Oct. 6, 1936. E. G. SHOWER 2,056,300

ACOUSTIC DEVICE

Filed May 31, 1934

FIG. 1

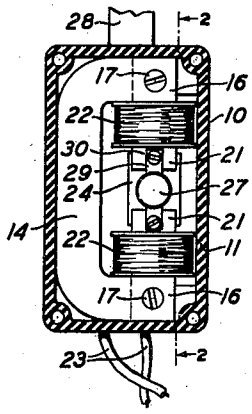


FIG. 2

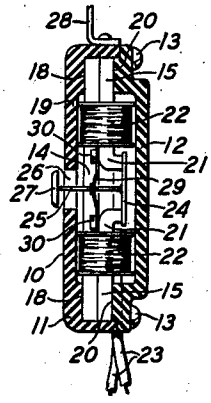


FIG. 2A

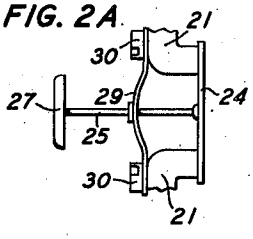


FIG. 2B

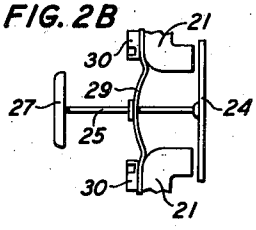


FIG. 4

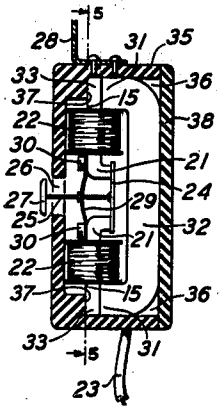


FIG. 5

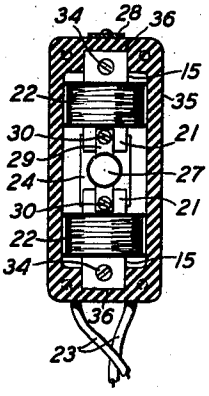


FIG. 3

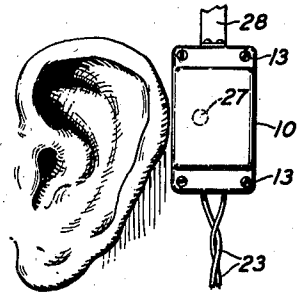


FIG. 6

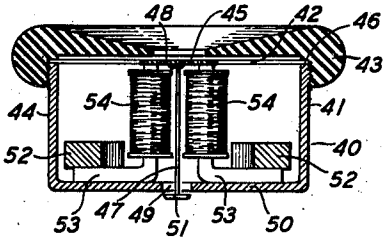
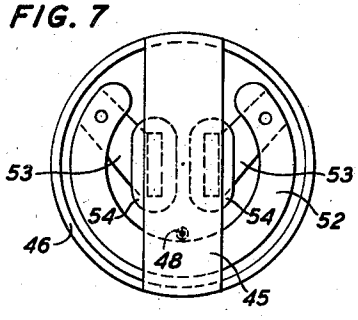


FIG. 7



INVENTOR
E. G. SHOWER
BY
Walter C. Kiesel
ATTORNEY

Patented Oct. 6, 1936 2,056,300

UNITED STATES PATENT OFFICE

2,056,300

ACOUSTIC DEVICE

Edmund G. Shower, New York, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application May 31, 1934, Serial No. 728,406

2 Claims. (Cl. 179—107)

This invention relates to acoustic devices, and, more particularly, to a bone conduction telephone receiver.

An object of this invention is to improve the efficiency and operating characteristics of the bone conduction type receiver.

A feature of this invention comprises a receiver having a sound wave frequency responsive member connected to a bone actuating member and normally in contact with the magnet structure of the receiver.

A further feature comprises a receiver having a bone actuating member connected eccentrically to the receiver vibratory member, and functioning, when in use, to force the vibratory member away from the receiver magnet structure.

Still other features will be apparent from the detailed description which follows hereinafter.

An acoustic device in accordance with this invention comprises, preferably, a flattened magnet structure having pole-pieces, an armature normally lightly pressed against or in contact with the faces of the pole-pieces, an elongated, vibrations-conducting rod connected at one end to the armature and terminating at its other end preferably in a button-shaped member adapted to engage with the mastoid eminence of the user, and means, for instance, a spring member, for supporting the rod and armature. In operation, the button-shaped member is pressed, preferably, against the user's mastoid eminence, and the armature is forced away from the pole-pieces. The gap between the pole-pieces and the armature, with this arrangement, may be maintained at a minimum for efficient operation.

A modification of the invention comprises an acoustic device having a casing enclosing a magnet structure having pole-pieces, and supporting a stiff strip of magnetic material on its rim portion and adjacent the faces of the pole-pieces in contact therewith or spaced slightly therefrom. An elongated, vibrations-conducting rod or member is connected at one end to the strip at a point intermediate the midportion and one end thereof, and at its other end passes through an opening in the casing to terminate, preferably, in a button-shaped member adapted to be pressed against the mastoid eminence of a user. When the device is in use, the pressing of the button member against the user's body increases the separation between, or spaces apart the pole-pieces and magnetic strip.

