United States Patent [19]

Milani

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[45] ***Nov. 11, 1975**

[54] **HEARING AID DEVICE**

[75] Inventor: **Humbert Milani,** San Jose, Calif.

[73] Assignees: **Robert M. Sheeley; Larry M. Sheeley,** both of San Jose, Calif.

[*] Notice: The portion of the term of this patent subsequent to Mar. 26, 1991, has been disclaimed.

[22] Filed: **Oct. 3, 1973**

[21] Appl. No.: **403,198**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 275,324, July 26, 1972, Pat. No. 3,800,101.

[52] **U.S. Cl.** ..... **181/135;** 179/107 E; 181/130

[51] **Int. Cl.**[2] **G06C 25/00;** H04R 25/00

[58] **Field of Search** ..... 189/135, 130, 129; 179/107 E

[56] **References Cited**

UNITED STATES PATENTS

3,800,101 3/1974 Milani ..... 179/107 E

Primary Examiner—Stephen J. Tomsky

Attorney, Agent, or Firm—Gerald L. Moore; Ben J. Chromy

[57] **ABSTRACT**

A hearing aid device which comprises a venting tube adapter for connecting the sound tube from the hearing aid amplifier to the molded ear insert and at the same time venting the channel to the auditory canal of the ear to which the hearing aid is connected. The adapter is made of plastic and it is provided with a part that extends into a hole through the ear insert so that the channel through this hole and through the adapter is connected to both the sound tube from the hearing aid amplifier and to the auditory canal of the wearer's ear. In addition, the plastic adapter is provided with a venting hole that is controlled by a small adjustable screw which is threaded into the adapter and which is prevented from being accidentally removed therefrom by means of a plastic flange surrounding the shank of the screw and formed with the plastic of the adapter.

1 Claim, 6 Drawing Figures

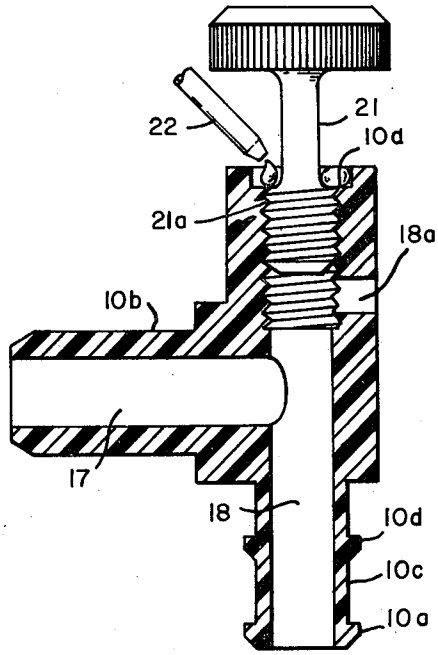


FIG. 1

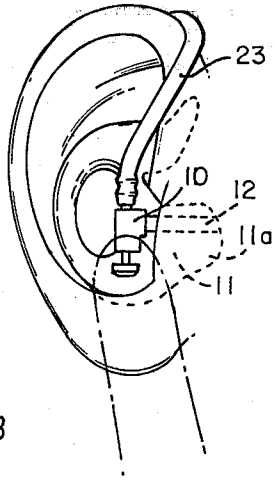


FIG. 3

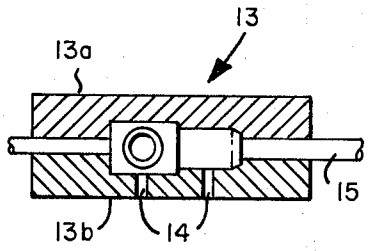
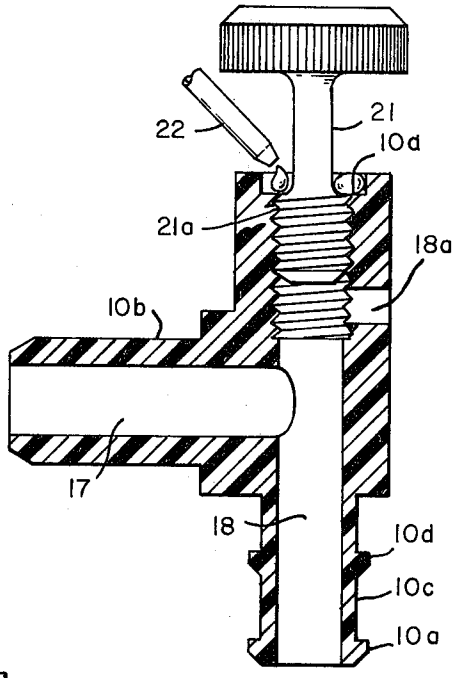


