Jan. 3, 1939. L. D. NORTON ET AL 2,142,407

HEARING TUBE

Filed July 7, 1937

Fig. 1.

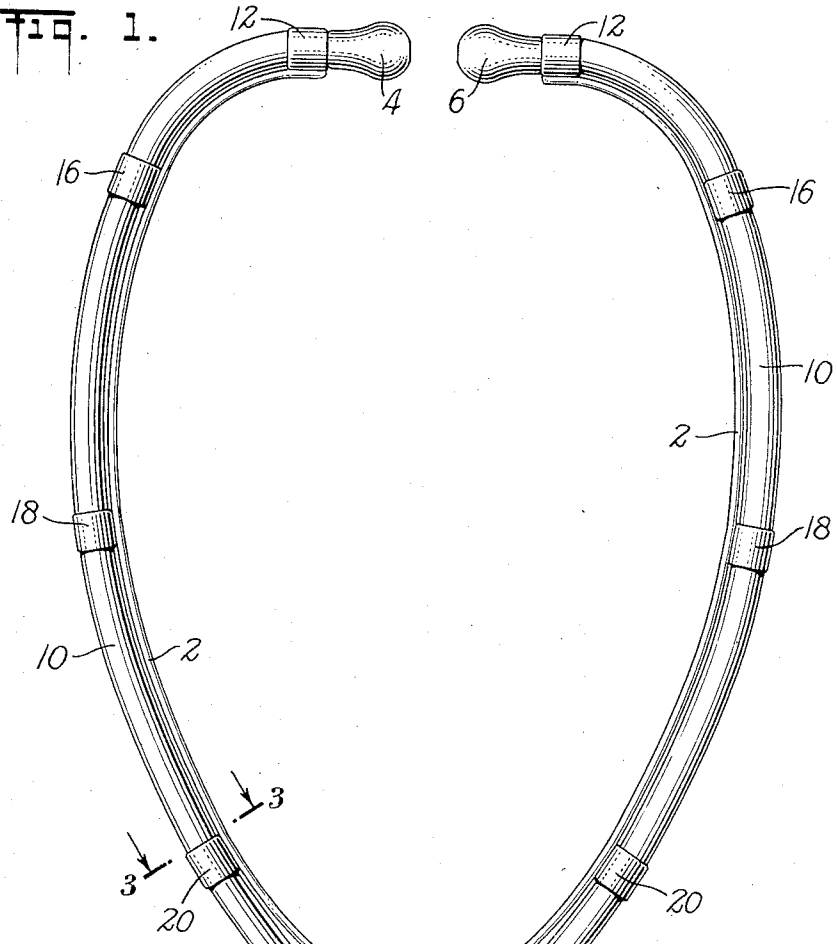



Fig. 3.

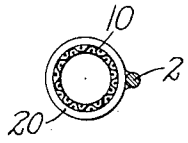
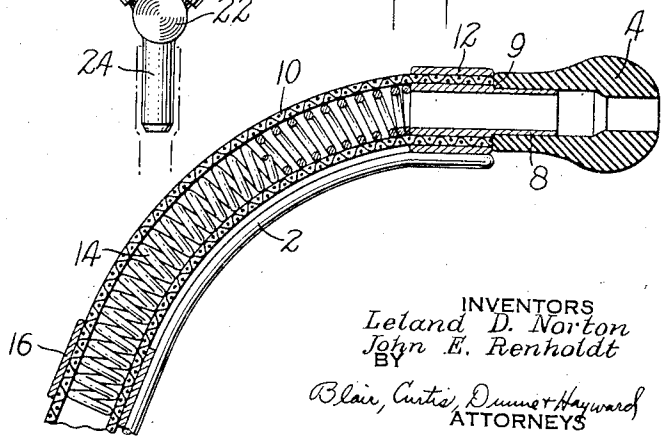



Fig. 2.




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2,142,407

## HEARING TUBE

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6 Claims. (Cl. 181—24)

This invention relates to hearing tubes, and more in particular, to head-pieces of hearing tubes of the type which are used with dictating machines and sound detecting and producing machines.

An object of this invention is to provide a device of this nature which is light in weight, simple in construction, and efficient in use, and one which may be economically manufactured. A further object is to provide a device of this character which is highly practical and which may be used without undesirable results which are at times present in the use of certain prior art devices.

Another object is to provide a hearing tube for general use which is efficient in transmitting sound and which is not subject to damage which might interfere with its operation.

