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STETHOSCOPE

Filed Feb. 10, 1966

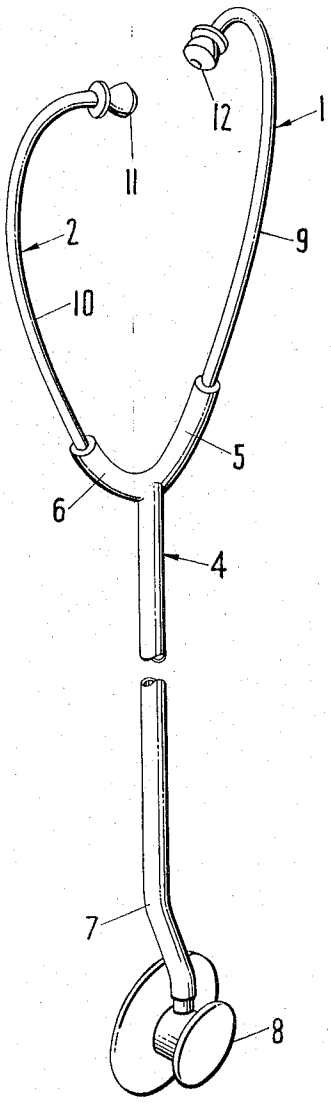


Fig. 1

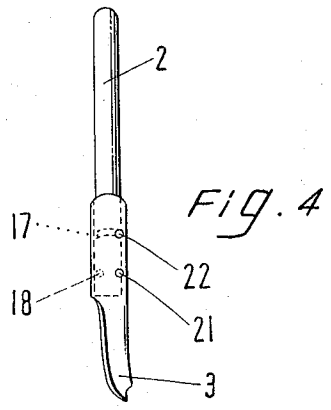


Fig. 4

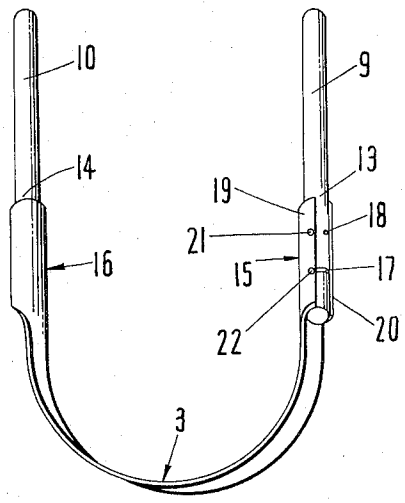


Fig. 2

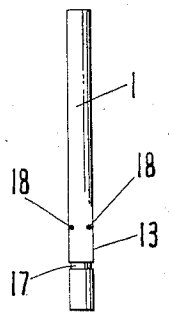


Fig. 3

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STETHOSCOPE

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The present invention relates to stethoscopes and more particularly to an improved form of an adjustable binaural stethoscope.

Stethoscope constructions are known which have a hidden spring connecting ear tubes of a binaural construction. Such constructions provide for either fixed or rotatable ear tubes on the spring member which urges the ear tubes against the ears of the user.

An important object of this invention is to provide an improved binaural stethoscope construction having the advantages of both the previously known fixed ear tube constructions and rotatable ear tube constructions.

Another important object of this invention is to provide an improved binaural stethoscope construction which permits adjustment of ear tubes to various predetermined indexed positions enabling ease of positive adjustment.

According to the invention a pair of elongated, hollow, rigid ear tubes each having a lower end are connected to a curved spring in an adjustable binaural stethoscope construction. The curved spring defines a first end connected to one of the ear tube ends and a second spring end connected to the end of the other ear tube by first and second connections respectively. The connections each comprise means for preventing longitudinal movement of the ear tubes and for rotational indexing of the ear tubes about their axes so that the ear tubes can be snapped into preselected positions and adjusted to the preference of the user. Preferably the spring is covered by a flexible Y-shaped sound tube which extends over either end of the spring onto each of the ear tubes. The lower end of the Y-shaped sound tube is interconnected with a conventional stethoscope head as is well known. Preferably the upper ends of the ear tubes are curved inwardly and carry ear plugs as is known in the art.

In the preferred form of the invention, the spring is a leaf spring defining outwardly extending flared ends. Spaced indentations are provided on at least one of the flared ends in registration with corresponding indentations in each associated ear tube to provide for locking the ear tubes against longitudinal movement in either direction while permitting rotational movement of the ear tubes about their longitudinal axes and locking of the ear tubes in preselected positions by the use of indexing means.