A more complete understanding of this invention will be obtained from the detailed description which follows, read with reference to the appended drawing, wherein:

Fig. 1 is a sectional view of a bone conduction receiver embodying this invention;

Fig. 2 is a sectional view of the device of Fig. 1 taken along the line 2—2 thereof;

Figs. 2—A and 2—B are enlarged views of a fragment of the device of Fig. 1 and show the position of the receiver armature when the device is not in use and when it is in use, respectively;

Fig. 3 shows how a receiver embodying this invention would be used;

Fig. 4 is a sectional view of another embodiment of this invention;

Fig. 5 is a sectional view of the device of Fig. 4 taken along the line 5—5 thereof;

Fig. 6 is a sectional view of still another embodiment of this invention, and

Fig. 7 is a plan view of the device of Fig. 6 with the cover member removed.

The acoustic device of Figs. 1–3 comprises a bone conduction receiver, designated generally 10, comprising a case or enclosure 11 having an open end closed by a cover member 12 held in place by any suitable fastening means, for instance, screws 13. The case contains a substantially U shaped permanent magnet 14, for instance, of cobalt steel, pole-pieces 15, for instance, of silicon steel, being secured to the end portions 16 of the magnet by any suitable means, such as the screws 17, the adjacent portions of the magnet and pole-pieces being clamped between the ridge portion 18 on the wall portion 19 of the case, and the ridge portion 20 on the cover member 12. The adjacent but spaced end portions 21 of the pole-pieces are bent substantially at right angles. An energizing winding comprising coils 22 is supported on the pole-pieces, and is connected with a source of sound wave frequency electric signal impulses through the conductors 23. An armature member 24 of any suitable magnetic material, normally in contact with and pressed lightly against the bent end portions of the pole-pieces, is connected at its midportion to a vibrations-conducting or transferring member or elongated rod 25 that extends between the pole-pieces and through an aperture 26 in the case wall 19, terminating in an enlargement or button member 27 adapted to engage with the mastoid eminence of a user's head when the receiver 10 is supported on the user's head by the head strap or band 28, as shown clearly in Fig. 3. The rod and armature are supported by a resilient strip or spring member 29, of non-magnetic material, such as phosphor

bronze, bowed in a direction away from the armature, attached at its mid-portion to the rod 25 intermediate the armature and button member, and at its extremities to the pole-pieces by any suitable means, such as the screws 30.

In use, the receiver 10 is mounted as shown in Fig. 3 so that pressure is exerted on the button member to force the armature away from the ends of the pole-pieces as indicated in Fig. 2—B. Since the reluctance of the magnetic path is at a minimum when the air-gap length is a minimum, it is obvious that the efficiency of the receiver will be at a maximum for the lightest pressure at which the receiver will operate at all. Since the armature is forced away from the pole-pieces, it is obvious, of course, that there is no tendency for the armature to freeze to the pole-pieces while the receiver is in use.

In the bone conduction receiver of Figs. 4 and 5, the end portions 31 of the substantially U shaped permanent magnet 32 are secured to the end portions 33 of the pole-pieces 15 by any suitable fastening means, such as screws 34, the case 35 being provided with grooves 36 to receive the end portions of the pole-pieces and magnet which are clamped between the shoulders 37 and the case cover member 38. This receiver is otherwise the same as that of Figs. 1 to 3.

The acoustic device of Figs. 6 and 7 comprises a bone conduction receiver, designated generally 40, comprising a case or enclosure 41 having an open end 42 closed by a cover member or cap 43, threadedly engaging the wall portion 44 and clamping a vibratory strip or armature 45 of any suitable magnetic material across the open end of the case and against the rim 46 thereof. A vibrations-conducting member or elongated rod 47 is connected at one end 48 to the armature at a point intermediate the mid-portion and one end of the armature, and extends through an aperture 49 in the end wall 50 of the case to terminate in an enlargement or button member 51 adapted to engage with the mastoid eminence of a user's head. Within the case are disposed a permanent magnet 52, arcuate in shape and being, for instance, of cobalt steel, a pair of L shaped pole-pieces 53, for instance, of silicon steel, and an energizing winding comprising coils 54 wound on the vertical portions of the pole-pieces. The ends of the pole-pieces are lightly engaged by the armature which, when the receiver is in use, is forced away from the pole-pieces, the armature being vibrated in accordance with the sound wave frequency electric signal impulses passing through the energizing winding, these vibrations being communicated to the user by the vibration of his head bones.

While this invention has been disclosed with reference to several specific embodiments thereof, it is to be understood that various modifications in structure are possible without departing from the invention, the scope of which is to be considered as limited by the appended claims, only.

What is claimed is:

1. A bone conduction receiver comprising a magnetic structure having a reentrant pole-piece portion, an energizing winding for said structure, an armature between said reentrant portion and another portion of the structure, means connected to said armature for transferring its vibrations to the head bone structure of a user, and a single, bowed spring supported on said pole-piece portion and supporting said means.

2. A bone conduction receiver comprising a magnetic structure having a permanent magnet and pole-pieces projecting toward and whose pole-faces are spaced from the permanent magnet, an energizing winding for said structure, an armature between said pole-pieces and said magnet, means connected to said armature for transferring the armature vibrations to the head bone structure of the user, and means supported on the pole-pieces and supporting said vibrations transferring means, said means comprising a single, bowed spring.

EDMUND G. SHOWER.