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(54) Title: A HEADSET

(57) Abstract: A headset (10) includes speaker (11) and housing (12) for electronic circuitry, the housing defining a generally U-shaped mouth (13), having a first leg (14) for extending below the ear and a second leg (15) for extending above the ear, the second leg (15) having a dependent crank projection (16) for supporting the speak (11) adjacent the users ear canal and a boom microphone (17) mounted on a pivot (18).

A HEADSET

This invention relates to a headset and in particular, but not exclusively, to a wireless headset mountable on a single ear.

With the development of call centres, speech-based word processing and the need for so-called "hands free" communication for mobile phones in cars and other environments, there is a significant need for comfortable ergonomic headsets which can be used, without significant adjustment, by a wide range of people. It is further preferred that such headsets be carried on a single ear, because whilst over the head straps provide good location, they are not always comfortable to wear and are unacceptable to those who sport expensive hair-dos. A further consideration is the development of a wide range of equipment, which is intended to operate on wireless protocols such as "Bluetooth". This latter approach means that the headset has to include circuitry to operate the wireless protocol, as well as a speaker and usually a microphone.

All of these considerations produce significant design problems which are mitigated by at least certain of the embodiments.

From one aspect the invention consists in a headset having a rigid mounting engageable on a user's ear such that the centre of gravity of the headset lies behind the user's ear

so that it acts in a sense to rotate the headset rearwardly causing a part of the mounting to engage against the underside of the ear.

From another aspect the invention consists in a headset mountable on a single ear, including a speaker and a housing for electronic circuitry, wherein the housing defining a generally U-shaped mouth having a first leg for extending below the ear and a second leg for extending above the ear, one of the legs having a crank projection for supporting the speaker adjacent the ear canal, whereby in use the mouth can be presented downwardly onto the user's ear in an inverted orientation and then rotated so that the first and second legs lie below and above the ear respectively.

It is preferred that in the location position the centre of gravity lies behind the ear so that it acts in a sense to rotate the headset rearwardly causing the first leg to engage against the underside of the ear and hence hold the headset assembly on the ear.

The projection is preferably on the second leg and depends therefrom. This arrangement may help to counter-balance the weight of the housing and further counter-balancing can be achieved if the first leg extends beyond the centre of gravity of the headset.

The projection is preferably integral with and/or rigidly connected to the second leg. Many previous designs have the speaker relatively moveable with respect to the

housing, in an attempt to accommodate different ear sizes, but this tends to mean that the headset is an insecure fit on most ear sizes. The U-shaped mouth construction, set out above, is particularly advantageous when used in combination with this feature, because it enables a rigid integral construction to be mountable on a wide variety of ear sizes.

To provide improved location it is desirable that the projection has a rearwardly pointing wedge shaped cross-section to enable a good fit between the skull and the top of the pinna.

The headset preferably includes a depressible switch located above a portion of the first leg, such that the first leg can be engaged by a user's thumb, whilst the user's first finger is depressing the switch, whereby the thumb resists the downward force on the headset.

The headset will normally include a microphone and, particularly conveniently, a boom microphone which can be mounted on the projection, for example on the speaker or the speaker support. In that event it is preferred that the headset includes a boom microphone mounting and this may include a pivot for supporting the boom microphone. The pivot may include a base defining a channel for slidably receiving the boom microphone, the base being rotatable about a first axis extending orthogonally through the bottom of the channel and the second axis orthogonal to the first.

The base may be mounted on a ball joint and electrical connections may extend through the ball of that joint. It is particularly preferred that the channel includes a projecting electrical connection, which locates in an elongate opening in the boom. For example, the projection may have a neck which passes through the elongate opening and an enlarged head carrying exposed contacts for slidably engaging corresponding contacts within the boom. By keeping the tolerance between the opening and the neck small, the contacts can be protected against grease and moisture, but sliding seals may be provided if desired. Additionally or alternatively, a sliding cover may be provided within the boom microphone, through which the projection can extend so that the cover moves relative to the boom as the boom position is adjusted longitudinally.

From a further aspect the invention consists in a headset including a speaker, a housing for receiving an electronic circuit, a formation for engaging the housing on the user's ear, with the housing behind the pinna, and a rigid cranked projection, extending from the housing, for mounting the speaker adjacent the ear canal.

From a still further aspect the invention consists in a headset including a speaker, a boom microphone, a formation for mounting the speaker on the ear adjacent the ear canal and a pivot for receiving a boom microphone to allow pivoting of the microphone about orthogonal axes.

It is particularly preferred that the boom microphone is longitudinally slideable relative to the pivot.

From yet another aspect the invention consists in a pivot for supporting a boom microphone, including a base defining a channel for slidably receiving the boom microphone, the base being rotatable about a first axis extending orthogonal to the bottom of the channel, and about a second axis orthogonal to the first.

The pivot may further include a ball joint for mounting the base, and the ball joint may be provided with a channel through which electrical connections can extend without interfering with the movement of the base upon the ball. The channel may include a projecting electrical connection for locating in a boom microphone.

However, in any of the above arrangements the pivot may be constructed with the base forming a rocker element and the pivot may further comprise a chassis for carrying the rocker element, the chassis being rotatable about the first axis. In this case the electrical connections pass into the boom adjacent the rocker.

The invention may further include the combination of the above pivot and a boom microphone and the combination may have the electrical connection features which are set out above.

Although the invention has been defined above, it is to be understood that it includes any inventive combination of the features set out above or in the following

description.

The invention may be performed in a number of ways and a specific embodiment will now be described with reference to the accompanying drawings, in which;

- 5 Figure 1 is a view of the headset in the position in which it would appear if mounted on a user's right ear;
- Figure 2 is a reverse view of the headset of Figure 1;
- Figure 3 is a view from above of the headset of Figure 1;
- Figure 4 is a view from below of the headset of Figure 1;
- 10 Figure 5 is a rear view of the headset of Figure 1;
- Figure 6 is a view from the front of the headset of Figure 1;
- Figure 7 is an enlarged view of the housing of the headset on the arrow C in Figure 2;
- 15 Figure 8 is a schematic sectional view through a pivot for mounting a boom microphone;
- Figure 9 is an enlarged scrap section of the pivot of Figure 8 with the boom microphone located in the channel of the pivot;
- 20 Figure 10 is an exploded view of an alternative pivot and microphone combination;
- Figure 11 is an enlarged assembled view of the pivot in Figure 10;
- Figure 12 is a longitudinal section of Figure 11;
- 25 Figure 13 is an exploded view of the microphone end of the boom microphone of the headset of Figure 1;
- Figure 14 is a section through a battery recess cover of

the housing of the headset of Figure 1;

Figures 15 (a) to (d) illustrate various microphone options;

Figures 16 to 18 illustrate variants of the headset
5 according to the invention;

Figure 19 illustrates an alternative approach to a headset; and

Figure 20 illustrates a still further variant for a headset mounting.

