

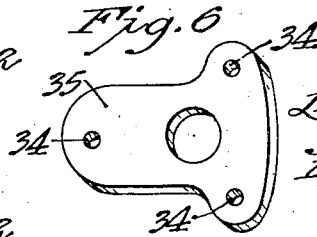
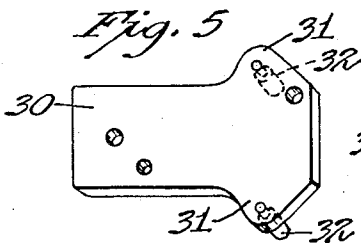
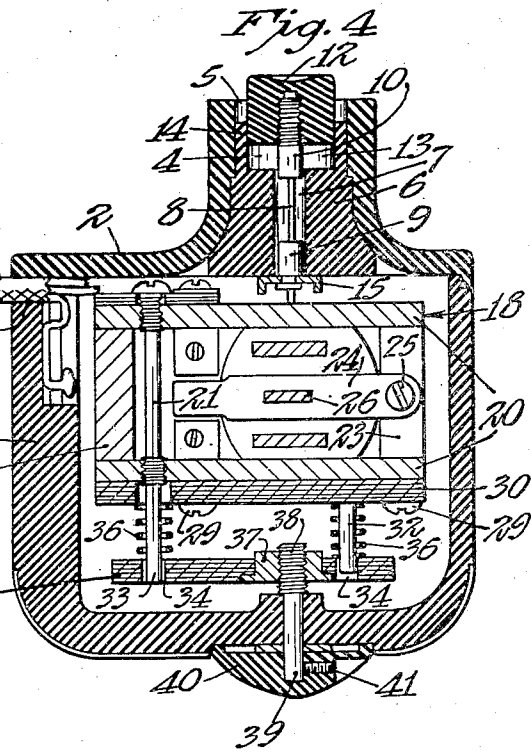
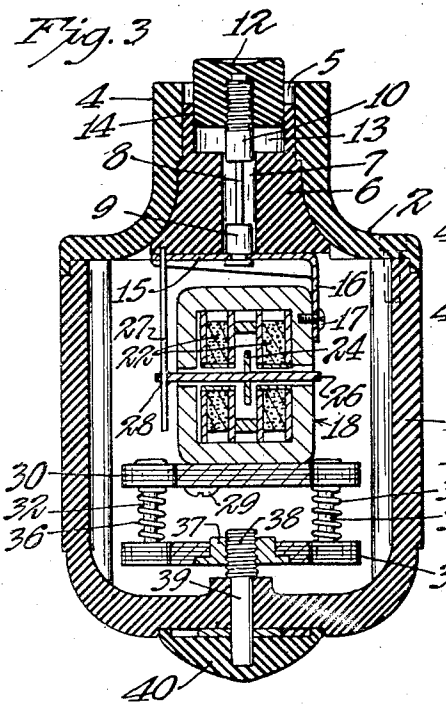
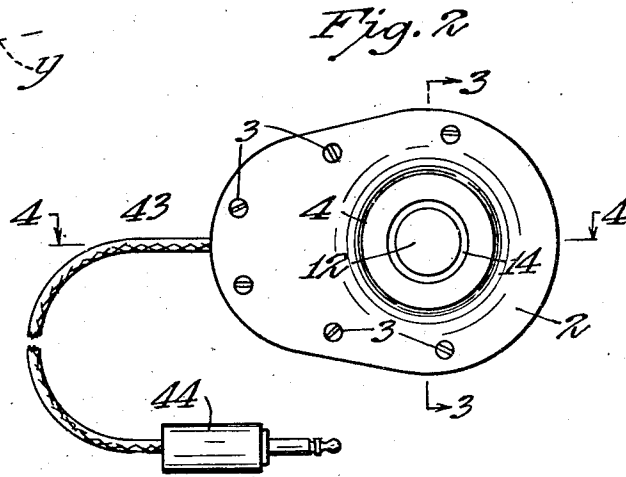
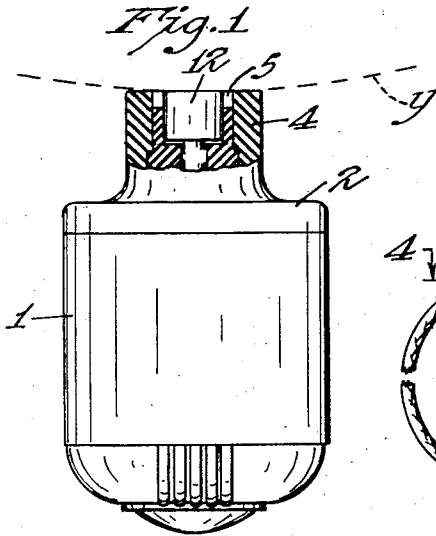
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2,454,494

