

- [54] HEADSETS
- [75] Inventor: **Anthony Graham Gorman**, Ruislip, England
- [73] Assignee: **Amplivox Communications Limited**
- [22] Filed: **May 2, 1972**
- [21] Appl. No.: **249,602**

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Primary Examiner—William C. Cooper
Attorney, Agent, or Firm—Lawrence E. Laubscher

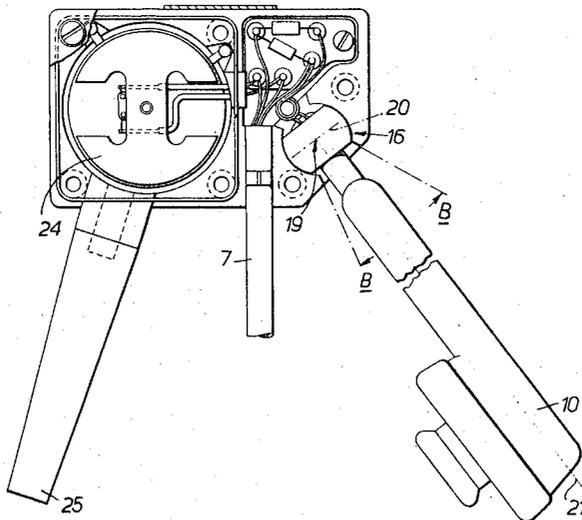
- [30] Foreign Application Priority Data
May 17, 1971 Great Britain..... 15355/71
- [52] U.S. Cl. 179/156 A, 179/178
- [51] Int. Cl. H04m 1/05
- [58] Field of Search..... 179/156 R, 156 A

[57] ABSTRACT

A headset is provided with a mounting member attached to the headband or for mounting on a spectacle frame. The earpiece is in the end of a support member which is pivotally mounted on the mounting member in such a way that it can rotate about two mutually perpendicular axes perpendicular to the longitudinal axis of the support member.

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9 Claims, 9 Drawing Figures



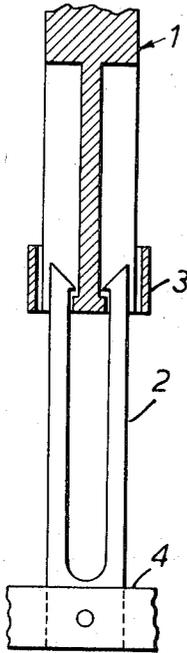


FIG. 1a.