FIG. 5



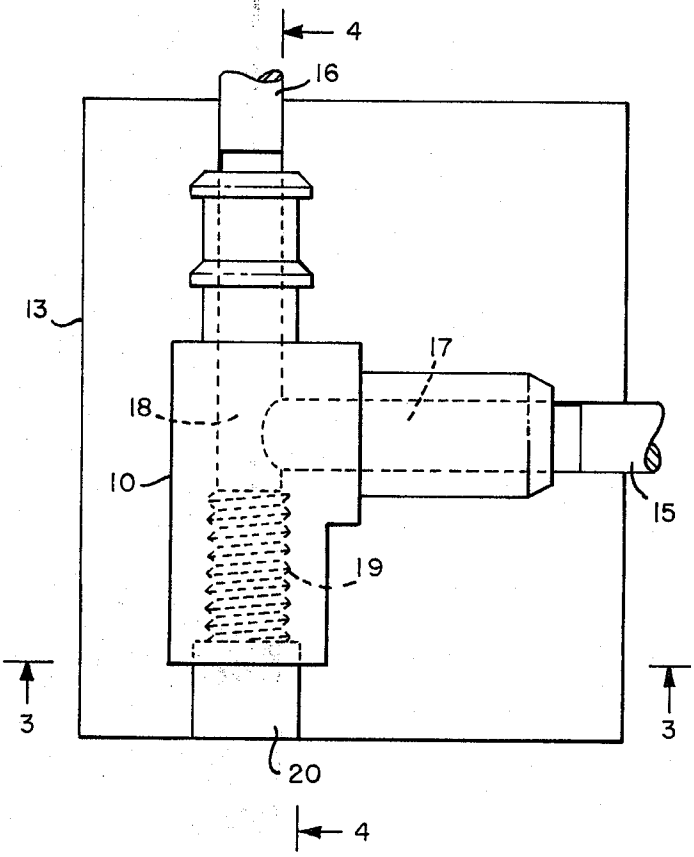


FIG. 2

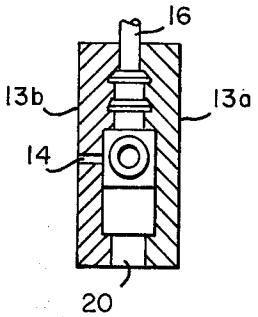


FIG. 4

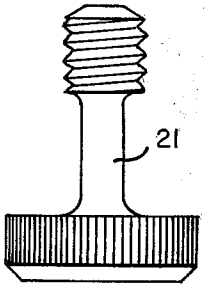


FIG. 6

HEARING AID DEVICE

This application is a continuation-in-part of my application Ser. No. 275,324 filed July 26, 1972 and now U.S. Pat. No. 3,800,101 issued Mar. 26, 1974 for Hearing Aid Device.

DESCRIPTION OF THE INVENTION

This invention relates to a hearing aid device and the method of making said device.

An object of this invention is to provide an improved hearing aid device that is used for attaching the sound tube of the hearing aid amplifier to the molded ear insert.

Another object of this invention is to provide an improved plastic adapter for venting the molded ear insert that is employed in hearing aids.

Another object of this invention is to provide an improved method of manufacturing a plastic adapter for use in connecting the sound tube of the hearing aid amplifier to the plastic ear insert provided to the hearing aid.

Still another object of this invention is to provide a plastic adapter used for connecting the sound tube from the hearing aid amplifier to the molded ear insert, said adapter being constructed so that it may be economically and efficiently manufactured.

Still another object of this invention is to provide an improved adjustable venting and sound transmitting device that may be easily attached to hearing aid ear molds, said device being adapted to be economically manufactured by an improved method of manufacture.

A further object of this invention is to provide an adjustable venting and sound transmitting device attached to the hearing aid ear mold, said device being of small size and light weight and it also being constructed so that it may be adjusted by the wearer to control the venting and sound transmission of the sound channel through the ear mold.

Other and further objects of this invention will be apparent to those skilled in the art to which it relates from the following specification, claims and drawing.

In this invention I have provided a hearing aid device and method of manufacturing the same whereby the sound tube from the hearing aid amplifier and the venting valve are connected to the same hole through the plastic ear insert. Thus the channel leading into the auditory canal of the wearer's ear is vented by this device at the same time as some frequency control is provided thereto. Furthermore, the adapter of my invention is made of a sufficiently small size so that it can be fitted to all molded ear inserts without difficulty.

Heretofore various variable venting devices have been proposed and disclosed in different patents. However, so far as I am aware these various devices were either too bulky to use on conventional plastic ear molds or they were difficult to install in the ear mold, sometimes even requiring an additional hole through the ear mold to receive the venting device. These difficulties have been overcome by my invention with the additional advantage that the cost thereof is kept low through an improved manufacturing process.