BONE CONDUCTION RECEIVER

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BONE CONDUCTION RECEIVER

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2 Claims. (Cl. 179-107)

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Our invention relates to bone conduction receivers of the type utilized in the audiometric testing of hearing to determine air and bone conduction acuity and their relationship.

In making audiometric examinations or tests, it is extremely important that accurate measurements of bone conduction be obtained because increased bone conduction in relation to the air conduction curve of the audiometer indicates the auditory nerve itself is healthy and that the deafness is primarily an obstructive form. Increased bone conduction is one of the principal indications of an otosclerotic type of deafness. Decreased bone conduction is an indication that there is nerve deafness present. This determination has taken on added importance with the advent of the fenestration operation.

Previously in audiometric testing of hearing to determine air and bone conduction acuity and their relationship, one of the great problems with a bone conduction receiver has been the variation in the hearing acuity register and the variations of output of the receiver to the bone of the skull depending upon the pressure with which the surface or point of contact was applied against the mastoid process.

Our invention has for its object the provision of a device wherein the pressure of the bone conduction contact piece of the bone conduction receiver against the bones of the skull or mastoid process is capable of being maintained constant, irrespective of the degree of force exerted by the holder of the bone conduction receiver unit against the head.

Another object of our invention is to provide a bone conduction receiver in which the recordable pressure of the bone conduction contact piece against the bones of the skull or mastoid process may be adjusted within desired limits.

The above and still further objects and advantages of our invention will become apparent from the following detailed specification, appended claims and attached drawings.

Referring with greater particularity to the drawings:

Fig. 1 is a top plan view of a housing enclosing our novel bone conduction receiver unit;

Fig. 2 is a front elevational view;

Fig. 3 is a transverse section taken on the line 3-3 of Fig. 2;

Fig. 4 is a vertical axial section taken on the line 4-4 of Fig. 2;

Fig. 5 is a fragmentary perspective view; and

Fig. 6 is a fragmentary perspective view.

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Referring with greater particularity to the drawings, the numeral 1 indicated a cup-like housing or casing, preferably made of plastic or other electrical insulating material. The open end of housing 1 is normally closed by a cap or cover 2 and cooperating circumferentially-spaced screws or the like 3. Cap 2 is formed, preferably integrally, with an outwardly-projecting sleeve or hub 4 having an opening 5 into which is fitted a guide block 6, preferably of soft rubber or other resilient material. Guide block 6 has an opening 7 therethrough, which is concentric with the opening 5 through the hub 4. Slidably mounted in the opening 7 of the guide block 6 is a plunger 8 shown as having enlarged inner and outer ends 9 and 10, respectively. Secured to the outer end 10 of plunger 8, by screw-threaded engagement therewith, is a conduction contact button or element 12 which slides in a recess 13 provided by a sleeve-like extension 14 of guide block 6, and normally projects outwardly beyond the end of hub 4.

Rigidly secured to the inner end 9 of plunger 8 is a bracket 15 having a downturned end 16 to which is secured, by means of screws or the like 17, a conventional magnetic reproducer identified in its entirety by the numeral 18, and including a permanent magnet 19, a pair of opposed spaced brackets 20 secured to the permanent magnet by means of a threaded stud 21 and providing a magnetic extension thereof, a pair of electro-magnetic coils 22, a non-magnetic spacer 23, between the ends of the brackets 20, a vibratory tongue 24, one end of which is secured to the intermediate portion of the spacer 23 by means of a screw 25, and an armature 26, secured to the intermediate portion of the tongue 24 and adapted to move between the electro-magnetic coils 22 responsive to electro-magnetic pulls within the unit 18.

