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E. S. MENDELSON ET AL

3,469,651

ADJUSTABLE STETHOSCOPE EARMUFF SHELL

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Fig. 1

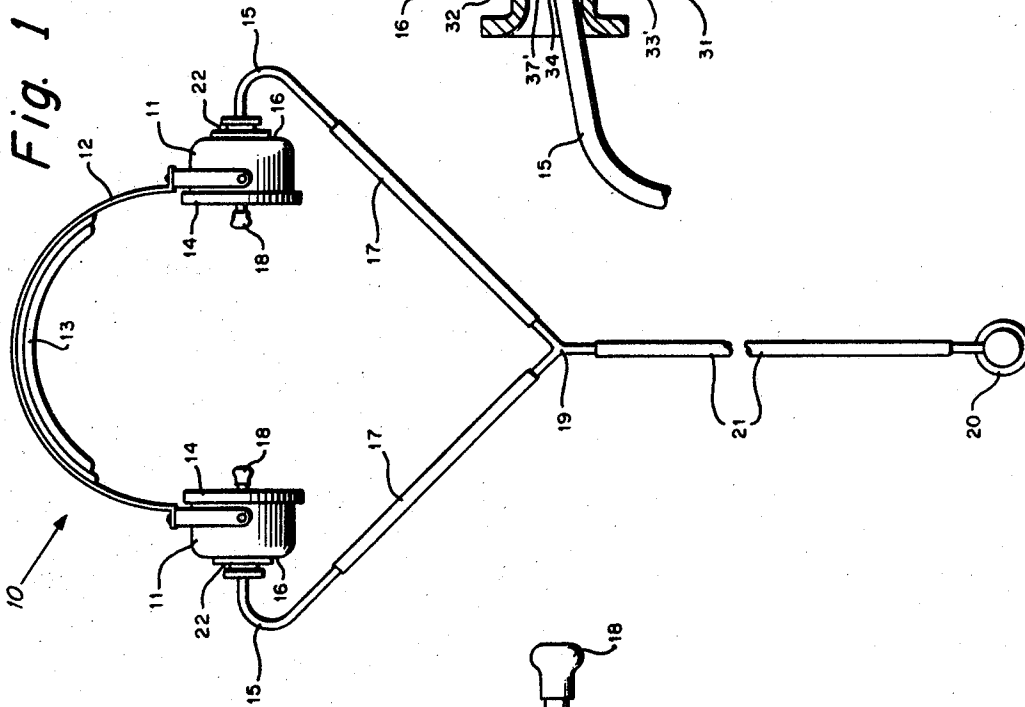


Fig. 3

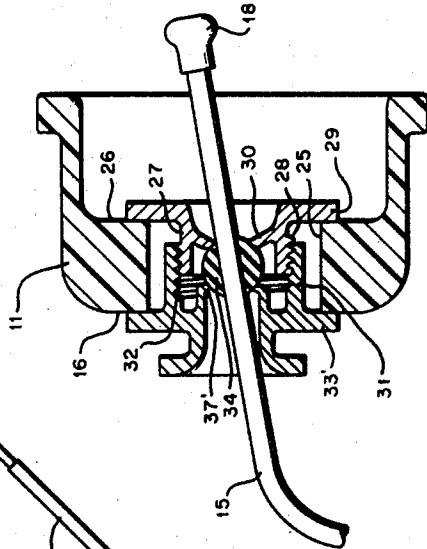
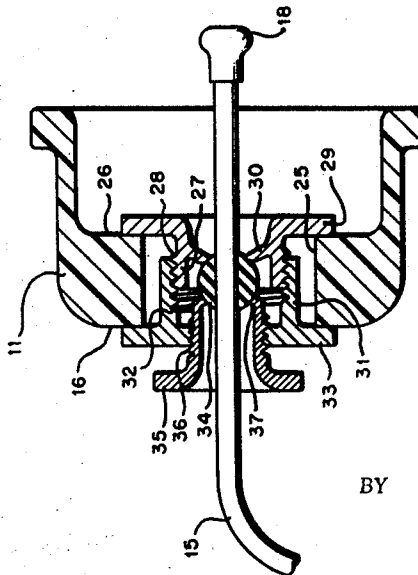


