March 3, 1964 J. G. PRENTISS ETAL 3,123,678

HEARING AID APPARATUS

Filed Dec. 13, 1955 3 Sheets-Sheet 1

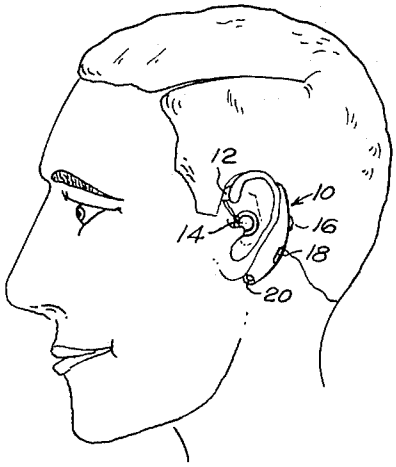

Fig. 1

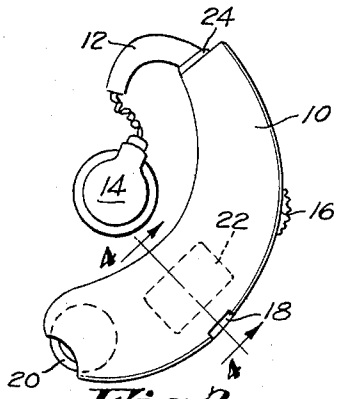

Fig. 2

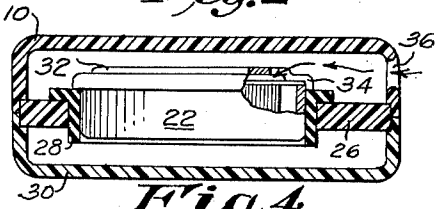

Fig. 4

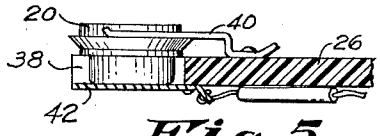

Fig. 5

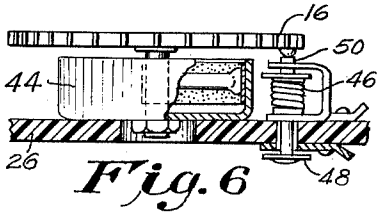

Fig. 6

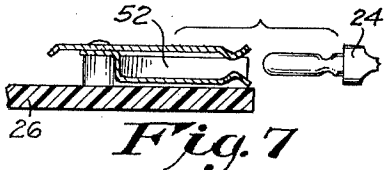

Fig. 7

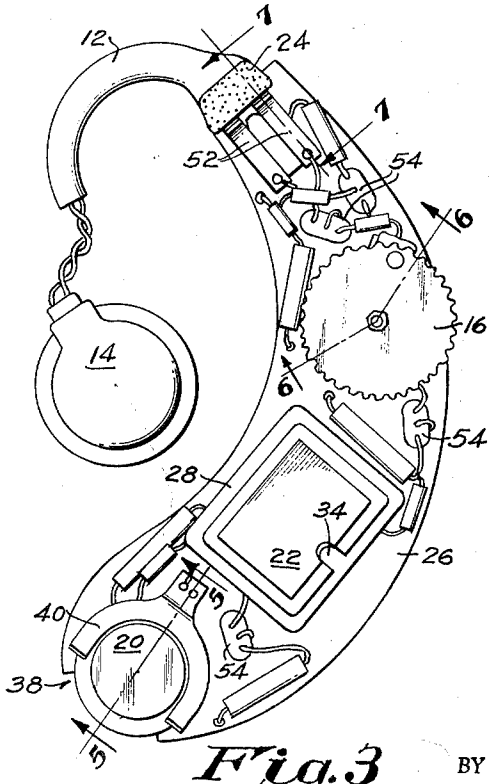

Fig. 3

INVENTORS:
JOHN G. PRENTISS and
JOHN T. VALASKOVIC

BY John J. Pederson
ATTORNEY

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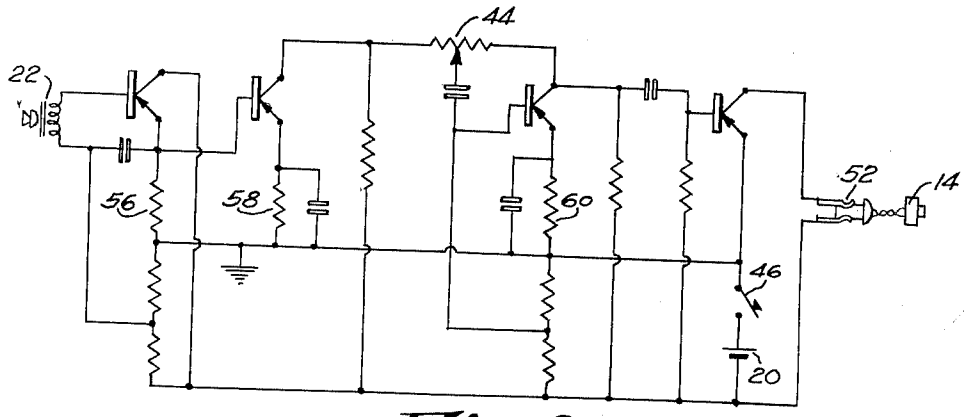

