March 12, 1935. J. TORRANCE, JR 1,994,008

STETHOSCOPE

Filed April 30, 1934

FIG. I.

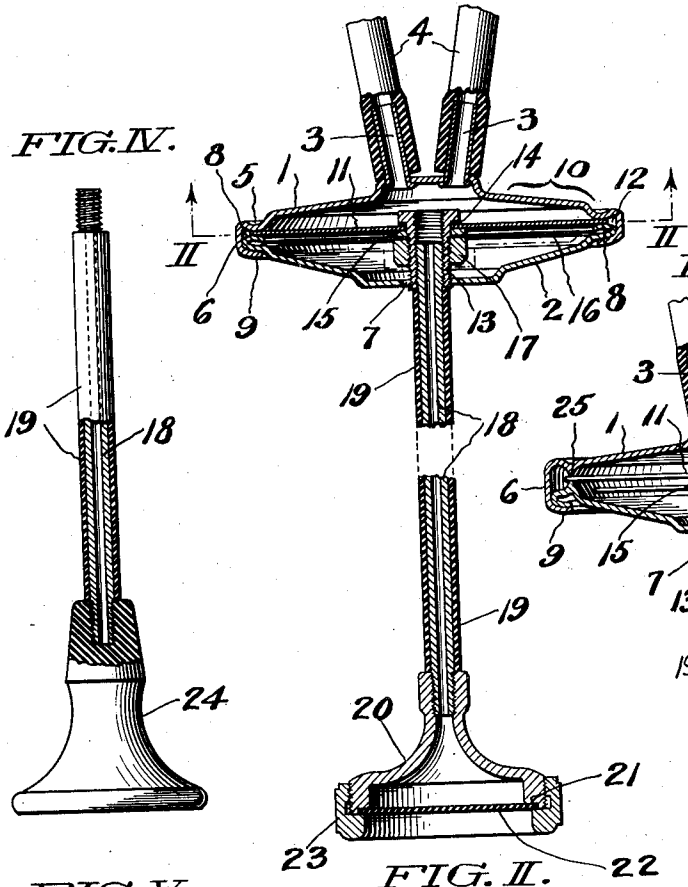


FIG. VI.

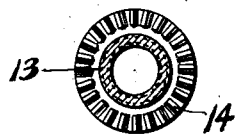


FIG. VII.

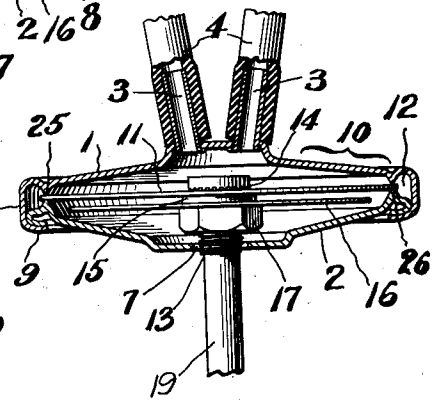


FIG. IV.

FIG. V.

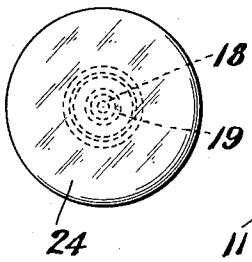


FIG. II.

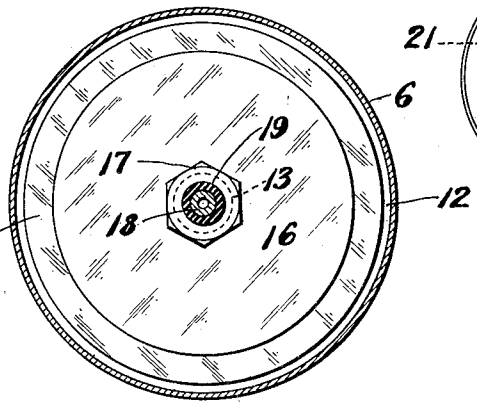
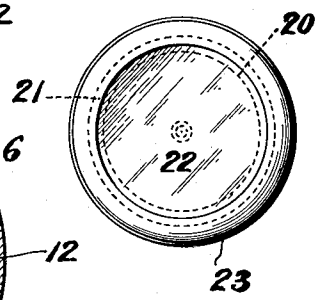


FIG. III.



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STETHOSCOPE

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Application April 30, 1934, Serial No. 723,206

11 Claims. (Cl. 181—24)

This invention relates to devices for locating sounds and more particularly to stethoscopic instruments used in the medical and kindred professions for making physical diagnosis such as the heart flow of blood and respiratory conditions, in addition to the location of subcutaneous, muscular, or other constitutional disorders.

The primary object of this invention is to provide a novel and highly efficient stethoscope which is adapted to instantly locate and audibly transmit, to the ear of the user, the most delicate and sensitive sounds or pulsations whether natural, or set up by some local disorder or injury.

