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Speidel

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[54] **MEMBRANE-BREASTPIECE FOR STETHOSCOPES AND METHOD OF MANUFACTURING SAME**

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[52] **U.S. Cl.** **181/24**

[51] **U.S. Cl.** **A61b 7/02**

[58] **Field of Search** 181/24

[56] **References Cited**

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[57] **ABSTRACT**

A membrane-breastpiece for stethoscopes including a funnel-shaped member having a cylindrical funnel throat portion integrally formed therewith as a protuberance in its upper surface at an angle relative to the surface of the sound membrane of the breastpiece; a through bore in the funnel throat portion receiving a hollow tubular connector for a stethoscope tube, and with the end of the connector in the bore being upset to form a hollow rivet structure rigidly fastened to the throat portion. The breastpiece is formed by deep-drawing and stamping metal blanks, which may be sequentially conveyed along an endless belt or band for series manufacture.

6 Claims, 5 Drawing Figures

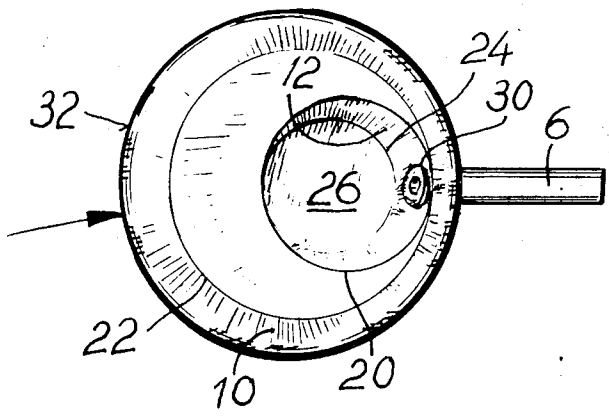


Fig.1

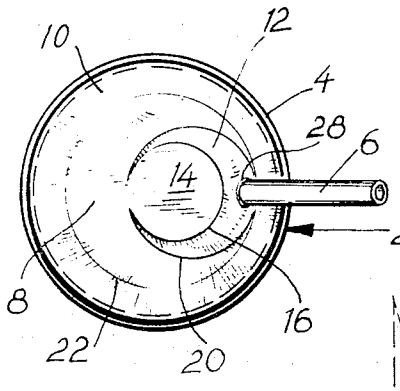
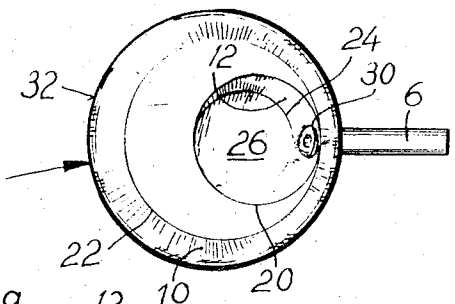


Fig.2



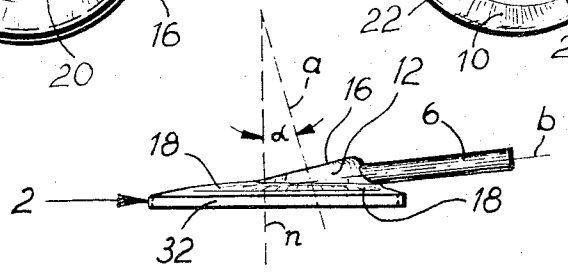


Fig.3

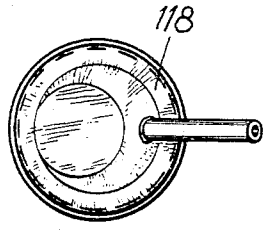


Fig.4

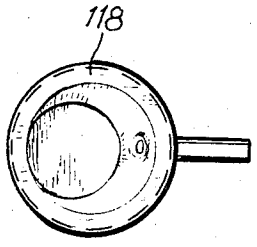


Fig.5

MEMBRANE-BREASTPIECE FOR STETHOSCOPES AND METHOD OF MANUFACTURING SAME

FIELD OF THE INVENTION

The present invention relates to a membrane-breastpiece for stethoscopes. More particularly, the present invention relates to a breastpiece having a sound funnel or projector, which is covered by a membrane, and includes a funnel throat portion, the latter of which is joined to a connector for a stethoscope tube. Furthermore, the invention relates to a method of manufacturing a breastpiece of the type described having a sound funnel provided with a stethoscope tube connector.

DISCUSSION OF THE PRIOR ART

A breastpiece of the type described is known, wherein the breastpiece sound funnel portion includes a three cornered wedge-shaped configuration formed at its upper surface so as to facilitate insertion of the breastpiece below a patients' bandages, and with the wedge-shaped portion integrally formed with the breastpiece. At its lower surface the sound funnel extends from the edge thereof into a funnel-like disk portion which is covered by a sound membrane. The funnel throat is formed, at the upper surface of the sound funnel or projector, by a central pocket bore within the wedge, and is in communication with another bore in the wedge extending parallel to the upper surface thereof. The last-mentioned bore includes, at an arched base of the wedge, an internally threaded end face so as to provide for the fastening thereto of a stethoscope tube-connecting member by means of a complementary externally threaded portion.