10 Referring to Figures 1 to 5 a headset, generally indicated at 10, includes a speaker 11, a housing 12 for electronic circuitry, the housing defining a generally U-shaped mouth 13, having a first leg 14 for extending below the ear and a second leg 15 for extending above the ear, the second
15 leg 15 having a dependant cranked projection 16 for supporting the speaker 11 adjacent the user's ear canal and a boom microphone 17 mounted on a pivot 18. The shape of the mouth enables it to be presented downwardly onto the user's ear, in an inverted orientation, and then rotated so
20 that the first and second legs lie above and below the ear respectively.

The design therefore enables the ear-piece to be located readily on most users' ears, without any relative adjustment between the speaker 11 and the housing 12. When
25 so located, the housing 12 sits behind the user's ear and the centre of gravity of the headset lies behind the ear so that it acts in a sense to rotate the head rearwardly

causing the first leg 14 to engage against the underside of the ear hence hold the headset assembly on the ear. So as to avoid over-pressure on the underside of the ear, the weight of the housing may to an extent be counterbalanced by the projection 16, the speaker 11 and boom microphone 17. The precise positioning of the housing 12 will depend on the physical structure of the user's ear, but in many instances the first leg 14 will extend beyond the centre of gravity of the headset 10, thus providing added stability. Although the housing 12 is preferably essentially rigid the tip 14a of the first leg 14 may be flexible or include a resilient cushion to increase comfort.

It is particularly preferred that the headset should be used as a wireless "hands free" headset and, for example, it may provide voice-activated communication. However, it can also be provided, as illustrated, with a call accept call cancel button 19, which is preferably located above a part of the first leg 14, so that the user can support the first leg 14, whilst their forefinger is depressing the button 19 and thus resist any movement of the ear-piece.

It is clearly desirable that the position of the boom microphone 17 is adjustable. To this end the pivot 18 is rotatable about two orthogonal axes as indicated by the arrows A and B in Figures 3 and 4 respectively. It will also be noted that the microphone 17 is received in a channel 20 in the pivot 18, so as to be longitudinally slideable relative to the pivot. Preferably the boom

microphone 17 is a friction fit within the channel 20.

One construction of the pivot 18 can be more clearly seen in Figures 8 and 9. Thus the pivot 18 includes a ball 21, which is mounted on the projection 16 and which is received in a spherical cavity 22 in a pivot base 23, which in turn defines a channel 20. It will be seen that the ball joint 21, 22 provides the rotation indicated by the arrows B and C and that the microphone 17 is effectively a friction fit in the channel 20.

As can be seen in Figure 9, electrical connections 24 can pass through the central axis of the ball 21 to a projection 25 mounted in a part of the base of the channel 20. The projection 25 extends into an elongate cavity 26 within the boom microphone 17, and has exposed contacts 27, 28 for engaging corresponding contacts within the cavity 26.

As has been explained above, the boom microphone 17 and the projection 25 may be structured to prevent the ingress of water or dirt onto the contacts and a sliding cover may be provided. In that construction, the base 23 will most conveniently be in the form of a two part moulding and the boom microphone may itself need to be in two parts to engage on the projection. Many other electrical connection constructions can be used, although it will be understood that loose leads could be problematic when sliding adjustment takes place.

Another and currently preferred pivot construction is illustrated in Figures 10 to 12. In this construction the pivot 18 is assembled on a ring 30 which forms the free end 31 of the projection 16. The pivot 18 essentially consists of a base 23a constituted by rocker element 32 and a rotatable chassis 33. The rocker element 32 defines a channel 30a for the boom microphone 17 and has lateral pins 33, which rotatably locate in openings 34 that upstand from the chassis 33. The chassis 33 has tangs 35 and a spaced lower skirt 36 so that can be snapped on to the ring 30 from below. A speaker 37 can be screwed on to the ring 30 by means of an annular plate 37a. Covers 38 and 39 are provided for the top and bottom of the assembly. As can be seen Figure 12, the microphone boom 17 is formed with overlapping orthogonally orientated slots 40 and 41 to allow a passage for wire 42 (see Figure 13), which debouch from the projection 16.

The end 17a of the boom microphone is illustrated in Figure 13 and includes a transparent tip 43 which locates the microphone 44 and defines acoustic passages 45 and 45a. The tip 43 has legs 46 for snap fitting in the boom 17a. At least one LED 47 is located between the legs to illuminate the tip 43, light being transmitted along a light guide defined by a wedge-shaped section 48 of the tip 43. The tip 43 can be illuminated on a variety of colours to indicate the status of the headset 10.

Figure 14 is an enlarged section of the area circled D in

Figure 1 and illustrates an opening 49 for a charger plug alongside a battery location 50, the latter being closed by a cover 50a. The cover 50a has an extended leg 51 with a tang 52, which locates in a detent 53, which opens into the opening 48. The cover 50a can therefore be released by
5 deflecting through the opening 48 the tang 52 out of the detent 53.

From the above it will be seen that the design provides a robust, easily located headset with a fully adjustable
10 microphone position.

Figure 15 illustrates some further microphone possibilities. At (a) the boom microphone is foldable; at (b) the microphone is externally mounted on a projection on the pivot, and this may be a more desirable arrangement for
15 an electrical connection of the type described above, because it simplifies the assembly and construction; at (c) the microphone passes through a tunnel in the pivot; and at (d) the microphone is simply housed in the projection 16. This last construction might be extremely useful as a deaf
20 aid for the particularly hard-of-hearing, because it gives a clear indication of where the speaker should address the user.

Figure 16 illustrates a headset produced on the same principles but with the boom microphone formed as an
25 extension of the second leg. This construction is particularly good if produced on an individual basis, but it is less stable and so is less satisfactory for a

universal design. In Figures 17 (a) and (b) the device is constructed so that it can be inverted and used on either ear, with the microphone either coming from below the ear or above the ear as illustrated.

5 In Figure 18 the first and second legs produce a more C-shaped construction which can be worn on either ear due to the symmetry of the design. The full housing has been omitted from this illustration, but it is represented as being behind the ear.

10 In Figure 19 a different approach is illustrated. Here the housing is mounted on a moulded plug which fits inside the ear canal, and the invention includes a headset including a moulded plug insertable in the ear canal for supporting electronic circuitry and/or a microphone. Additionally the
15 plug may carry a 'bone' transducer for engaging the bone of the user, which transmits an acoustic speech signal, thus dispensing of the need for a conventional microphone. Such devices are commercially available.

