

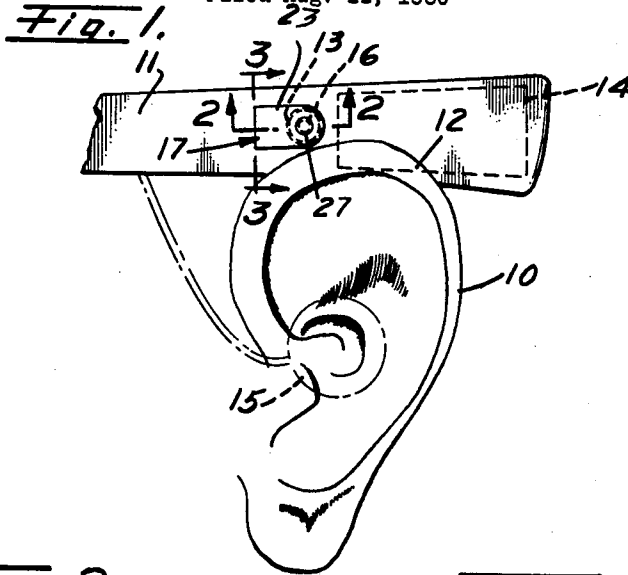
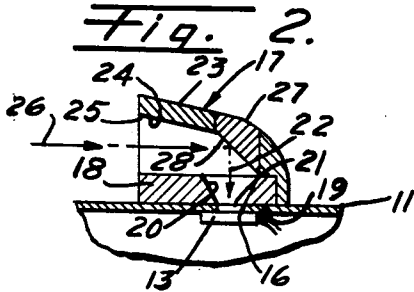
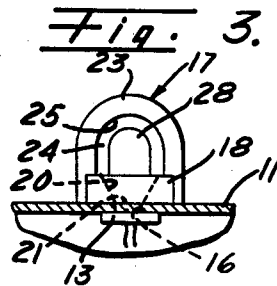
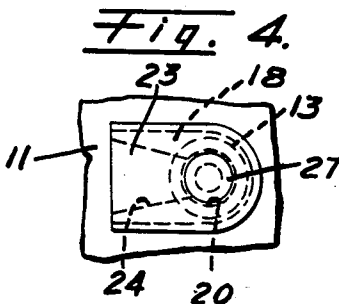
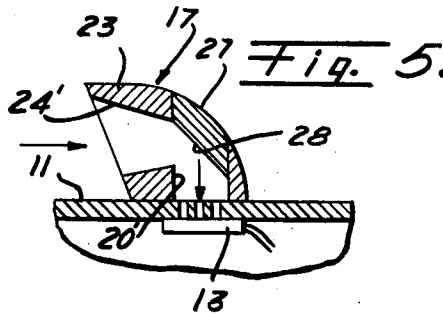
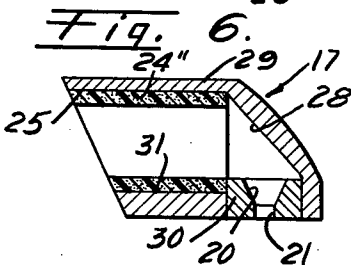
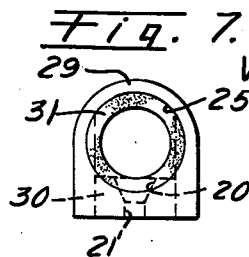
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W. VAN E. THOMPSON

3,076,061

HEARING AID

Filed Aug. 11, 1960



Walter Van E. Thompson,
INVENTOR.

WHANN & McMANIGAL
Attorneys for Applicant

by *O. H. Thompson*

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3,076,061

HEARING AID

Walter Van E. Thompson, San Marino, Calif.

(2251 E. Seventh St., Los Angeles 23, Calif.)

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3 Claims. (Cl. 179-107)

The present invention relates generally to hearing aids, and is more particularly concerned with hearing aid equipment of the character wherein certain parts, and in particular the sound vibration receiving portion of the equipment, is supported in fixed position on the head of the wearer as by one of the side bows of a pair of real or simulated spectacles.

The present application is a continuation-in-part of my copending application for Improvement in Hearing Aid, Serial No. 835,495, filed August 24, 1959.

In conventional hearing aids, the sound vibration receiving portion of the equipment consists of a miniature microphone placed in the side piece or bow of the spectacle, with sound receiving passages which are directed in a lateral direction away from the wearer's head in such manner that sound vibration may be received through an angle of substantially 180°. Such an arrangement has the disadvantage in that it permits the entrance of street noises and other sounds than those directly in front of the hearing aid, thus making it more difficult to determine and hear the conversation of those to whom the wearer might be talking.