Fig. 8

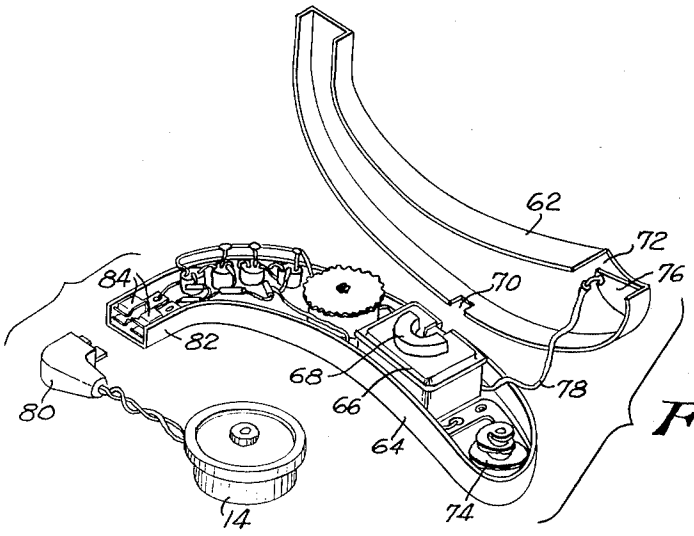

Fig. 9

INVENTORS:
JOHN G. PRENTISS and
JOHN T. VALASKOVIC

BY John J. Pederson

ATTORNEY

March 3, 1964 J. G. PRENTISS ETAL 3,123,678

HEARING AID APPARATUS

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3 Sheets-Sheet 3

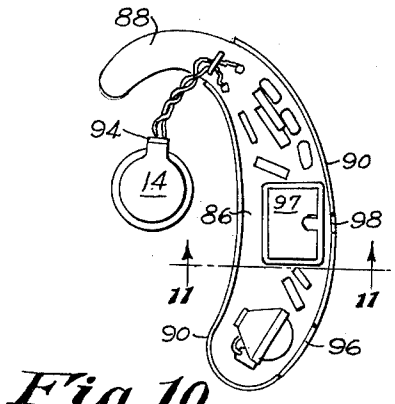

Fig. 10

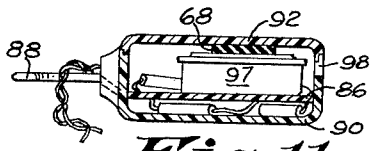

Fig. 11

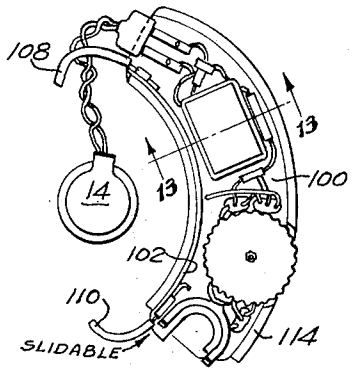

Fig. 12

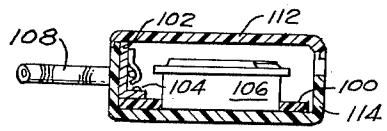

Fig. 13

INVENTORS:
JOHN G. PRENTISS and
JOHN T. VALASKOVIC

BY John J. Pederson

ATTORNEY

United States Patent Office 3,123,678
Patented Mar. 3, 1964

3,123,678

HEARING AID APPARATUS

John G. Prentiss, Berwyn, and John T. Valaskovic, Chicago, Ill., assignors to Zenith Radio Corporation, a corporation of Delaware

Filed Dec. 13, 1955, Ser. No. 552,744
17 Claims. (Cl. 179—107)

This invention relates to wearable hearing aid instruments, and particularly to an improved electronic hearing aid of such special shape and compact configuration that the entire instrument can be supported by the external ear of the user.

Introductory Discussion

In order to appreciate fully the significance of the present invention, and its relationship to prior art developments, a brief review of the technical background may be helpful. Ever since the initial advent of the electronic amplifier, efforts have been made to to apply it to overcoming the handicap of those whose hearing is partially or wholly impaired. Early versions of the electronic hearing aid were extremely bulky and cumbersome by present day standards; the early wearable hearing aids commonly required separate cases of substantial size to house the amplifier itself and the necessary batteries to power the same. While it was feasible in some cases to mount the microphone in one of these cases, the ear piece (or bone-conduction vibrator) ordinarily had to be located on the user's head, and connected to the amplifier casing by wires. Wires connecting the amplifier to the batteries were also needed. By thus separating the major components, the sizes thereof were kept sufficiently low to permit them to be more or less effectively concealed by the user's clothing. However, both size and weight remained substantial, and represented a source of discomfort or annoyance, particularly if the user was at all sensitive to public recognition of his impaired hearing. This sensitivity of the hard of hearing in many cases prevented their acceptance of the technical advances which would have greatly alleviated their impairment, and it remains today a substantial obstacle to the adoption of the hearing aid by many persons who prefer to suffer a hearing impairment where the remedy involves bulky equipment or conspicuous wiring or appliances.

