

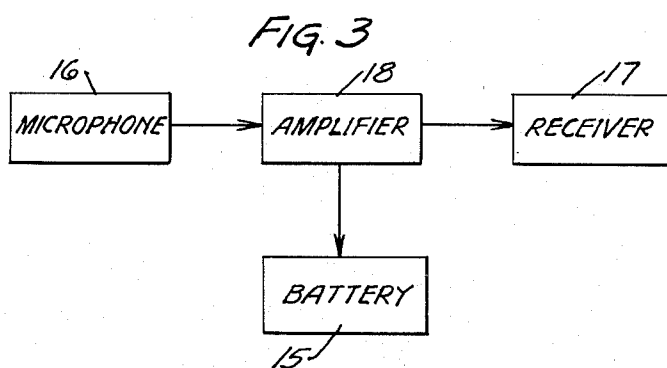
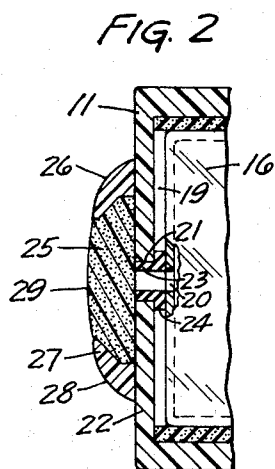
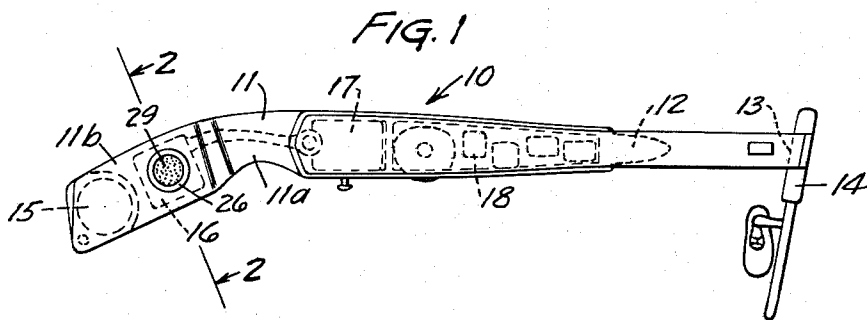
Dec. 31, 1963

D. J. BEHYMER ET AL

3,116,376

ACOUSTICAL DEVICE

Filed March 28, 1962



INVENTORS
CLAYTON D. MULLIN
DONALD J. BEHYMER
BY
Williamson & Palmatier
ATTORNEYS

1

3,116,376

ACOUSTICAL DEVICE

Donald J. Behymer, Minneapolis, and Clayton D. Mullin, St. Paul, Minn., assignors to Maico Electronics, Inc., Minneapolis, Minn., a corporation of Minnesota
Filed Mar. 28, 1962, Ser. No. 183,267
4 Claims. (Cl. 179-107)

This invention relates to hearing aids of the type to be supported on the wearer's body or head in such a position as to be exposed to the wind, and more particularly relates to a hearing aid of said type which is provided with apparatus to prevent or minimize the generation of noise adjacent the microphone.

Many of the hearing aids being currently used are supported on the wearer's head in an exposed position so that the case for the hearing aid is exposed to the wind. Examples of such types of hearing aids are the eyeglass hearing aid wherein an entire hearing aid is incorporated in a case which forms the temple member of a pair of eyeglasses; and a second example of this type of hearing aid is the "behind the ear" hearing aid which is housed in a case which will ordinarily be disposed behind the wearer's ear and between the helix of the ear and the person's head with a sound tube passing over the top of the ear and downwardly to a tip which is fitted into the wearer's ear canal. It has been experienced that when such a hearing aid is worn and operated out-of-doors, that the wind moving past the hearing aid casing and particularly in the area of the opening permitting sound to pass inwardly of the casing to the microphone, will produce a turbulence and result in the production of noise which is transmitted into the microphone, amplified by the amplifier and then transmitted into the receiver and into the wearer's ear. This random noise which is generated by the wind is quite objectionable to the wearer of the hearing aid because the random noise tends to obscure the sounds which the hearing aid wearer wants to hear, such as sound of a person talking or other similar sounds.