Another object of this invention is to provide an improved stethoscope embodying means whereby the instrument may be readily changed from normal use and adopted for effective intercostal examinations, which are ordinarily difficult or impossible of attainment with conventional stethoscopes.

Other objects and attendant advantages of the invention, more or less specific than those above referred to, will be in part obvious from, and in part pointed out, in the following description of the elements, combinations and arrangements of parts, as well as the application of the principle constituting said invention; while the scope of protection contemplated is defined in the claims.

In the further disclosure of this invention reference is had to the accompanying sheet of drawing, wherein like characters of reference denote the same or corresponding parts in all the views.

Fig. I is a broken sectional view of one convenient embodiment of this invention, the thickness of the various parts being exaggerated for purposes of clarity in illustration.

Fig. II is a transverse sectional view, taken as indicated by the line and arrows II—II on Fig. I.

Fig. III is an underside plan view of the lower portion of Fig. I.

Fig. IV is a part elevational and part sectional view of a substitute attachment for making intercostal examinations.

Fig. V is an underside plan view of the preceding Figure.

Fig. VI is detail view of a clamping sleeve later on fully described; and,

Fig. VII is a view corresponding with the upper portion of Fig. I, but showing a modified form of the stethoscope body and the manner of securing the diaphragm therein.

Referring more in detail to the drawing, and to the embodiment thereof specifically illustrated by Figs. I—VI, my improved stethoscope comprises counter-dished or opposingly-concaved components 1, 2, of suitable sheet metal. Of these components that designated 1, and forming the back of the body portion, embodies a central embossing which is fitted with two outwardly-projecting and preferably slightly-divergent short conduits 3, for attaching-reception of individual sound conducting or aural tubes 4, said tubes having at their free ends suitable ear pieces, not shown. The component 1, is also shaped to provide a concentric bead-section or annular-seat 5, with a relatively angled cylindrical flange or rim 6, later on again referred to. The other or front body component 2 generally conforms in cross-section with the back component 1, but differs by having a central orifice 7, while its circumferential flange is inwardly curved to provide a substantially oviform-section periphery 8, of a diameter snugly fitting the back cylindrical flange 6, the latter being clinched thereover at 9, as clearly understandable from Fig. I, more particularly, when the parts are finally assembled. It is to be noted that the oviform-section periphery 8 by virtue of its cross-sectional formation is slightly resilient or springy.

Within the stethoscope body portion 10, formed by the two components 1, 2, is a discous or main diaphragm 11, conveniently although not essentially of sheet steel, that is securely clamped between the component annular seat 5 and the component oviform peripheral-section 8, by the clinching 9, in a manner obvious from Fig. I. It is to be understood that the diameter of the diaphragm 11 is of a dimension greater than the actual contacting point of the parts 5 and 8, were said diaphragm not interposed between them, but substantially less than the inside diameter of the cylindrical flange or rim 6, with provision of a surrounding clearance 12.

Snugly fitting through an axial-aperture in the main diaphragm 11 is a flanged-sleeve 13, the body portion whereof is exteriorly and interiorly screw-threaded, while the underside of the sleeve flange is radially-serrated at 14, Fig. VI, for a purpose later on explained. This sleeve 13 is not exteriorly screw-threaded along its entire length, but is plain where it passes through the main diaphragm 11, a spacing washer 15, and a supplmental or vibration-balancing diaphragm 16, said parts being rigidly secured together by a lock nut 17. Incidentally it will be appreciated that the radial serrations 14 effectively prevent relative movement between the diaphragm 11 and sleeve 13; while it is to be particularly noted

that the balancing diaphragm 16 is much less in diameter than the main diaphragm 11, as well as being of considerably thinner material, preferably although not essentially sheet-copper. It is also to be remarked that the sleeve 13, when the parts are assembled projects slightly beyond the outer face of the body component 2, and that there is a clearance thereabout with respect to the orifice 7, in said component.

Threadedly-engaged in the outer end of the flanged sleeve 13 is a small diameter rigid tube 18, encircled by an insulating-material covering 19, and at the free end of said tube is a bell-shaped body member 20, which is interiorly grooved to provide a seat 21, for the pick-up, or, which I term hereinafter, "hanging" diaphragm 22. This hanging non-vibratory diaphragm disc 22 is held firmly in place by a clamping collar 23 threadedly engaged exteriorly of the member 20, and particular attention is drawn to the depth of said sleeve outwardly beyond the diaphragm 22, whereby skin contacts with the latter are effectively prevented. It is to be further noted that the diameter of the hanging-diaphragm 22 is considerably smaller than that of its main diaphragm 11 and that it is sustained by the latter, hence my terming of the same as a hanging diaphragm.

