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2,652,457

HEADBAND FOR HEARING AID TRANSDUCERS

Original Filed Nov. 13, 1946

Fig. 1

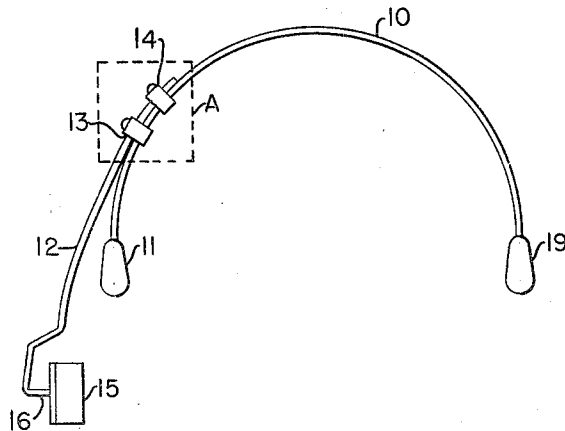
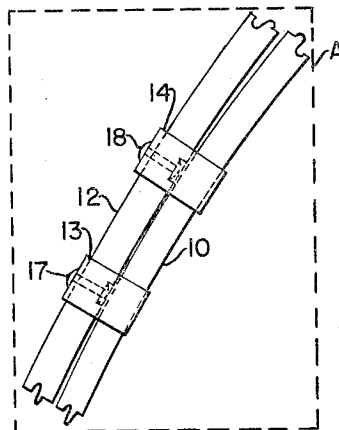


Fig. 2



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UNITED STATES PATENT OFFICE

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HEADBAND FOR HEARING AID
TRANSDUCERS

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Original application November 13, 1946, Serial No.
709,580. Divided and this application February
12, 1949, Serial No. 76,068

1 Claim. (Cl. 179—156)

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This is a divisional application of application Serial No. 709,580, now abandoned, filed November 13, 1946, in the name of Hugh S. Knowles for a Bone Conduction Unit.

This invention relates to an improved headband for a bone conduction transducer and more particularly to such a headband adapted to support a bone conduction transducer upon a user's head in such a fashion as to provide optimum efficiency and comfort.

One type of headband, which has previously been used for such purposes, utilizes a resilient U-shaped member which is arranged to encompass the user's head. The transducer is positioned at the extremity of one leg of the U. Thus, the pressure with which the transducer is sustained against the mastoid bone is directly dependent on the pressure which is exerted across the legs of the U. Since different users require different pressures in order to maintain the headband on the head, optimum pressure is difficult to attain for all cases.

Therefore, it is an object of this invention to provide an improved headband which sustains a bone conduction transducer against the mastoid bone of the user at a fixed pressure, independent of the pressure required to maintain the headband on the user's head.

A hearing aid apparatus constructed in accordance with the invention includes a headband arranged to engage a user's head and to provide a supporting portion. A bone conduction transducer, constructed to vibrate within a predetermined band of frequencies, is included in the apparatus, and a single resilient distortable member is mechanically connected to the supporting portion of the headband, extending beyond one termination of the headband effectively to constitute an extension thereof and supporting the transducer at its free end. The mechanical system comprising the resilient member and the transducer has a natural resonant frequency below the band of frequencies within which the transducer operates.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claim. The present invention itself, both as to its organization and manner of operation, together with further objects and advantages thereof may best be understood by reference to the following description taken in connection with the accompanying drawing in which:

Figure 1 shows a headband embodying the present invention, and

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Figure 2 shows an enlarged sectional view of the portion A of Figure 1.

Referring to Figure 1 of the drawing, the headband shown therein includes a U-shaped, head engaging, resilient strap member 10 having buttons or padded portions 11 and 19 positioned at the ends thereof. A second, elongated, resilient member 12 is slidably positioned, at one end, on member 10 by means of clamps 13 and 14. A bone conduction unit 15 is positioned at the other end of member 12 on a support pin 16.

In applying the headband to the head of a user, resilient member 10 is physically distorted in such a manner that the pressure exerted upon buttons 11 and 19 suits the needs of the user. The position of bone conduction transducer 15 is adjusted by sliding member 12 with respect to member 10. Member 12 then is physically distorted in such a manner that the bone conduction transducer 15 is sustained in contact with the user's mastoid bone at a pressure which provides optimum transmission efficiency of the transducer. This bone conduction transducer may, for example, be of the pressure-warning type illustrated in copending application Serial No. 560,667, filed October 27, 1944, now matured into Patent 2,459,325, entitled "Bone Conduction Unit," in the name of Hugh S. Knowles, and assigned to the same assignee as the present application.

Resilient member 12 and transducer 15 form a mechanical system to which a mechanical natural resonant frequency can be attributed. In one form of the invention, it is important that this resonant frequency occur outside of the band of operating frequencies for the transducer in order that the frequency response characteristics thereof be unaffected. It is apparent that by forming member 12 of small cross-sectional area as compared with its length and of a material having a relatively low modulus of elasticity, a resonant frequency below that of the lowest operating frequency for the transducer can be attained. It is equally apparent that by proper construction of resilient member 12, a natural resonant frequency for the mechanical system can be attained which is above that of the highest operating frequency for transducer 15.

Figure 2 shows in detail the portion A of Figure 1 which includes clamps 13 and 14. There are also shown rivets 17 and 18 which permanently fasten member 12 to clamps 13 and 14, respectively. The clamps individually encompass member 10 which is free to slide therein and with respect to member 12. Member 10 is maintained

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at any selected position with respect to member 12 since clamps 13 and 14 are constructed to grasp the members 10 and 12 into close frictional engagement therewith.

It may be seen that the arrangement of Figure 1 provides a headband which maintains a bone conduction transducer in operative position with optimum pressure irrespective of the pressure needed to maintain the headband on the head of the user. Also, this feature reduces the tendency of a transducer 15 to "crawl" off the mastoid bone.

The frequency response characteristic for the transducer depends on contact pressure. Thus, by providing a uniformly compliant connection 15 affording constant pressure between the transducer and the user's head the desired frequency-response characteristic can be maintained.

While a particular embodiment of the present invention has been shown and described, it is apparent to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects, and therefore, the aim in the appended claim is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

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I claim:

Hearing aid apparatus including, a headband arranged to engage a user's head and to provide a supporting portion; a bone conduction transducer constructed to vibrate within a predetermined band of frequencies; and a single resilient distortable member mechanically connected to said supporting portion of said headband, extending beyond one termination of said headband effectively to constitute an extension thereof, and supporting said transducers at its free end, the mechanical system comprising said resilient member and said transducer having a natural resonant frequency below said band of frequencies.

HUGH S. KNOWLES.

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