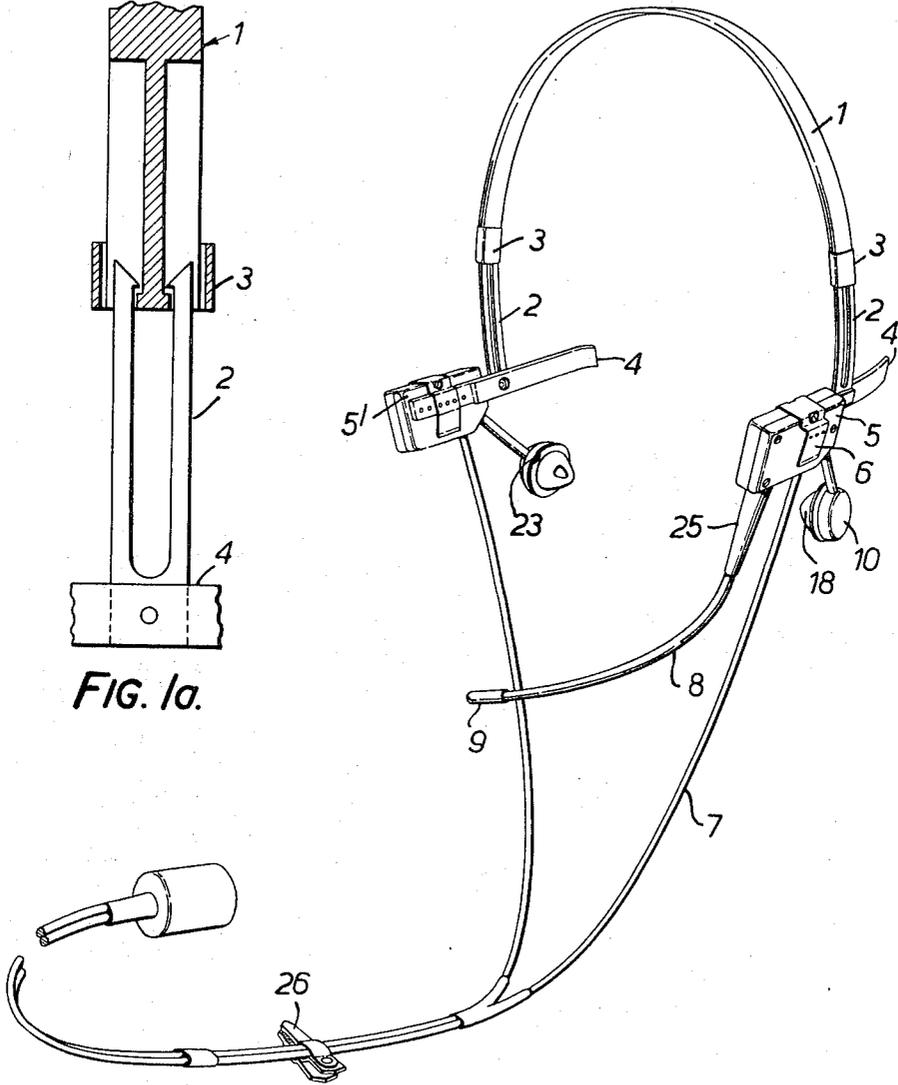


FIG. 1.

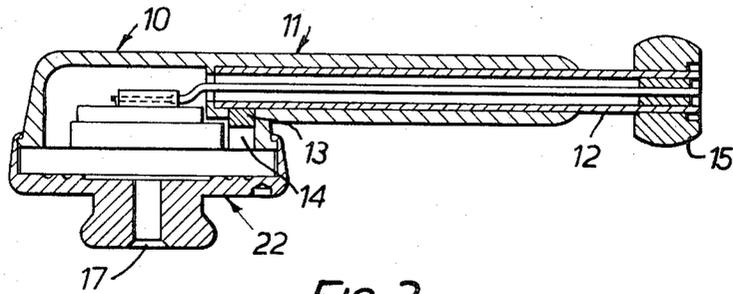


FIG. 2.

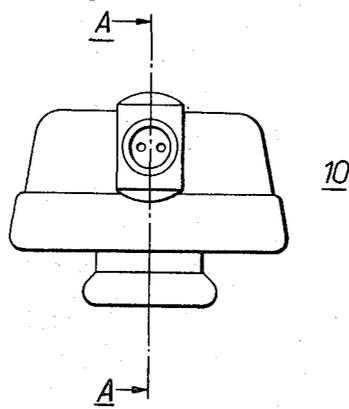


FIG. 2a.

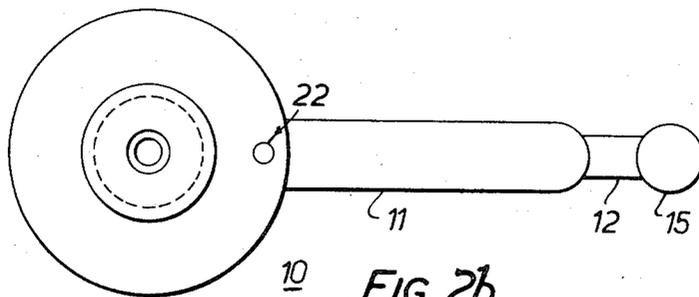


FIG. 2b.