It is true that later advances in electronics, particularly the advent of efficient miniature thermionic tubes and associated components, and the development of small and light-weight batteries, have permitted the electronic hearing aid to be reduced to a single small casing containing microphone, amplifier and batteries. Such a unit can readily be carried in a vest pocket or elsewhere upon the person, but must still be connected by wires to an earpiece or vibrator on the user's head. Not only are these wires unsightly and objectionable to many persons, but they are subject to more or less continuous wear and motion, and hence need frequent replacement. A more serious objection to this system, which is typical of the art prior to the present invention, is that maximum concealment of the instrument casing, as in a pocket, produces two serious and related consequences. First, since the microphone is shielded acoustically from sounds originating away from the user's body, substantially greater amplification is needed than would be the case if the microphone were freely exposed. This increase in amplification, or sensitivity, makes the system especially sensitive to noise produced by movements of the wearer's clothing adjacent the microphone and/or its cord. The rustling sounds thus amplified and fed into the earpiece or other reproducer can only be attenuated at the expense of lessened output or reduced reproduction quality. The effort to make the instrument inconspicuous has thus been to some extent self-defeating, and has produced its share of resistance to the use of hearing aids by many who could be greatly benefited by such assistance.

The present invention aims to solve the dilemma outlined above by a basically new approach to the design of wearable hearing aid devices. Essentially, the invention provides a hearing aid in which all of the components, including microphone, amplifier, battery supply and the earpiece or reproducer, are carried and supported directly by the user's ear, yet in such a way that the entire device is considerably less conspicuous than presently conventional appliances in this field. The satisfactory accomplishment of this result in a practical and acceptable device requires more than merely the use of miniature components and batteries. Several serious problems are raised by such an objective, and it is to the solution of these problems that the present invention is directed.

Objects of the Invention

From the foregoing discussion, it will have been realized that the principal object of the invention is to provide an electronic hearing aid appliance all of whose parts are carried and supported directly by the user's ear, or (in the case of binaural hearing assistance to be described below), by his respective ears. A related object of the invention is to provide such a hearing aid which is of such special shape and compact form that it is largely concealed by the ear, specifically by reason of being located behind and beneath the external helix of the ear. By this construction, not only is the instrument rendered in all cases quite inconspicuous, but in the instance of wear by women, it can be rendered wholly invisible. Not only is the wearer freed entirely from the need for connecting wires extending from the ear or head downward into the clothing, which is in itself a substantial improvement from the viewpoint of concealment, but the centralization of the entire apparatus at the ear enables the wearer to position and remove the unit at will. Thus, a very sensitive person is enabled to remove the appliance when going in public, for example, without disconnecting wires or connectors, and need not forego the benefits of hearing assistance at other times and places.

It is believed that the combined effect of this elimination of exposed wiring and unitary removability should go far toward overcoming the social or psychological opposition to hearing assistance which even today prevents large numbers of shy or sensitive persons from enjoying the benefits of adequate hearing. It is further considered that once these benefits are realized by such users of the present invention, a gradual acclimation to the use of the device will ultimately overcome excessive shyness to the end that full hearing acuity may be enjoyed at all times and places.

A collateral object of the invention is to provide a unitary hearing aid device so arranged and designed that a single instrument may be used in either the right or left ear, as occasion dictates or as a particular unilateral impairment requires. While the ordinary user normally prefers assistance always at a particular ear, there are occasions when a change is desired; e.g., depending upon one's orientation in a fixed group of people. The interchangeability as to left and right also has other practical merits. It permits a single type of unit to be manufactured, effecting production economies and minimizing inventory at the factory and all distribution points; the resulting saving in cost to the user may be substantial. Moreover, duplicate units may be used in both the user's ears to provide the advantages of binaural listening at minimum cost.

It has already been mentioned that a great disadvantage of prior art hearing aids is that the microphone concealed

by clothing picks up considerable rustle noise therefrom. The centralization of the microphone on the head eliminates this failing, and of course since clothing no longer muffles the microphone, a desired signal output can be realized from a simpler and less expensive amplifier, or with less battery replacement expense. An advantage of the ear-supported microphone which is especially related to binaural hearing assistance, using an instrument at each ear, is that the directional axis shifts as the head is turned, so that direction estimation is related to head movements, and to differential intensity at the respective ears, in the natural way of persons having unimpaired hearing. This contrasts, for example, with efforts to obtain binaural hearing assistance by separate body-carried microphones, in which case the directional axis does not follow head movements.

A further object of the invention is to provide a hearing aid whose parts are shaped and related so that the assembly is self-supporting on the user's ear; that is, one in which the support function is accomplished as an incident to the other functions, and without requiring an auxiliary supporting device or devices. More specifically, the invention utilizes a portion of the complete assembly lying between the earpiece or reproducer and the electronic parts casing, both for carrying the signal conductors and for hanging the equipment in the desired inconspicuous location. No clips, headband or other auxiliaries are employed.