Finally Figure 20 illustrates a full ear loop where the
20 weight of the electronics etc. are intended to be positioned to place the centre of gravity behind the ear, although a practical device may need the weight to be located a little more rearwardly than indicated on the illustrated mock-up.

CLAIMS

1. A headset having a rigid mounting engageable on a user's ear such that the centre of gravity of the headset lies behind the user's ear so that it acts in a sense to rotate the headset rearwardly causing a part of the mounting to engage against the underside of the ear.
2. A headset as claimed in Claim 1 wherein the headset includes a single housing containing electronic circuitry and a speaker.
3. A headset as claimed in Claim 2 further including a microphone contained in the single housing.
4. A headset as claimed in any one of Claims 1 to 3 wherein the mounting is substantially rigid.
5. A headset mountable on a single ear including a speaker, a housing for electronic circuitry, the housing defining a U-shaped mouth having a first leg for extending below the ear and a second leg for extending above the ear, one of the legs having a projection for supporting the speaker adjacent the ear canal whereby, in use, the mouth can be presented downwardly onto the ear in an inverted orientation and be rotated so that the first and second legs lie below and above the ear respectively.
6. A headset as claimed in Claim 5 wherein the mounting is not adjustable.
7. A headset as claimed in Claim 6 wherein the mounting is substantially rigid.
8. A headset as claimed in any of Claims 5 to 6 wherein

the projection is on the second leg and depends therefrom.

9. A headset as claimed in Claim 8 wherein the projection is integral with the second leg.

10. A headset as claimed in Claim 9 wherein the projection
5 is rigidly connected to the second leg.

11. A headset as claimed in any one of Claims 5 to 10 wherein the projection has a rearwardly pointing wedge shaped cross-section.

12. A headset as claimed in any one of Claims 5 to 11
10 wherein further including a depressable switch located above a portion of the first leg.

13. A headset as claimed in any one of the preceding claims further including a boom microphone.

14. A headset as claimed in Claim 13 wherein the boom
15 microphone is mounted by a pivot.

15. A headset as claimed in Claim 14 wherein the pivot includes a base for slidably receiving the boom microphone, the base being mounted about a first axis extending orthogonally through the bottom of the channel
20 and a second axis orthogonal to the first axis.

16. A headset as claimed in Claim 15 wherein the base is in the form of a rocker element rotatable about the second axis and wherein the pivot further comprises a chassis for carrying the rocker element, the chassis being rotatable
25 about the first axis.

17. A headset as claimed in Claim 16 wherein the chassis is snap fitted in an opening on the projection.

18. A headset as claimed in Claim 15 wherein the base is mounted on a ball joint.

19. A head set as claimed in any one of Claims 1 to 12 further including an acoustic bone sensor acoustically engageable with a bone of the user which transmits the user's speech.

20. A headset as claimed in any one of the preceding claims in which housing defines an opening for a charger plug and an adjacent battery recess, in which the battery recess is closed by a lockable cover and the cover lock is accessible through the opening.

21. A headset including a speaker, a housing for receiving an electronic circuit, a formation for engaging the housing on the user's ear, with the housing behind the pinna, and a rigid cranked projection, extending from the housing, for mounting the speaker adjacent the ear canal.

22. A headset including a speaker, a boom microphone, a formation for mounting the speaker on the ear adjacent the ear canal and a pivot for receiving a boom microphone to allow pivoting of the microphone about orthogonal axes.

23. A headset as claimed in Claim 1 wherein the boom microphone is longitudinally slideable relative to the pivot.

24. A pivot for supporting a boom microphone, including a base defining a channel for slidably receiving the boom microphone, the base being rotatable about a first axis extending orthogonal to the bottom of the channel, and

about a second axis orthogonal to the first.

25. A pivot as claimed in Claim 24 wherein the base is in the form of a rocker element rotatable about the second axis and wherein the pivot further comprises a chassis for carrying the rocker element, the chassis being rotatable about the first axis.

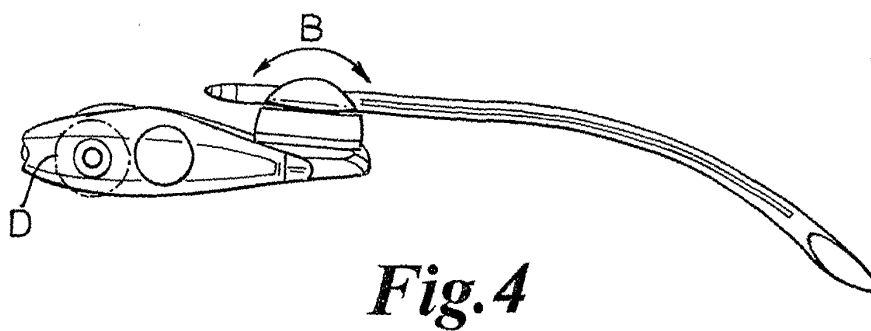
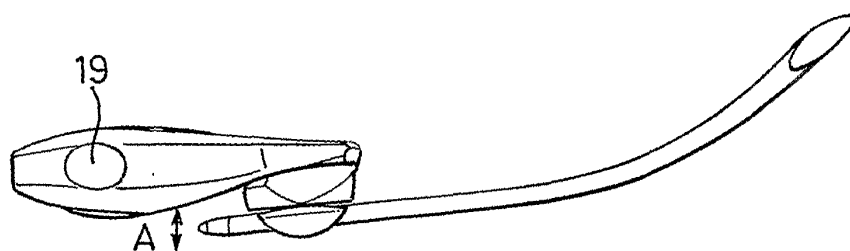
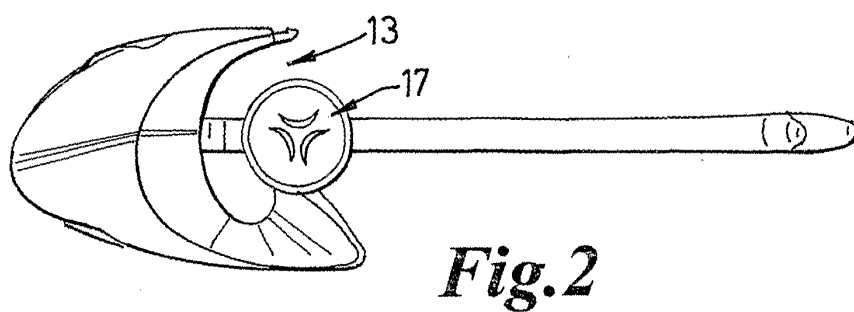
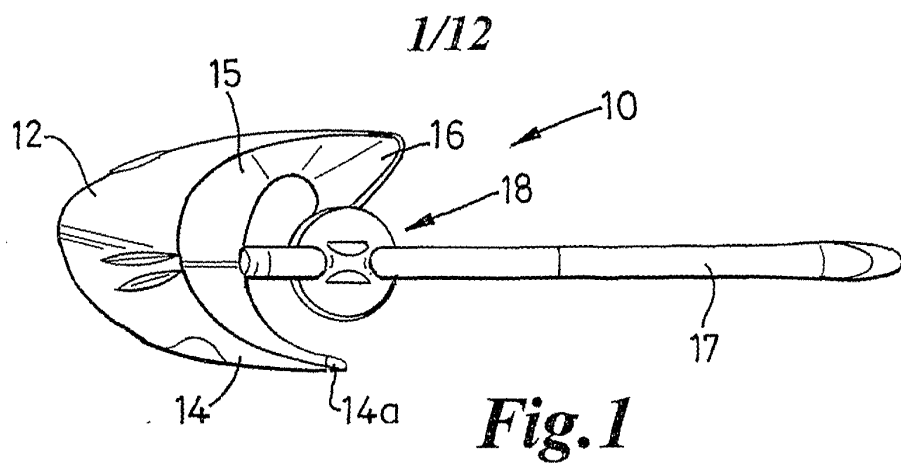
26. A pivot as claimed in Claim 24 further including a projecting electrical connection for location in a boom microphone.