The prior art breastpiece is subject to the disadvantage that the construction of the basic configuration of the sound funnel or projector having the wedge portion can be obtained only through a tension-relieving deformation of a basic blank, which also requires the provision of two separate bores and two threading operations. Consequently, this renders the manufacture of the known prior art breastpieces relatively expensive. Furthermore, the prior art breastpieces have the disadvantage that the relatively small cross-sectional dimensions of the funnel throat do not allow for optimum sound reception for the stethoscope.

SUMMARY OF THE INVENTION

Accordingly, the present invention provides for a novel and unique membrane-breastpiece for stethoscopes which may be economically manufactured and which possesses improved sound reception properties in comparison with prior art breastpieces.

The problems encountered in producing prior art breastpieces are solved in that the breastpiece according to the invention provides for a funnel throat portion which is formed by a cylindrical protuberance of the upper breastpiece funnel wall, and which has a longitudinal cylindrical axis defining a predetermined angle with an axis extending normal to the plane surface of the membrane. Furthermore, the funnel throat surface projected along its encompassing edge lines is smoothly faired into the upper surface of the annular portion of the funnel or sound projector wall encompassing the funnel throat, with a connecting member for the stethoscope tube extending into a smooth bore formed in the funnel throat, having one end thereof inserted into the bore, and then formed into a hollow rivet structure so as to rigidly fasten the connecting member to the funnel throat. By means of this simple jointed construction of the breastpiece sound projector together with the connecting member, it becomes feasible that the sound projector is formed through tensionless deformation of a blank, and may be connected to the connecting member in a simple constructive manner. This permits the manufacturing costs of the breastpiece to be significantly reduced. Furthermore, the present breastpiece construction provides for the further advantage in that the sound funnel throat portion thereof has a relatively large cross-sectional dimension so as to impart an improved sound reception to the stethoscope.

In a preferred embodiment of the breastpiece, according to the present invention, the funnel throat is eccentrically located with respect to the central axis of the sound funnel or projector, and the connecting member projects radially across the smallest circumferential portion of the funnel wall. This imparts the breastpiece with a generally wedge-shaped form which greatly assists in the positioning or insertion of the breastpiece below a patients' bandages, in manner similar to that of prior art breastpieces. Furthermore, in the preferred embodiment of the breastpiece it is provided for that the central portion of the upper funnel wall, which incorporates the funnel throat forming portion, is shaped into a generally circular plate which extends into a hollow frusto-conical shaped breastpiece edge or rim configuration. This facilitates the obtaining of a relatively large internal funnel volume, in which the sound reception characteristic thereof is still further improved. Additionally, this also imparts the further advantage that in the present breastpiece no outwardly curved or arched sound membranes are required, since these would lead to a reduced quality sound reception for the stethoscope.

The invention further provides for a novel method of manufacturing stethscope breastpieces with sound funnels or projectors having incorporated therein the stethoscope tube-connecting members, and which is readily carried out through only a few relatively simple manufacturing steps, so as to allow for a considerable reduction in the manufacturing costs of the breastpiece.

The foregoing method is accomplished in that a suitable metal blank is deep-drawn and then stamped so as to form the funnel and the funnel throat portion of the breastpiece, the funnel throat portion then subsequently being bored through an end thereof, so as to facilitate for a hollow connecting member for the stethoscope tube to be inserted into the bore, and the end of the connecting member extending into the funnel throat to be deformed or upset into a hollow rivet structure which is rigidly fastened to the funnel throat portion. The tensionless deformation of the metal blank and of the connecting member so as to form the breastpiece in only a few sequential work steps permits the formation as a single entity of the breastpiece sound funnel, funnel throat and of the connecting member. The formation of a thread about the annular rim of the sound funnel or projector for attachment of a membrane, and the finishing of the upper surface thereof may be completed out in the usual manner. As is known, the only remaining step lies in the threaded mounting of the membrane, which is generally posi-

tioned in a supporting ring, onto the sound projector or funnel.

In a preferred embodiment of the method of manufacturing the breastpieces according to the invention, an endless movable band of sequentially positioned metal blanks may be utilized, which are deep-drawn and stamped at predetermined stations spaced along the direction of movement of the band. This renders possible the fully automatic series production of sound funnels or projectors for the inventive breastpieces.

BRIEF DESCRIPTION OF THE DRAWING

Reference may now be had to the detailed description of two preferred embodiments of the inventive stethoscope breastpieces, taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a top plan view of a first embodiment of a breastpiece formed in accordance with the present invention;

FIG. **2** is a bottom plan view of the breastpiece of FIG. **1**, illustrated with the membrane removed therefrom;

FIG. **3** is a side elevational view of the embodiment of FIG. **1**;

FIG. **4** is a top plan view, on a reduced scale, of a second embodiment of the breastpiece shown in FIG. **1**; and

FIG. **5** is a bottom plan view of the breastpiece of FIG. **4**, illustrated with the membrane having been removed therefrom.

