

Nov. 4, 1952

M. W. LEVY
HEARING AID DEVICE

2,616,985

Filed Sept. 28, 1950

2 SHEETS—SHEET 1

Fig. 1.

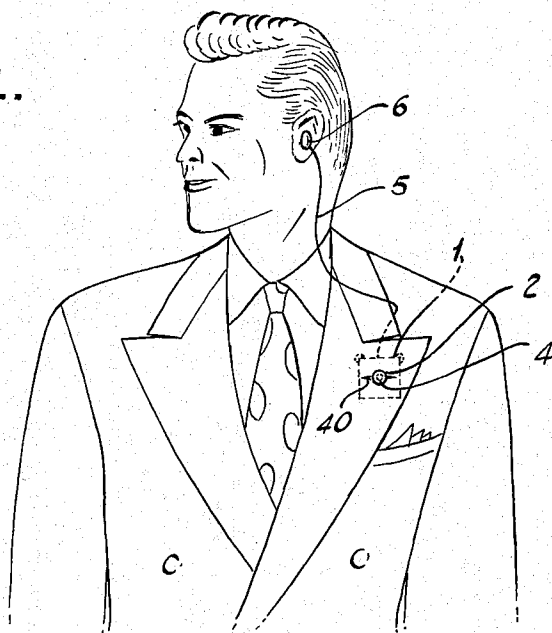


Fig. 2.

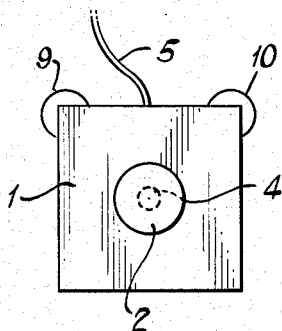


Fig. 3.

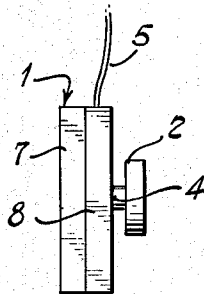
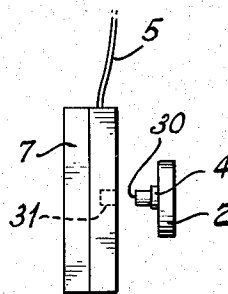


Fig. 4.



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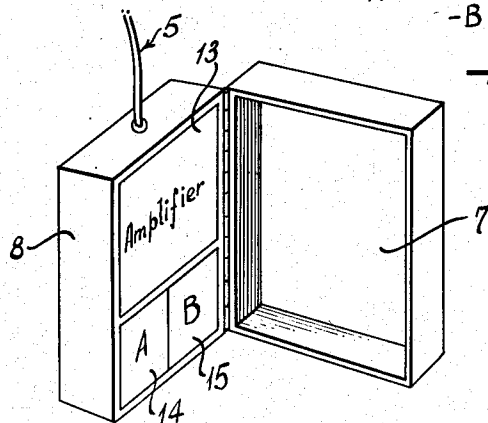
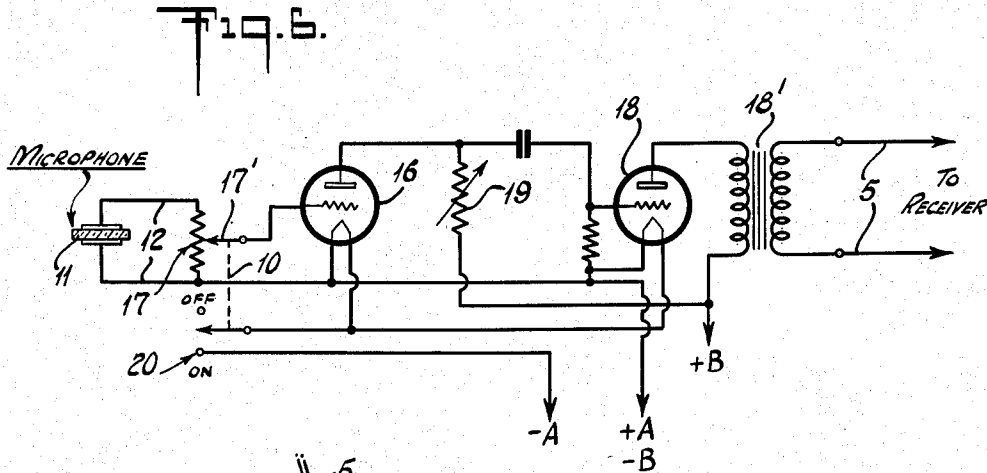
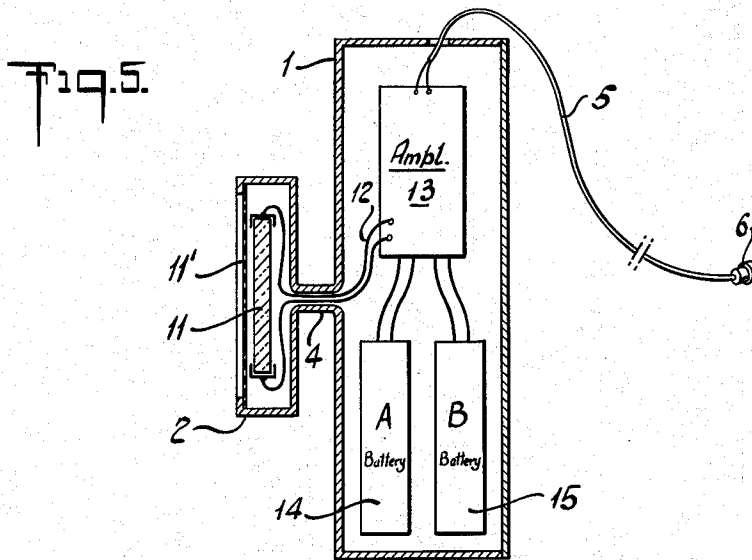
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2 SHEETS—SHEET 2



