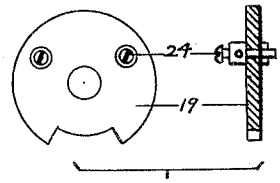


Fig 4

Inventor
James Kendel Delano

By his Attorney
John Thompson

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UNITED STATES PATENT OFFICE.

JAMES KENDAL DELANO, OF YONKERS, NEW YORK.

LOUD-SPEAKING TELEPHONE RECEIVER.

Application filed May 26, 1923, Serial No. 641,596. Renewed January 19, 1928.

This invention relates to loud speaking telephone receivers, and more particularly to those used in the radio art.

In the loud speakers heretofore it has been customary to employ essentially the same parts as are described in this invention but, due to the particular form and design of this invention, the parts are made so that distortion of voice and music is practically eliminated and a pleasing, mellow tone is the result.

The apparatus herein described is ordinarily used in conjunction with an amplifying horn of some character but is not precluded from being used with substantially the same construction for ordinary head receivers where great sensitiveness and response to signal strength are required.

With these and other objects in view, my invention consists in certain construction and combination of parts as will hereinafter be fully described and claimed, and illustrated in the accompanying drawings which form a part of this application and in which like figures of reference refer to corresponding parts in all of the views, and it is fully understood that while I have described my invention as here shown that I do not confine myself to the exact design as slight changes may be made without departing from the spirit of the invention.

In the drawings,

Figure 1 shows a vertical section of the device.

Figure 2 is a plan view of the magnet construction.

Figure 3 is a detail view of a part of the magnet pole.

Figure 4 is a detail view of the insulating washer for the magnet.

Figure 5 shows a different magnet system than shown in Figure 1.

Referring to the drawings the device comprises a drawn cup or shell 1, formed of non-magnetic material and nesting or contained within another drawn cup or shell 2, of suitable material and arranged to slide vertically therein; and the upper end of the shell 2 has a threaded portion which is screwed within the flanged part of a metallic holder 20 which forms the resonant chamber of the receiver and also has an extension 23 formed upon it to carry the ferrule 14 for the horn 24.

A diaphragm 5, of suitable material and which is hereinafter more fully described and which is of the same diameter as that of the shell 1, is wedged between the holder 20 and the upper edge of the shell 1, but separated from the holder 20 by a thin felt packing 3, and by a soft, pliable, rubber gasket 6 from the edge of the shell 1.

In the center of the shell 2 and concentrically affixed thereto is a bushing 15 which is formed with a machine thread of small pitch within its central hole; and within said hole is threaded a screw 10 having rigidly secured thereto a large coarse-knurled ratchet member 11, so arranged that by turning upon this knurled member 11 the screw 10 raises the shell 1, compressing the soft rubber gasket 6 between it and the diaphragm 5 so that the magnetic parts contained in the shell 1 are brought closer or further away from the diaphragm, depending upon the pressure of the screw 10.

A spring 12 is riveted to the shell 2 and so arranged as to catch in the ratchet member 11 and hold it in the proper position.

It has been found that there is a proper position of the magnets as regards distance from the diaphragm, and that this distance is so minute that unless a large member, such as 11, is employed, it would be extremely difficult to find this point but by having fairly fine ratchet teeth in the member 11 this point can readily be found and held by the method described.

This point also depends upon the voltage applied to the magnetic coil members and should be adjusted to suit different requirements of the user.

Contained within the shell 1, is a permanent magnet 4, of semi-circular form as shown in Figure 2, and is formed with two members 7 and 8 of magnetic material fastened to its poles by the screws 9, which also go through the bottom of the shell 1, and serve to hold the complete magnetic assembly.

The member 7 comprises a punched and formed member which is circular in shape having an extension formed at one end for the tubular part as shown; which is split as shown to prevent short-circuiting or eddy currents which might be induced into it by the rapidly fluctuating current of the magnetizing coil.

The member 8 is an extension carrying at one end a magnetic member of suitable material 16, and is affixed as shown in the drawings in the center of the circular part of the member 7.

These two members 7 and 8 form the poles of the instrument.

An insulating washer 19 of suitable material is interposed between the members 7 and 8 and is formed with a notch to conform to the shape of the member 7 so that it may not turn and tends to hold the parts rigidly together when they are assembled; and this washer 19 also carries the terminal posts 25 of the magnetic coils, shown in detail in Figure 4.

Referring to Figure 1 are shown the magnetizing coils 17 and 18; and if extremely loud tone or speaking is required, the coil 17 is connected in the circuit of the receiver. Great response can be obtained by having these coils of balanced electrical characteristics and placed in multiple in respect to each other, but having the polarity so they induce opposite poles in the magnetic structure. Also series connecting may be employed, depending on the requirements as regards volume of sound.