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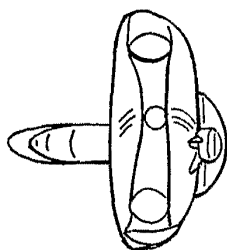


Fig. 5

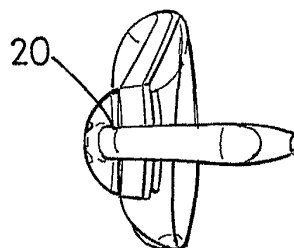


Fig. 6

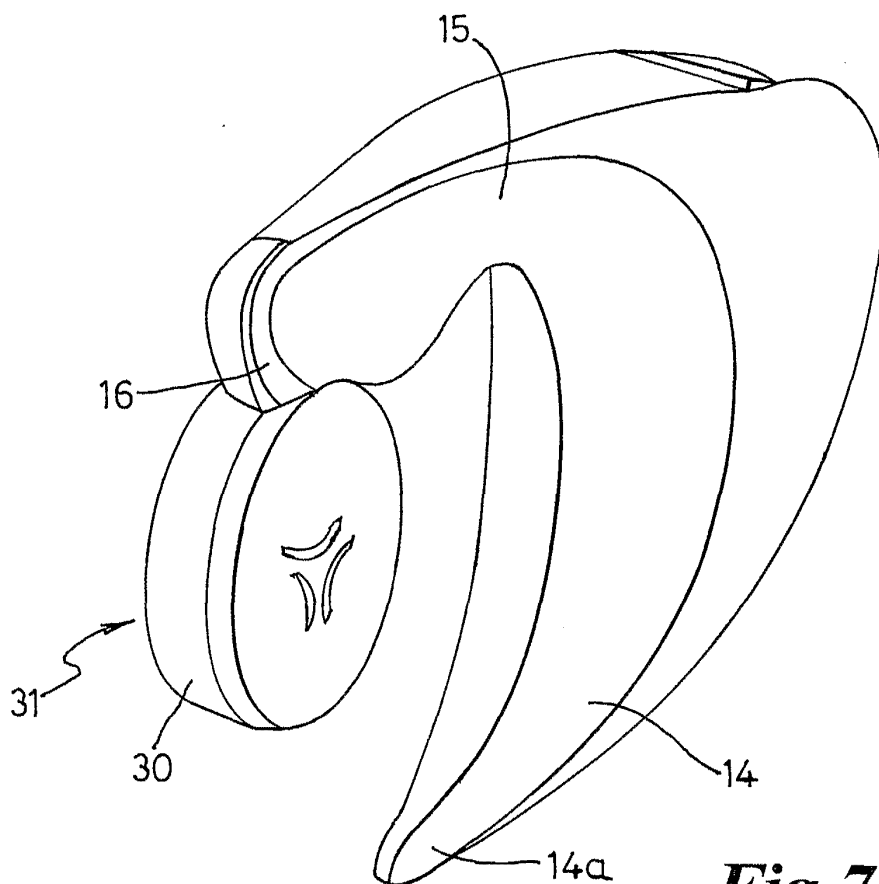


Fig. 7

4/12

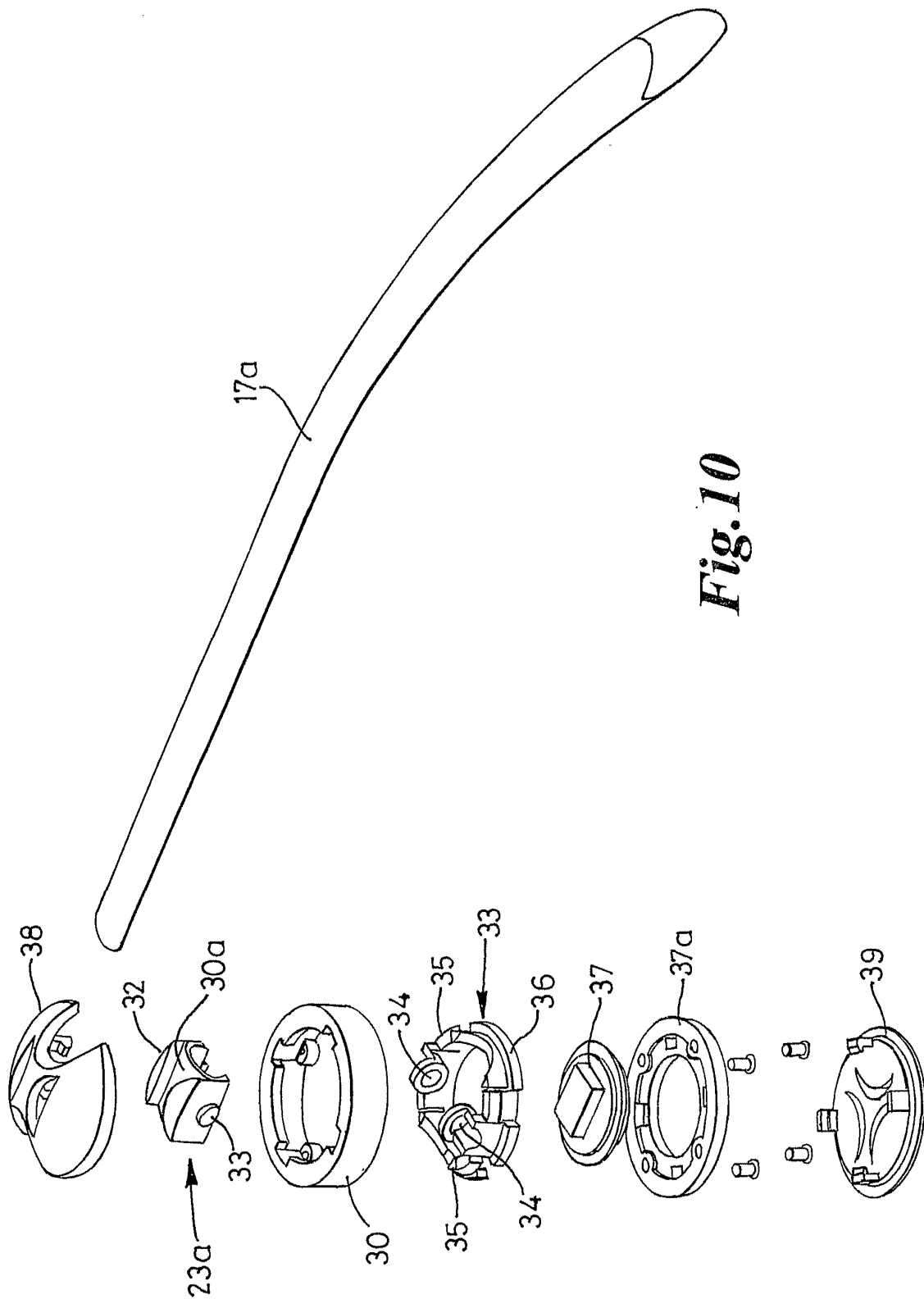
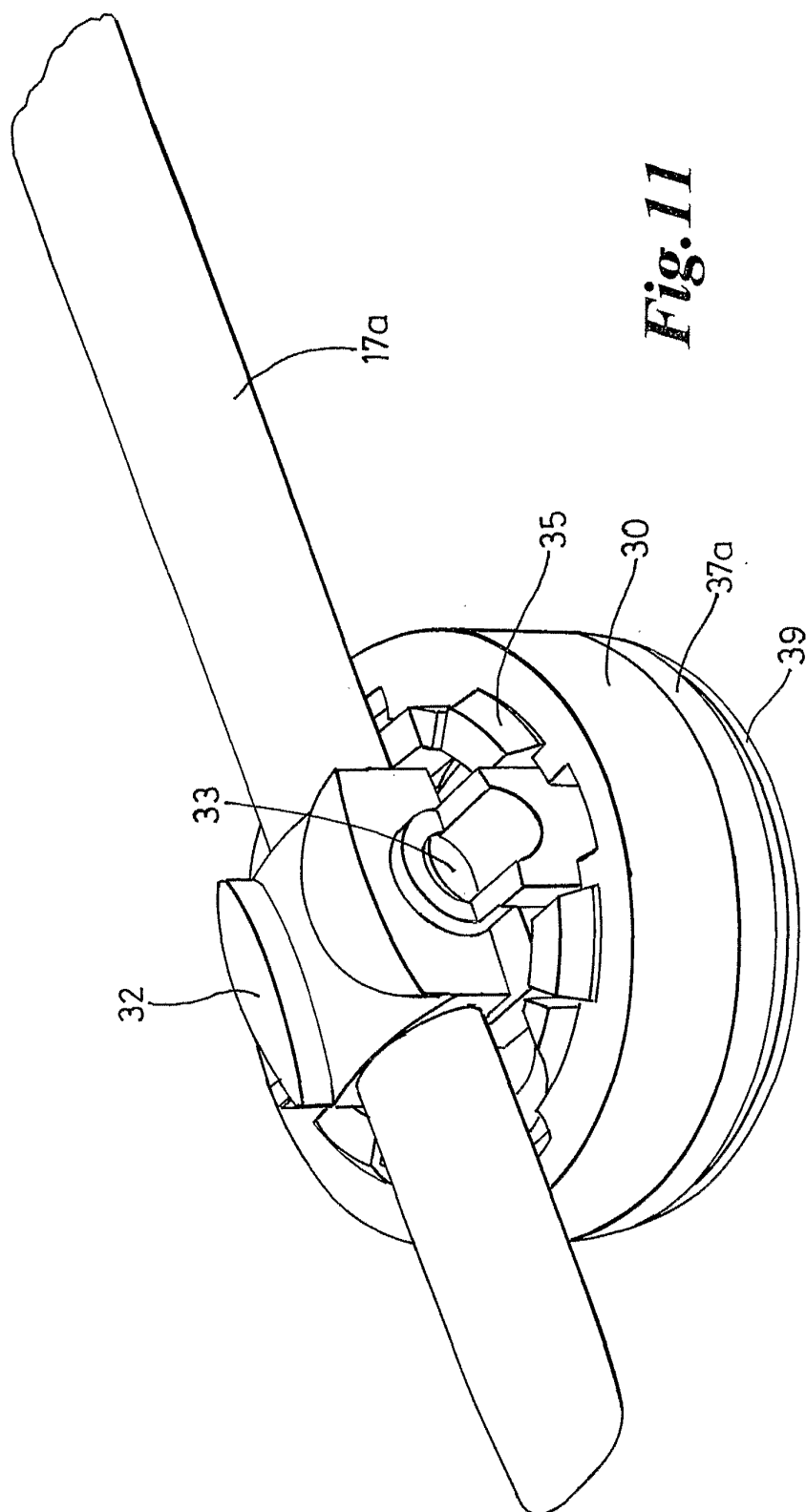


