Aug. 27, 1963

M. COHEN

HEARING AID

3,102,172

Filed Nov. 12, 1959

4 Sheets-Sheet 1

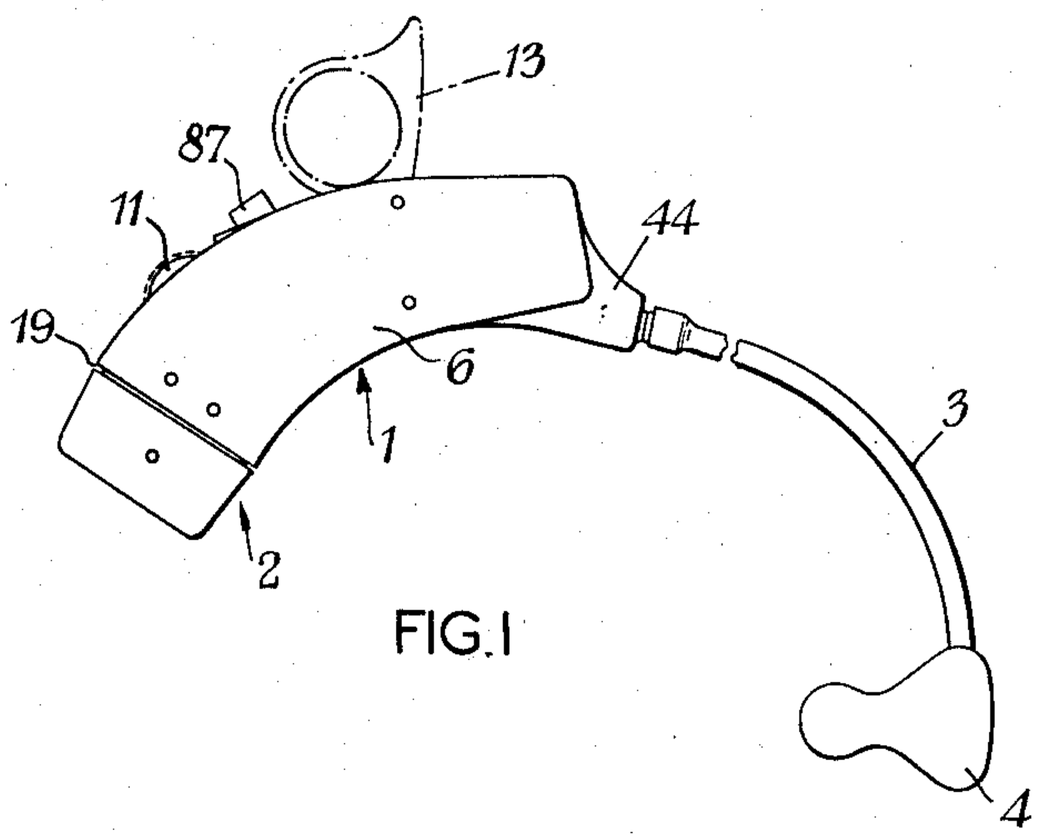

FIG.1

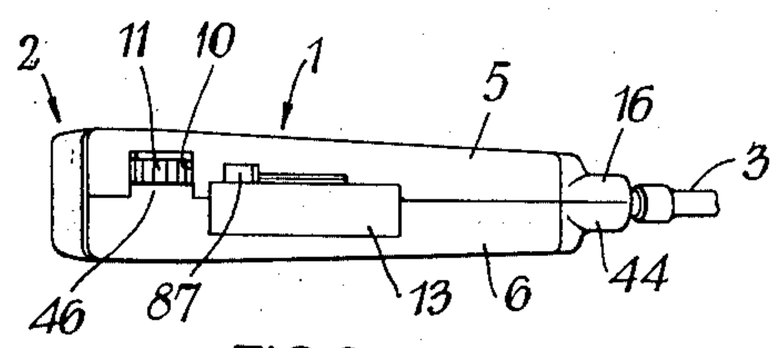

FIG.2

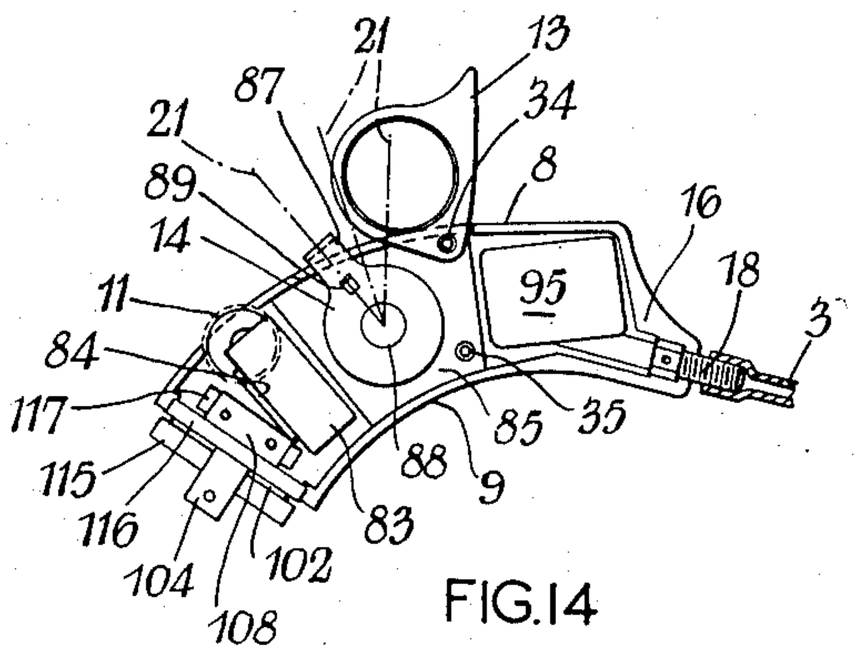

FIG.14

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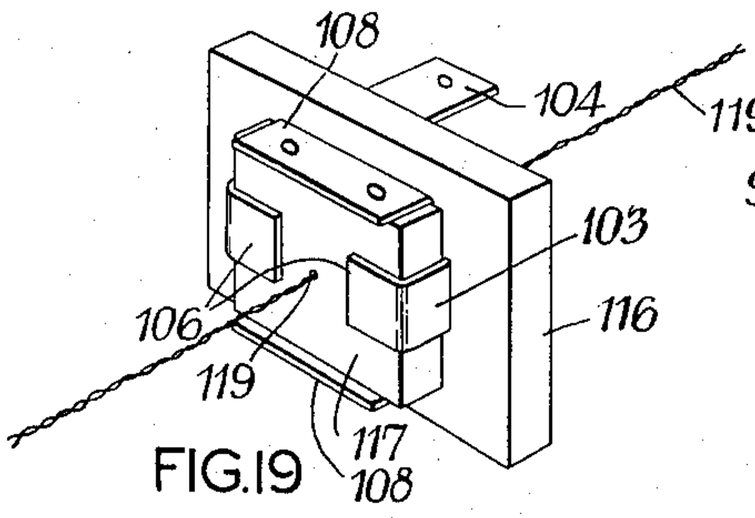

