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E. W. LAISNE ETAL

3,123,069

EAR INSERT

Filed June 25, 1962

Fig. 1.

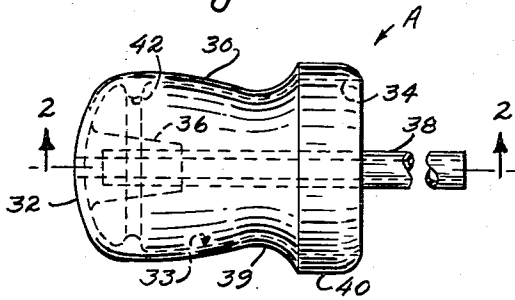


Fig. 3.

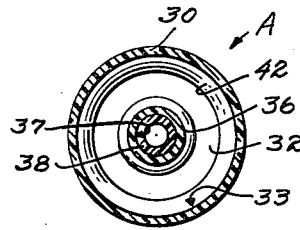


Fig. 2.

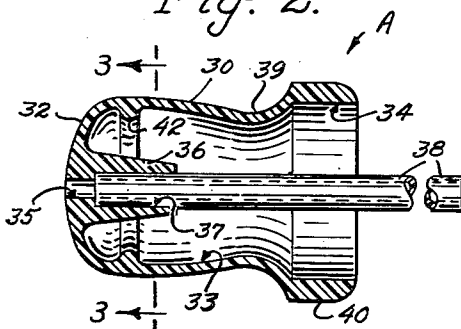


Fig. 4.

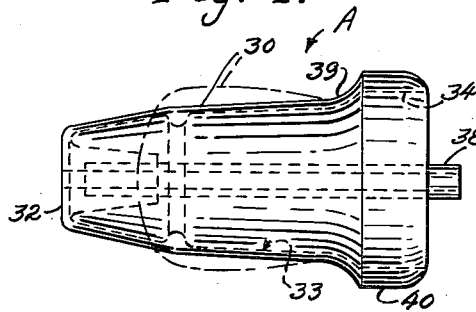


Fig. 6.

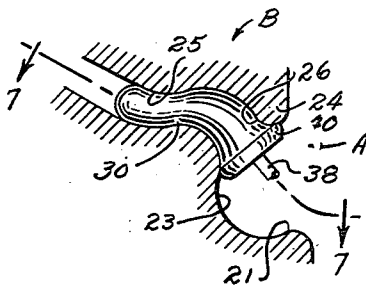


Fig. 5.

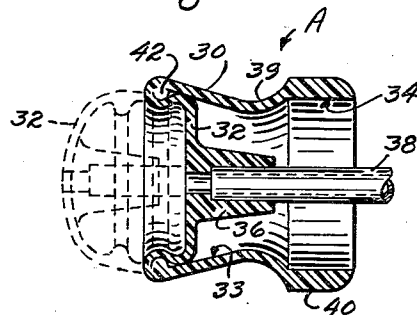
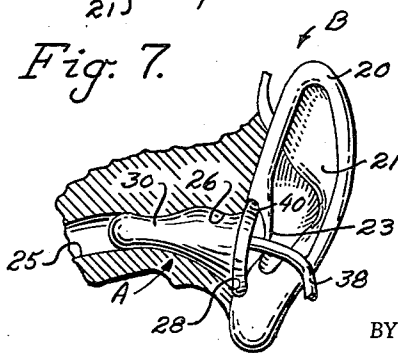


Fig. 7.



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EAR INSERT

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This invention relates to improvement in inserts designed to be received within the human ear for protecting the ear from loud noises, sudden pressure changes, etc., and for establishing an artificial auditory ear canal for use with hearing aids, radio receivers, etc.

Presently provided ear inserts are generally formed of rigid, semi-rigid, or relatively stiff materials, such as rubber or synthetic materials with only a small degree of localized resilience, if any; and are generally of a size somewhat greater than that of the ear canal so that considerable pressure must be applied to the outer end of the insert in order to force it to expand or stretch the external entrance of the ear canal to permit the insert to pass therethrough, causing soreness and often serious damage. This pressure upon and distortion of the ear canal wall imposes a constant pressure upon the insert which tends to force or expel it from its position, necessitating frequent adjustment by the wearer in order to restore it to its proper position, and likewise permits sound leakage. Such sound leakage is particularly annoying when the insert is used in connection with a hearing aid or radio receiver, in which case passage of sound through the transmitting tube and leakage of sound about the ear insert produces a confused medley of sound and places the wearer under a constant, exhausting, nerve racking strain. The continued pressure of such ear inserts likewise produce a deadening effect upon the ear canal wall, which is communicated to the inner ear, with the result that the sound transmitted by the hearing aid or radio receiver may be distorted, unintelligible, and extremely annoying. Such previously provided ear inserts likewise cannot adjust themselves to changes in the ear canal such as are caused by variations in the body temperature, body weight, or movements of the head or parts thereof such as may be caused by coughing, chewing, talking, etc.