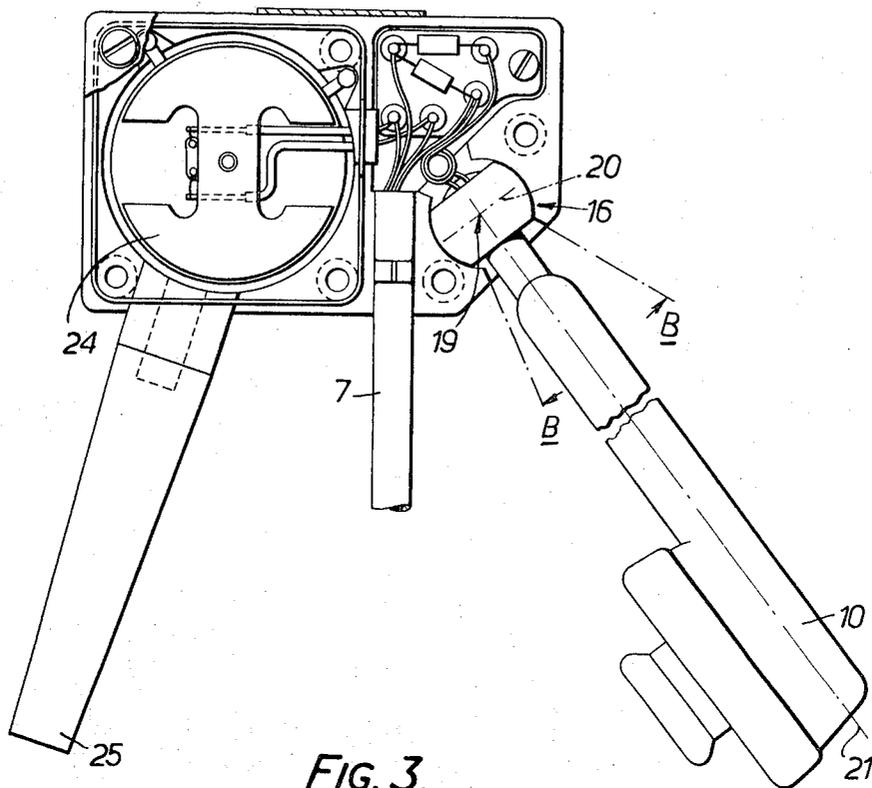


FIG. 3.

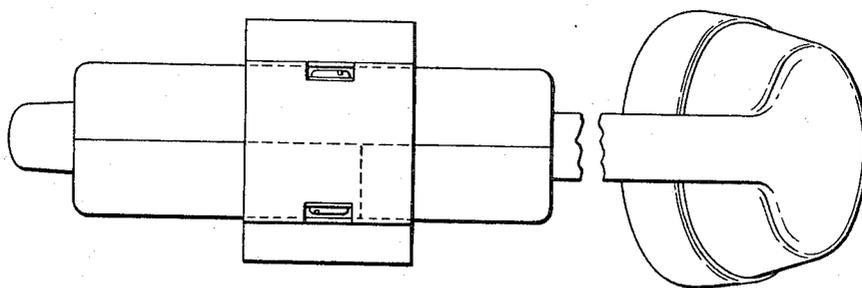


FIG. 3a

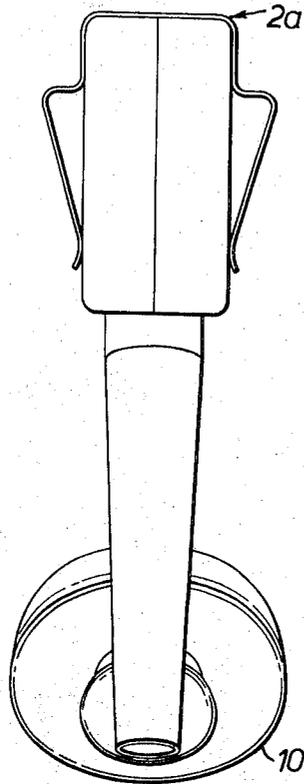


FIG. 3b.

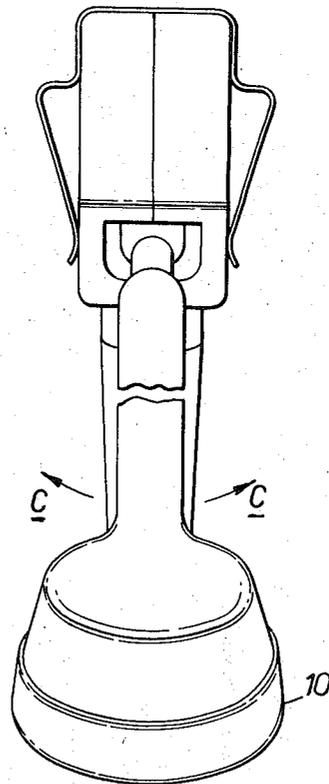


FIG. 3c.

1
HEADSETS

This invention relates to earphone assemblies.

There is an increasing tendency towards reducing the bulk and weight of material which has to be seated on the human head in order to provide listening and/or speaking facilities. The use of lightweight headsets offers increased comfort and reduced wearing fatigue.