FIG.19

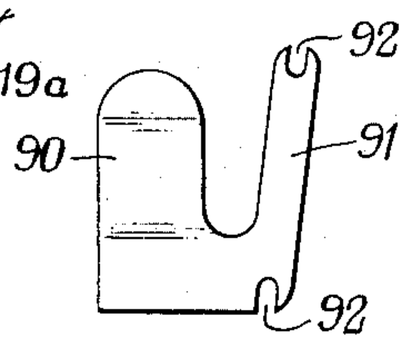

FIG.20

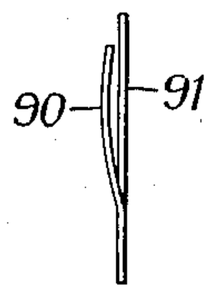

FIG.21

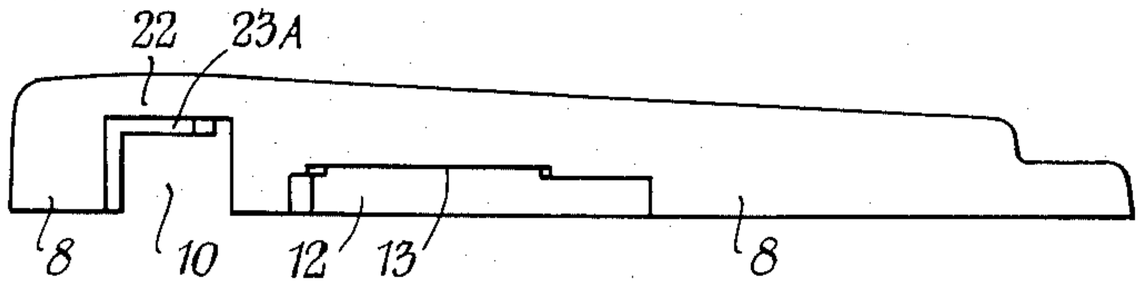

FIG.4

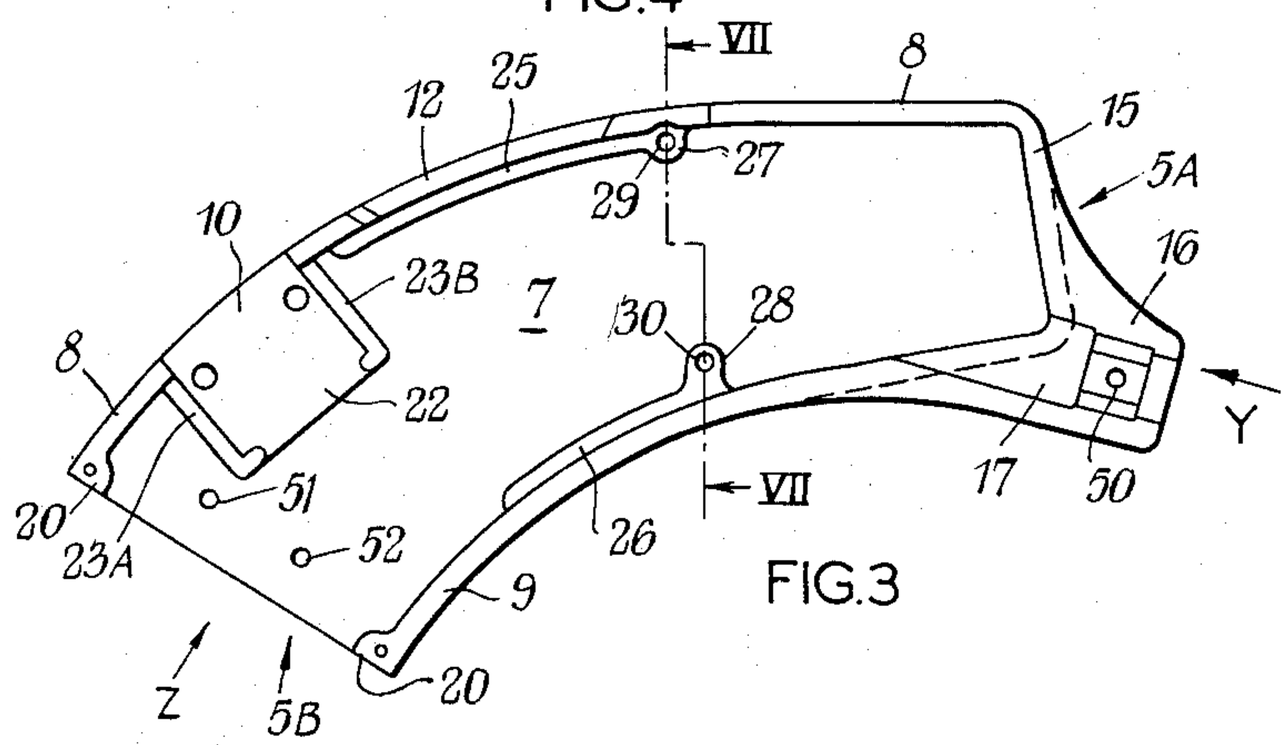

FIG.3

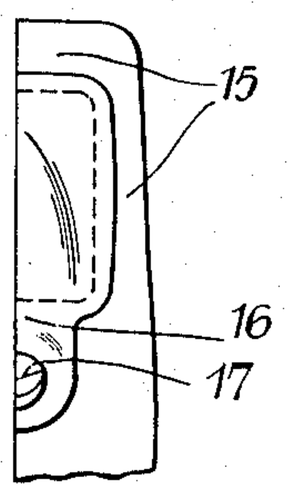

FIG.5

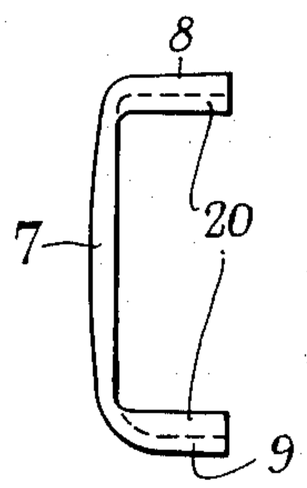

FIG.6

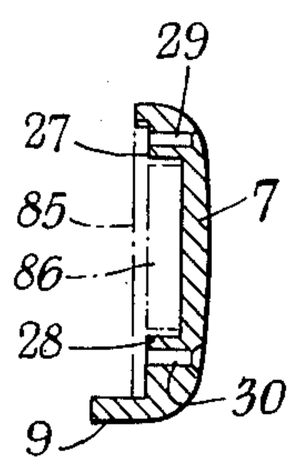

FIG.7

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HEARING AID

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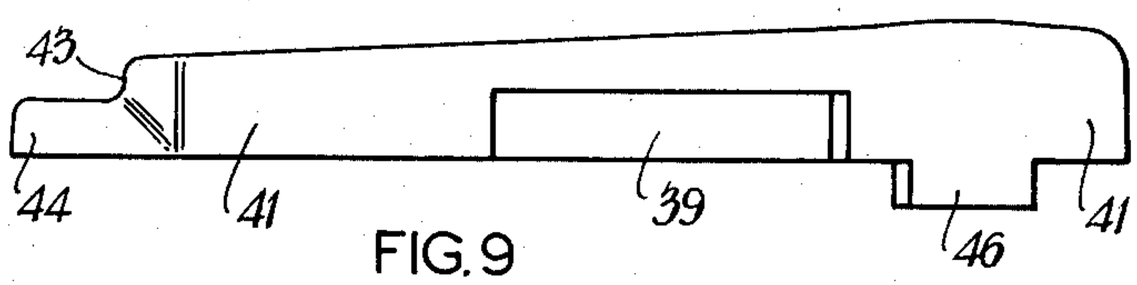