The primary object of our invention is to provide an ear insert having a high degree of tolerance for the tender tissues of the ear that line the natural auditory canal of the human ear; which will without appreciable pressure, automatically conform to and register with the inner wall of the ear canal regardless of the peculiar shape or configuration thereof, eliminating the development of pressure spots or differential pressure areas against the tender tissues of the ear; which may be quickly and easily positioned within the ear canal; and which will cling to the inner wall of the ear canal with affinitive adherence and maintain its position against accidental displacement or removal, but which may be easily and quickly withdrawn when desired.

A further object is the provision of an ear insert defining an artificial auditory ear canal having the attributes and functional efficiency of the natural canal, without the usual disadvantages associated with ear molds and related devices.

A further object is the provision of an ear insert which is extremely light in weight and requires no special devices, such as metal springs or the like, for retaining and attaching the insert in the ear.

A further object is the provision of an ear insert which will automatically coincide with the changes in the ear canal caused by body temperature variation, changes in body weight or movements of the head or parts thereof such as are caused by coughing, talking, chewing, head

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movements, etc., without surrendering its skin-like affinitive adherence to the ear.

Other objects and advantages of the invention will be apparent during the course of the following detailed description, taken in connection with the accompanying drawing, forming a portion of this specification, and in which drawing:

FIG. 1 is a side elevation of our improved ear insert.

FIG. 2 is a transverse sectional view taken substantially on the line 2—2 of FIG. 1.

FIG. 3 is a vertical sectional view taken substantially on the line 3—3 of FIG. 2.

FIG. 4 is a side elevation of our improved ear insert in its elongated position, as it would appear during its insertion into an ear canal.

FIG. 5 is a transverse sectional view of our improved ear insert, showing its action in resisting displacement through retrograde action.

FIG. 6 is a horizontal sectional view taken through an ear canal, showing our improved ear insert positioned therein.

FIG. 7 is a vertical section through an ear canal, taken substantially on the line 7—7 of FIG. 6.

In the drawing, wherein for the purpose of illustration is shown a preferred embodiment of the invention, and wherein similar reference characters designate corresponding parts throughout the several views, the letter A may generally designate our improved ear insert, and B a human ear. Inasmuch as the ear insert A will be described in relationship to the human ear B, the ear B will be first described.

The human ear includes a helix 20, antihelix 21, concha 23, tragus 24, and ear canal 25, the ear canal 25 having an external auditory entrance 26 having an edge or rim 28.

We have discovered, by making numerous molds of the ear canals of various persons, that human ear canals differ not only between individuals, but that each ear canal of a single individual is likely to be of a different configuration from the other. Furthermore, we have discovered that the human ear canal is not annular or circular in transverse section, as has been generally accepted, but is somewhat elliptical or ovate in shape, having a plurality of irregular curves, so that any ear insert must, if it is to be effective, be capable of automatically adjusting itself in all directions and to cling to the inner wall of the canal along its entire contact area. FIGS. 6 and 7 are illustrative of the irregular curves present in the ear canal.

The ear insert A preferably includes a hollow, substantially tubular body portion 30 having a rounded tip or wall portion 32 forming a closure at one end thereof. The body portion 30 and wall 32 define a chamber 33 which is open at the end 34 thereof. The wall 32 may be provided with an opening 35. Adjacent the opening 35, and extending internally of the chamber 33, the wall 32 may be provided with an integral tubular projection or boss 36 which boss 36 surrounds the opening 35 and registers with it. The boss 36 may be provided with a recessed portion 37 for receiving a plunger 38.

The end of body portion 30 adjacent opening 34 is slightly reduced in size or diameter to form a neck 39 and is then flared outwardly and terminates in an annulus 40, which annulus 40 is adapted for positioning within the concha 23 and antihelix 21 of the ear, in close contact with the edge or rim 28 of the external auditory entrance 26 of the ear canal 25.

The ear insert as shown in the drawings is designed for use in establishing an artificial auditory ear canal for use with hearing aids, radio receivers, and the like, the plunger 38 being tubular and forming a sound transmis-

sion tube so that sound may be transmitted through the transmission tube 38, through opening 35, and to the inner ear. It is obvious that in the event the ear insert is to be utilized for purposes such as the protection of ear from loud noises or as a swimming aid, that the opening 35 may be eliminated, providing a continuous wall 32 at one end of the body portion 30, and that the plunger 38 may be solid, rather than tubular.

As shown in the drawings, the plunger 38 is preferably of rigid or semi-rigid character having one end thereof securely positioned within the recess 37 of the boss 36, extends longitudinally through chamber 33, and terminates at a suitable distance beyond the outer face of the annulus 40. A suitable flexible tube, not shown, may be attached to plunger 38 when the insert is used in conjunction with a hearing aid, radio receiver, etc.