Some devices in use at present tend to use modern, sub-miniature hearing aid type transducers both for the earphone and the microphone. The transducers are contained within the smallest possible housing and this housing is suitably attached to a side arm which is in turn mounted on a lightweight adjustable headband.

The sound from the wearer's mouth is conveyed to the microphone unit by an acoustic tube shaped in the form of a boom arm such that its open end is adjacent to the wearer's mouth whilst the other end is acoustically coupled to the microphone transducer. The acoustic boom is normally adjustable, as necessary, to permit proper location of the open end close to the wearer's mouth.

The earphone is coupled to the wearer's ear by means of a flexible acoustic tube which terminates in some suitable type of eartip. This eartip has to be firmly inserted into the outer end of the ear canal of the wearer's ear in order properly to convey sound to the wearer. The earphone and earphone coupling arrangements are therefore substantially identical to those commonly used in ear level hearing aids.

The system used in such headsets is open to the objection that eartips inserted into the ear canal are not popular either from the point of view of comfort or of hygiene. There is a distinct danger of skin irritation or even infection of the ear canal due to the continued use of a close-fitting eartip. In addition, the necessary acoustic tube between the earphone transducer and the wearer's ear introduces undesirable resonances and anti-resonances into the frequency response of the complete earphone arrangement and these resonances and anti-resonances cause a deterioration in both the quality and intelligibility of the received sound.

It is an object of the present invention to provide an arrangement in which one or more of the above mentioned disadvantages are overcome or reduced.

The invention comprises an earphone assembly comprising a mounting member provided with means for attachment to a device to be worn on the head, an earpiece support member mounted on said mounting member, said support member including an earpiece at its end remote from said mounting member, said support member being mounted on said mounting member by mounting means which permit pivoting of said bracket about each of two mutually perpendicular axes perpendicular to the longitudinal axis of said support member.

Preferred features and advantages of the invention will become apparent from the following description of an embodiment thereof, given by way of example, in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of the headset described herein;

FIG. 1a shows a detail of the headband of said headset;

FIG. 2 is a vertical section of the earphone assembly of said headset along the line A—A of FIG. 2a;

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FIG. 2a is an end view of the earphone assembly;

FIG. 2b is a plan view of said earphone assembly;

FIG. 3 is a view of the microphone-earphone assembly of said headset with the cover removed;

FIG. 3a is a view of the microphone-earphone assembly as seen from the upper edge of the drawing shown in FIG. 3;

FIG. 3b is a view of the microphone-earphone assembly as seen from the left-hand side of the drawing shown in FIG. 3; and

FIG. 3c is a view of the microphone-earphone assembly as seen from the right-hand side of the drawing shown in FIG. 3.

Referring to FIG. 1, reference numeral 1 indicates a lightweight headband composed of a suitable plastics material, preferably acetal resin. This headband has two sliding metallic extension members 2, which permit proper fitting of the headband assembly to the necessary range of head sizes. In order to provide greatest comfort and minimum sizes, these sliding extensions consist of two long fingers which slide in slots in the front and rear edges of the plastic headband so that nothing protrudes beyond the outer surfaces of the headband. Small inwardly projecting teeth at the upper ends of the fingers come up against small outwardly projecting features at the lower ends of the moulded slots in the headband so as to prevent the sliding members 2 from completely disengaging from the headband. Two small sleeves 3 prevent the upper ends of the fingers from spreading apart and perhaps overcoming the action of the previously-mentioned teeth.

At the lower ends of members 2 are two side arms 4 which serve the dual purpose of providing security of fitting to the wearer's head and support for the earphone/microphone unit 5 mounting member. The unit 5 can be fitted to the side arm on either side of the headband assembly or alternatively two units can be fitted, one on each side of the headband assembly to provide binaural listening. In this case, the second unit 5' would normally only contain an earphone arrangement.

The side arms 4 can be rotated to be parallel with the headband when unit 5 or units 5 and 5' are not fitted so as to permit packing in the smallest possible carrying container.

Units 5 and 5' are retained on the side arms 4 by suitable spring clips 6 and the earphone/microphone units 5 can be slid forwards or backwards on the side arms 4 to assist proper fitting of the earphones to the wearer's ears. A locating arrangement consisting of a series of pips on the inside faces of the side arms 4 and a series of mating holes in the clips 6 ensures that the earphone/microphone units remain in the chosen position on the side arms.