Fig. 10

5/12

Fig. 11



6/12

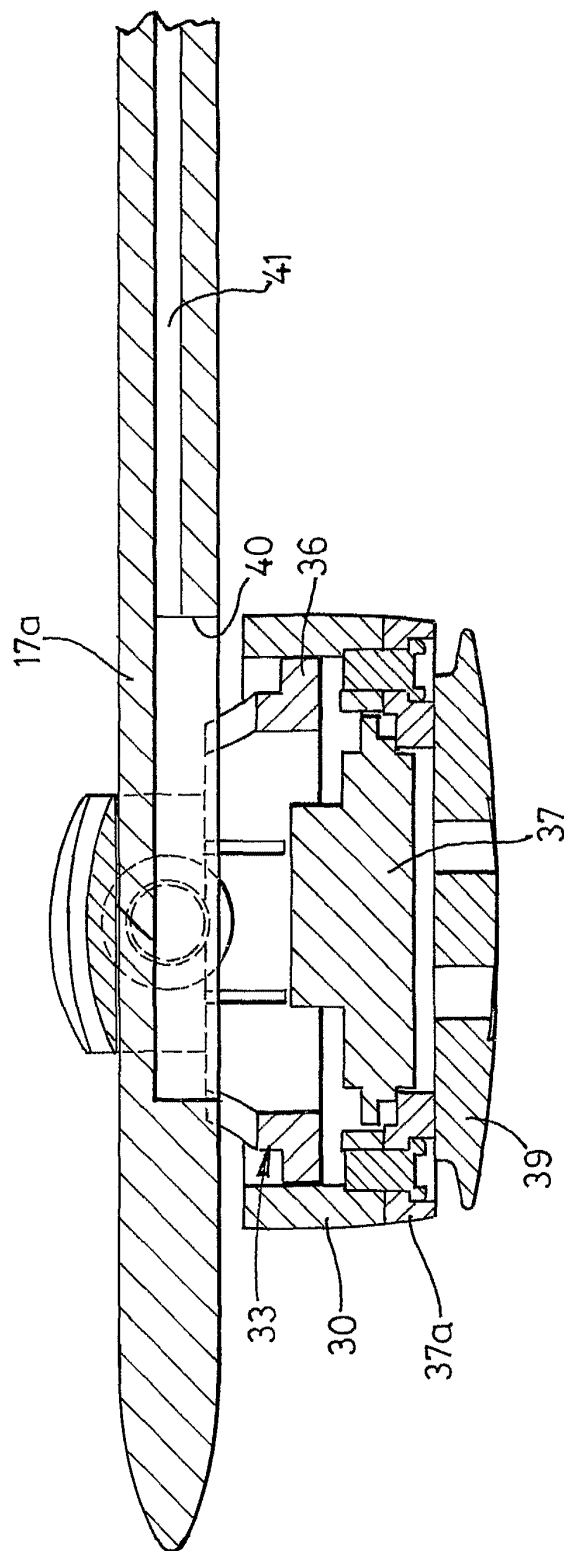
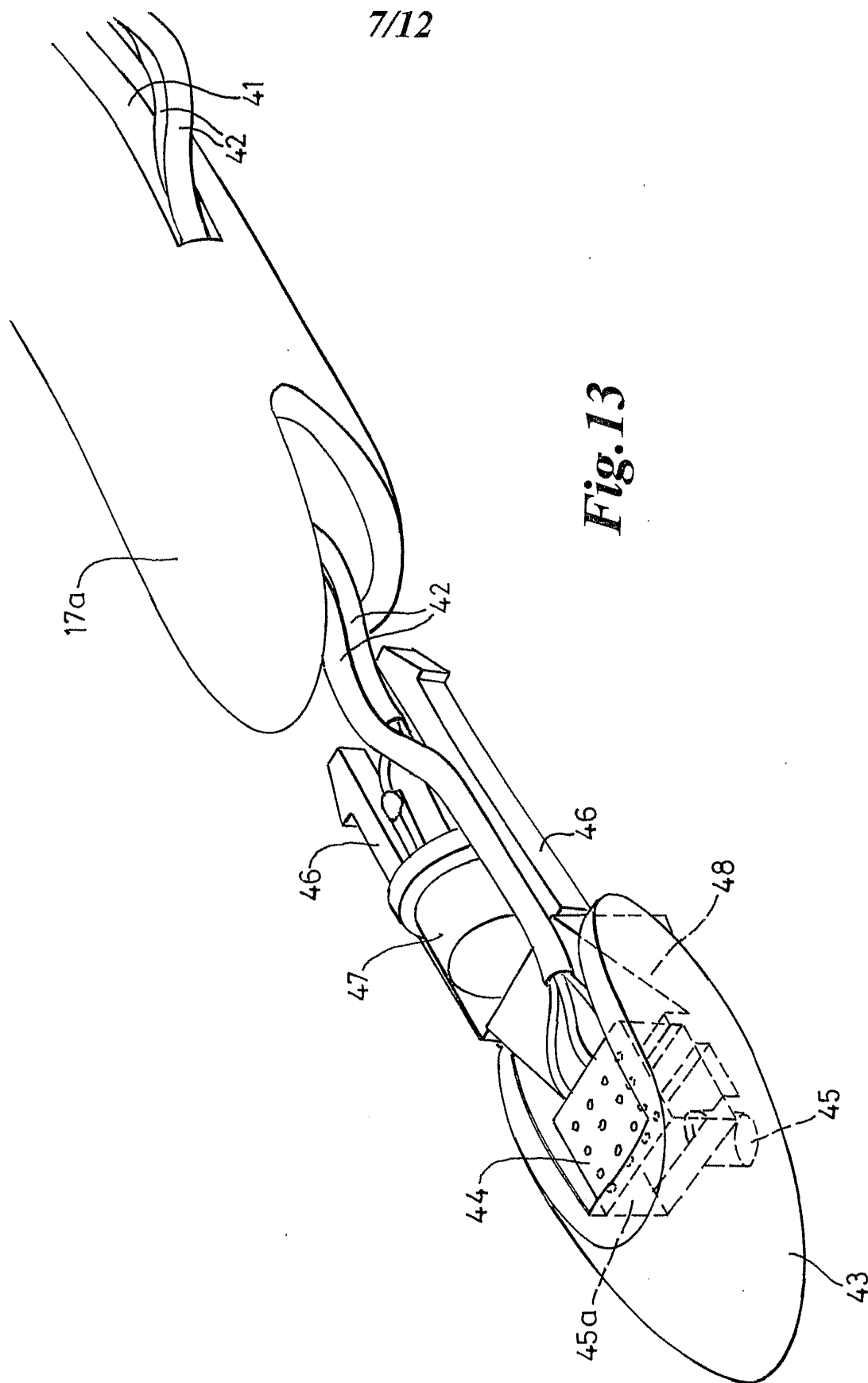