A further object of the invention is to provide a hearing aid of the above-described general type, in which the major electronic components are carried in a novel manner by a single chassis plate within a conforming casing of curved profile adapted to embrace the rearward surface of the external auditory meatus where the latter joins the integument of the skull, said casing being proportioned so as to be largely covered by the helix, the antihelix and the lobe of the auricle. Preferably, the upper end of the casing, where it approaches the horizontal line touching the top of the external meatus, has a firm but separable plug connection to a hook-shaped member adapted to support most of the weight of the casing upon the ear, and to convey the earpiece circuit conductors forwardly to a point just above and ahead of the tragus, where the conductors emerge to connect flexibly with the usual earpiece receiver held behind the tragus. The lower part of the curved casing, normally behind the lobe, may be somewhat wider than the upper end, and preferably receives through an opening at the extreme end thereof a single long-life battery such as a mercury cell held in position by a spring clip for ready removal and replacement. This organization of the parts permits easy battery replacement, adequate component space with maximum concealment, and satisfactory support from the ear, as well as facilitating proper matching of amplifier and earpiece during initial fitting or selection of the instrument.

Still another object of the invention is to provide an extremely compact amplifier and microphone assembly for wearable hearing aids and the like, carried upon a single one-piece flat chassis or support plate, with the thicker components of the assembly disposed in or passing through apertures in the plate to minimize the total thickness dimension of the unit. A subsidiary object of the invention related to the object just stated lies in the provision of a microphone mounting locating the microphone cartridge in an aperture in the support or chassis plate by frictional engagement with an intervening resilient gasket, which frictionally retains the cartridge in position as well as providing a vibration-reducing shock mount therefor, to minimize excessive shock to the cartridge and to reduce the noise and microphonics introduced into the sensitive input circuit of the amplifier.

An additional object of the invention is to provide a compact hearing aid instrument of the above type in which the arrangement of the self-contained microphone, with particular reference to its axis of maximum sensitivity to the sound field, is such that direct acoustical feedback between the earpiece or reproducer and said microphone is minimized, whereby the tendency to oscillate or sing is eliminated, even when the amplifier is adjusted for maximum amplification or gain. The arrangement of the invention in this respect enables a substantial increase in the useful sensitivity of the device as compared with other head-supported hearing aids which have been proposed.

The above and other objects and advantages of the invention will best be understood by referring now to the following detailed specification of certain preferred embodiments of the invention, taken in connection with the appended drawings, in which:

FIG. 1 is a side elevation showing one form of the device in operating position upon the user's head.

FIG. 2 is a side view, to a larger scale, of the instrument shown in FIG. 1.

FIG. 3 is a further enlarged view of the device of FIG. 1, with the outer casing removed to show the internal construction.

FIG. 4 is a sectional view taken on the line 4—4 of FIG. 2.

FIG. 5 is a fragmentary sectional view taken on line 5—5 of FIG. 3.

FIG. 6 is a similar view taken on line 6—6 of FIG. 3.

FIG. 7 is another fragmentary sectional view taken on line 7—7 of FIG. 3.

FIG. 8 is a schematic wiring diagram of the hearing aid of the preceding figures.

FIG. 9 is a perspective view, with the cover turned aside, of a modified arrangement according to the invention.

FIG. 10 is a plan view of a further modified form of the invention, with the casing cover removed.

FIG. 11 is a sectional view taken on line **11**—**11** of FIG. 10, but with the complete casing and cover in place.

FIG. 12 is a view similar to FIG. 10 of a further form of the invention.

FIG. 13 is a sectional view taken on line **13**—**13** of FIG. 12.

All of the hearing aid embodiments shown in the drawings and described hereinafter have the common characteristic that the complete amplifier, including its input transducer or microphone, and its battery power supply, are constituted by an integral assembly whose shape and size are such that it can fit snugly behind the external ear of the wearer, being largely concealed thereby as seen from the front and at least partially concealed from the side. Moreover, all of the forms are related in that the signal output end of the assembly is so shaped or curved, alone or in combination with the output conductors or their sheath, that it can pass forwardly over the dorsal surface of the outer ear to support the entire unit in place without other fastening or attaching means. Moreover, this hook-like part, however constituted, carries the flexible conductors which thence lead downwardly into the usual earpiece, or transducer and ear mold, located behind the tragus of the ear and serving to couple the output energy of the amplifier into the ear canal itself. In all cases, the acoustical path leading to the sensitive element of the microphone is directed more or less rearwardly of the head. The combination of this directional orientation with the acoustic baffling provided by the ear flap itself, permits substantial amplifier gain without adverse feedback coupling between the earpiece as an output transducer and the microphone as an input element. In this respect the invention is clearly distinguished from unitary hearing aids supported upon spectacle frames or the like, in which the microphone is in more or less direct acoustical coupling with the output transducer or earpiece.