The earphone/microphone units can alternatively be fitted to normal spectacle frame side arms by virtue of the same clips 6 which are the appropriate size and shape for this purpose.

A connecting cable 7 for the two transducers (earphone and microphone) emerges from the lower face of the earphone/microphone unit for connection to the necessary associate electronic communications system.

The boom tube 8 is a suitably shaped plastic member and is preferably made of polytetrafluoroethylene (PTFE) but can be made of other suitable material so as not to burn or melt or char or give off unpleasant or

dangerous fumes, if the wearer should accidentally apply a match flame or petrol or gas lighter flame or the lighted end of a cigarette, to the boom arm. As a further safety precaution, the end of the tube adjacent to the wearer's mouth is fitted with a metallic member 9 to spread and dissipate any local source of heat which might be applied as described above. The member 9 is also designed to retain a suitable acoustic filter within the open end of the tube to reduce implosive sounds due to the breath of the wearer passing over the end of the tube. The tube 8 is rotatable about its mounting axis to the earphone/microphone unit and can also be slid vertically within its mounting. These features provide proper adjustment for placing the end of the tube adjacent to the wearer's mouth. The tube can also easily be withdrawn when necessary for cleaning or replacement and this feature also permits personal issue of the acoustic tube to individual users when the complete headset is not a personal issue but may be worn by a number of users, and this feature obviously increases the degree of hygiene.

The earphone arrangements will now be described. The earphone transducer is contained within an ear-piece support member comprising a moulded case, as shown in FIG. 2. The plastic moulded case 10 has a tubular extension 11, and within this tubular extension is a metal tube 12 which is just free to rotate within extension 11. The rotation of this metal tube 12 is limited to about 200° total by means of a stop pin 13 which is firmly attached to the metal tube 12 and which moves in a suitable slot 14 in the plastic case 10 of the earphone. The stop pin and the slot are so designed and dimensioned as to limit the rotational movement between the metal tube and the plastic moulding, to the aforesaid 200°. At the outer end of the metal tube 12 is transversely mounted intermediate its ends a metal cylinder 15 which is substantially solid and therefore very strong and which has rounded (i.e., radiused) ends. This metal part 15 fits appropriately into a moulded cavity 16 in the earphone/microphone unit as shown in FIG. 3. The correlation of the metal cylinder 15 and the corresponding moulded cavity 16 is such that, when the headset is fitted to the wearer's head, the earphone can be swung through a limited arc in the vertical plane, as shown by B—B in FIG. 3, and can also be swung through a limited arc in the horizontal plane, as shown by C—C in FIG. 3c. Because of the correlation between extension 11 and tube 12 (FIG. 2), the earphone can also be rotated around the longitudinal axis of the tube 12 so as to permit the earphone sound exit to point either to the left or to the right, as viewed from the front of the wearer, for either left-hand or right-hand fitting. This rotational feature also permits the best and most comfortable fitting of the sound exit of the earphone into the bowl of the wearer's ear.

The sound exit of the earphone 17 (FIG. 2) is, in use, covered and extended by a soft and suitably shaped eartip 18 (FIG. 1). Although the eartip can be shaped for insertion in the end of the ear canal, it is preferred that this item be arranged to sit gently and comfortably in the bowl of the wearer's ear by appropriate use of the previously-mentioned vertical, horizontal and rotational adjustments of the earphone. The eartip is made of suitable non-toxic and non-dermatitic material and its great advantage compared with the normal eartip arrangement is that, in this case, the eartip is not inserted into the ear canal at all but merely rests lightly