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UNITED STATES PATENT OFFICE

2,616,985

HEARING AID DEVICE

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3 Claims. (Cl. 179—107)

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This invention relates to an audiphone or hearing aid device and more particularly to such a device in which the sound pick-up unit and audio amplifying unit thereof are housed in a single compact assembly. This application is a continuation-in-part of my application Ser. No. 74,532 filed February 4, 1949.

As an object in the design of audiphones, it is desirable that the device be as inconspicuous as possible when in use. For this reason many current types of audiphones are designed so that the microphone and amplifier units thereof are housed in a single assembly which can be worn entirely concealed within the clothing of the user. The receiver and receiver cord of such hearing aid devices are ordinarily exposed. However, devices so designed suffer from a serious disadvantage, since the microphone is worn interiorly of the user's clothing and frictional noises are picked up and amplified along with the desired signal. Background noises thus engendered not only seriously decrease the practical efficiency of such hearing aid devices, but may even encourage in the user a habit of shallow breathing to minimize this annoying interference. Many persons having impaired hearing forego the benefits of audiphones, because of their dissatisfaction with devices of the type described above and their disinclination to use hearing aid devices exposed to sight.

Attempts have been made to overcome this difficulty by providing hearing aid devices in which only the amplifier is concealed by the user's clothing, but in which the microphone is worn exteriorly of the clothing. An example of such a device is found in U. S. Patent No. 1,592,277 granted to C. E. Lane July 13, 1926. While such devices may avoid frictional noises, they suffer from a different drawback in that the long cord from the microphone to the amplifier causes difficulties, due either to electrical loss or to the introduction of undesired capacitance. Moreover, the connecting cord is a source of inconvenience and is subject to breakage.

It is, therefore, an important object of the present invention to provide a hearing aid device in which the microphone can be worn exteriorly of the user's clothing, while the amplifier is worn interiorly of the clothing, but in which the microphone and the amplifier are in substantial juxtaposition, so as to avoid the inherent defects of a lead-in or cord connecting the microphone to the amplifier.

It is a further object of the invention to provide such a unit which shall be compact, light

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in weight, and readily supported on the user's clothing.

My invention may be defined as an amplifying device, and more particularly a hearing aid, comprising a casing; an amplifier housed in said casing; a microphone unit operatively connected to said amplifier and mounted on said casing in substantial juxtaposition thereto and projecting therefrom; and means joining said casing and said microphone unit for supporting said casing on an article of clothing of the wearer of said amplifying device in such a manner that the casing may be substantially entirely concealed by said article of clothing and also for supporting said microphone unit on said article of clothing in such a manner that said microphone unit may be substantially entirely exposed, said supporting means comprising the electrical connections between said amplifier and said microphone and being of relatively small cross-sectional area as compared with the face areas of said amplifier casing and said microphone unit, respectively.

Other objects and advantages of the invention will become more apparent from the following detailed description taken with reference to the accompanying drawings wherein:

Figure 1 is a pictorial representation of a wearer showing the manner in which a hearing aid device embodying the invention may be worn;

Figure 2 is a front view of one embodiment of the invention;

Figure 3 is a side view of the embodiment shown in Figure 2;

Figure 4 is a side view, showing a modified embodiment of the invention;

Figure 5 is a longitudinal section through the audiphone casing showing the electrical components thereof;

Figure 6 is a schematic diagram of the electrical circuits which may be employed; and

Figure 7 shows the casing in opened condition to reveal the interior components.