Fig. 2



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1

3,469,651

ADJUSTABLE STETHOSCOPE EARMUFF SHELL
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6 Claims

ABSTRACT OF THE DISCLOSURE

A binaural stethoscope having a protective earmuff shell with a positioning and locking device for the eartubes entering the shell at a fixed position to provide comfortable and effective placement of the stethoscope eartips in the ears of an examiner during auscultation.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates particularly to an improved binaural stethoscope and earmuff shell therefore for use in high intensity noise areas.

For the most part, when stethoscopes are being used by a doctor or medical examiner, the person being examined is in an area where the ambient noise is at a sufficiently low level so as not to interfere with the sounds picked up by the stethoscope. However, there are many instances where the patient is found in an area where the intensity of the noise is of such a high level as to render it impossible for the examiner to make an accurate diagnosis because the ambient noise interferes with and prevents the reception of necessary information. When the noise is extremely loud, the problem is aggravated to a point where no auscultation whatever is possible. For example, stethoscopes have previously been used with poor results in noisy environments such as the boiler or engine room of a ship where an accident has occurred; a battle field where a soldier has been wounded; and where a wounded soldier is being evacuated from the battle field to a hospital by helicopter.

Accordingly, to overcome the abovementioned difficulties of using a stethoscope in a high noise environment, attempts have been made to enclose the ears of an examiner with earmuff shells which are adopted to protect the user from the unwanted high ambient noise levels. Eartubes of the stethoscope are brought through sealed perforations in the earmuff shells in such a way as to permit insertion of the eartips in the ears of the examiner. However, if flexible tubing is used, it becomes difficult to establish and maintain the eartips in proper contact with the ears. The use of rigid eartubes inserted through various locations on the earmuff shells reduces the problem to an extent, but the variability of the relative locations of the external ears, the ear canals, the inward course of the ear canals and of the surrounding head structures in different individuals prevents the proper adjustment of the rigid eartubes entering the earmuff shells at fixed positions. This in turn causes personal discomfort to the user and also prevents an effective seal of the eartips in the examiner's ear canals.

It is therefore an object of the present invention to provide a novel and improved stethoscope and earmuff shell capable of use in areas of high noise level.

It is a further object of the present invention to provide a novel and improved stethoscope and earmuff shell which permits the stethoscope eartips to be properly positioned in the ears of an examiner without excessive personal discomfort.

2

It is another object of the present invention to provide a novel and improved stethoscope and earmuff shell which is relatively simple in construction and yet highly accurate and reliable in use to establish an effective acoustic seal of the eartips of the stethoscope within the ear canals of an examiner.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing wherein:

FIGURE 1 of the drawing is a front elevational view of a device comprising a stethoscope and earmuff shell according to the invention; and

FIGURES 2 and 3 of the drawing are cross-sectional views of an earmuff shell of two embodiments of the present invention on an enlarged scale.

Referring now to the details of the drawing, wherein like reference numerals apply to like parts throughout, and more particularly to FIGURE 1, it will be seen that there is shown there a binaural stethoscope 10 which includes earcups or earmuff shells 11 that are held in place on an examiner's head by means of a head band 12 which may be made of a resilient, springy metal so that the earmuff shells 11 are maintained in their relative positions with respect to each other. The headband 12 may be made adjustable to fit the contour of the head of the examiner and may be provided with a padding 13 to improve comfort over prolonged periods of use. The earmuff shells 11 are preferably filled with a foamy, resilient, plastic material which is also provided around the outer edges 14 of the shells 11 so that they will fit tightly and exclude ambient noise when placed over the examiner's ears.