For ordinary use, however, the coil 18 alone could suffice.

These coils 17 and 18 are necessarily, when used in the ordinary circuit, of fairly high resistance except where a stepdown transformer is used for supplying current for the loud speaker. These coils are circular in shape and consequently are extremely efficient.

The coil 17 in respect to the coil 18 is arranged to induce the opposite polarity in pole 7 to that which coil 18 will induce in the pole 16 thereby being cumulative with the permanent magnetism supplied by the permanent magnet 4.

The circular form of the pole or member 7, and by reason of the pole or member 8 being in the exact center of the diaphragm 5, starts mechanical impulse through the diaphragm in its exact center spreading through the surface of the diaphragm equally in all directions and it has been found by experiment that the response and modulation is much better when this form is employed.

Special attention has been given to the construction of the diaphragm 5; that is, this diaphragm is made of a fairly stiff piece of magnetic material, such as steel or iron of the proper magnetic elements, and has a heavy plating of copper on the face next to the magnetic poles of the receiver.

This plating of copper not only causes the diaphragm to be somewhat less responsive to extremely sharp magnetic impulses, which would cause a rattle in the diaphragm, but it also lags the diaphragm by reason of hysteresis or eddy currents induced in the heavy copper plating; and it is therefore important to get a thick uniform coating of copper plating on the diaphragm for the best results.

Other diaphragms of different characters, such as corrugated iron or of mica or bakelite, with iron magnetic centers may be employed but I have found that the diaphragm described above gives the best results.

The speaker as here shown is mounted by having a casing 13 provided to which it is secured by the jam nut 22 threaded upon the neck of the member 20.

This also serves to hold the parts of the device in an upright position and also is of weight sufficient to counterbalance an amplifying horn so that the device will not readily upset.

Other forms of mounting, other than that shown may be employed without detracting from the essentials of this invention.

Referring to Figure 5 of the drawings, a different magnet system is shown, comprising a member 28 circular in form with a number of deep concentric grooves 26 within which the coils 27 are imbedded. These grooves 26 may be any number in respect to bringing out the requisite number of poles. In the drawing two grooves are shown, thus giving three polar projections; two coils are shown so wound to induce the center polar projection and outside projection of one polarity and the intermediate projection the other polarity. This magnet system may be employed with or without permanent magnetism as in other forms and where the current is of sufficient strength to cause the coils to magnetize the structure. This design is especially useful where the diaphragm of the speaker is of large diameter and where the lower octaves of the voice or music is to be reached as it can be made of sufficient diameter to cover more of the diaphragm surface and prevent undue vibration by its magnetic pull on the surface of the diaphragm.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is—

1. In a loud speaking telephone receiver, a circular shell containing a magnetic system, a diaphragm in magnetic responsive relation thereto, said diaphragm being composed of magnetic material and highly conductive material so placed that current is induced in said diaphragm by current variations in the magnetic system.

2. In a loud speaking telephone receiver, a circular shell containing a magnetic system, a diaphragm made of magnetic responsive material and highly conductive material so arranged that eddy currents are induced in said conductive material simultaneously when the magnetic material is responding to fluctuations in the magnetic system.

3. In a loud speaking telephone receiver, a circular shell containing a magnetic system, a diaphragm made of magnetic responsive material and highly conductive material so arranged that eddy currents are induced in said conductive material simultaneously when the magnetic material is responding to fluctuations in the magnetic system and

means to vary the proximity of said diaphragm and the magnetic system.

4. In a loud speaker mechanism, a diaphragm having highly electrical conductive material incorporated in its construction and in inductive and responsive relation to a magnetic system energized by voice frequency current.

5. In a loud speaking telephone mechanism, a magnetic system, a diaphragm in responsive relation thereto, said diaphragm being composed of magnetic material and of low resistance material so that the responsive action of the magnetic material caused by fluctuations in the magnetic system is electrically damped by induced currents in the low resistance material.

6. In a device of the class described, comprising two members telescoped one within the other, a resonating chamber secured to the end of the outer telescopic member, a diaphragm mounted between the resonating chamber and the inner telescopic member, a permanent magnet mounted within the inner telescopic member, poles secured to the ends of said magnet, one of said poles formed with a tubular extension having an open side, the other pole formed with a circular stem concentric with said tubular extension, and means to adjust the interior telescopic member relative to the exterior telescopic member whereby the distance between the magnet poles and the diaphragm may be varied.

In testimony whereof I hereunto affix my signature.

JAMES KENDAL DELANO.