These and other objects, features and advantages of the present invention will be more clearly understood when considered in conjunction with the following description and accompanying drawings in which:

FIG. 1 is a perspective view of a stethoscope in accordance with the preferred embodiment of this invention;

FIG. 2 is a perspective view of the improved indexing and connection means thereof;

FIG. 3 is a perspective view of an element thereof; and,

FIG. 4 is a fragmentary view of an alternate embodiment thereof.

With reference now to the drawings, a preferred embodiment of a binaural stethoscope is shown in FIG. 1 and has a pair of ear tubes 1 and 2 joined together by a flat leaf spring 3 lying within a flexible Y-shaped sound tube 4 having upwardly extending legs 5 and 6 which enclose the spring and extend over the connection of the spring to the ear tubes. A downwardly extending portion 7 of the sound tube is interconnected with a known stethoscope head 8 which may have two receivers as shown.

The elongated hollow ear tubes 1 and 2 have their upper ends bent over preferably in the same plane as their elongated extensions 9 and 10. Each bent over upper end carries a conventional ear plug such as illustrated at 11 and 12 to suitably permit insertion of the ear plugs in the wearer's ears. The ear tubes are preferably formed of a stainless steel with an outer diameter of approximately 3/16 of an inch and with a 0.018 inch wall thickness. The length of the elongated portions 9 and 10 can be varied but preferably is approximately seven inches long. The lower ends of the ear tubes are connected to the upper ends of the U-shaped spring 3 as will be described. In order to avoid unnecessary duplication in the description, the connections between the lower ends 13 and 14 of the ear tubes with the upper collar portions 15 and 16 respectively of the spring 3 which are identical, only one such connection will be described in detail.

Each lower end such as 13 of each ear tube in the preferred embodiment carries an indented annular circumferential groove 17 preferably lying substantially perpendicular to the longitudinal axis of the ear tube. Spaced longitudinally from the groove 17 are a plurality of indentations or dimples 18 which form a part of the indexing means of the present invention as will be described. The indentations 18 in the preferred embodiment are spaced circumferentially from each other at preselected positions and three such indentations are used although fewer or more can be used.

The spring 3 is preferably formed of a high carbon spring steel having a Rockwell hardness of approximately 40–45. The spring 3 is preferably pre-stressed to form an arc of substantially 180°. The leaf of the spring 3 is flared at both ends to form the collars such as 15 and 16.

In the connection of the spring to the ear tubes, the flared ends which form lateral extensions 19 and 20 are crimped or otherwise positioned about the lower ends of the ear tubes as shown at end 13 in FIG. 2. Thus extensions 19 and 20 define a cylindrical bore or passageway within which the ear tube end 13 snugly fits. At least one edge portion of the extension 20 is indented at spaced longitudinal positions illustrated at the inwardly extending dimples shown at 21 and 22. The indentations 21 and 22 form inwardly extending projections positioned and arranged to lie in registration with indentations 18 and the annular groove 17 respectively.

The collar 15 by means of the crimping operation, or by pre-forming of the collar before entry of the ear tube end 13 therein, is pre-stressed to have projection 22 seating in groove 17 and projection 21 seating in one indentation 18. This prevents longitudinal movement of the ear tube 9 with respect to the collar 15 either upwardly or downwardly as shown in FIG. 2. Thus, the only movement that the ear tube 9 can undergo in normal usage is rotational movement about its axis. When ear tube 1 is rotated about its axis projection 21 snaps into and out of engagement with the dimples 18. When projection 21 is positioned within any one of the indentations 18, it tends to hold the ear tube from rotation or counter-rotation about its axis during normal usage, but, due to the spring action of the material from which the leaf spring 3 is made, it will permit gripping of the spring 3 and rotational movement of the ear tube by the hand of the user to index the ear tube to a position wherein projection 21 snaps out of one indexing indentation 18 and into another indexing indentation 18.