Plunger 38 cooperates with the tubular body portion 30 for forming a means for the facile positioning of the tubular body portion 30 within the ear canal. This plunger 38 acts as a means whereby pressure thereupon, in the direction of the wall 32, causes the tubular body portion 30 to become elongated, as shown in FIG. 4, which elongation causes a corresponding reduction in the outer diameter of the tubular body portion so that it may be easily inserted within the ear canal. This plunger 38 must have sufficient axial strength to permit proper elongation of the tubular body portion 30, and, as will be seen from FIG. 6, the same must be laterally flexible so that it may follow the irregularly curved contour of the ear canal 25 when it is inserted, together with the tubular body portion 30, in the human ear.

Formed upon the tubular body portion 30, adjacent the wall 32, and extending circumferentially within the chamber 33, is a ring-like thickened portion 42. This ring-like portion 42 is, due to its thickness, less resilient than the remainder of the hollow tubular body portion 30 and serves as a retaining ring to prevent accidental displacement of the ear insert from within the ear canal.

In the placement of the insert within the ear, the outer end of plunger 38 is grasped, the wall 32 is presented to the external auditory entrance 26 of the ear, and the plunger 38 is pressed toward the ear canal 25. The ear canal, due to its irregularly curved contour, will offer resistance to placement of the ear insert therewithin, and this resistance will cause the tubular body portion 30 to become elongated, which reduces the outer diameter thereof, so that the insert can easily pass into the ear canal.

There are frequently exerted upon ear inserts retrograde pressures which may tend to pull the insert from within the ear, such as an unwanted pull upon the plunger 38. In our invention, such a pull upon the tube 38 will cause the wall 32 to be pulled within the chamber 33, as shown in FIG. 5, over the ring 42, which tends to expand the ring 42 slightly, increasing the outer diameter of the tubular body portion 30, which increases the pressure thereof against the ear canal wall and acts to retard or prevent an unwanted dislodging of the insert from the ear canal.

In the removal of the insert from the ear, the plunger 38 is pulled, which will initially tend to cause the expansion of the tubular body portion 30, as previously described, however, this expansion is slight and continued pull upon the tube 38 will dislodge the ear insert from the canal, the ear insert returning to its original shape after initial dislodgement, permitting easy withdrawal of the insert from its position within the ear canal.

The resilient body portion 30 is preferably membranous in character, the same being of minimum thickness, and having maximum pliability and resiliency, so that the same is inherently capable of maintaining its pre-formed shape and configuration when unconfined, and to instantly assume, register with, and cling to the wall of the ear canal, regardless of the configuration, irregular or otherwise of the ear canal, and will return to and assume its

original predetermined, pre-formed condition when withdrawn.

Various changes in the shape, size and arrangement of parts may be made to the form of invention herein shown and described, without departing from the spirit of the invention or scope of the following claims.

We claim:

1. An ear insert including a hollow tubular body portion formed of thin membranous material, a wall having an opening therethrough being provided at one end of said body portion and the end of said body portion opposite said wall being opened, a transmission tube connected at one end thereof to said wall in juxtaposition for communication with the opening thereof said transmission tube extending through said hollow tubular body portion, said hollow tubular body portion having a circumferentially extending portion thereof of a greater thickness than the remainder thereof, said circumferentially extending portion extending internally of said hollow tubular body portion and adjacent said wall in juxtaposition whereby pull of said transmission tube upon said wall will cause said wall to fold inwardly of said hollow tubular body portion and collapse upon the circumferentially extending portion thereof.

2. An ear insert including a hollow tubular body portion formed of thin membranous material, a wall being provided at one end of said body portion and the end of said body portion opposite said wall being open, plunger means connected at one end thereof to said wall and extending through said hollow tubular body portion, said hollow tubular body portion having a circumferentially extending portion thereof of a greater thickness than the remainder thereof, said circumferentially extending portion extending internally of said hollow tubular body portion and adjacent said wall in juxtaposition whereby pull of said plunger means upon said wall will cause said wall to fold inwardly of said hollow tubular body portion and collapse upon the circumferentially extending portion thereof.

3. An ear insert including a hollow tubular body portion formed of thin membranous material, a wall being provided at one end of said body portion and the end of said body portion opposite said wall being open, said wall being concavo-convex with the concave portion thereof opening interiorly of said hollow body portion, plunger means connected at one end thereof to the apex of the concave portion of said wall and extending through said hollow tubular body portion in juxtaposition whereby movement of said plunger means towards said concave portion increases the concavity thereof and axially elongates said hollow tubular body portion and causes a reduction in the outer diameter thereof proportional to the degree of elongation, said hollow tubular body portion having a circumferentially extending portion thereof of a greater thickness than the remainder thereof, said circumferentially extending portion extending internally of said hollow tubular body portion and adjacent said wall in juxtaposition whereby the pull of said plunger means upon said wall will cause said wall to fold inwardly of said hollow tubular body portion and collapse upon the circumferentially extending portion thereof, such collapsing exerting an expansive pressure upon said hollow tubular body portion adjacent said circumferentially extending portion thereof to resist retrograde pressures exerted upon said ear insert.

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