The present invention seeks to overcome this difficulty by providing means which will directionally discriminate as between desired and undesired sounds, and which will further act to preamplify the desired sound prior to its reaching the microphone of the equipment.

Briefly, the invention comprises a small shell-like inconspicuous structure which may be secured to a spectacle side bow, and is arranged with a forward facing inlet opening for receiving the sound impulses along a forwardly facing axis, but which is shielded with respect to sounds emanating generally rearwardly of the wearer. The received sound enters a passage from whence it is directed to an outlet opening, the axis of which is angularly disposed with respect to the axis of the inlet opening, and directed towards the microphone of the equipment. In the course of travel through the passage, the sound passes through a frusto-conical section where the sound waves or impulses are compressed and thus amplified. The path of travel of the entering sound waves is also changed in the passage so that it will exit through the outlet opening. This is accomplished by providing an angularly positioned reflecting surface in the passage.

A still further object is to provide in a device of the herein described character, a unique arrangement which effectively attenuates and absorbs background and random noises.

A further object is to provide an article of manufacture which may be separately fabricated as an attachment for use with conventional hearing aid equipment.

Further objects of the invention will be brought out in the following part of the specification, wherein detailed description is for the purpose of fully disclosing the invention without placing limitations thereon.

Referring to the accompanying drawings, which are for illustrative purposes:

FIG. 1 is an enlarged fragmentary view of hearing aid equipment embodying the features of the present invention;

FIG. 2 is an enlarged sectional view showing the internal construction, taken substantially on line 2-2 of FIG. 1;

FIG. 3 is a sectional view, taken substantially on line 3-3 of FIG. 1, showing the front elevation of the device;

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FIG. 4 is a plan view of the same;

FIG. 5 is an enlarged sectional view of a slightly modified construction over that shown in FIG. 2;

FIG. 6 is an enlarged sectional view of another modified construction; and

FIG. 7 is a front elevational view of the modification shown in FIG. 6.

Referring more specifically to the drawings, for purposes of illustration, a hearing aid embodying the present invention is disclosed in association with an ear 10 of the hearing aid user. The hearing aid equipment, in this case, is associated with a support of a type arranged to occupy a substantially fixed position. As shown, the support illustrated comprises a side bow 11 of a pair of real or simulated spectacles, this bow extending behind the helix portion 12 of the ear 10.

The above type of hearing aid equipment may embody either of the two conventional forms of sound reproduction devices. In the one form, the sound waves are picked up by a receiving microphone 13 carried by the side bow, and converted into electrical impulses which are utilized to actuate a conventional type of bone conduction sound reproducer, as diagrammatically indicated by the numeral 14. In the other type, the electrical impulses are conducted to a sound reproducer of the ear plug type as diagrammatically shown in phantom lines and identified by the numeral 15, the ear plug being arranged to be inserted in the concha of the ear in communication with the auditory canal.

In the conventional installation, the microphone 13 is positioned in the side bow below one or more sound conducting openings 16 through which the sound enters on the primary axis of the microphone. As thus mounted, this primary axis of the microphone extends laterally from the wearer's head and is substantially at right angles to the direction in which the user is facing. As a consequence, the microphone as thus located will receive sound waves through an angle of substantially 180°. Thus, street noises and other background noises and sounds may enter the microphone and prove to be very annoying, when it is desired to preferentially receive sounds coming from directly in front of the wearer of the hearing aid, as when talking directly to someone.

In order to permit a more or less preferential selection of sound waves emanating in front of the wearer of the hearing aid, and attenuate the other noise and sounds from other directions, it is proposed to provide according to the present invention an attachment, as generally indicated at 17, which will preferentially determine the direction of sound pickup, and serve as a preamplifier of such sounds which are redirected to the microphone 13. This device may be more or less varied as to construction, but basically comprises a shell-like structure of suitable plastic or other material which may be attached to the exterior surface of the bow 11 at the microphone location.

More specifically, as shown in FIG. 2, the device comprises a base or a bottom wall portion 18 having a planar surface 19 which may be mounted in face engagement with and secured by suitable bonding agent to the exterior surface of the side bow. This bottom wall portion is provided with a frusto-conical passage 20 terminating at its small end in an outlet opening 21 lying in the surface 19, and which is in registration with the opening 16. The axis of the frusto-conical passage as indicated by the numeral 22 will thus be coincident with the primary receiving axis of the microphone 13.