FIG. 9

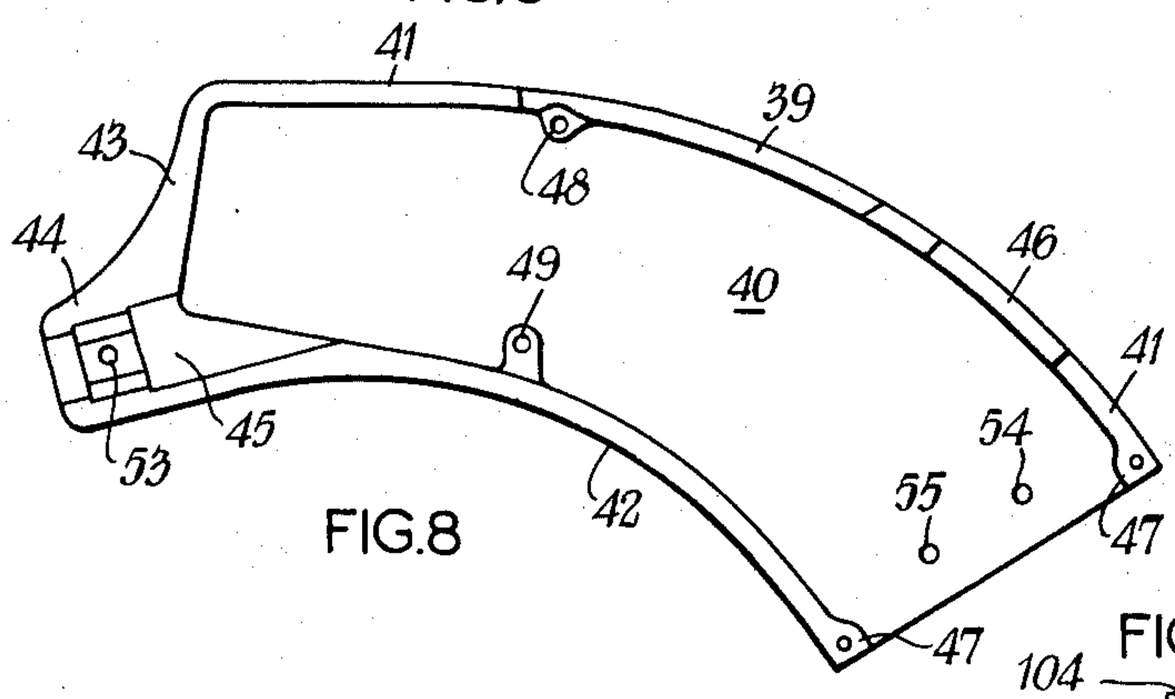

FIG. 8

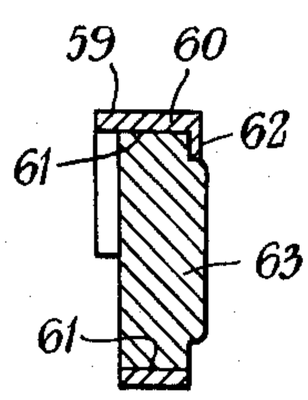

FIG. 11

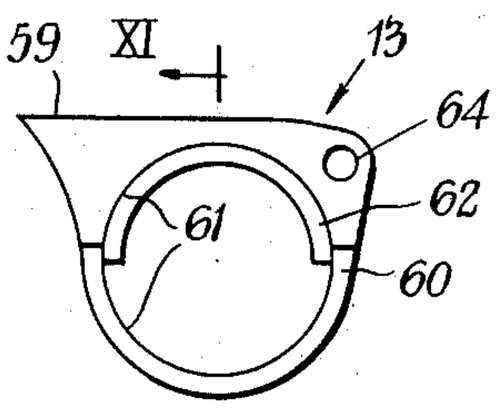

FIG. 10

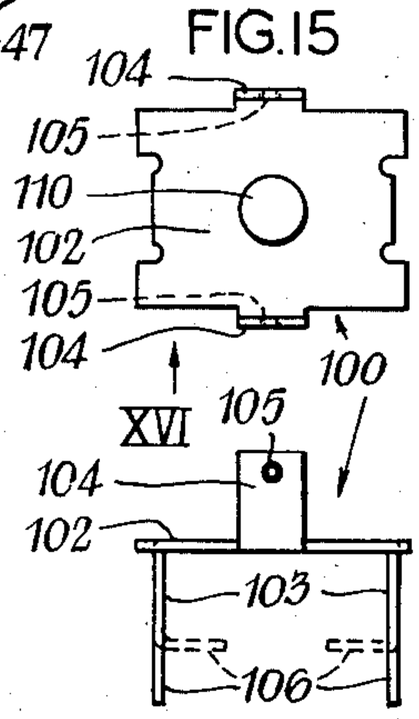

FIG. 15

FIG. 16

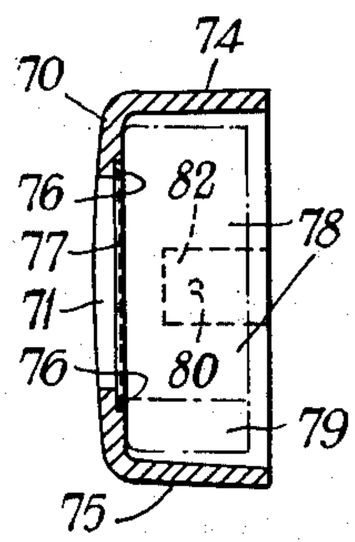

FIG. 13

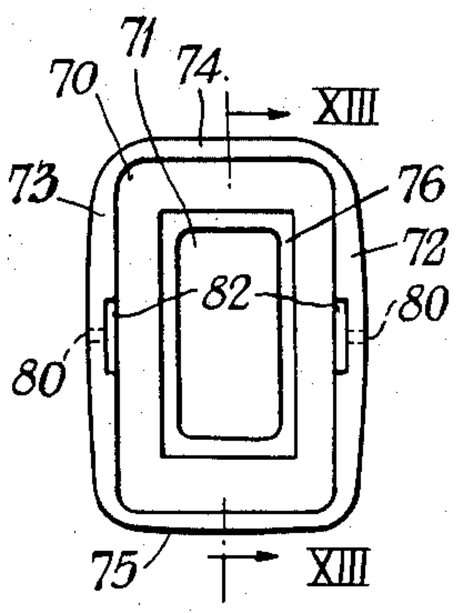

FIG. 12

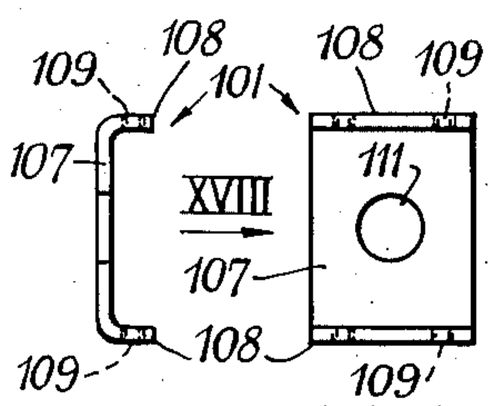

FIG. 18 FIG. 17

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HEARING AID

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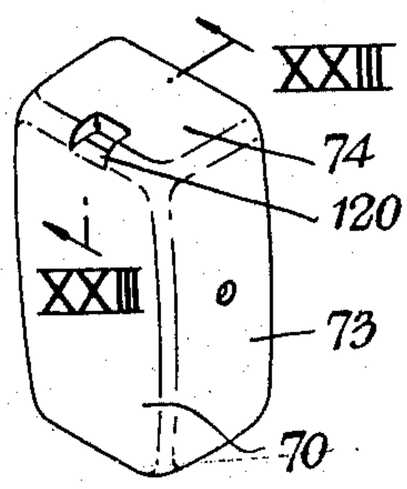

FIG.22

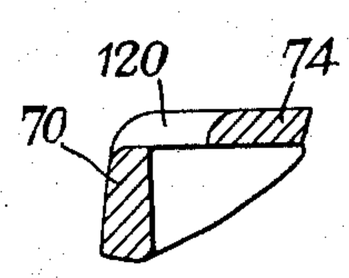

FIG.23

