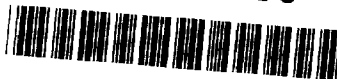


10-23-2000



y Docket No. 59184-P001US-10021070

101493929

1. Name of conveying party(ies):

Clearstone Hearing Aid Laboratories,
Inc.

Additional name(s) of conveying party(ies)

2. Name and address of receiving party(ies):

Hear-Wear, L.L.C.
2323 S. Sheridan
Tulsa, Oklahoma 74129-1043

Additional name(s) & address(es)

3. Nature of Conveyance:

☒ Assignment (Nunc pro tunc)☒ Merger☐ Change of Name☐ Security Agreement☐ Other _____

Execution Date(s): June 23, 2000

4. Application number(s) or patent number(s):

If this document is being filed together with a new application, the execution date of the application is:

A. Patent Application No.(s):

B. Patent No.(s) 5,606,621

Serial No.:

Date Filed:

Additional numbers attached? ☐ Yes ☒ No

5. Name and address of party to whom correspondence concerning document should be mailed.

David H. Tannenbaum
Fulbright & Jaworski L.L.P.
2200 Ross Avenue, Suite 2800
Dallas, Texas 75201

6. Total number of applications and patents involved: 1 (One)

7. Total fee (37 CFR 3.41): \$ 40.00

☒ Enclosed☐ Authorization to be charged to deposit account

8. Deposit account number: 06-2380

DO NOT USE THIS SPACE

9. Statement and signature.

To the best of my knowledge and belief, the foregoing information is true and correct and any attached copy is a true copy of the original document.

Matthew D. Jones

Name of Person Signing

Signature

October 5, 2000

Date

Total number of pages including cover sheet, attachments, and document. 8

Mail documents to be recorded with required cover sheet information to:

Commissioner for Patents

Box Assignment

Washington, D.C. 20231

PATENT
REEL: 011164 FRAME: 0171

Confirmatory Patent Assignment Deed

WHEREAS, Cleartone Hearing Aid Laboratories, Inc., an Oklahoma corporation ("Assignor"), 2323 S. Sheridan, Tulsa, Oklahoma, 74129-1043, acting through James P. Feeley, its President, is the record owner of U.S. Patent No. 5,606,621 ("Patent"), and

WHEREAS effective June 23, 2000, the Assignor sold the Patent to Hear-Wear, L.L.C., an Oklahoma limited liability company, ("Assignee"), 2323 S. Sheridan, Tulsa, Oklahoma 74129-1043, acting through James P. Feeley, its President, and

WHEREAS the Assignor has agreed to confirm such assignment in a deed for recordation in the U.S. Patent and Trademark Office to convey record title to the Patent into the Assignee;

NOW THEREFORE, the parties hereto agree as follows:

1. The Assignor hereby confirms that effective June 23, 2000 nunc pro tunc, it sold, assigned, and transferred to the Assignee all such right, title, and interest as the Assignor then had or may have had in U.S. Patent No. 5,606,621.

2. The Assignor hereby confirms that the above-referenced sale, assignment, and transfer included all claims for infringement of U.S. Patent No. 5,606,621 that existed or might have existed on June 23, 2000, together with the right to assert such claims, to bring suit on such claims, and to settle such claims.

IN WITNESS WHEREOF, the Assignor has signed this Confirmatory Patent Assignment Deed.

Cleartone Hearing Aid Laboratories, Inc.

Date: June 23, 2000

By


James P. Feeley, President

Patent Assignment Agreement

This is an agreement between Cleartone Hearing Aid Laboratories, Inc.
* ("Transferor"),

an Oklahoma corporation, acting through James P. Feeley, its President, and located at 2323 S. Sheridan, Tulsa Oklahoma 74129-1043 and Hear-Wear, L.L.C., an Oklahoma limited liability company ("Transferee"), acting through James P. Feeley, its President and located at 2323 S. Sheridan, Tulsa Oklahoma 74129-1043.