Referring now to the several figures, in which like reference numerals denote like elements, the embodiment of the invention shown in Figures 1, 2, and 3 comprises a main casing 1 in which is housed an amplifier assembly, and a relatively smaller microphone casing 2, in which is housed a microphone assembly. Either casing may obviously have any desired configuration. The microphone assembly is electrically connected to the amplifier assembly by suitable electric circuits, and the microphone casing 2 is coupled to the amplifier casing 1 by a connecting and supporting means 4. The means 4 may consist

of a relatively narrow short neck located between any desired point on the rear face of the microphone casing and any desired point on the front face of the amplifier casing. Illustratively, such connecting structure is shown affixed centrally to the two aforementioned casing faces. An offset position may also be used. The cross-sectional area of the structure 4 is relatively small in comparison with the face areas of the microphone casing and the amplifier casing. The amplifier casing is electrically connected by a duplex cord 5 to a suitable receiver 6. The amplifier casing 1 may comprise two separable parts 7 and 8 so that access may be had to the internal amplifier assembly for adjustment and repair thereof. The casing 1 is further provided with control elements, e. g. tone control disc 9 and a combined volume control and "on-off" switch disc 10. These latter elements 9 and 10 are common in hearing aid devices and are not specifically shown in Figures 1, 3, 4, 5 and 7.

An alternative embodiment of the invention is illustrated in Figure 4. In this embodiment, the microphone component is severably connected to the amplifier component, rather than inseparably as in the embodiment of Figure 1. The connection in this embodiment is accomplished illustratively by means of a plug 30 projecting from neck 4 and adapted for insertion into a mating socket 31 in the amplifier casing 1. Other separable fastening elements may be employed, e. g., screw type, twist type, snap type, and the like. The neck portion may be eliminated and the microphone attached to the amplifier by terminal prongs or other form of separable fastener, which, per se, serve as the supporting means.

Figure 5 illustrates the general relative locations of the internal electrical components. Thus, within microphone casing 2 is housed a crystal microphone 11 to convert the sound waves passing through the usual small openings of plate 11' into audio frequency voltages. The leads 12 from the opposed crystal electrodes may pass through the interior of structure 4 to the input terminals of a suitable amplifier 13. In the embodiment of Figures 1, 2, and 3, the structure 4 functions not only as a connection between and support for the two casings 1 and 2, but also as a housing for the electrical connections or leads 12 from crystal pick-up 11 to amplifier 13. The amplifier may, for example, be provided with sub-miniature amplifier tubes (not shown) suited to the compact volume of casing 1. The output terminals of amplifier 13 are connected to duplex leads or cords 5 which terminate at receiver 6. Suitably small "A" and "B" batteries 14, 15 are housed in the casing 1, and are connected to the respective filaments and plates of the amplifier tubes. The sub-miniature tubes, batteries, and circuit components required for the small casing 1 are well known to the electronic art.

In Figure 6 I have shown an illustrative circuit diagram for the pick-up device 11 and amplifier 13. The electrodes of the microphone crystal are connected by leads 12 to the input electrodes of amplifier tube 16. The resistor 17, across the crystal electrodes, may have its adjustable tap 17' provide one electrical component of the combined volume control and "on-off" switch of Figure 1. The tap 17' is connected to the control grid of tube 16. The second amplifier tube 18 has its input electrodes connected to the output electrodes of tube 16 through suitable capacity and resistance coupling. The output transformer 18' couples the output leads 5 to the output cir-

cuit of amplifier tube 18. The variable resistor 19 may function as the electrical component of tone control 9. The "on-off" switch 20 operates in conjunction with the volume control resistor 17-17'. The dashed line 10 in Figure 6 denotes the mechanical coupling between resistor 17-17' and switch 20, controlled by disc 10 in Figure 1. When switch 20 is adjusted to "on" by rotation of disc 10, current flows through the filaments of the tubes. Further rotation of disc 10 adjusts tap 17' to increase the signal voltage applied to the grid of tube 16. The type of control elements and circuit employed in the illustrative embodiment are known to those skilled in the art, and I deem further explanation or illustration thereof to be superfluous.

Figure 7 shows the interior of the amplifier casing with the components installed. The rear cover 7 (see Figure 3) is opened, revealing in Figure 7 the batteries 14 and 15. The amplifier unit 13 with its output leads 5 is also depicted. Of course, the components will all be of miniature size to suit the dimensions imposed by the required small size of the device.