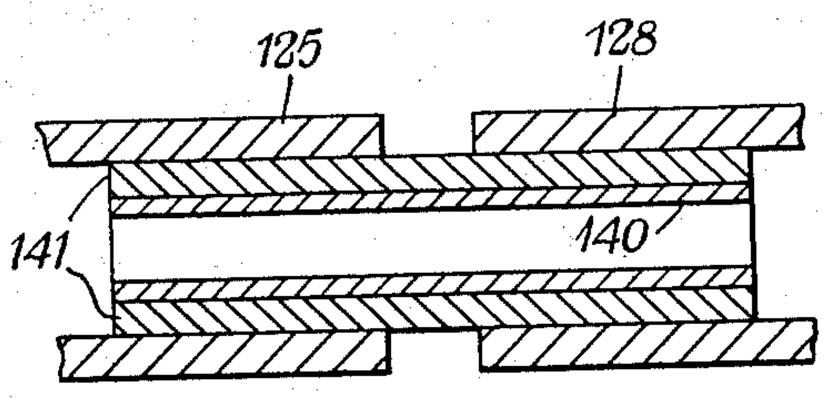

FIG.25

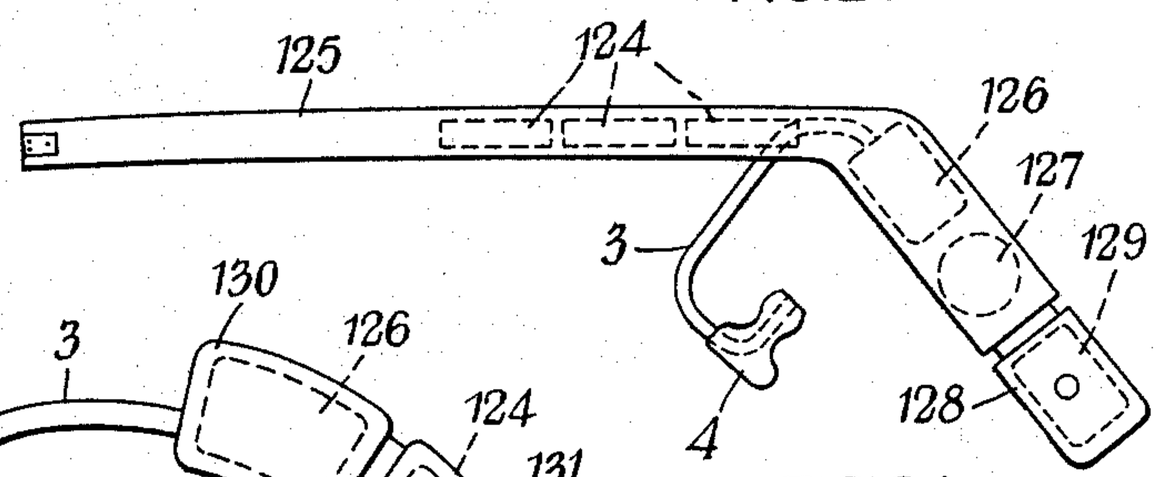

FIG.24

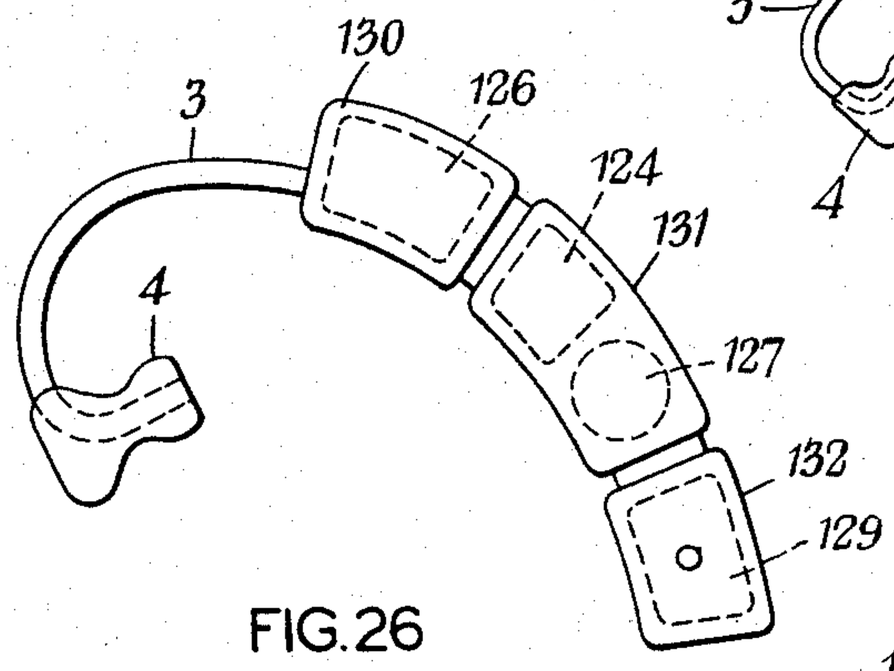

FIG.26

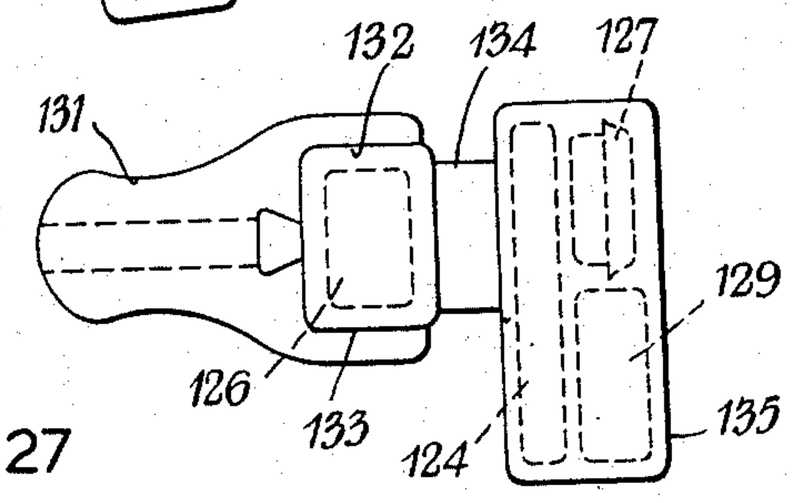

FIG.27

United States Patent Office

3,102,172
Patented Aug. 27, 1963

3,102,172
HEARING AID

Michael Cohen, Middlesex, England, assignor to Ardente Acoustic Laboratories Limited, London, England, a company of Great Britain

Filed Nov. 12, 1959, Ser. No. 852,441
Claims priority, application Great Britain Nov. 12, 1958
19 Claims. (Cl. 179—107)

This invention relates to hearing aids to be worn on the head.