As an alternative for the hanging-diaphragm 22, when it is desired to use the stethoscope for intercostal examinations, I remove said diaphragm by simply unscrewing the bell-shaped member 20, from the outer end of the rigid tube 18, and substituting therefor the solid or hard material contact-piece 24, likewise bell-shaped. This contact-piece 24 in practice is much smaller than the member 20 and by virtue of its cross-section closes in the outer end of the tube 18, while its configuration is well adapted for projection between the ribs, or into body crevices, where an ordinary stethoscope is difficult of application, whereby local infirmity diagnosis is considerably enhanced.

In the modified form of the invention shown in Fig. VII, it is to be noted that the only distinction, over the form previously described, is that the body members 1, 2 are respectively fashioned with opposing annular somewhat angular or knife edges 25, 26, for grippage of the main diaphragm 11; accordingly corresponding reference characters are applied to the other parts shown in order to avoid repetitive descriptive matter.

In use, the member 20, or the contact-piece 24, is applied to or pressed against the part of the human body being examined, and by reason of the inherent conductivity of the associated parts, the blood flow or other pulsation is instantly transmitted via the hanging diaphragm 22, or piece 24, through the bore of the tube 18, to the main diaphragm 11. By virtue of the novel arrangement and combination with the main diaphragm 11 of the balancing diaphragm 16, all sounds or pulsations picked up by the hanging diaphragm 22 are collected and amplified for conduction by the aural-tubes 4, to the ears of the user. In practice I have found that stethoscopes constructed as hereinbefore described are not only extremely sensitive but that the degree of sound amplification is greater and more pronounced whereby better physical diagnoses are attainable than heretofore.

As changes could be readily made in the constructions described, of my improved stethoscope, without departing from the scope of the invention as defined in the following claims, it is intended that all matters contained in the foregoing specification, or shown by the accompanying drawing, shall be interpreted as illustrative only and not in a limiting sense.

Having thus described my invention, I claim:—

1. In a stethoscope the combination of a hollow body comprising opposedly-dished members embodying annular grippage-portions, a main vibratory diaphragm supported by said grippage portions with provision of an encircling clearance, a smaller supplemental-diaphragm spacedly-held relative to and concentric with the main diaphragm, and a pick-up diaphragm sustained by a tubular connection from the main diaphragm.

2. In a stethoscope the combination of a hollow body comprising opposedly-dished components embodying annular grippage-portions proximate the circumferential edges thereof, one of said components being interengagingly retained by the other, a main vibratory diaphragm secured between said grippage portions with provision of an encircling clearance, a smaller vibration-balancing diaphragm supported concentric with and in spaced relation to the main diaphragm, and a pick-up diaphragm axially-sustained by a rigid tubular connection from the main diaphragm.

3. The combination of claim 2 wherein one of the body components is provided with outwardly-projecting conduits for attachment of individual aural tubes.

4. The combination of claim 2 wherein one of the body components is centrally embossed and fitted with short slightly-divergent conduits for the connection of individual aural tubes.

5. The combination of claim 2 wherein one of the body components is centrally embossed outward and fitted with short slightly-divergent conduits for the application of individual aural tubes, and the other component is central apertured for passage of the pick-up diaphragm tubular connection with a clearance thereabout.

6. In a stethoscope the combination of a hollow body comprising interconnected opposedly-dished back and frontal components, the back component being centrally embossed outwards and fitted with divergent short conduits for the connection of individual aural tubes and embodying an annular bead grippage section proximate to a cylindrically-flanged rim, the frontal body component having a central orifice and a surrounding oviform-section grippage adapted to fit in the back component cylindrical flange, said parts being secured together by clinching the free edge of the cylindrically-flanged rim of the back component over onto the oviform-section of the frontal component, a main discous vibratory diaphragm clamped between the bead-section seat and oviform-section portions of said back and front components with provision of an encircling clearance, a smaller vibration-balancing discous diaphragm supported concentric with and in spaced relation to the main diaphragm, and a pick-up hanging-diaphragm axially-sustained by a rigid tubular conduit from the main diaphragm.

7. The combination of claim 6, wherein the respective grippage sections of the back and front body components are formed as angular-section annuli.

8. The combination of claim 6 wherein the main and spacedly related balancing diaphragms are respectively of greater and smaller diameter as well as of differing sheet metal and gage.

9. The combination of claim 6 wherein the main and balancing diaphragms are clamped to an axial flanged-sleeve, with interposition of a spacer, by an exterior threadedly-engaged lock nut, and the underside of the flanged portion of such sleeve is serrated to prevent relative rotation between the main diaphragm and said sleeve.

10. The combination of claim 6 wherein the hanging-diaphragm consists of a detachable bell-shaped body having an interior grooving, a non-vibratory diaphragm disc seated in said grooving, and a clamping collar for such diaphragm having projection outwardly beyond said disc to prevent body contacts.

11. The combination of claim 6 wherein the hanging diaphragm consists of a solid bell-contoured contact-piece closing in the lower end of the tubular conduit from the main diaphragm.

JAMES TORRANCE, JR.