WHEREAS, Transferor owns U.S. Patent No. 5,606,621 (the "'621 patent") and foreign counterpart patent applications thereto (the '621 patent and foreign counterpart patent applications being hereinafter collectively referred to as the "Patent Rights"), Transferee wishes to receive the Patent Rights, and Transferor is willing to transfer the Patent Rights.

NOW THEREFORE, in consideration of their mutual promises, and intending to be legally bound, the parties hereto agree as follows:

1. Assignment. Transferor hereby assigns all of its right, title and interest in the Patent Rights to Transferee, free and clear of all liens, claims and encumbrances.
2. Record Title; Conveyance of '621 Patent. Transferor will prepare a deed of Assignment to Transferee, for the purpose of conveying record title to the '621 patent
3. No Warranties. Transferor is unaware of any claim that a hearing aid covered by the '621 patent infringes any patent owned by any third party. Transferor does not warrant that any of the Patent Rights are valid, and does not warrant that any hearing aid manufacturer manufactures any product that infringes any of the Patent Rights. WITH RESPECT TO THE PATENT RIGHTS, TRANSFEROR MAKES NO WARRANTY, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION; ANY IMPLIED WARRANTY OF MERCHANTABILITY OR ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.
4. Amendments to be in Writing. This Agreement may not be amended except in a writing signed by the parties.
5. Effective Date. This Agreement is effective as of June 23, 2000.

Cleartone Hearing Aid Laboratories, Inc.

By: 

James P. Feeley, President

Hear-Wear, L.L.C.

By: Cleartone Hearing Aid Laboratories, Inc.
It's sole Member

By: 

James P. Feeley, President

f:\users\trd\agms\cleartone patent assgnt agmt to hw.doc

95P 74506



US005606621A

United States Patent [19]

[11] Patent Number: 5,606,621

Reiter et al.

[45] Date of Patent: Feb. 25, 1997

[54] HYBRID BEHIND-THE-EAR AND COMPLETELY-IN-CANAL HEARING AID

[75] Inventors: James J. Reiter, Champlin; Gordon Berkholz, Minneapolis, both of Minn.

[73] Assignee: Siemens Hearing Instruments, Inc., Piscataway, N.J.

2058158	5/1971	France	
3508830A1	9/1986	Germany	
3601440A1	7/1987	Germany	
3638747C1	10/1987	Germany	
3625891A1	2/1988	Germany	
0151100	7/1987	Japan	381/68.7
92/13430	8/1992	WIPO	

OTHER PUBLICATIONS

[21] Appl. No.: 490,214

[22] Filed: Jun. 14, 1995

[51] Int. Cl.⁶ H04R 25/00

[52] U.S. Cl. 381/68.6; 381/68.7

[58] Field of Search 381/23.1, 68, 68.1, 381/68.2, 68.3, 68.4, 68.5, 68.6, 68.7, 69, 69.1, 69.2; 181/129, 130, 134, 135; 128/864, 865, 866

[56] References Cited

U.S. PATENT DOCUMENTS

3,123,678	3/1964	Prentiss et al.	381/68.7
3,688,863	9/1972	Johnson	181/23
3,890,474	6/1975	Glicksberg	179/107
4,089,332	5/1978	Rose	128/865
4,606,329	8/1986	Hough	381/68.3
5,381,484	1/1995	Claes et al.	381/68.6

FOREIGN PATENT DOCUMENTS

0158391A1	10/1985	European Pat. Off.
0158391B1	10/1988	European Pat. Off.

International Search Report.

William K. Vass, MS, and Laura A. Mims, MS; 'Exploring the deep canal fitting advantage'; Hearing Instruments; vol. 44, Number 12, 1993; pp. 26 & 27.

Gustav Mueller; 'CIC Hearing Aids: What Is Their Impact On The Occlusion Effect?'; The Hearing Journal; vol. 47, No. 11, Nov. 1994; pp. 29-35.

Webster's Ninth New Collegiate Dictionary, 1990, p. 392.