A link in the form of a pin 27 is rigidly secured at one end to the bracket 15, and adjacent its other end to the outwardly-projecting end of armature 26 as indicated at 28.

Secured to one of the brackets 20, by means of screws 29 or the like, is an elongated insulating member in the form of a plate 30, preferably and as shown, being cut from sheet material. Secured to laterally-projecting ears 31 of plate 30 are a pair of outwardly-projecting pins 32, which, together with the lower end 33 of threaded stud 21, provide a plurality of guide pins. Guide pins 32 and 33 extend through openings 34 in a thrust plate 35, which exerts a yielding pressure on the plate 30 and the magnetic re-

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producer 18, through coil compression springs 36 mounted on the pins 32 and 33 between the plates 30 and 35. A nut 37, seated in the thrust plate 35, receives the threaded end 38 of a tension-adjusting shaft 39 which is journaled for rotation in the bottom of the cup-like housing 1 and is provided at its extreme outer end with a turning knob 40 secured thereto by a set screw or the like 41.

Through an opening 42 in the housing 1, a suitably insulated conducting wire or cable 43 leads from the coils 22 to a source of electric current and recording devices, not shown, through a plug or the like 44.

Operation

When the device is not in use, the spring elements 36, working against the thrust plate 35, the plate 30, magnetic reproducer 18, bracket 16, plunger element 8, and contact button 12 are all biased in an outward direction so that the button 12 projects beyond the end of the sleeve 4. With the device in this position, the spring elements 36 may be placed under a desired degree of compression so as to cause them to exert a predetermined outward pressure upon the plunger 8 and contact button 12, by manipulation of the knob 40. When the sleeve 4 is then brought into contact with the skull or mastoid process, indicated by broken line *y* in Fig. 1, the contact button 12 is inwardly pressed, against the action of the compression spring 36, to a point where it is substantially on the same plane as the outer end of the tubular hub or sleeve 4. It should be obvious that irrespective of the pressure exerted through the housing 1 and sleeve 4 to the skull, that the pressure exerted by the contact button 12 against the skull will remain uniform at the predetermined pressure set by the knob 40. As the pressure is increased, by compressing springs 36, the greater the inward thrust by link 27 against armature 26, and consequently the greater the dampening effect upon the vibratory movements of the same.

What we claim is:

1. An audiometric device for determining bone conduction acuity comprising a casing having a head-engaging portion, a plunger mounted for limited reciprocating movements in said head-engaging portion and normally projecting outwardly therefrom, a magnetic reproducer having a vibratory element mounted for reciprocation within said casing, means rigidly connecting the

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plunger to the vibratory element on the reproducer, a thrust plate in said casing, yielding biasing means interposed between the thrust plate and the magnetic reproducer, and means for imparting movements to the thrust plate whereby to vary the pressure exerted by the yielding biasing means against the reproducer and plunger, said last-mentioned means terminating in a manually operatable knob exterior of the casing and remote from said plunger.

2. An audiometric device for determining bone conduction acuity comprising an open-ended casing, a cap normally closing the open end of said casing, a sleeve projecting outwardly approximately at right angles to said cap, a magnetic reproducer unit having a vibratory element mounted for limited axial reciprocal movements within said housing, an annular resilient grommet in said sleeve, said grommet having an enlarged axial opening at its outer end and a restricted axial opening connecting its inner end with said enlarged opening, a magnetic reproducer unit having a vibratory element within said casing, a plunger mounted for reciprocal movements in the restricted passage in said grommet and having its inner end rigidly connected to said vibratory element, a contact button on the outer end of said plunger within the enlarged open end of said grommet and normally projecting axially outwardly of said sleeve, a thrust plate within said casing, yielding biasing means interposed between said thrust plate and said magnetic reproducer, and means terminating in a knob exterior of said casing and opposed to said plunger for varying the bias exerted by the yielding means upon said magnetic reproducer.

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