It is known to provide hearing aids which are incorporated in spectacles frames or are worn in the ear, behind the ear or in the hair. Such hearing aids consist principally of a microphone to receive the sounds and to produce electrical signals accordingly, a transistor amplifier to amplify the electrical signals and a receiver to produce sounds from the amplified electrical signals. The volume of the sound emitted by the receiver can be regulated by a volume control which adjusts the gain of the amplifier. A flexible tube usually extends from the receiver into the auditory canal of the wearer and is sealed therein by a plug having a passage therethrough for the flexible tube. The plug is moulded to be a good fit in the ear of the wearer, since, in addition to supporting the tube comfortably in the ear, its purpose is to prevent sound waves coming out of the ear, from the inner end of the flexible tube, and influencing the microphone. Influencing of the microphone by sounds emanating from the earphone is known as acoustic feedback and produces whistling noises. Disturbing noises will also be produced if mechanical vibrations of the receiver are transmitted to the microphone, this being known as mechanical feedback.

Hearing aids of the kind described above have to be very small and it is common practice to mount the microphone, the amplifier and the receiver in a common casing. However, inherent in this construction are particularly serious problems of acoustic and mechanical feedback. Mechanical vibrations from the receiver are transmitted to the microphone by way of components fitted on the inside walls of the casing and also by way of the casing walls themselves. Moreover, a proportion of the sound emitted by the receiver travels within the casing to the microphone. Attempts have been made to solve the problem of mechanical feedback by resiliently mounting the microphone and the receiver within the casing, for example by interposing pads of foamed rubber or foamed plastic between the microphone and the casing wall and between the receiver and the casing wall. This means that the casing must be undesirably larger in order to accommodate the foamed plastic or rubber parts. In spite of all known precautions to limit acoustic and mechanical feedback, in view of their existence it is necessary to limit the gain of the hearing aids to about 40 db.

According to the invention there is provided a hearing aid of the air conduction type comprising a casing assembly including a first substantially rigid casing means including a microphone, a second substantially rigid casing means including a receiver, and coupling means coupling said first and second casing means, said microphone being held by said first casing means outside of and out of rigid contact with said second casing means, said receiver being held by said second casing means outside of and out of rigid contact with said first casing means, said coupling means comprising a compliable block disposed between said first and second casing means to retain said first and second casing means wholly out of rigid contact but in such a close proximity that said casing assembly is substantially rigid as a whole, said block serving to resist mechanical feedback from one casing to the other, an amplifier in said casing assembly and electrical connections between the amplifier and the microphone and receiver, said connections including flexible conductors extending through said block between the first and second casing means.

With such a construction, a higher gain may be employed than in the known hearing aids discussed above. Moreover, the microphone and receiver may be situated closer together than hitherto, which is a great advantage, particularly in heatring aids of the spectacles type.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made to the accompanying drawings in which:

FIGURE 1 is a side view, and FIGURE 2 is a top plan view, of a complete hearing aid to be worn behind the ear,

FIGURE 3 is a side view, corresponding to FIGURE 1, showing the inside of part of a casing of the hearing aid.

FIGURE 4 is a top plan view of that casing part,

FIGURES 5 and 6 are views of the casing part, as seen in the directions of the arrows Y and Z, respectively, in FIGURE 3,

FIGURE 7 is a sectional view of the casing part, as seen in the direction of the arrows VII—VII in FIGURE 3,

FIGURE 8 is a side view showing the inside of a cover which is combined with the casing part shown in FIGURES 3 to 7 to form a casing,

FIGURE 9 is a top plan view of the cover,

FIGURE 10 is a side view of a holder for an electric cell,

FIGURE 11 is a sectional view of the holder, as seen in the direction of the arrows XI—XI in FIGURE 10 and showing the cell in position,

FIGURE 12 shows the inside of another casing,

FIGURE 13 is a sectional view of the latter casing, as seen in the direction of the arrows XIII—XIII in FIGURE 12, and showing also a microphone and associated circuit elements,

FIGURE 14 is a side view of the casing of FIGURES 3 to 9, with the cover removed, showing the components that are fitted therein,

FIGURE 15 illustrates a first member that is used to connect the two casings together,

FIGURE 16 is a further view of that member, as seen in the direction of the arrow XVI in FIGURE 15,

FIGURE 17 illustrates a second member that is used to connect the two casings together,

FIGURE 18 is a further view of the second member, as seen in the direction of the arrow XVIII in FIGURE 17,

FIGURE 19 is a perspective view of the first and second members after assembly with foamed rubber pads,

FIGURE 20 is a plan view of a contact plate,

FIGURE 21 is a side view of the contact plate,

FIGURE 22 is a pictorial view of an alternative form of the casing of FIGURES 12 and 13,

FIGURE 23 is a sectional view, taken as indicated by the arrows XXIII in FIGURE 22, of a portion of the casing shown in FIGURE 22,

FIGURE 24 is a diagrammatic view of a part of a hearing aid of the spectacles type,

FIGURE 25 illustrates a coupling structure for use in the hearing aid of FIGURE 24,

FIGURE 26 is a diagrammatic view of a hearing aid to be worn behind the ear or in the air, and

FIGURE 27 shows diagrammatically a hearing aid to be worn in the ear.

The hearing aid shown in FIGURES 1 to 21 consists of two casings **1** and **2** made of cellulose propionate, electrical components within the casings, a tube **3** extending from the casing **1** and a plug **4** which is to be inserted

into the auditory canal. When the hearing aid is in use, the casings 1 and 2 will be positioned between the pinna and the side of the head and towards the back of the pinna so that a person looking at the wearer from the front will be unable to see much, if any, of the casings 1 and 2. The casing 2 will be at the back end, and at the same time the lower end, of the structure.

The casing 1 consists of a base part 5 and a cover 6 therefor. The base part has a flat, arcuate bottom panel 7 and two side walls 8 and 9 extending from the edges thereof. The side wall 8 is formed with a recess 10 which receives a knurled rotary volume-control member 11. Also formed in the side wall 8 is a shallower and longer recess 12 which receives part of a holder 13 (shown in FIGURES 10 and 11) for an electric cell. The recess 12 is deepened at 13 to accommodate the actuating arm of an on-off and tone-control switch, which arm is shown at 14 in FIGURE 14. There are no such recesses in the side wall 9.