Primary Examiner—Forester W. Isen

Attorney, Agent, or Firm—Mark H. Jay

[57]

ABSTRACT

A hybrid BTE and CIC hearing aid has a BTE component which is worn behind the patient's ear and a CIC component which is worn in the bony portion of the patient's ear canal. The BTE and CIC components are connected together with a wire cable. Electroacoustic feedback is reduced or eliminated, allowing gain to be increased. The patient is not disturbed by the occlusion effect.

3 Claims, 1 Drawing Sheet

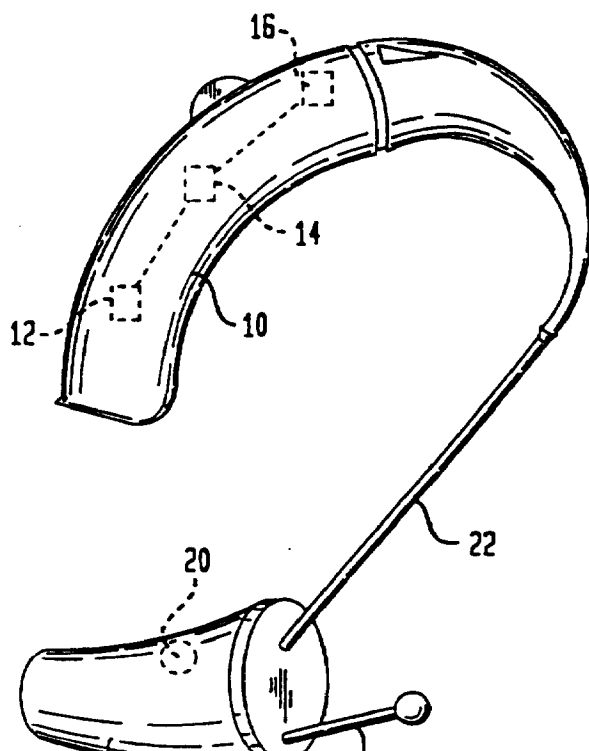


FIG. 2B

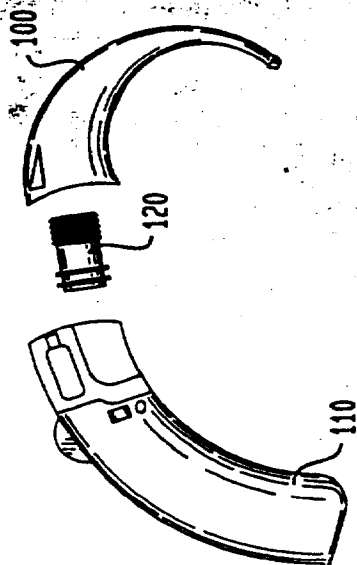


FIG. 2D

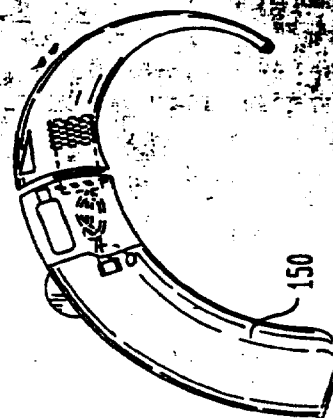


FIG. 2A

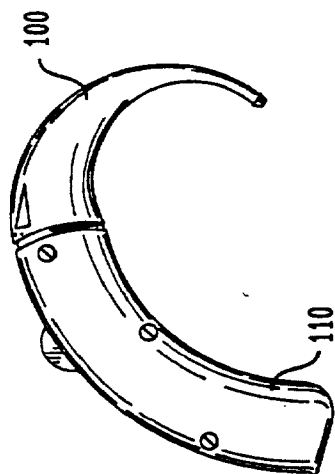


FIG. 2C

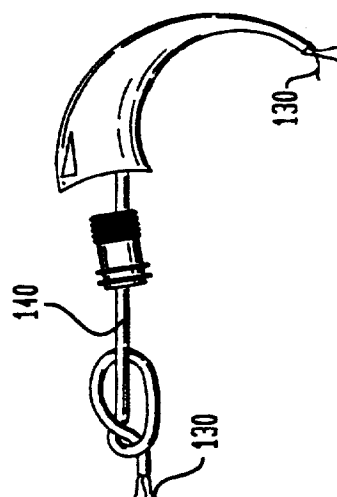
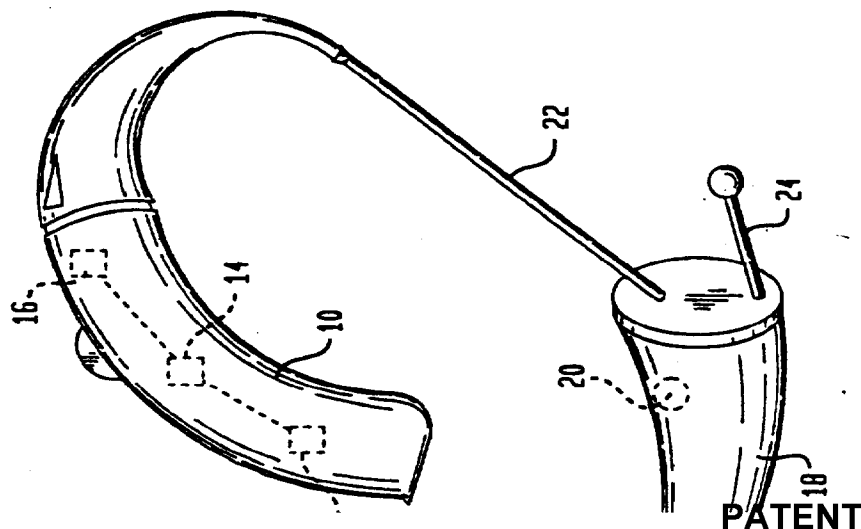


FIG. 1



HYBRID BEHIND-THE-EAR AND COMPLETELY-IN-CANAL HEARING AID

BACKGROUND OF THE INVENTION

The invention relates to hearing aids, and more particularly relates to high-gain hearing aids. In its most immediate sense, the invention relates to high-gain hearing aids which reduce the occlusion effect.

Patients with severe hearing loss require high-gain hearing aids. Such aids use high-power amplification circuitry. Conventionally, such circuitry uses comparatively large electrical components. For this reason, high-gain hearing aids are conventionally of the behind-the-ear ("BTE") type.

However, such aids suffer from a serious limitation. This is that as the gain of the aid is increased, electroacoustic feedback also increases. This is because the hearing aid microphone and receiver are mechanically coupled to each other because both are mounted to the same housing. As a result, the gain of the aid is limited by the electroacoustic feedback.

In the past, efforts have been made to reduce electroacoustic feedback by physically separating the microphone and the receiver used in the hearing aid. For example, *The Volta Review* 1-80 pp. 40-44 describes a hearing aid in which the receiver is separated from the main body of the aid and mounted in an earmold that in turn is placed in the patient's ear.

While such a hearing aid would reduce electroacoustic feedback, it would be commercially unacceptable. This is because such an instrument would cause the patient to experience the occlusion effect, which is the plugged, sensation caused by the introduction of e.g. an earmold in the outermost portion of the ear.

It would therefore be advantageous to provide a high-gain hearing aid that has reduced electroacoustic feedback characteristics while nonetheless being constructed to reduce or eliminate the occlusion effect.

In accordance with the invention, there is provided a hybrid BTE and completely-in-canal ("CIC") hearing aid. A hearing aid in accordance with the invention has two components: a BTE component and a CIC component. These components are mechanically isolated from each other. The BTE component, which is mounted behind the ear, contains the microphone, the battery and the amplifier circuitry. The CIC component, which is shaped to fit into the ear canal of the patient in such a manner as to touch the bony portion of the ear canal, contains the hearing aid receiver, which is connected to the amplifier means.