Further details and features of this invention will be set forth in the following specification, claims and drawing, in which, briefly:

FIG. 1 is a view of this device attached to the molded ear insert;

FIG. 2 is a view of one member of the injection molding die in which the device of this invention is made;

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 2 showing the plastic adapter formed in the die;

FIG. 4 is a sectional view of the die taken along the line 4—4 of FIG. 2;

FIG. 5 is a sectional view of the plastic adapter showing the metal screw positioned therein and also showing the addition of solvent around the shoulder of the screw to form the plastic screw retaining flange; and

FIG. 6 is a side view of the metal screw provided to the device as shown in FIG. 5.

Referring to the drawing in detail, reference numeral **10** designates a venting tube adapter attached to the mold **11** which forms the ear insert of the hearing aid wearer and which is provided with a hole **12** to which the adapter **10** is attached. The ear insert **11** may be made of suitable plastic, such as acrylic resin or other soft or hard plastic as referred to in the plastic trade. This ear insert is provided with a tapered portion **11***a* that fits into the outer end of the auditory channel of the ear of the earer and the hole **12** communicates with the wearer's auditory canal.

The adapter **10** is made of suitable thermoplastic material and it is formed in the injection molding die **13** which is made in two pieces, **13***a* and **13***b*, which are provided with a cavity having the outer shape of the adapter **10.** The die parts **13***a* and **13***b* are provided with one or more holes such as the hole **14** through which molten plastic is injected into the cavity in the die to form the ear insert device **10.** The die **13** is also provided with movable pistons **15** and **16** which are moved into the cavity in the die predetermined distances before the molten plastic is injected into the die cavity through holes **14.** Thus, the piston **15** is moved into the die cavity so as to form the hole **17** through the adapter **10** and piston **16** is moved into the die cavity to contact the threaded insert **19** to form the hole **18.** The insert **19** is provided with a shank **20** which is clamped between the die parts **13***a* and **13***b*.

After the molten plastic is injected into the die **13** through holes **14** and the adapter **10** is formed, pistons **15** and **16** are withdrawn from the plastic adapter and the die parts **13***a* and **13***b* are opened so that the plastic device **10** is released therefrom. The threaded member **19** is then withdrawn from the plastic device **10** by gripping the shank **20** and unscrewing it therefrom. The hole **18***a* is then drilled into the side of the adapter into the threaded hole.

After the plastic device **10** is removed from the die and the threaded member **19** is unscrewed therefrom the machine screw **21** is inserted into the threaded hole formed in the plastic device. The machine screw **21** is screwed into the plastic device until the shoulder **21***a* of the machine screw is aligned with the shoulder **10***a* of the plastic device as shown in the drawing. The plastic device **10** is then held in vertical position and the eye dropper **22** with a small quantity of plastic solvent is used to place a small quantity of the solvent into the cavity formed around the shank **21** of the machine screw. This solvent functions to dissolve some of the plastic of the plastic device **10** and form a flange around the shank **21** so that the machine screw can not be unscrewed from the plastic device without destroying this plastic flange. The machine screw then is used to control the opening of the hole **18***a* which was drilled into the plastic body into the threaded portion thereof. Thus, the machine screw **21** may be used for control-

ling the venting of the holes **17** and **18** through the plastic device **10** and also the hole **12** leading into the auditory canal of the hearing aid wire.

The plastic device **10** is formed with the tubular portions **10***b* and **10***c*. The tubular portion **10***b* is inserted into the hole **12** of the ear mold **11** and is glued into place with a suitable adhesive. The tubular portion **10***c* is provided with flanges **10***d* and the plastic tube **23** is stretched over these flanges. The flanges keep the tube **23** from slipping off of the tubular portion **10***c* during use of the device.

While I have shown and described a preferred embodiment of the invention, it is apparent that the invention is capable of variation and modification from the form shown so that the scope thereof should be limited only by the scope of the claims appended hereto.

What I claim is:

1. In a hearing aid apparatus, a venting adapter for connecting the round tube from a hearing aid amplifier to an ear mold, comprising:

a first hollow tubular body member having a hole therethrough, said tubular member having one end adapted for attachment of the sound tube leading from a hearing aid and said tubular member having the hole at the other end threaded;

a second hollow tubular member having one end fixed to said first tubular member and having a hole therethrough communicating with the first tubular member hole and having the other end adapted for attachment to an ear mold such that sound transmitted from the sound tube of the hearing aid will pass through said tubular member holes to the ear mold and on to the ear auditory canal of the hearing aid wearer;

a vent opening in said first tubular member near the other end thereof and leading from the hole therein to the outside of the tubular member at a point external to the ear; and

a threaded screw member threaded into the threaded hole at the other end of the first tubular member such that by turning the threaded screw member it will be caused to overlap and regulate the size of the vent opening for regulation of the volume of sound transmitted through the adapter to the ear auditory canal of the wearer.

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