DETAILED DESCRIPTION

Referring now in detail to the drawing, a breastpiece including a sound funnel or projector **2** is formed essentially of a metal plate having a generally circular central portion **8** and a contiguous depending ring-shaped edge portion **10.** The central portion **8** is furthermore provided with a generally cylindrical protuberance in its upper wall which forms a funnel throat **12.** The cylindrical axis of the funnel throat encompasses, together with an imaginary axis '*n*' extending normal to the plane surface of a membrane, an angle α of approximately 20°. The outer upper surface **14** of the funnel throat **12** extends into a smooth faired relationship along a section of its annular edge defining line **16** into the upper surface of an encompassing surface **18** about funnel throat **12.** The greater length of the edge line **16** is defined by a circular edge forming a line **22** at the opening of the funnel throat **12.** This line **16,** at the lower surface of the central portion **8,** contacts in proximity to a mounting or juncture point for a stethoscope tube-connecting member **6** at the funnel throat **12,** the circular edge line **22** intermediate the central portion **8** and the edge portion **10.** Similarly, a circular edge line **24** contacts with the juncture point of the connecting member **6** at the same imaginary cross-sectional measured point, the internal bottom surface **26** of the funnel throat **12,** and an edge line **20** of the opening of the funnel throat. At the juncture point for the connecting member **6,** the funnel throat **12** is provided with a through bore **28** of suitable diameter. An axis '*b*' along the connecting member **6** forms approximately the half-angle defined by the surfaces through the funnel throat surface **14** and the plane membrane surface. One end of the connecting member **6,** which is a hollow, generally tubular piece, is positioned within bore **28,** and is deformed or upset within the funnel throat **12** into a hollow rivet **30** rigidly joined with the funnel throat. The connecting member **6** projects across, as measured in a radial direction, the encompassing surface **18** at its smallest diametral point, whereby the axis '*b*' of the connecting member **6** lies in a predetermined plane defined by cylindrical axis '*a*' and the membrane normal axis '*n*'. The encompassing edge **10** of the sound projector **2** has a hollow frusto-conical form, in view of which the sound projector, aside from the funnel throat **12,** presents an essentially trapezoidal cross-sectional configuration. The peripheral end surface **32** of the edge or rim portion **10** is provided with suitable threads, so as to facilitate threaded engagement with the internal threads of a membrane support ring **4.**

The second exemplary embodiment of the inventive breastpiece, as illustrated in FIGS. **4** and **5** of the drawing, has the same basic form and dimensions for the funnel throat thereof, and including a stethoscope tube-connector member as in the first embodiment, and primarily distinguishes therefrom in that it eliminates the rim portion, and in which the extent of ring **118** has the same overall width. This embodiment is particularly adapted for applications in which a minimal stethoscope sound sensitivity is sufficient, or in which the dimensions of the sound funnel portion, in regard to its listening position on the patient, must have a smaller, more compact diameter.

While there has been shown what is considered to be the preferred embodiment of the invention, it will be obvious that modifications may be made which come within the scope of the disclosure of the specification.

What I claim is:

1. A membrane-breastpiece for stethoscopes, comprising a generally disk-shaped sound projector having an upper sound funnel wall, a sound funnel throat portion comprising a cylindrical protuberance of said funnel wall and having its periphery smoothly faired into the upper surface of said funnel wall; sound membrane means extending across and adapted to cover the lower surface of said sound projector, the longitudinal cylindrical axis of said funnel throat portion defining an angle α with an imaginary axis extending normal to the surface of said membrane means; and a connection means for a stethoscope tube having one end positioned in and projecting from a smooth bore formed in said funnel throat portion, said connection means end portion within said funnel throat portion being formed into a hollow rivet construction therewith.

2. A breastpiece as claimed in claim **1,** said funnel throat portion being positioned eccentrically relative to the central axis of said sound projector, said connection means projecting radially across the smallest portion of the circumference of said funnel wall upper surface.

3. A breastpiece as claimed in claim **1,** said funnel wall portion having said funnel throat portion formed therein being essentially a circular plate, said plate extending radially outwardly into a downwardly depending frusto-conical annular rim portion.

4. A breastpiece as claimed in claim **3,** said funnel throat portion having its edge at the transitional line defined between said plate and frusto-conical rim portion of said funnel wall in contact with the juncture point for said connection means.

5. A method of forming a membrane-breastpiece comprising a generally disk-shaped sound projector adapted to have one surface thereof covered by a mem-

brane, comprising deep-drawing a sheet metal blank into a funnel having an upper wall surface; stamping a funnel throat portion out of said wall surface so as to form a generally cylindrical protuberance, drilling a bore through one end of said throat portion; joining a hollow connector for a stethoscope tube to said breastpiece by positioning one end thereof within said bore; and upsetting said connector end in said bore so as to form a hollow rivet structure with said throat portion.

6. A method as claimed in claim **5,** comprising continuously forming a plurality of said breastpieces by sequentially deepdrawing and stamping a sequential number of said metal blanks movable along an endless belt of operative stations in the longitudinal direction of movement thereof.

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