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts, as will be hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing in which an illustrative form of the invention is shown,

Figure 1 is a view showing the assembled head-piece;

Figure 2 is a sectional view showing the detailed structure of one ear-piece and the parts associated therewith; and

Figure 3 is a sectional view on the line 3—3 of Figure 1.

In connection with dictation machines, phonographs, radio devices, surgical instruments such as stethoscopes, and sound analysis and transmitting devices in general, it is desirable to convey the sound in an efficient manner without distortion. At the same time, it is often undesirable to amplify the sound and means must, therefore, be provided to convey the sound directly to the ear of the listener with high efficiency and without echo or the introduction of extraneous noises.

A very satisfactory means for obtaining these results is to provide a closed tube with an air column extending from the source of sound to the ear of the listener, or to the other means to which sound is being conveyed. The tube may be provided with a Y-connection adjacent the head of the listener and the sound thus conveyed through a pair of tubes to both ears. A means for accomplishing certain of these results which is very satisfactory in some respects is shown in United States Patent No. 1,775,204. In use, this device hangs from the head of the listener with the ear-pieces inserted in the ears, so that the weight of the device is carried by the ears. The tubes extend outwardly from the ears and downwardly under the chin, generally following the contour of the head, but not in contact therewith.

In the use of devices of this character, it has been found that if the tubing is of metal, the weight of the device is great enough to be objectionable at times. Furthermore, metal tubing is rigid and it has been desirable to use a joint such as that shown in the above-mentioned patent. To avoid these and certain other objections, it is proposed that a relatively rigid wire frame or bail be provided and that a flexible non-metallic tube be carried by the bail. The bail is rigid enough to hold the ear-pieces in position, but is flexible enough to permit ready accommodation of the device to listeners of varying physical characteristics. At the same time, the ear-pieces are reliably held in contact with the ears so that the sound is delivered undistorted to the ears, and the device is reliably supported without inconvenience to the listener.

Referring to the drawing, wherein one embodiment of the invention is shown, a flexible bail 2 of steel wire, substantially in the form of an oval, as shown, connects the two ear-pieces 4 and 6 and forms a flexible support for the hearing tubes. This bail normally retains the position shown, but may be easily flexed to other positions so as to avoid the possibility of strain upon the listener. It will be noted that the ear-pieces are in substantial alignment and that if they are pulled from each other, they will tend to remain substantially in this relationship; thus they are always in position to fit the ears of the listener.

In this embodiment, the right and left sides of the head-pieces are identical, and only the left side will be described in detail. There is an opening through each of the ear-pieces 4 and 6 such as shown in ear-piece 4 in Figure 2. This opening is enlarged at the left and serves as a socket to receive the reduced portion of a metal sleeve 8, which sleeve is provided with a shoulder, as at 9, to limit the distance that sleeve 8 may enter ear-piece 4.

Sleeve 8 receives upon its left end a flexible tube 10 which is preferably of varnished cambric, or of other material having similar physical and acoustic characteristics. Varnished cambric is admirably adapted for this use, as it is light in weight and flexible, but, at the same time, is

rigid enough to maintain an unobstructed opening throughout its length. Furthermore, it has been found that varnished cambric has certain extremely desirable acoustic properties which are very important under some conditions of usage.

Surrounding the end of flexible tube 10 and tightly clamping it to sleeve 8, is a collar 12 which is rigidly attached by means of solder to flexible bail 2. Flexible bail 2 and tube 10 are curved adjacent collar 12, and extending within tube 10 along this curved portion is a coil spring 14. One end of coil spring 14 abuts the end of sleeve 8, and surrounding the other end of spring 14 so as to hold tube 10 tightly into contact therewith is a collar 16. Collar 16 is attached to flexible bail 2 in the same manner as is collar 12.

Suitable additional collars 18 and 20 are also attached to bail 2 and reliably hold tube 10 in place, as shown in Figure 3. Tube 10 is connected (Figure 1) at its lower end to one of the upper legs of a Y-connection 22, the lower leg 24 of which is connected to a source of sound through an additional sound tube not shown.

It will be seen that a flexible supporting means is formed for the sound tubes 10 so that the ear-pieces are maintained in contact with the ears in such a manner that the sound is delivered to the ears in an efficient manner and extraneous noises are excluded. At the same time, the head-piece is reliably supported by the ears without discomfort to the listener and the weight of the head-piece is not great enough to cause tiring.

With this construction, unbroken columns of air, without sharp corners, extend from the Y-connection 22, through the tubes 10, the sleeves 8, and the ear-pieces 4 and 6, directly to the ears. When tubes 10 are constructed of material such as varnished cambric, the sound is transmitted undistorted through these columns of air and danger of obstructing the passageways through the tubes is lessened.