An object of our invention is to provide a new and improved apparatus for substantially reducing the random noise produced by wind in and around a hearing aid in such a manner as to prevent the noise from being transmitted through the amplifier and receiver of the hearing aid and into the wearer's ear.

Another object of our invention is to provide a novel apparatus which is attachable to many of the presently known hearing aids of the type which are supported in an exposed position on the head of the wearer so as to materially reduce the generation of random noise due to wind passing by and circulating around the housing for the hearing aid.

These and other objects and advantages of our invention will more fully appear from the following description made in connection with the accompanying drawings wherein like reference characters refer to the same or similar parts throughout the several views and in which:

FIG. 1 is a side elevation view of an eyeglass hearing aid unit shown attached to a pair of spectacles and incorporated in the present invention;

FIG. 2 is a detail section view taken at 2-2 in FIG. 1;

FIG. 3 is a schematic block diagram of the typical circuitry used in the hearing aid.

One form of the invention is shown in the drawings and is described herein. The hearing aid, indicated in general by numeral 10 is completely defined within an elongate housing 11 which is adapted to lie along the side of a person's head and in overlying relation with his ear, a cover plate 12 overlies a portion of the housing 11 and extends forwardly beyond the forward end of the housing

2

for attachment to a hinge 13 which is secured to the lens frame 14 of a pair of eyeglasses.

The housing 11 contains all of the major and minor components of the hearing aid and the major components are shown in dotted lines and are designated as follows: battery 15, microphone 16, receiver 17 and transistor amplifier 18, which are shown in FIG. 3 in a block diagram schematic of a typical hearing aid circuit.

This particular model of hearing aid has the microphone 16 located rearwardly of the portion 11a of the housing 11 which is reduced in thickness and recessed for comfortably fitting upon the wearer's ear, and it will be noted that the hearing aid 10 is so positioned on the wearer's head so that the hearing aid is substantially always exposed to the weather and wind.

The portion 11b of the housing 11 which is normally disposed rearwardly of the wearer's ear, defines an interior compartment or chamber 19 in which the microphone 16 is confined. Although microphones may vary slightly in shape and size, the microphone 16 is typical of the type of microphones currently used in hearing aids and may be substantially rectangular in configuration with the sound-receiving opening 20 in the microphone aligned with the aperture 21 in the wall 22 of housing 11 for transmission of sound to the microphone 16.

A short rubber tube 23 disposed in the aperture 21 has an annular flange 24 at its inner end to lie between and engage the microphone 16 and the inner surface of the wall 22. The rubber tube 23 extends only from the microphone 16 to the outer surface of the wall 22 and respectively seals against the microphone housing in concentric relation with the sound-receiving aperture therein, and against the periphery of the aperture 21.

A broad and generally flat circular disc 25 is provided and is of a porous or open cellular material such as felt or polyurethane foam wherein the interstices or cells are inter-connected and provide numerous random paths through which sounds may pass. The disc 25 overlies the exterior surface of the wall 22 at the aperture 21 so as to cover the open end of the rubber tube 23. The disc 25 will have a sufficiently low acoustic resistance so as to have a negligible effect upon the acoustic response of the microphone and hearing aid, yet the disc 25 prevents turbulently moving air from producing noise adjacent the microphone. It will be seen that the disc 25 is substantially larger in diameter than the diameter of aperture 21 in wall 22, and in the preferable form, the disc 25 is approximately four to five times the diameter of the microphone opening.

The disc 25 is retained on the exterior of wall 22 by a circular ring 26 which has an inwardly projecting inner flange 27 for retaining the disc 25 in its proper position on wall 22. The ring 26 is secured to the wall 22 as by adhesive, and has a smoothly rounded outer surface 28 so as to prevent the formation of new air turbulences and to cause the air or wind to pass smoothly along or across the housing 11 with the ring 26 and disc 25 thereon. It will be seen that the outer surface 29 of the disc 25 is substantially flush with the outer surface of the ring 26 so as to prevent the establishment of any new air turbulences in this area.