Ear tubes 15, comprising part of the sound conducting channels which form the binaural section of the stethoscope, consist of rigid L-shaped tube portions, one end of which passes through the outer face 16 of the earmuff shells 11 to communicate directly with the sound conducting channels 17. The other end of ear tubes 15 terminate in plastic ear pieces 18 for insertion into the examiner's ears. The conducting channels 17 are connected to a bifurcation 19 which is also connected to a chestpiece 20 through a sound conducting channel 21. The body of the stethoscope, as shown, utilizes a single-tube pickup system wherein the binaural section is joined to the single conducting channel 21 by means of a bifurcation. However, a dual-tube system wherein both conducting channels of the binaural presentation are connected directly to the chestpiece may be employed with equal results, and the present invention is not confined to either type system.

A locking device 22 is provided on the outer face 16 of the earmuff shell 11 to prevent movement of the ear tubes 15 once they have been properly positioned by the examiner, as will become more apparent hereinafter in connection with the description of FIGURES 2 and 3, to which reference is now made.

The earmuff shell 11 shown in FIGURE 2 has a substantially elliptical opening or aperture 25 which extends completely through the body of the earmuff shell from the outer face 16 to an inner face 26; the major axis of the opening 25 is located along the vertical length of the earmuff shell 11 to provide a greater degree of adjustability of the ear tubes in a vertical plane, as will become more apparent hereinafter. The outer and inner faces of the earmuff shell 11 are substantially flat or of some other contour which will permit the opening 25 to be covered and sealed on both faces with little difficulty. A circular sleeve 27 having a threaded outer surface 28 extends a distance into the opening 25 from the inner face 26. At the inner extremity of the sleeve 27 there is integrally

formed a substantially elliptical flange 29 which bears against the inner face 26. The flange 29 is large enough to completely cover and seal the opening 25 at the inner face no matter where the sleeve 27 may eventually be positioned, as will become more apparent hereinafter. The sleeve 27 is also provided with a shoulder portion or retainer 30 on its inner surface.

Another circular sleeve 31 extends a distance into the opening 25 from the outer face 16 having a complementary threaded inner surface 32 designed to mate with and screw onto the aforesaid outer threaded surface 28 of the sleeve 27. At the outer extremity of the sleeve 31 there is integrally formed a substantially elliptical flange 33 which bears against the outer face 16 and, similar to the flange 29, is large enough to completely cover and seal the opening 25 at the outer face 16.

A rotatable member 34, which may be a flexible plastic or rubber ball for example, is positioned within the inner surface of the sleeve 27 and prevented from protruding out of the sleeve and into the earmuff shell 11 by the retainer 30. One of the ear tubes 15 of the stethoscope 10 passes from the outside to the inside of the earmuff shell 11 through the center portion of the rotatable member 34. The ear tube 15 is slideably engaged by the rotatable member 34 and its position (projection into the earmuff shell 11) may be changed by sliding a portion of its length through the member 34, thereby allowing the ear tip 18 to be brought into engagement with the examiner's ears sufficient to provide a comfortable seating and sealing therein. The rotatable member 34 and the sleeve 27 form what functions as a ball-and-socket joint, so as to allow the rotatable member 34, and therefore the ear tube 15 which it maintains in position, to have freedom and rotary motion in every direction.

A tubular clamping plug or locking device 35 having a complementary threaded outer surface 36 is provided to mate with and screw into a threaded inner surface of the flange 33. On the forward end of the locking device 35 a shoulder portion or retainer 37 is provided to engage and compress the rotatable member 34, thereby to maintain the position of the ear tube selected by the examiner. Only one of the earmuff shells 11 has been shown in detail, but it is to be understood that one such shell covers each ear of the user and they are identical in construction and operation.