Referring now to FIG. 1 of the drawings, there is illustrated the use of a hearing aid in accordance with the invention, the casing of the same being designated as a whole by the reference numeral **10** and shown as occupying its normal position behind the flap or helix (and the

lobe) of the wearer's ear. At its upper end, where the casing 10 curves forwardly to extend along the dorsal surface of the skin joining the ear to the scalp, the casing merges into a curved sheath 12 forming a cover for the flexible short leads extending the output circuit to the conventional ear-contained reproducer 14 disposed at the entrance to the ear canal, and of course normally provided with a fitted ear mold, not shown, extending into the canal to provide a good acuostic seal with the canal. Also indicated by numerals are the exposed portion of a volume control knob 16, an opening 18 leading to the microphone, and an opening or cutout at the lower tip of the casing to receive the single cell battery 20 which supplies operating power to the amplifier.

The apparatus of FIG. 1 is shown to a larger scale in FIG. 2, in which the same parts bear identical reference numbers. The preferred microphone position within the casing 10 is indicated by the dotted lines 22. This figure more clearly shows the curved configuration of the casing 10, and the way in which at its upper end it receives a miniature plug 24 integral with the curved or hook-like sheath 12 carrying the reproducer conductors over the top of the ear. The conductors extend from the end of sheath 12 to the usual earpiece or miniature receiver 14, this flexibility permitting the device to be used with any normal shape or size of ear. It will be observed that casing 10 is arcuate in both its inner and outer profiles, or in other words is shaped rather like a bean; this shape is designated "reniform" herein by analogy to the shape of the kidney, and it is to be understood that in this connection the term refers to an arcuate casing which is rather thin and flat, and whose inner and outer profiles are both curved so that the inner profile will snugly engage the skin and cartilage of the ear where it extends outward from the scalp integument, while the outer profile will be concealed, as much as may be, by the helix and lobe or flap of the ear. The arcs need not be concentric, however, and as shown in FIG. 2 need not be arcs of circles. Preferably, the upper portion of the casing may be of smaller dimension both in the radial direction and in the direction of casing thickness than is the lower portion. This provides greater casing space at the lower end where the microphone 22 and battery 20 are located. The battery is disposed at the lower end of casing 10 because this location permits it to be readily installed or removed merely by sliding it out of a suitable spring clip within the casing, without disturbing the other parts.

FIGURE 3 of the drawings shows the internal arrangement of the instrument, the casing 10 being entirely removed, and the parts drawn to double the scale of FIG. 2. In this form of the invention, the entire amplifier assembly is mounted upon a single arcuate or reniform chassis plate 26 which may be formed of insulating fiber board, phenolic plastic or the like, and serving to mount the parts in their fixed relationships to one another. Certain of these parts, especially those of the greater thicknesses, are mounted in apertures in plate 26, as will be described below, for maximum compactness. This mounting arrangement for the microphone 22 is detailed in FIG. 4, in which the microphone itself is shown as encircled by a conforming rubber or neoprene flanged gasket 28 sized to fit snugly within an opening in the plate 26 and thereby to hold the microphone in place and at the same time insulating it against mechanical shocks. The microphone may, however, readily be slipped out of place when necessary for repairs or replacement. FIG. 4 also illustrates how plate 26 may be fitted into rabbets in the mating halves of the casing 10 (the lower half shell is indicated by numeral 30), and also indicates the way in which the upper or cover plate 32 of the microphone is channeled as at 34 to define an acoustic path leading towards the aperture 36 in the casing wall directed to the rear of the wearer's head.

At its lower end, the plate 26 is cut away as indicated at numeral 38 in FIG. 5, to receive and partially encircle the cylindrical cup of a conventional long-life unit cell or dry battery 20, which is held in place by the pressure of a bifurcated spring clip 40 rivetted to the plate 26. The spring also forms one terminal of the battery connection, the other contact being formed by a metallic plate 42 secured to the underside of plate 26 so that the battery cup is held against it by the spring clip 40. The outer casing is apertured as already indicated to permit the cell to be removed at will.

Both of elements 22 and 20 thus lie partially on opposite sides of chassis plate 26, and the thickness of this plate is therefore accommodated in the casing without being additive to the thicknesses of these parts. The thinner components may be positioned on either side of plate 26, being for the most part on its upper surface. Thus, FIG. 6 shows the location of a potentiometer-type volume control 44 of conventional circular construction having the control dial or knob 16 already mentioned. An on-off switch for the battery circuit is indicated at 46, and is of known construction, both the potentiometer and switch being mounted upon the upper surface of the plate 26, although the contacts 48 of the switch may be below the plate and operated by a shaft or rod 50 urged against spring tension by a protuberance on the under side of the control dial 16.

At the narrow and relatively thinner upper end of the device, plate 26 carries usual spring contact clips 52 which deliver the amplified output to the conductors of plug 24 which pass through the sheath 12 as above described. This integral curved sheath is a very convenient feature, since it extends the hook-like shape of the chassis plate itself sufficiently far to provide firm engagement with the ear itself, yet permits ready change of the earpiece as required, merely by slipping plug 24 out of the mating relationship to clips 52. The latter are readily made to have sufficient grasp on plug 24 to prevent accidental loosening of the engagement. The weight of the entire instrument with the casing is only a few ounces, so that accidental disengagement is practically impossible. FIG. 7 shows the contact clips and plug in enlarged section.