in the outer bowl of the ear. Due to inevitable slight differences between the contour of the eartip and the contour of the bowl of the ear, physical contact between the two occurs at a discrete number of points and a degree of ventilation is therefore always present. This feature significantly reduces the amount of perspiration that may occur in the wearer's ear and consequently reduces any untoward effects of this perspiration. A further feature of the design is that the earphone may be swung slightly outwards from the bowl of the ear, under favourable and appropriate conditions, so that there is no contact at all between the eartip and the wearer's ear. Under these conditions the earphone behaves as a radiator-type transducer. The volume level of the received sound falls somewhat, especially in the lower frequencies, but the reception is still sufficiently clear and loud for many purposes. At any time, the earphone can be replaced in the bowl of the ear by a light and simple pressure on the rear of the earphone and to facilitate this type of usage, movement of the earphone in the horizontal arc, is intentionally made less stiff than movement in the vertical arc or in the rotational mode. This feature is obtained by appropriate design of the arrangements providing the correlation between the solid cylinder 15 and the corresponding moulded cavity 16. The solid cylinder is longer along its axis than is the diameter of the cylinder. There is friction between the radiused ends of the cylinder and the corresponding faces of the moulded cavity. It can be seen therefore that the friction applicable when the earphone is moved in the vertical plane, operates further from the point of rotation 19 (FIG. 3) than does the friction which operates when the earphone is moved in the horizontal plane around the axis of rotation 20 (FIG. 3). Rotation of the earphone about the axis of rotation 21 (FIG. 3) is fairly stiff because of the large area of contact between the metal tube 12 and the moulded tube 11. These design features ensure that once the earphone has been suitably located in the vertical plane and suitably rotated so as to comfortably and properly sit in the bowl of the wearer's ear, then these adjustments are not easily disturbed whereas the in-and-out adjustment through the horizontal plane is easily made, as necessary.

It can be seen that the earphone mounting features permit the use of an earphone without any acoustic tube coupling and thus provide the smoother and generally superior frequency response which is obtainable without an acoustic tube. The design features also permit satisfactory acoustic coupling to the wearer's ear without the disadvantage of an eartip firmly inserted into the ear canal.

The eartip 18 is made of an appropriate grade of polyvinyl chloride although other materials could be used. The eartip is easily removable from the earphone for purposes of replacement and cleaning and for personal issue so as to permit a high degree of hygiene. The angular position of the eartip on the earphone is important and correct positioning is indicated by means of a red dot on the earphone cap 22 which the user arranges to coincide with a small cut-out 23 (FIG. 1) in the periphery of the eartip.

The microphone transducer is shown at 24 in FIG. 3, and the 'snout' 25 serves the purpose of mounting and acoustically coupling the acoustic boom tube to the microphone.

A suitable lightweight and flexible cable 7 emerges from the bottom of the earphone/microphone unit and passes to a contact board within the earphone/microphone unit, as shown in FIG. 3. A suitable resistive attenuating network can be fitted to this contact board so that alternative sensitivities and impedances of earphones can be provided at the time of manufacture to suit various user requirements.

A clothing clip is secured to the cable at an appropriate point along its length so as to help support the cable above this point and prevent disturbing forces from being applied to the headset due to movement of the wearer's head and due to movement of the wearer generally, with respect to the equipment into which the headset is connected.

I claim:

1. An earphone assembly, comprising

- a. mounting means adapted for mounting on the head of a user;
- b. earpiece means including an electro-acoustical transducer;
- c. earpiece support means connected at one end with said earpiece means; and
- d. means connecting said support means with said mounting means for pivotal movement through limited arcs about each of two mutually perpendicular axes each normal to the longitudinal axis of said support means.

2. Apparatus as defined in claim 1, wherein said connecting means affords a greater frictional resistance to movement of said support means about one pivotal axis than the other.

3. Apparatus as defined in claim 2, wherein said connecting means comprises

- 1. a cylinder mounted intermediate its ends at one

end of and normal to said earpiece support means, said cylinder having rounded ends,

2. said mounting means containing a cavity receiving said cylinder, the configuration of said cavity in one plane conforming to the rounded ends of said cylinder to permit limited pivotal movement of said support means through a first arc (B-B), the configuration of said cavity in the plane normal to said one plane conforming with the circular cross-section of said cylinder member to permit limited pivotal movement of said support means through a second arc.

4. Apparatus as defined in claim 3, wherein said connecting means further includes means affording rotational movement of said earpiece means about the longitudinal axis of said support means.

5. Apparatus as defined in claim 1, wherein said earpiece means includes a pliable eartip member shaped to conform to the bowl of the ear of a user.

6. Apparatus as defined in claim 1, wherein said mounting means includes spectacles connecting means for connecting the earpiece means with spectacles worn by a user. ccl

7. Apparatus as defined in claim 1, wherein said mounting means includes a headband.

8. Apparatus as defined in claim 1, and further including a microphone, and an acoustic tube connecting said microphone with said mounting means in such a manner that the distal end of the tube is adjacent the mouth of the user.

9. Apparatus as defined in claim 1, wherein said earpiece means includes a pair of electro-acoustical transducers associated with the ears of the user, respectively.

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