Operation of the inventive arrangement will be clear from what has been said before. To use the device in a high noise area, the adjustable components (flange 33 and locking device 35) are first loosened and the ear tubes are retracted by sliding a portion through the rotatable member 34 so that the ear tips 18 do not extend too deeply into the examiner's ear canals. The earmuff shells 11 are placed over the examiner's ears at positions and with compressive forces against the slides of the head which will suitably exclude ambient noise leakage. The positions of the sleeves 27 and 31 within the openings 25, of the rotatable members 34 within the sleeves and of the ear tips 18 are then varied by successive manipulations of the portions of the ear tubes outside of the shells until satisfactory contact and seating of the ear tips have been established in the ear canals of the examiner. The assemblies through the earmuff shells are then locked into position by rotating the flange 33 and its integral sleeve 31 inwardly which acts to clamp the flanges 29 and 33 against the inner and outer faces of the earmuff shells. As stated before, the flanges 29 and 33 are of sufficient size and shape to cover and seal the opening 25 no matter where the sleeves 27 and 31 are finally positioned. The locking device 35 is then rotated inwardly until it compresses the rotatable member against the shoulder 30 thereby fixing the ear tips in their selected position. The rotatable member 34 fills and seals the inner surface of the sleeve 27 so that the entire opening 25 is now sealed from ambient noise. The preceding steps may be made by an examiner without any undue loss of time and will

enable him to obtain optimum sound transmission from his stethoscope with the least extraneous interference and with a minimum of personal discomfort.

FIGURE 3 is a slight modification of FIGURE 2, wherein the threaded locking device 35 is replaced by a shoulder 37' provided on the inner surface 32 of the sleeve 31 and which performs the similar function of maintaining the rotatable member in position once it has been properly adjusted by the examiner. The function and operation of the stethoscope arrangement of FIGURE 3 is substantially the same as that described hereinabove except that there is one less operation to be performed to effectively seal the opening 25 and to lock the rotatable member 34 in place. By replacing the locking device 35 with the integral shoulder 37' and by selecting and controlling the dimensional characteristics of the various elements involved, it will be seen that when the opening 25 is sealed on both sides of the earmuff shell by the flanges 29 and 33', the shoulders 30 and 37' will sufficiently engage and compress the rotatable member 34 to maintain it in its adjusted position.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. In combination with a binaural stethoscope of the type wherein a pair of earmuff shells are provided therewith to cover at least the major portion of the ears of an examiner for excluding ambient noise during auscultation, each of said earmuff shells having an aperture extending through the face thereof opposite the examiner's ears, an ear tube of said stethoscope extending through each of said apertures for insertion into the ear located in said shell, the improvement which comprises:

- (a) means for properly positioning the ear tubes of said stethoscope in the ears of an examiner to establish a comfortable and effective sound seal therein;
- (b) means for sealing the apertures of said earmuff shells to prevent ambient noise from reaching the examiner's ears;
- (c) and means for locking said ear tubes in the adjusted position to prevent movement thereof.

2. The combination substantially as described in claim 1, wherein said positioning means comprises:

- (a) an internally threaded circular sleeve member which is adapted to engage a complementary externally threaded sleeve member, said sleeve members extending through the aperture from the outer to the inner face of the earmuff shell and movable to positions within said aperture;
- (b) a rotatable, flexible ball member positioned within said externally threaded sleeve member, an ear tube of the stethoscope passing through the center of said ball member and slideably engaged thereby;
- (c) and a continuous inwardly projecting shoulder on the inner surface of said externally threaded sleeve member which prevents said ball member from protruding out of said last mentioned sleeve and into the earmuff shell, the position of the ear tube being changed by adjusting the position of said sleeves within the aperture, by sliding a length of the ear tube through said ball member and by rotating said ball member to a new position.

3. The combination substantially as described in claim 2, wherein said sealing means comprises a continuous outwardly projecting flange formed on each of said sleeve members at the inner and outer faces of the earmuff shell to cover and seal the aperture therein.

4. The combination substantially as described in claim 2, wherein said locking means comprises an externally threaded tubular clamping plug adapted to engage said internally threaded sleeve member, said plug including an

5

inwardly projecting shoulder formed at its inner extremity to engage and compress said ball member.

5. The combination substantially as described in claim 2, wherein said locking means comprises a continuous inwardly projecting shoulder formed around the inner surface of said internally threaded sleeve member to engage and compress said ball member.

6. The combination substantially as described in claim 2, wherein said ball member has a diameter substantially equal to said externally threaded sleeve member so that said ball will have support and unimpaired freedom and rotary motion in every direction.

6

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10 STEPHEN J. TOMSKY, Primary Examiner

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179—182; 181—23