The amplifier of the form of the invention described above utilizes four transistor stages for good amplification with light weight. The transistor sthemselves are indicated in FIG. 3 by numeral 54, merely to show how they may be disposed, with the other small components such as resistors and condensers, about the chassis plate 26. Actually, the transistors are preferably fitted into conforming apertures in the plate 26, their leads providing sufficient retaining force. The circuit itself is shown in FIG. 8 of the drawings, but since its detailed nature forms no part of the present invention, it will merely be pointed out that all of the transistors are of the PNP type, the variable inductance microphone 22 being connected between the base and emitter of the first stage transistor. Operating potential for all the emitters is furnished by battery 20, directly in the case of the last stage and through suitable resistors 56, 58 and 60 for the earlier stages. The necessary bias resistors and coupling and by-pass capacitors are indicated in usual symbolic form, and the volume control potentiometer 44 is connected between the collector of the second stage and the collector of the third stage (reading from left to right in the diagram) with the sliding contact connected to the base of the third stage. As has already been indicated, battery switch 46 may be ganged to potentiometer 44 to be opened at one extremity of the travel of the sliding contact. Power gains of 60 decibels or higher are readily obtained with this circuit, and with the physical arrangement of microphone and earpiece inherent in the chassis construction, such amplifications can be used without objectionable whistling or feedback troubles.

A modified construction is illustrated in the perspective view of FIG. 9, which shows the device with its casing cover 62 removed. The lower casing half is denoted by numeral 64, and the components are disposed therein in about the same arrangement as in FIG. 3. However, in

this case, no chassis plate as such is employed, the components being cemented or otherwise secured in the lower casing half 64. In this case, the microphone 66 may be loose in its position, being secured by the pressure of a resilient washer 68 when the casing cover 62 is in place. The acoustic channel again opens rearwardly of the head, as through a slot 70 in the casing cover. The battery (not shown in this view) slips through a casing aperture 72 where it is held, when the casing is closed, between a spring contact 74 and the contact plate 76 connected by a conductor 78 to the remaining parts. The cover 62 may be cemented in place, or it may be secured by small screws passing into the lower casing half itself. The reproducer 14 is again furnished with a plug here denoted 80 angled to direct the leads properly from the upper casing terminus 82 containing the contact clips 84. This modification of the invention illustrates the use of a complete 90° bend at the upper end of the casing, so that when plug 80 is in place, a complete hook is provided without requiring the separate cable sheath 12 of FIGS. 1 to 3.

Still another modification is shown in FIGS. 10 and 11 of the drawings. In this case, a common chassis plate 86 is again employed, similar to the plate 26 of the first form described. However, in the modified form, this plate 86 has an integral hook-like upper terminus 88 suitable for engaging the dorsal surface of the ear where it joins the head. This plate 86 again preferably lies midway between the upper and lower walls of the outer casing 90 (see FIG. 11), so that hook 88 is substantially on the median plane of the casing, an arrangement which enables the device to be hooked over either the right or left ear, which is of course true of the earlier-described forms of the invention. While no earpiece plug connector is illustrated in this form of the invention, such may be provided, if desired. Alternatively, the earpiece 14 may be uncoupled at its plug terminal 94, or reversed in direction merely by twisting its flexible leads to accommodate either ear location. FIG. 10 shows the battery receiving aperture as located on the rear casing wall at 96, but the arrangement of the other figures could equally well be employed. The microphone acoustic channel is directed through the casing aperture 98, as in the earlier mentioned forms. A resilient washer 68 (as in FIG. 9) wedges the microphone 97 in place when the case is closed by cover 92.

It is pointed out that, since the casing itself has merely a protective or concealing function, in the forms of FIGS. 1 to 3 and FIG. 10, being in effect carried upon the chassis plate rather than vice versa, a slip-on type of flexible housing could readily be employed. In any event, the material of the outer casing is preferably flesh-colored to blend inconspicuously with the user's skin.

FIGS. 12 and 13 show a further variant of the invention, in which the parts of the amplifier (and the microphone) are carried upon a base plate 100 preferably also of rigid insulating material, and having along its inner arc a metal flange or edge 102 secured to plate 100 as by rivets 104. The components of the amplifier itself are carried upon base plate 100 in the usual way, the thicker components such as the microphone 106 being recessed therein as shown in FIG. 13. At its upper and lower extremities, the flange 102 has secured thereto the extending loops 108, 110 of ductile wire or the like which lie in the median plane of the device and which may be bent or shaped to engage both the upper and lower peripheral ear surfaces where they merge into the head itself. These loops are preferably covered with flesh-colored plastic or the like so as to be relatively inconspicuous where they pass in front of the ear. An earpiece 14 is again connected to the amplifier by flexible leads and suitable plug to permit reversal for wear upon either of the user's ears. The chassis assembly may be encased as indicated at 112, 114 (the upper casing cover 112 is removed in FIG. 12), and the other parts are as described in connection with the previous embodiments.