A cap cover 23 is secured over the base portion 18 and cooperates therewith to provide a passage 24 which communicates at its outermost end with an inlet opening 25 and extends inwardly with decreasing transverse sec-

tional area to form a sound conducting passage having an axis 26 at substantially right angles to the axis 22 for receiving sound waves from a direction generally forward of the wearer of the hearing aid.

Transition of the entering sound wave along the axis 26, to the microphone 13 along the axis 22 is accomplished by providing an insert 27 in the cap cover wall, this insert having an inner end planar surface 28 which is disposed at an angle of 45° to the axes 22 and 26 so as to provide a sound reflecting surface. It will be appreciated that with the inlet opening 25 facing forwardly, the rear end of the cap cover will form a shield against the entrance of sound waves from lateral and rear directions of the hearing aid wearer.

The sound wave passage through the device also serves to preamplify the entering sound waves. This is accomplished by the condensing action due to the frusto-conical or converging cross section of the passage. Such a converging passage portion may be constructed at the outlet as exemplified by the frusto-conical passage 20, as shown in FIG. 2, or by an inlet frusto-conical passage portion 24', as shown in a modified structure in FIG. 5. Where the sound wave compressing action is mounted at the inlet, as shown in FIG. 5, the outlet may in such case be of cylindrical formation as indicated at 20'. Under some conditions, it may be desirable to provide for compressing action and incident amplification at both the inlet and outlet of the device.

The modified form of the invention, as shown in FIGS. 6 and 7, has a shell-like structure of simplified construction. In this form, instead of using a separate base 18, cap cover 23, and insert 27, these parts are integrally formed into a housing 29 with a passage 24'' of circular cross section communicating with the inlet opening 25.

The frusto-conical passage 20 and outlet opening 21 are in this case formed in a separate insert 30.

A further feature of this form of the invention, which it is to be understood may be incorporated in the arrangements previously described, resides in the use of a sound absorbing lining 31 in the passage 24''. This lining may be of any suitable material having proper sound absorbing characteristics, such as very soft sponge rubber.

A lining of this character has been shown in actual tests to have an absorbing and attenuating effect on objectionable background and random noise of at least fifty percent. With such a lining, conversations were clearly received above attenuated factory noises, whereas such conversations either could not be received, or were so difficult to understand as to be substantially unintelligible when the lining was removed. The use of such a lining, also enables a reduction in the amplification of the hearing aid, and provides a material saving in the batteries.

From the foregoing description, it is believed to be clearly evident that the device of the present invention accomplishes the contemplated objects and provides a simple means for improving hearing aid reception.

Various modifications may suggest themselves to those skilled in the art without departing from the spirit of my invention, and, hence, I do not wish to be restricted to the specific form shown or uses mentioned, except to the extent indicated in the appended claims.

I claim:

1. The combination with a hearing aid microphone carried by a side bow of a pair of spectacles, said microphone having a sound receiving primary axis directed generally laterally of the wearer's head, of a shell-like structure defining a sound carrying passage with one end portion in communication with an inlet opening having a generally forwardly directed axis with respect to the wearer's head, and its other end portion in communication with an outlet opening adjacent said microphone having an axis coincident with said primary axis, a lining of sound absorbing material on the interior of said one end portion, and a planar reflecting surface between said end portions for directing sound vibrations from said one end portion to said other end portion.

2. The combination with a hearing aid microphone carried by a side bow of a pair of spectacles, said microphone having a sound receiving primary axis directed generally laterally of the wearer's head, of a shell-like structure defining a sound carrying passage with one end portion in communication with an inlet opening having a generally forwardly directed axis with respect to the wearer's head, and its other end portion in communication with an outlet opening adjacent said microphone having an axis coincident with said primary axis, a lining of soft sponge rubber on the interior of said one end portion, and a planar reflecting surface between said end portions for directing sound vibrations from said one end portion to said other end portion.

3. The combination with a hearing aid microphone carried by a side bow of a pair of spectacles, said microphone having a sound receiving primary axis directed generally laterally of the wearer's head, of a shell-like structure defining a sound carrying passage with one end portion in communication with an inlet opening having a generally forwardly directed axis with respect to the wearer's head, and its other end portion having a converging cross-section in communication with an outlet opening adjacent said microphone and coaxial with said primary axis, a lining of sound absorbing material on the interior of said one end portion, and a planar reflecting surface between said end portions for directing sound vibrations from said one end portion to said other end portion.

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