During the normal usage of the hearing aid, the sound will travel easily through disc 25 and readily pass into the tube 23 and into the microphone 16. However, the disc 25 absorbs the energy of the moving air or wind and materially reduces the generation of noise due to the turbulence of the wind in the area adjacent the microphone opening. In view of the substantial reduction of the wind-produced random noise which substantially presents a countinuing roar in the hearing

aid without the present invention and under certain climatic conditions, the sounds desired to be heard, apart from the wind noise, stand out clearly and makes the wearing of the hearing aid considerably more comfortable and useful for the wearer. It should further be noted that the resilient disc 25 may be periodically replaced if necessary by merely squeezing the disc together and removing it from the permanently affixed ring 26, whereupon another disc may be readily inserted.

It will be recognized that although an eyeglass type of hearing aid is illustrated in the drawings, the open cellular disc 25 and ring 26 may be readily and easily applied according to the present invention, to other types of hearing aids which are worn in exposed positions and outside the clothes of the wearer. One example of another type of hearing aid to which the present invention may be applied is the type of hearing aid which is normally worn behind the helix of the wearer's ear and is supported on the ear. Conventionally a portion of this type of hearing aid which may be a sound tube, passes over the top of the helix of the wearer's ear and is attached to a tip which fits into the ear canal of the wearer. The disc 25 and ring 26 may be conveniently applied in overlying relation with the microphone opening of such a hearing aid so long as the rubber tube 23 which seals the microphone to the wall of the housing is also employed.

It will be seen that we have provided a new and novel apparatus for minimizing and substantially eliminating the effect of wind and turbulent air moving adjacent a hearing aid for producing sound and general random noise. The elimination of this source of random noise in the hearing aid permits the sounds desired to be heard to stand out clearly so as to increase the usefulness and comfort of the hearing aid to the wearer.

It will, of course, be understood that various changes may be made in the form, details, materials, arrangement and proportion of the parts without departing from the scope of our invention which consists of the matter shown and described herein and set forth in the appended claims.

What we claim is:

1. A hearing aid, comprising a housing having means to be supported on the head of the wearer, the housing having a wall with an aperture therethrough, hearing aid circuitry within the housing and including a microphone adjacent the interior of said wall, said

microphone having a sound-receiving opening aligned with said aperture,

resilient means sealing said microphone to the wall and around the entire periphery of the aperture therein, a disc of porous material and having a central portion overlying said aperture at the exterior of the wall and absorbing the energy of the wind passing along the housing and thereby preventing generation of random noise adjacent the opening in the wall, said disc also having an outer peripheral portion lying against the exterior of the wall adjacent the aperture, and a rigid ring around the periphery of the disc and secured to the wall, said ring having an inwardly protruding lip engaging and holding the disc against the wall, the exterior periphery of the ring being smoothly contoured to permit wind flow therearound, said disc having an outer surface lying substantially flush with the lip of the ring and being resiliently deformable to permit removal of the disc from the ring, whereby to eliminate wind turbulence at the aperture and thereby materially reduce generation of random noise.

2. The invention set forth in claim 1 wherein said disc is constructed of a porous felt material permitting passage of sound therethrough and materially reducing generation of random noise due to wind.

3. The invention set forth in claim 1 wherein said disc is constructed of an open cellular resiliently compressible foam-like material with intercommunicating cells randomly arranged and permitting sound passage through the disc, but materially reducing generation of random noise due to wind.

4. The invention set forth in claim 1 wherein the exterior periphery of the ring includes an outwardly facing and smoothly rounded annular surface lying generally obliquely of said wall and extending between the wall and the inner periphery of the ring.

References Cited in the file of this patent

UNITED STATES PATENTS

2,080,552	Whittaker	May 18, 1937
2,536,261	Caldwell	Jan. 2, 1951
2,623,957	Cragg et al.	Dec. 30, 1952
3,019,305	McCarrell	Jan. 30, 1962

FOREIGN PATENTS

1,076,182	Germany	Feb. 26, 1960
-----------	---------	---------------