While particular embodiments of the present invention have been shown and described, it will be obvious 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 claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

What is claimed is:

1. A hearing aid comprising: a casing having an acoustic aperature and of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent the rearward junction between the pinna and the head; an input transducer supported in said casing and responsive to received acoustical signals for developing electrical signals representative thereof; an amplifier supported in said casing and coupled to said input transducer for amplifying said electrical signals; means in addition to said casing for positively supporting said casing grippingly in said position; and means, including an output transducer coupled to said amplifier, responsive to the amplified electrical signals for disseminating amplified acoustical energy into the auditory canal on the side of said external ear opposite said casing.

2. A hearing aid comprising: a casing having an acoustic aperture and of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent the rearward junction between the pinna and the head; an input transducer supported in said casing and responsive to received acoustical signals for developing electrical signals representative thereof; an amplifier supported in said casing and coupled to said input transducer for amplifying said electrical signals; means including an element of adjustably deformable shape for positively supporting said casing grippingly in said position; and means, including an output transducer coupled to said amplifier, responsive to the amplified electrical signals for disseminating amplified acoustical energy into the auditory canal on the side of said external ear opposite said casing.

3. A hearing aid comprising: a casing having an acoustic aperture and of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent the rearward junction between the pinna and the head; an input transducer supported in said casing and responsive to received acoustical signals for developing electrical signals representative thereof; an amplifier supported in said casing and coupled to said input transducer for amplifying said electrical signals; and means, including an output transducer coupled to said amplifier, responsive to the amplified electrical signals for disseminating amplified acoustic energy into the auditory canal on the side of said external ear opposite the casing and having an element in addition to said casing for positively supporting said casing grippingly in said position.

4. A hearing aid comprising: a casing having an acoustic aperture and of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent the rearward junction between the pinna and the head; an input transducer supported in said casing and responsive to received acoustical signals for developing electrical signals representative thereof; an amplifier supported in said casing and coupled to said input transducer for amplifying said electrical signals; and means, including an output transducer coupled to said amplifier, responsive to the amplified electrical signals for disseminating amplified acoustic energy into the auditory canal on the side of said external ear opposite the casing and including an element adjustably deformable in shape for positively supporting said casing grippingly in said position.

5. A hearing aid comprising: a casing having an acoustic aperture and of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent the rearward junction between the pinna and the head; an input transducer supported in said casing and responsive to received acoustical signals for developing

electrical signals representative thereof; an amplifier supported in said casing and coupled to said input transducer for amplifying said electrical signals; means in addition to said casing and including a hook-shaped member projecting from said casing over the junction between the helix and the head for positively supporting said casing grippingly in said position; and means, including an output transducer coupled to said amplifier, responsive to the amplified electrical signals for disseminating amplified acoustical energy into the auditory canal on the side of said external ear opposite said casing.

6. A hearing aid comprising: a casing having an acoustic aperture and of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent the rearward junction between the pinna and the head; an input transducer supported in said casing and responsive to received acoustical signals for developing electrical signals representative thereof; an amplifier supported in said casing and coupled to said input transducer for amplifying said electrical signals; means including a pair of hook-shaped members projecting forwardly from opposite ends of said casing for positively supporting said casing grippingly in said position; and means, including an output transducer coupled to said amplifier, responsive to the amplified electrical signals for disseminating amplified acoustical energy into the auditory canal on the side of said external ear opposite said casing.

7. A hearing aid comprising: a casing having an acoustic aperture and of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent the rearward junction between the pinna and the head; an input transducer supported in said casing and responsive to received acoustical signals for developing electrical signals representative thereof; an amplifier supported in said casing and coupled to said input transducer for amplifying said electrical signals; means including a hook-shaped member projecting from said casing over the junction between the helix and the head for positively supporting said casing grippingly in said position with said hook-shape member having a stiffness sufficient to be shaped manually to conformingly engage the dorsal surface of the junction between the pinna and the head of the wearer; and means including an output transducer coupled to said amplifier, responsive to the amplified electrical signals for disseminating amplified acoustical energy into the auditory canal on the side of said external ear opposite said casing.

8. A hearing aid comprising: a casing having an acoustic aperture and of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent the rearward junction between the pinna and the head; an input transducer supported in said casing and responsive to received acoustical signals for developing electrical signals representative thereof; an amplifier supported in said casing and coupled to said input transducer for amplifying said electrical signals; means in addition to said casing for positively supporting said casing directly from the ear of the wearer and grippingly in said position; and means, including an output transducer coupled to said amplifier, responsive to the amplified electrical signals for disseminating amplified acoustical energy into the auditory canal on the side of said external ear opposite said casing.