In using the embodiment of the invention illustrated in Figures 1, 2, and 3, the wearer will pass the microphone casing 2 through an aperture in the clothing, e. g., a lapel opening in a man's coat, as shown in Figure 1, in such a manner that the microphone front plate openings 11' (Figure 5) are exposed. Hence, the size of casing 2 should be such as to pass through a lapel opening 40 (Figure 1). Using the modification of Figure 4 (separable supporting and connecting means), the amplifier and microphone casings will likewise be joined through a suitable aperture in the clothing. Connecting prongs, if employed as the sole supporting means, may pierce the fabric to effectuate contact and furnish support. The amplifier casing 1 is substantially concealed, e. g. behind the lapel, as in Figure 1. The microphone and amplifier assembly is supported by the connecting element 4, which latter element acts as the sole support directly connected to the microphone unit. If desired, the assembly may be further supported by supporting contrivances in addition to the connecting element 4, e. g. a pin carried by the amplifier casing 1 and adapted to be attached to the back of the concealing apparel, e. g. the lapel; or by a band to be worn under the apparel, e. g. under the collar of a man's coat.

Ordinarily, male users of the device will wear the receiver 6 and a portion of the receiver cord 5 exposed, but many feminine users will be able to conceal these elements of the hearing aid by suitable hair arrangements, as in prior usage. Essentially, the only element of the device which need be exposed is the microphone component, and this can be camouflaged by suitable ornamentation. For example, the casing 2 thereof can be made to bear a fraternal emblem or the like. It will be apparent that most potential users of hearing aid devices would prefer an inconspicuous yet operationally effective device of this character to prior art devices which are unsatisfactory either from the esthetic or the operational point of view.

The amplifier assembly used in the device can be any desired electrical type. The receiver 5 likewise can be of any desired type: an air conduction receiver is shown in Figure 1, but it will be obvious that a bone conduction receiver can be substituted if desired. Likewise the microphone can be of any desired type, e. g. piezoelectric, magnetic, or dynamic.

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While a particular arrangement of and kind of control elements are shown in the illustrative embodiments of the invention, it will be understood that the arrangement, the number, and the type of these controls, can be varied at the option of the designer of the electrical layout. Although plug and socket connectors are shown in the drawing as a means for accomplishing the separable connections, it will be obvious that other types of separable connectors, e. g. twist, screw, or snap connectors, can be employed. The amplifier casing is shown in the drawing as being comprised of approximately equal halves, but access to the amplifier can be accomplished in any other desired manner.

The specific configurations of the two casings 1 and 2 and their connecting structure 4, as well as the relative dimensions and positioning of these elements, may be varied as a matter of design, but should have relation to the article of apparel which is intended to substantially conceal the amplifier component, and to the aperture or apertures in said apparel which will receive the supporting structure 4.

It will be evident from the foregoing that the invention is not limited to the specific construction and arrangement of parts disclosed herein for illustration, but that the invention is susceptible of numerous variations coming within the spirit thereof as defined in the appended claims.

I claim:

1. A hearing aid device comprising a casing, an amplifier housed in said casing, a microphone unit mounted on said casing in substantial juxtaposition thereto and projecting therefrom and operatively connected to said amplifier, a narrow neck of substantially small cross sectional area as compared with the face areas of said casing and said microphone unit connecting said casing and said microphone unit for supporting said hearing aid device on an article of apparel, said neck comprising the electrical connection between said amplifier and said microphone, and

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means for conveying an amplified signal from said amplifier to the wearer of said apparel.

2. A hearing aid device comprising a casing, an amplifier housed in said casing, a microphone unit integrally mounted on said casing in substantial juxtaposition thereto and projecting therefrom and operatively connected to said amplifier, a narrow neck of substantially small cross sectional area as compared with the face areas of said casing and said microphone unit connecting said casing and said microphone unit for supporting said hearing aid device on an article of apparel, said neck comprising the electrical connection between said amplifier and said microphone, and means for conveying an amplified signal from said amplifier to the wearer of said apparel.

3. A hearing aid device comprising a casing, an amplifier housed in said casing, a microphone unit severably mounted on said casing in substantial juxtaposition thereto and projecting therefrom and operatively connected to said amplifier, a narrow neck of substantially small cross sectional area as compared with the face areas of said casing and said microphone unit connecting said casing and said microphone unit for supporting said hearing aid device on an article of apparel, said neck comprising the electrical connection between said amplifier and said microphone, and means for conveying an amplified signal from said amplifier to the wearer of said apparel.

MAURICE W. LEVY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
622,238	Collins	Apr. 4, 1899
849,353	Clarke	Apr. 2, 1907
883,003	Davy	Mar. 24, 1908
1,318,874	Hooghiemstra	Oct. 14, 1919
2,212,431	Bly	Aug. 20 1940