At the end of the base part 5 which is marked 5A in FIGURE 3 there is an end wall 15 and a nose portion 16, the latter being formed with a groove 17 which receives a connecting piece 18 (shown in FIGURE 14) for connecting the tube 3 to a receiver which is within the casing 1. At the opposite end, 5B, of the base part 5, there is no end wall but only two very short inwardly-projecting portions 20 extending from the ends of the side walls 8 and 9.

A raised portion 22 projects slightly from the inside of the bottom panel 7 and is partly surrounded by two L-shaped ridges 23A and 23B. The raised portion 22 serves as a mounting platform for the control member 11. Two ledges 25 and 26 extend along the insides of the side walls 8 and 9 and are each formed at one end with an inwardly projecting nose, 27 or 28. The noses 27 and 28 are formed with holes 29 and 30 which extend through the bottom panel 7 and receive two screws (not shown) that pass from the exterior of the casing, through the holes 29 and 30, and into internally screw-threaded ends of two metal tubes, shown at 34 and 35 in FIGURE 14.

The cover 6 has an arcuate bottom panel 40 similar to the panel 7 of the base part 5 and it has two side walls 41 and 42, an end wall 43 and a nose portion 44 having a groove 45, the parts 43 to 45 being similar to the parts 15 to 17 already described. The side wall 41 is formed with a recess 39 which, like the recess 12 in the casing part 5, receives part of the holder 13. Projecting from one edge of the side wall 41 is a portion 46 which fits into the recess 10 in the base part 5 and terminates adjacent the control member 11, as can be seen from FIGURE 2. There are no recesses in the side wall 42. At the ends of the side walls 41 and 42 there are very short inwardly-projecting portions 47 similar to the portions 20 shown in FIGURE 3.

Holes 48 and 49 extend through the bottom panel 40 of the cover 6 and fixing screws (not shown) extend through them and into the ends of the two tubes 34 and 35, which ends are internally screw-threaded. Thus, the two tubes and the fixing screws hold the two parts of the casing 1 together.

The base part 5 is formed with further holes 50–52 to receive fixing screws and the cover 6 is formed with holes 53–55 for the same purpose. All these screw holes are countersunk on the outside of the casing. The screws which pass through the holes 50 and 53 engage in screw-threaded holes in the connecting piece 18. The purpose of the screw holes 51, 52, 54 and 55 will be explained subsequently.

The cell holder 13 consists of a frame member 60 having a circular internal surface 61. The frame member also has a semi-circular inwardly-directed flange 62. The circular surface 61 defines a cavity into which is fitted a mercury cell 63 (FIGURE 11) which provides the operating voltage for the electric circuit components

of the hearing aid. The cell is in the form of a thick disc. It is inserted in the holder from the side which is shown to the left in FIGURE 11 and is prevented by the flange 62 from falling out of the other side. The frame member 60 is formed with a bore 64 through which passes the tube 34, which thus affords a pivotal connection for the cell holder and enables it to be swung into the position shown in dotted lines in FIGURE 1 to enable the cell 63 to be removed and replaced by another. When the hearing aid is in use, the cell holder will occupy a position in which the surface marked 59 lies flush with the side walls 8 and 41.

The casing 2 is roughly in the shape of a rectangular box having no lid and having a rectangular hole. Thus it has a base portion 70 formed with a rectangular hole 71, two major side walls 72 and 73 and two minor side walls 74 and 75. The edges of the hole 71 are rabbeted, as shown at 76, to accommodate a baffle plate 77. A microphone in a rectangular brass housing 78 is inserted in the casing 2, the sound inlet of the microphone being adjacent the baffle plate 77 and the hole 71. Electrical components forming all, or part of, the first stage of a transistor amplifier are attached to the microphone housing 78 and are represented by the rectangle 79.

The side walls 72 and 73 are formed with countersunk holes 80 through which fixing screws (not shown) pass. The walls 72 and 73 are also formed internally with rectangular recesses 82, the purpose of which will be discussed below.

Further electrical components, including second, third and fourth stages of the transistor amplifier, are assembled together and disposed in the casing 1, the assembly being represented by the rectangle 83. A pad 84 of foamed rubber is attached to one side of the assembly of components.

A sheet 85 of rigid insulating material (FIGURE 14) has one edge thereof resting upon the ledge 25 and the opposite edge resting upon the ledge 26, as shown in dotted lines in FIGURE 7 so that a chamber 86 is formed between the bottom panel 7 and the sheet 85. In this chamber is disposed the on-off and tone-control switch. The switch has contacts deposited by a "printed circuit" technique on that face of the sheet 85 which is nearest the bottom panel 7 of the casing 1. The contacts are wiped by a moving contact member (not shown) that is actuated by a finger (shown at 89 but not in detail) which extends through the sheet 85 from the arm 14, the arm being in the form of a disc which is pivotally mounted at the centre by means of a rivet (the head of which is shown at 88) which passes through a hole in the arm 14. The arm 14 has a portion 87 extending out of the casing 1 so that the arm 14 may be turned by the wearer so that it occupies one of three positions shown by chain lines 21 in FIGURE 14. The rivet head 88 engages one side of the cell 63 to carry the current therefrom. The other side of the cell is engaged by a contact device as shown in FIGURES 20 and 21 in the form of thin sheet metal having a curved portion 90 which actually contacts the cell and an arm 91 formed with a recess 92 at each end. The screws (not shown) which pass through the bottom panel 40 of the cover 6 and enter the ends of the tubes 34 and 35 also lie in these recesses 92 so that the screws hold the contact device in position. For ease of illustration, the contact plate is not shown in FIGURE 14.

A receiver 95 is disposed in a housing made of brass and the latter is wrapped in a sheet of foamed rubber (not shown) and disposed in the casing 1 at the end 5A. A short tube 101 extends from the sound outlet of the receiver to the connecting piece 18.

The casings 1 and 2 are connected together by a coupling structure which includes a first coupling member 100 shown in FIGURES 15 and 16 and a second coupling member 101 shown in FIGURES 17 and 18, these coupling members being bent from brass sheet. The member 100 has a plate portion 102 with two arms 103

bent in one direction from opposite ends of it and two lugs **104** bent in the opposite direction from the two sides of it, the lugs being formed with screw-threaded holes **105**. During assembly of the coupling structure, the end portions **106** of the arms **103** will be bent inwardly as shown in dotted lines. The member **101** consists of a rectangular plate **107** having its two ends bent over to form flanges **108** which are each provided with two screw-threaded holes **109**. Central apertures **110** and **111** extend through the members **100** and **101** respectively.