9. A hearing aid comprising: a casing having an acoustic aperture and of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent the rearward junction between the pinna and the head with its upper end portion positioned near the upper terminus of said junction; an input transducer supported in said casing and responsive to received acoustical signals for developing electrical signals representative thereof; an amplifier supported in said casing and coupled to said input transducer for amplifying said electrical signals; means in addition to said casing for positively supporting said casing grippingly in said position; and means, including an output transducer coupled to said amplifier, extending from said amplifier out of said upper end portion to the area behind the tragus on the side of said external ear opposite the casing and responsive to the amplified electrical signals for disseminating amplified acoustic energy into the auditory canal.

10. In combination: a hearing aid assembly, including an input transducer responsive to received acoustical signals for developing electrical signals representative thereof and an amplifier coupled to said input transducer for amplifying said electrical signals, of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent the rearward junction between the pinna and the head; means for positively supporting said assembly grippingly in said position; and means, including an output transducer coupled to said amplifier, responsive to the amplified electrical signals for disseminating amplified acoustical energy into the auditory canal on the side of said external ear opposite said assembly.

11. A hearing aid comprising: a casing having an acoustic aperture and of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent the rearward junction between the pinna and the head; means for positively supporting said casing in gripping engagement directly with the ear and in a position adjacent the rearward junction between the pinna and the head; an input transducer contained within said casing and responsive to acoustic energy; an amplifier contained within said casing and coupled to said input transducer; and means in addition to said casing, including an output transducer coupled to said amplifier, for disposal behind the tragus on the side of the external ear opposite said casing to disseminate amplified acoustic energy into the auditory canal.

12. A hearing aid comprising: a casing having an acoustic aperture and of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent the rearward junction between the pinna and the head; an input transducer supported in said casing and responsive to acoustic energy; an amplifier contained within said casing and coupled to said input transducer; means, including an output transducer coupled to said amplifier, for disseminating amplified acoustic energy into the auditory canal; and means, including means for electrically coupling said output transducer to said amplifier, for positively supporting said casing directly in gripping engagement with the ear in a position adjacent the rearward junction between the pinna and the head.

13. A hearing aid comprising: a casing having an acoustic aperture and of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent the rearward junction between the pinna and the head; an input transducer supported in said casing and responsive to acoustic energy; an amplifier contained within said casing and coupled to said input transducer; means, including an output transducer coupled to said amplifier, for disseminating amplified acoustic energy into the auditory canal; and means, including a pair of flexible conductors carried within a moldable hook-shaped sheath mechanically coupled to said casing with said conductors coupling said output transducer to said amplifier, for positively supporting said casing in direct gripping engagement with the ear and in a position adjacent the rearward junction between the pinna and the head.

14. A hearing aid comprising: a casing having an acoustic aperture and of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent the rearward junction between the pinna and the head; an input transducer supported in said casing and responsive to acoustic energy; an amplifier contained within said casing and coupled to said input transducer; means, including an output transducer coupled to said amplifier, for disseminating amplified acoustic energy into the auditory canal; and means, including a pair of flexible conductors carried within a moldable hook-

shaped sheath with said conductors and said sheath being mechanically coupled to said casing by a pair of separable electrical connector elements one of which is rigid with respect to said casing and the other of which is secured to said sheath, for positively supporting said casing in direct gripping engagement with the ear and in a position adjacent the rearward junction between the pinna and the head.

15. A hearing aid comprising: a reniform-shaped casing having a convex outer surface with an acoustic aperture therein and a concave inner surface with said casing being of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent the rearward junction between the pinna and the head; an input transducer disposed in said casing adjacent said aperture and responsive to acoustic energy transmitted therethrough; an amplifier contained within said casing and coupled to said input transducer; means, including a pair of flexible, adjustably deformable conducting elements electrically coupled at one end to said amplifier, in addition and mechanically coupled to said casing for supporting the latter positively and grippingly in direct engagement with and immediately behind the ear; and means, including an output transducer coupled to the other end of said conducting elements, for disposal immediately behind the tragus to disseminate amplified acoustic energy into the auditory canal.

16. A hearing aid comprising: a reniform-shaped casing having a convex outer surface with an aperture therein and an inner surface of a contour generally corresponding to the curvature of the rearward junction between the pinna and the head with said casing being of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent said rearward junction; an input transducer disposed in said casing adjacent said aperture and responsive to acoustic energy transmitted therethrough; an amplifier disposed in said casing and coupled to said input transducer; means, in addition and mechanically coupled to said casing, for positively supporting the casing in direct gripping engagement with and immediately behind the ear; and means, including an output transducer coupled to said amplifier for disposal immediately behind the tragus and, when said inner surface is disposed immediately adjacent said junction, on the side of the external ear opposite said casing, for disseminating amplified acoustic energy into the auditory canal.

17. A hearing aid comprising: a casing having an acoustic aperture and of a size enabling its disposal in a position substantially entirely behind the external ear and adjacent the rearward junction between the pinna and the head; means in addition to said casing for positively supporting said casing grippingly in said position; an input transducer supported in said casing and responsive to acoustical energy; an amplifier contained within said casing and coupled to said input transducer; and means, including an output transducer coupled to said amplifier, for disposal behind the tragus to disseminate amplified acoustical energy into the auditory canal on the side of the external ear opposite said casing.

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