Preferably the indexing indentations 18 as well as the positioning of the projections 21 at each connection be-

tween the ear tubes **1** and **2** and the ends or collars of the spring **3** are predetermined in position so that the ear tubes may be indexed into a variety of preselected positions. As shown in FIG. 1 the curved ear tubes **1** and **2** lie substantially in the same plane in one indexed preselected position of projections **21** and **18** of each connection. A second indexing position permits the planes passing from top to bottom through each ear tube to meet at an angle, and a third indexing position provides for a greater angle between the planes. The particular angles of planar intersection can be predetermined in manufacture and selected by the wearer to give proper fitting according to his particular desires. Yet, in each rotational preselected position of the ear tubes, the ear tubes are locked against longitudinal movement in either direction with respect to the spring **3** and also against rotational movement about their axes in normal usage. It is only by grasping the stethoscope with both hands and exerting some force on the ear tubes that rotational movement thereof is achieved. The particular amount of force required to move the ear tubes from one preselected position to another will be determined by the material used, size of the connection, depth of the projection and indentations as well as other mechanical factors and can be varied as desired.

As best shown in FIG. 1, in the preferred embodiment the legs **5** and **6** of the Y-shaped sound tube completely cover the collars **15** and **16** and extend slightly thereabove to hide the connection and indexing means from view. Yet since the sound tube is made of a resilient plastic material such as polyvinyl chloride, the extension of legs **5** and **6** above the connections does not hamper rotational movement of the ear tubes and in fact seals the connections against sound leakage in ordinary use.

In the alternate embodiment of the invention illustrated in FIG. 4 projections **21** and **22** are located on the back of the collar portion **15** rather than at one of the longitudinally extending edges as in the embodiment of FIG. 2. In addition the indentation **18** and annular groove **17** are reversed with the groove uppermost.

While specific embodiments of this invention have been shown and described, many modifications thereof are possible. For example, the material of the sound tubes can be varied to include hard plastics and other metals. The particular material of the spring may be varied in accordance with known practice. Similarly the ear tube ends can be provided with outwardly extending projections and the collars with indentations. Other portions of the collars **15** and **16** can provide the projections rather than the extreme edge of the extension **19**. One of the extensions **20** can be eliminated and a single integral extension such as **19** can extend about the entire circumference of the ear tube end. In some cases, the projections **22** may extend completely about the collars **15** and **16** rather than be a crimped or indented point as shown. The important concept of the invention is embodied in the use of an indexing means to provide for prevention of longitudinal movement of the ear tubes with respect to the spring and for indexing rotation of the ear tubes about their axes while providing for stable preselected positions in normal wearing and use of the improved stethoscope construction of this invention.

In view of the many modifications possible within the spirit and scope of this invention, this invention is to be limited only by the spirit and scope of the following claims.

What is claimed is:

1. An adjustable binaural stethoscope construction comprising,

a pair of elongated, hollow, rigid ear tubes each having an upper end and a lower end,

a curved spring defining a first end connected to one of said ear tube ends and a second end connected to the other said ear tube end by first and second connections,

said connections each comprising means for preventing longitudinal movement of said ear tubes and allowing rotational movement thereof and means for rotational indexing thereof about axes of said ear tubes,

said means for rotational indexing comprising a spring biased projection on one of said ear tubes or spring and a plurality of indexing indentations on the other of said ear tubes or spring.

2. An adjustable binaural stethoscope construction in accordance with claim **1** wherein said spring is a leaf spring pre-stressed substantially into a U-shape and said connections each comprise a collar formed on an end of said spring by at least one extension from the side of said spring,

said extension being wrapped securely about one ear tube lower end and defining an edge,

said one ear tube end defining a circumferential groove and a plurality of indexing indentations,

said extension carrying a first inwardly extending projection engaging said circumferential groove defined by said one ear tube end, and a second inwardly extending projection spaced longitudinally from said first projection and cooperating with said spaced indentations in said one ear tube end to permit rotational indexing of said one ear tube with respect to said spring.

3. An adjustable binaural stethoscope construction in accordance with claim **2**, wherein said projections are located at said edge.

4. An adjustable binaural stethoscope construction in accordance with claim **2** wherein a Y-shaped resilient sound tube covers said spring and has ends extending over said connections onto said ear tube lower ends to seal the sound passageway defined by said Y-shaped sound tube and said ear tubes.

5. An adjustable binaural stethoscope construction in accordance with claim **2** wherein said circumferential groove is closer to said one ear tube upper end than said spaced indentations.

6. An adjustable binaural stethoscope construction in accordance with claim **3** wherein a Y-shaped resilient sound tube covers said spring and has ends extending over said connections onto said ear tube lower ends to seal the sound passageway defined by said Y-shaped sound tube and said ear tubes.

7. An adjustable binaural stethoscope construction in accordance with claim **1** wherein said means for preventing longitudinal movement comprises a circumferential groove and a projection.

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