Also provided are three rectangular sheets of foamed rubber (or other foamed plastic material). The first, designated **115**, is a little longer than the plate portion **102** and of a width substantially equal to the distance between the two lugs **104**, and it is laid upon, and cemented to, the portion **102** between the lugs. This sheet is shown in FIGURE 14 but not in FIGURE 19. The second sheet, **116**, is longer and wider than the plate portion **102** and is laid thereon, and cemented thereto, with the arms **103** piercing the sheet **116**. The third sheet, **117**, is a little longer than the width of the plate **107** but shorter than the distance between the two arms **103**. Its width is a little less than the distance between the flanges **108**. It is laid upon, and cemented to, the plate **107** between the flanges **108**. To assemble the coupling structure, the sheets **115** and **116** are assembled, as described, with the member **100** and the sheet **117** is assembled with the member **101**. The exposed face of the plate **107** of the member **101** is then laid upon the exposed face of the sheet **116**, whereafter the ends **106** of the arms **103** are bent around the sides of the plate **107** and the ends of the sheet **117**, as clearly shown in FIGURE 19. It will now be understood that the members **100** and **101** cannot be pulled apart, although they are not in contact with one another, the only mechanical connection between them being by way of the foamed rubber sheets **116** and **117**. The sheets **115** to **117** are centrally pierced, as at **119**, so that flexible insulated conductors may pass through them as indicated by reference **119***a*. The apertures **110** and **111** (FIGURES 15 and 17) are provided for the same purpose

Two fixing screws pass through the holes **54** and **55** in the cover **6** and into the holes **109** in one of the flanges **108** of the member **101**, and two further screws pass through the holes **51** and **52** of the casing part **5** and into the holes in the other flange **108**. The lugs **104** of the member **100** fit into the recesses **82** in the casing **2** and two fixing screws pass through the holes **80** and into the holes **105** in the lugs **104**. The housing **78** is separated from the member **100** by the foamed rubber sheet **115**. The sheet **115** could be of paper instead of foamed rubber.

The lugs **104** will be of such length, and will be fixed to the casing **2** at such positions, that the casings **1** and **2** will be spaced apart as indicated by the gap **19** shown between them in FIGURE 1. Due to this and to the nature of the coupling structure connecting the two casings together, there is no possibility of any substantial mechanical vibrations being transmitted from one casing to the other. However, the casings **1** and **2** cannot be pulled further apart, due to the arms **103** being bent around the parts **101** and **117** as described above.

The electrical connections between the circuit components will be by way of very flexible insulated conductors, for example consisting of a few very fine tinned copper wires twisted together and insulated with polyvinyl chloride. Enamelled fine copper conductors may be used instead. The conductors **119***a* passing from the circuit elements in the casing **2** to those in the casing **1** will not transmit any substantial vibrations due to their flexibility. By virtue of the holes in the foamed rubber pads **115** to **117**, for the passage of the conductors **119***a*, being smaller than the apertures **110** and **111** in the members **100** and **101**, and being centrally located with respect thereto, the insulated conductors do not come into contact with the members **100** and **101** and this helps to avoid transmission of vibrations.

An alternative form of casing **2** is shown in FIGURES 22 and 23, wherein parts corresponding to those of the earlier figures are similarly numbered. This casing differs from that previously described in that instead of there being a hole **71** in the base **70**, there is a smaller hole **120** where the base **70** meets the wall **74**.

Referring to FIGURE 24, one arm **125** of a spectacles frame is formed at its rear end as a casing and in it are disposed an earphone **126**, a mercury cell **127** and other circuit components, represented by blocks **124**. The components are arranged in a row, so that this part of the arm **125** can be made very thin. Indeed, the only parts of the spectacles frame which need be thick or wide are those which fit behind the ear, where they are less noticeable.

A tube **3** extends from the receiver **126** to an earplug **4**. At the end of the arm **125** is disposed another casing **128** containing a microphone **129** and, if desired, the first stage of a transistor amplifier. The casing **128** may be constructed like the casing **2** described above, or as modified in accordance with FIGURES 22 and 23.

The casings **125** and **128** are mechanically connected together and spaced apart by a coupling structure which may, if desired, be constructed in accordance with FIGURES 15 to 19, and connected to the casings in a manner similar to that described above. Flexible electrical conductors (not shown) again interconnect the parts within the two casings.

An alternative coupling structure for the casings **125** and **128** is illustrated in FIGURE 25. A rigid and hollow coupling member **140**, through which pass the insulated conductors (not shown), is wrapped in a foamed rubber sheet **141** and its opposite ends are inserted in the ends of the casings **125** and **128**. The sheet **141** is cemented to the surfaces which it contacts.

In the construction according to FIGURES 1 to 23 or in that according to FIGURE 24 the two casings could be connected together by a simple rubber link but the described arrangements appear to be preferable because they prevent the hearing aid being damaged by the casings being pulled apart.

FIGURE 26 shows a hearing aid having three separate casings **130** to **132** arranged end-to-end so as to constitute an arc. They are interconnected by way of plastic, silicone rubber or india-rubber links, or by coupling arrangements as described with reference to FIGURES 15 to 19. The casing **130** contains the receiver **126**, the casing **132** contains the microphone **129** and the middle casing **131** contains the mercury cell **127** and the other electrical circuit components **124**. Thus the coupling structure which interconnects the casings containing, respectively, the microphone and the receiver consists of the third casing and two coupling arrangements according to FIGURES 15 to 19, or two links of rubber or the like.

Referring to FIGURE 27, a moulded plastic insert **131** which is to be fitted into the ear is bored longitudinally and is formed with a cup-shaped recess **132** at the end which is to be outermost when in use. This recess is to receive a casing **133** which houses a receiver **126**. Connected to this casing by a rubber link **134**, or by a coupling structure in accordance with FIGURES 15 to 19, is another, larger, casing **135** in which is mounted the microphone **129**, the mercury cell **127** and the other electric circuit components **124**.

I claim:

1. A hearing aid of the air-conduction type, comprising at least two casings, a microphone in a first of the casings, a receiver in a second of the casings, a sound-conducting tube connected at one end to the receiver, an earplug adapted to fit into the ear of the user connected to the other end of the tube to receive sound from the receiver, means coupling the casings together to form an assembly of casings shaped to be disposed wholly on one side of the head and at least partly in the rearward part of the space between the pinna and the side of the head of the

user, said coupling means including a first rigid coupling member rigidly secured to the first casing, a second rigid coupling member rigidly secured to the second casing and a compliable block disposed between the first and second members to preclude contact between them and said coupling means holding the first and second casings apart but preventing them from being accidentally pulled further apart whilst at the same time preventing them from being pushed into contact with one another, said block serving to resist mechanical feedback from one casing to the other, an amplifier in the assembly of casings and electrical connections between the amplifier and the microphone and receiver, said connections including flexible conductors extending through said block between the first and second casings.

2. A hearing aid according to claim 1, wherein a battery and components of said amplifier are disposed in the first casing.

3. A hearing aid according to claim 1, wherein a battery and components of said amplifier are disposed in the second casing.

4. A hearing aid according to claim 1, wherein said amplifier is a multi-stage amplifier and components of the first stage are disposed in the first casing and the components of the remainder of the amplifier are disposed in the second casing.

5. A hearing aid according to claim 1, and further comprising portions of one of the coupling members which embrace the other coupling member, thereby preventing the two casings being pulled apart.