Because the BTE and CIC components are mechanically isolated from each other, electroacoustic feedback is greatly reduced. This permits the gain of the hearing aid to be greatly increased and thereby made more suitable for patients with severe hearing loss. Additionally, because the CIC component is located so deep in the patient's ear canal as to touch the bony portion, it does not cause the patient to experience the occlusion effect. Therefore, a patient with severe hearing loss who uses a hearing aid in accordance with the invention can benefit from a higher gain without suffering from the occlusion effect.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be better understood with reference to the following illustrative and non-limiting drawings, in which:

FIG. 1 shows a preferred embodiment of the invention; and

FIGS. 2A, 2B, 2C and 2D show how a component of the preferred embodiment is manufactured from a BTE hearing aid.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

A BTE component 10 contains a microphone 12, amplifier circuitry 14 and a battery compartment 16. In this example, the BTE component is a BTE-type hearing aid from which the receiver has been removed.

A CIC component 18 has a shell which is molded to fit completely in the patient's hearing canal (not shown); the CIC component 18 touches the bony portion of the patient's hearing canal. A receiver 20 is located in the CIC component 18, and is connected to the BTE component 10 by a thin, flexible wire cable 22. To permit a user to easily grasp the CIC component 18 for introduction into and removal from the patient's hearing canal, a retrieval line 24 is attached to the CIC component.

In use, the BTE component 10 is placed behind the patient's ear (not shown) and the patient grasps the retrieval line 24 to install the CIC component 18 into the bony portion of the ear canal. In use, electroacoustic feedback is minimal because the only mechanical connection between the BTE component 10 and the CIC component 18 is via the patient's head. Additionally, because the CIC component 18 fits so deeply into the patient's ear canal, the patient is not disturbed by the occlusion effect.

In this example, the BTE component 10 is manufactured by modifying a BTE-type hearing aid such as is sold by Rexton, Inc. under the MP+ or PP-142 designations, but neither this manufacturing method nor these particular hearing aid models are parts of the invention. Referring to FIGS. 2A to 2D, to make the BTE component 10 the earhook 100 is removed from the case 110 of the hearing aid and the case is disassembled to reveal the receiver and the nubbin 120. Then, the wires for the receiver are desoldered from the remaining circuitry and the receiver with attached wires is removed. Electrical wires 130, such as 4/44 Litz wires with urethane insulation, are sheathed in a length of teflon tubing 140 to form the cable 22 and knotted at one end (to prevent the cable 22 from being pulled out through the nubbin 120 after the device has been assembled). The cable 22 is then passed through the earhook 100, the wires 130 are soldered at one end to the circuit board 150 in the BTE component 10 and are also soldered at the other end to the receiver 20. The earhook 100 and nubbin 120 are reattached to the case 110 to complete the BTE component 10. The receiver 20 is embedded in an appropriately molded CIC component 18.

The amplifier 14 may, if desired, be of the multi-channel type, may be programmable, and may contain signal processing sections (e.g. compressors, filters etc.). The electrical characteristics of the amplifier 14 are not part of the present invention. So, too, the battery compartment 16 may be of the type which swings out of the BTE component 10; the construction and location of the battery compartment are also not a part of the invention.

While in the preferred embodiment the BTE and CIC components 10 and 18 respectively are connected by a wire cable, this is not required; it may also be possible to connect these two components without a hard-wired connection (e.g. magnetically).

Although a preferred embodiment has been described above, the scope of the invention is limited only by the following claims:

We claim:

1. A hearing aid, comprising:

a behind-the-ear component, the behind-the-ear component being shaped to fit behind the ear of a patient and containing a microphone, battery receiving means and amplifier means, the amplifier means being operatively connected to the microphone and a battery received in the battery receiving means, and producing an amplified electrical signal in response to sound at the microphone; and

a completely-in-canal component, the completely-in-canal component being mechanically isolated from the behind-the-ear component, being shaped to fit into the ear canal of the patient in such a manner as to touch the bony portion of the ear canal, the completely-in-canal component containing a hearing aid receiver and being operatively connected to the amplifier means.

2. The hearing aid of claim 1, wherein the behind-the-ear component and the completely-in-canal component are connected together by a wire cable.

3. The hearing aid of claim 1, wherein a retrieval line is attached to the completely-in-canal component.

* * * * *