Fig. 12

7/12



8/12

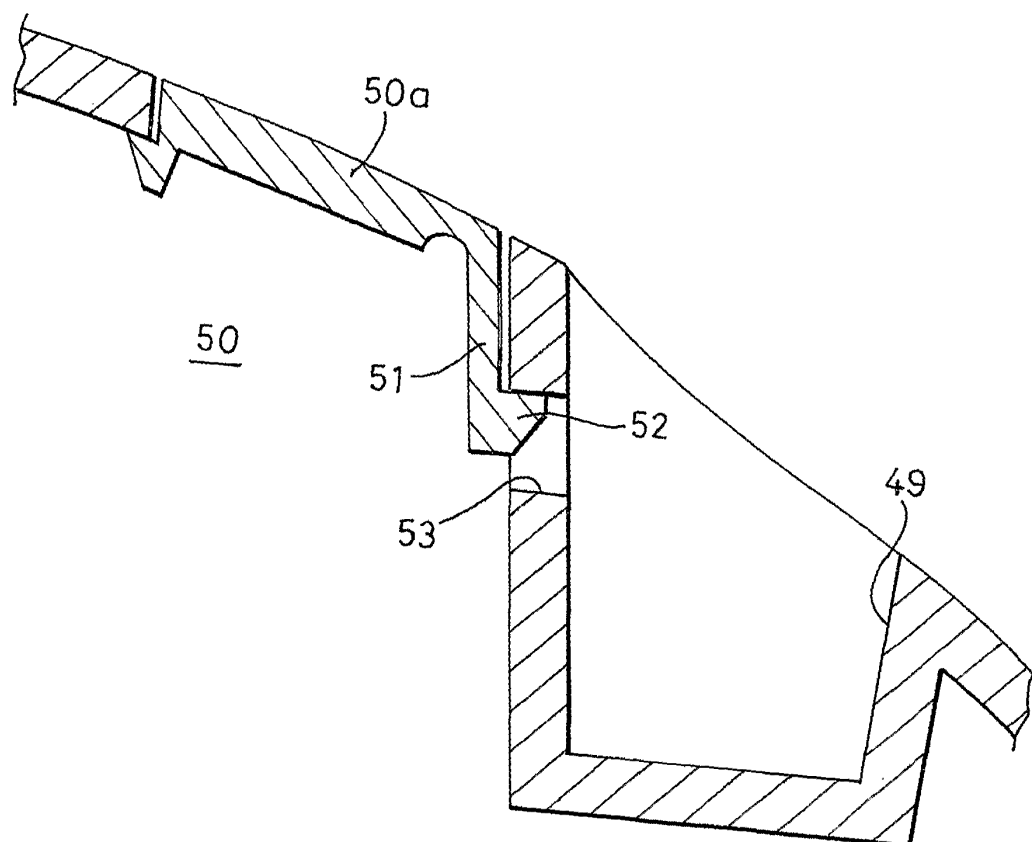


Fig. 14

9/12

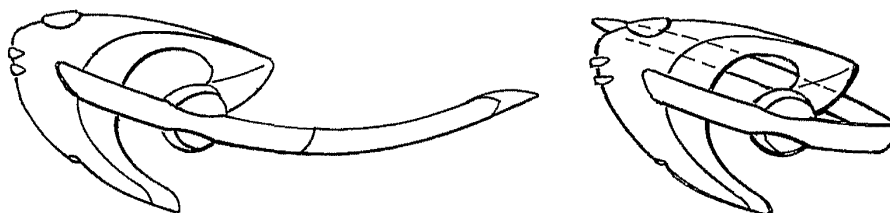


Fig.15(a)

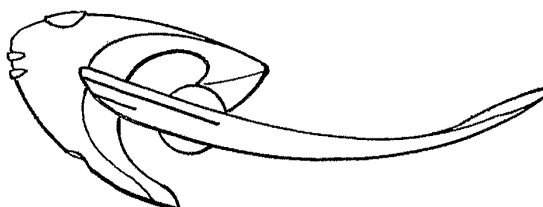


Fig.15(b)

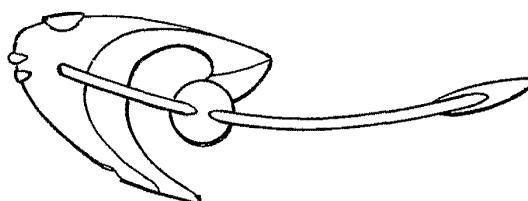


Fig.15(c)

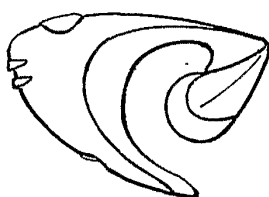


Fig.15(d)

10/12

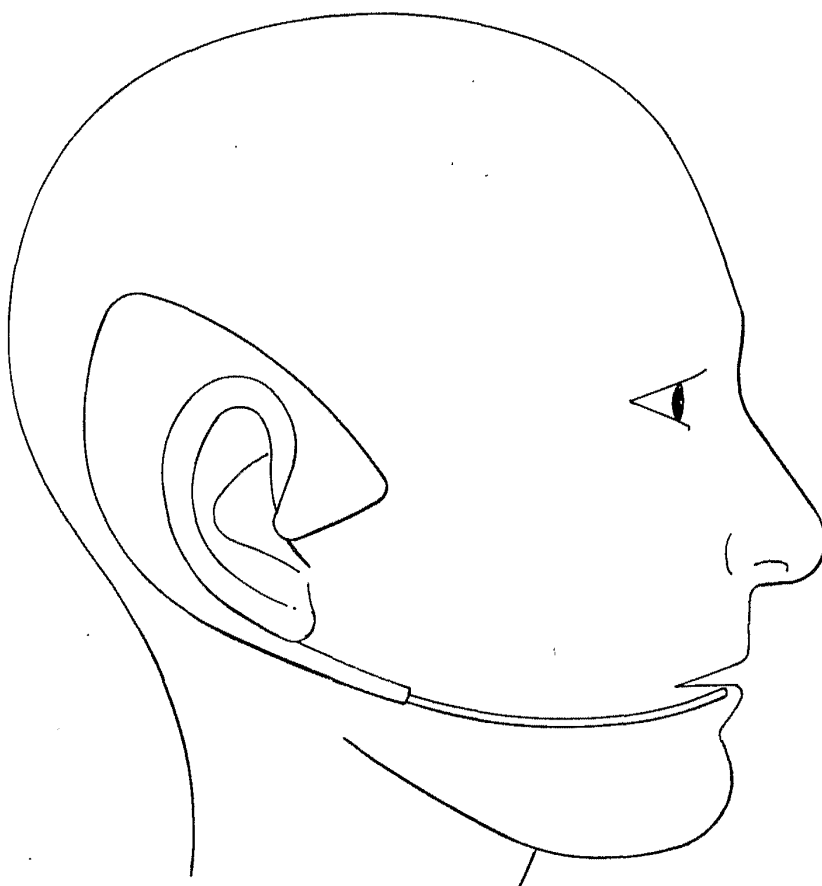


Fig. 16

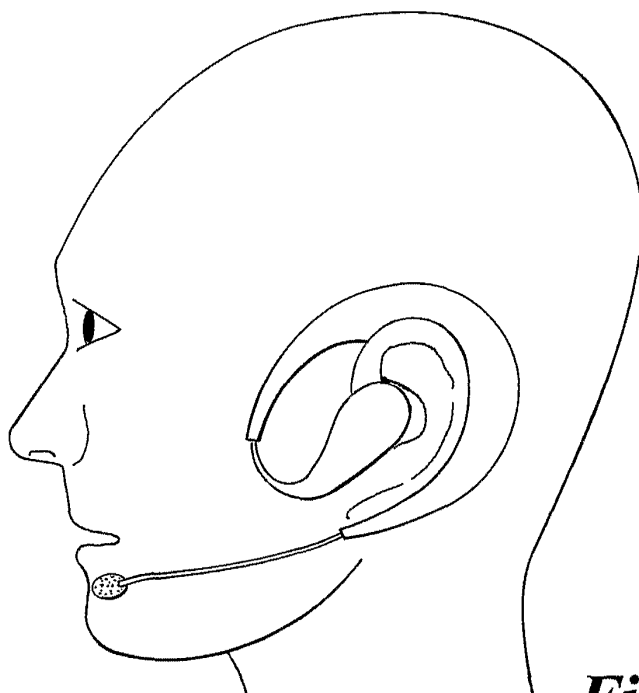


Fig. 17(a)