6. A hearing aid according to claim 5, and further comprising a first plate portion of the first coupling member disposed near the first casing, a second plate portion of the second coupling member substantially parallel to the first plate portion and disposed near the second casing, two parallel arms of the first coupling member extending from opposite edges of the first plate portion, perpendicularly thereto and towards the second casing, end portions of said arms bent around opposite edges of the second plate portion to the side thereof nearest the second casing, a first compliable block separating the two plate portions and a second compliable block separating the second plate portion from said end portions of said arms.

7. A hearing aid according to claim 6, and further comprising two flanges bent over from the second plate portion at opposite ends thereof, portions of said flanges defining holes therethrough and screws in said holes fixing the second coupling member to the second casing.

8. A hearing aid according to claim 6, and further comprising two parallel lugs extending from the first plate portion, perpendicularly thereto and away from the second casing, portions of said lugs defining holes therethrough and screws in said holes fixing the first coupling member to the first casing.

9. A hearing aid according to claim 8, wherein the microphone is disposed between the lugs and separated from the first plate portion by a pad of compliable material.

10. A hearing aid according to claim 1, wherein the first casing is in the form of a lidless rectangular box having portions defining an aperture, for the entry of sound, where the base meets one of the side walls.

11. A hearing aid according to claim 1, and further comprising a battery holder in said second casing and a pivotal connection between said holder and the second casing so that the holder can be swung out of the second casing for the battery to be removed.

12. A hearing aid according to claim 11, and further comprising a tone-control device and a battery in said second casing, an actuating member of said tone-control device, a pivot pin which pivotally mounts said actuating member in the second casing, and a portion of said pivot pin which constitutes a contact engaging one pole of the battery.

13. A hearing aid according to claim 11, wherein the first and second casings form part of one arm of a pair of spectacles.

14. A hearing aid of the air-conduction type, comprising first, second and third casings, of which the second is positioned between the first and third, a microphone in the first casing, a battery and at least part of an amplifier in the second casing, a receiver in the third casing, a sound-conducting tube connected at one end to the receiver, an earplug adapted to fit into the ear of the user connected to the other end of the tube to receive sound from the receiver, first coupling means coupling the first and second casings together, second coupling means coupling the second and third casings together, said casings and coupling means forming an assembly shaped to be disposed wholly on one side of the head and at least partly in the rearward part of the space between the pinna and the side of the head of the user, each coupling means including a first rigid coupling member rigidly connected to one of the two casings coupled by that coupling means, a second rigid coupling member rigidly connected to the other of the two casings coupled by that coupling means and a compliable block disposed between the first and second members to preclude contact between them and said coupling means holding the first and second and also the second and third casings apart but preventing them from being accidentally pulled further apart whilst at the same time preventing them from being pushed into contact with one another, said block serving to resist mechanical feedback from one casing to the other, an amplifier in the assembly of casings and electrical connections between the amplifier and the microphone and receiver, said connections including flexible conductors extending through said block between the first and second casings and between the second and third casings.

15. A hearing aid of the air-conduction type, comprising at least two casings, a microphone in a first of the casings, a receiver in a second of the casings, a sound-conducting tube connected at one end to the receiver, an earplug adapted to fit into the ear of the user connected to the other end of the tube to receive sound from the receiver, means coupling the casings together to form an assembly of casings shaped to be disposed wholly on one side of the head and at least partly in the rearward part of the space between the pinna and the side of the head of the user, said coupling means including a first rigid coupling portion carried by one of the first and second casings, a second rigid coupling portion carried by the other of those two casings, portions of the second coupling portion which embrace the first coupling portion and prevent the two casings being pulled apart and a compliable block disposed between the two coupling members and positively preventing contact between them, said block serving to resist mechanical feedback from one casing to the other, said hearing aid further comprising an amplifier in the assembly of casings and electrical connections between the amplifier and the microphone and receiver, said connections including flexible conductors extending through said block between the first and second casings.

16. A hearing aid of the air-conduction type, comprising at least two casings, a microphone in a first of the casings, a receiver in a second of the casings, a sound-conducting tube connected at one end to the receiver, an earplug adapted to fit into the ear of the user connected to the other end of the tube to receive sound from the receiver, means coupling the casings together to form an assembly of casings shaped to be disposed wholly on one side of the head and at least partly in the rearward part of the space between the pinna and the side of the head of the user, said coupling means including a first rigid plate portion carried by one of the first and second casings, a second rigid plate portion carried by the other of those two casings and positioned substantially parallel to the first plate portion, two parallel arms extending from opposite edges of the first plate portion perpendicular thereto and towards said other casing, end portions of said arms bent around opposite edges of the second plate portion to the side thereof nearer said other

casing, a first compliable block separating the two plate portions and a second compliable block separating the second plate portion from said end portions of said arms, said block serving to resist mechanical feedback from one casing to the other, said hearing aid further comprising an amplifier in the assembly of casings and electrical connections between the amplifier and the microphone and receiver, said connections including flexible conductors extending through said blocks between the first and second casings.

17. A hearing aid of the air-conduction type, comprising at least two casings, a microphone in a first of the casings, a receiver in a second of the casings, a sound-conducting tube connected at one end to the receiver, an earplug adapted to fit into the ear of the user connected to the other end of the tube to receive sound from the receiver, means coupling the casings together to form an assembly of casings shaped to be disposed wholly on one side of the head and at least partly in the rearward part of the space between the pinna and the side of the head of the user, said coupling means including a rigid tubular coupling member having one end inserted in the first casing and the other end inserted in the second casing and a compliable block separating the tube from the first and second casings, to preclude contact between them and said coupling means holding the first and second casings apart but preventing them from being accidentally pulled further apart whilst at the same time preventing them from being pushed into contact with one another, said block serving to resist mechanical feedback from one casing to the other, an amplifier in the assembly of casings and electrical connections between the amplifier and the microphone and receiver, said connections including flexible conductors extending through said block between the first and second casings.

18. A hearing aid of the air conduction type comprising a casing assembly including a first substantially rigid casing means including a microphone, a second substantially rigid casing means including a receiver, and coupling means coupling said first and second casing means, said microphone being held by said first casing means outside of and out of rigid contact with said second casing means, said receiver being held by said second casing means outside of and out of rigid contact with said first casing means, said coupling means comprising a compliable block disposed between said first and second casing means to retain said first and second casing means wholly out of rigid contact but in such a close

proximity that said casing assembly is substantially rigid as a whole, said block serving to resist mechanical feedback from one casing to the other, an amplifier in said casing assembly and electrical connections between the amplifier and the microphone and receiver, said connections including flexible conductors extending through said block between the first and second casing means.

19. A hearing aid of the air conduction type comprising a casing assembly dimensioned to be inserted into the ear, said casing assembly including a first substantially rigid casing means including a microphone, a second substantially rigid casing means including a receiver, and coupling means coupling said first and second casing means, said microphone being held by said first casing means outside of and out of rigid contact with said second casing means, said receiver being held by said second casing means outside of and out of rigid contact with said first casing means, said coupling means comprising a compliable block disposed between said first and second casing means to retain said first and second casing means wholly out of rigid mechanical contact, said block serving to resist mechanical feedback from one casing to the other, an earplug fitted to said second casing means in acoustical coupling with said receiver, an amplifier in said first casing means and electrical connections between the amplifier and the microphone and receiver, said connections including flexible conductors extending through said block between the first and second casings.

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