While bail 2 may be readily flexed as a whole, the wire of which it is made is stiff enough to resist the formation of sharp bends or kinks and the pressure of coil springs 14 further resists any ordinary force tending to bend it between collars 12 and 16. Ear-pieces 4 and 6 are therefore normally retained in alignment. At the same time, action which might tend to crush tube 10 is resisted by coil spring 14 so as to maintain a clear opening through the center of the tube.

The particular structure of bail 2, collars 12, 16, 18 and 20, and the means for retaining ear-pieces 4 and 6 in position, are highly important under some conditions of usage. It has been found that the head-piece may be subjected to very severe treatment without injury to tubes 10 and without impairing the efficient operation of the head-piece. This is in some respects due to the fact that collars 16, 18 and 20 may be positioned along the bail where most desirable, and, regardless of their position, the bail still retains its flexibility; at the same time, tubes 10 are maintained in proper position without strain, and they are protected from damaging action such as crushing or kinking.

In assembly, springs 14 and sleeves 8 are inserted in the ends of tubes 10 and collars 12, 16, 18 and 20 are then properly positioned and the collars are soldered to bail 2. The ends of tubes 10 are then slipped over the legs of Y-connection 22 and ear-pieces 4 and 6 are slipped onto sleeves 8. It has been found that this particular method of assembly is simple and practical and facilitates the relative adjustment of the various parts.

As many possible embodiments may be made of the above invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

We claim:

1. In a hearing tube head-piece of the type which is adapted to be supported by the ears of a person with ear-pieces at each ear and wherein said ear-pieces are connected by suitable tube means to a source of sound, the combination of, a flexible bail having inwardly extending end portions, a pair of varnished cambric tube members one of which extends from each of said ends to a point adjacent the center of said bail, means connecting said tube members at said last named point, and a pair of ear-pieces operatively associated with said tube members and connected to said bail.

2. In a hearing tube head-piece of the type which is adapted to be supported by the ears of a person with ear-pieces at each ear and wherein said ear-pieces are connected by suitable tube means to a source of sound, the combination of, a flexible bail, a flexible tube of varnished cambric, an ear-piece operatively associated with said tube, and means connecting said bail, said tube, and said ear-piece so that said tube is supported by said bail.

3. In a hearing tube head-piece of the type which is adapted to be supported by the ears of a person with ear-pieces at each ear and wherein said ear-pieces are connected by suitable tube means to a source of sound, the combination of, a flexible bail having a curved portion, a flexible tube, a pair of collars surrounding said tube and attached to said bail at the ends of said curved portion, and a coil spring within said tube operatively associated with said collars and said bail, with the result that said tube is held substantially in contact with said bail along said curved portion and flexing of said bail at said curved porton is resisted.

4. In a hearing tube head-piece of the type which is adapted to be supported by the ears of a person with ear pieces at each ear and wherein said ear pieces are connected to suitable sound-carrying tube means, the combination of, a flexible bail having a curved portion, a flexible tube of varnished cambric extending along said curved portion, a sleeve within said tube at one end of said curved portion, a coil spring within said tube extending along said curved portion and having one end operatively associated with said sleeve, a pair of outer collars rigidly attached to said bail and positioned at the opposite ends of said curved portion, one of said outer collars clamping said tube to said sleeve and the other of said outer collars clamping said tube to said coil spring.

5. In a hearing tube head-piece of the type which is adapted to be supported by the ears of a person with ear pieces at each ear and wherein said ear pieces are connected to suitable sound-carrying tube means, the combination of, a flexible bail having a curved portion, a flexible tube of varnished cambric extending along said curved portion, a sleeve within said tube at one end of said curved portion, an ear piece carried by said sleeve, a coil spring within said tube extending along said curved portion and having one end operatively associated with said sleeve, a

collar rigidly attached to said bail and clamping said tube to said sleeve.

6. In a hearing tube head-piece of the type which is adapted to be supported by the ears of a person with ear pieces at each ear and wherein said ear pieces are connected to suitable sound-carrying tube means, the combination of, a flexible tube having a predetermined internal diameter, a sleeve having a shoulder thereon forming an enlarged end which snugly fits within the end of said tube and an extension which extends beyond the end of said tube, a tubular ear piece having an opening therethrough with a counter-bore in said opening snugly receiving said extension, and a supporting means including a collar, said collar being snugly positioned around the end of said tube concentric with the enlarged end of said sleeve, the ends of said sleeve and said collar being in the plane of said shoulder to form an abutment for the end of said tubular ear piece.

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