11/12

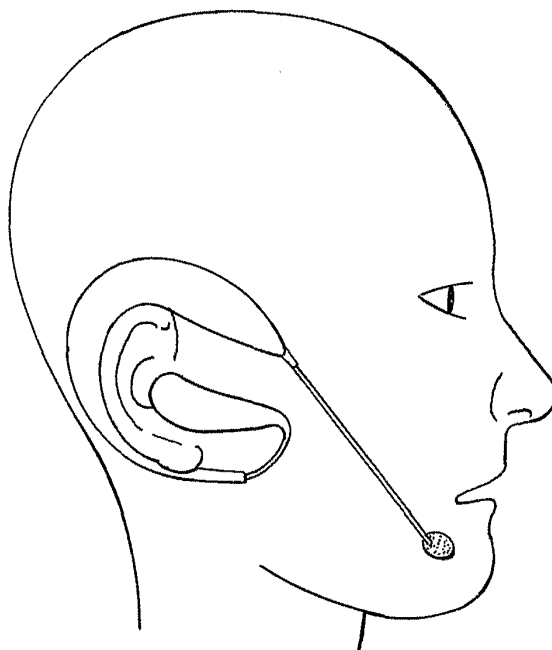


Fig. 17(b)

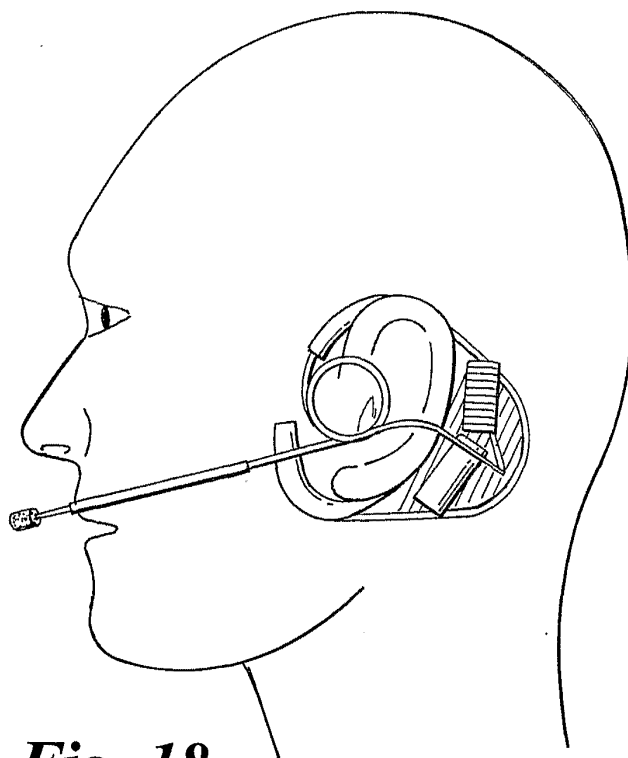


Fig. 18

12/12

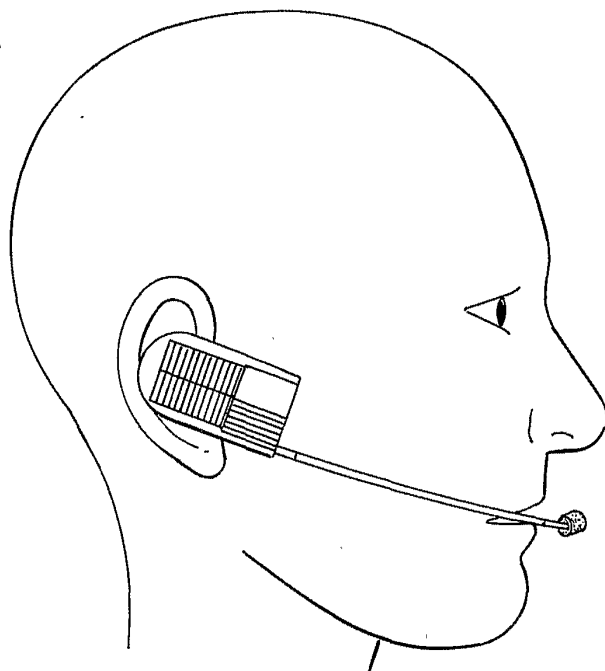


Fig. 19

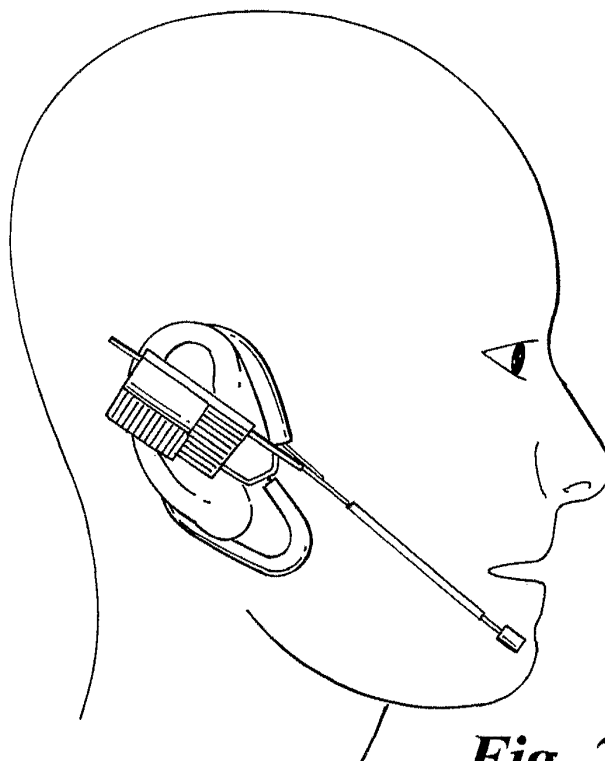


Fig. 20