Jan. 27, 1942. J. SMITHLINE 2,271,467

THREE-TONE STETHOSCOPE

Filed Oct. 22, 1940

Fig. 1

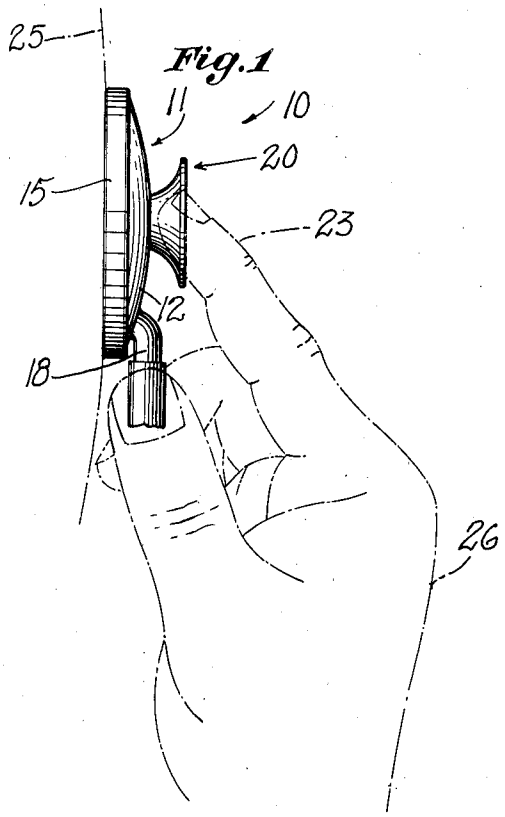


Fig. 3

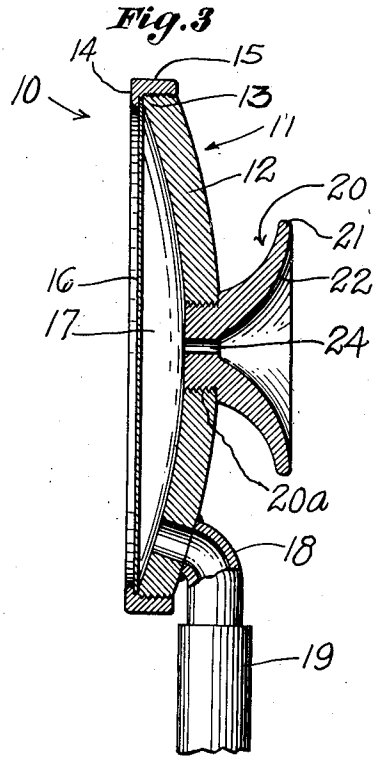
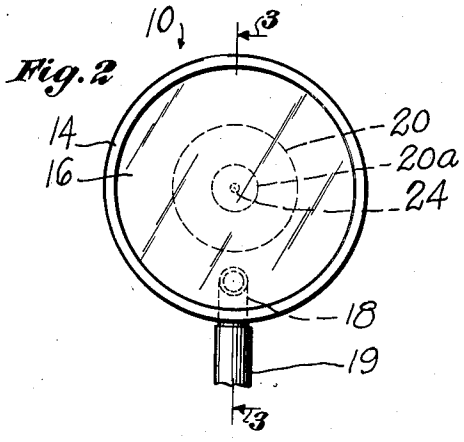


Fig. 2



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THREE-TONE STETHOSCOPE

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1 Claim. (Cl. 181—24)

This invention relates to stethoscopes, and has particular reference to devices of this character adapted for general and local auscultation.

The principal object of the invention is to provide a unitary stethoscope having improved means for three-tone response according to varied conditions of auscultation. Accordingly I provide a three-in-one stethoscope, combining the functions of the well known Bowles and Ford stethoscopes and a third tone less than that of the Ford; and the instrument affording greater amplification than that of a Bowles.

Heretofore, it has ben customary for the skilled medical diagnostician to have separate stethoscopes, one for general and one for local auscultation, the former being used as in listening to sounds in the lungs, and the latter being used as in listening to sounds from the heart, particularly in diseased conditions of this organ which necessitated that indications be taken at different points, and sometimes closely between the ribs of the patient.

To avoid the need for carrying different stethoscopes when visiting the patient at his home, it has been heretofore proposed to combine these stethoscopes, and to control the combination by a three way valve. The resulting structure was quite expensive, but its principal drawback was that it was unduly large and cumbersome in use, and lacked that neatness and compactness which the fastidious practitioner requires.

Another difficulty was that sound indications vary under different conditions. For example, with children, the heart beats are very pronounced and distinct, much more so than with adults. Furthermore, the indications of the diseased heart may be so weak as to be barely audible, and yet distinctness is essential for a positive diagnosis. I perceived the important desirability of producing a single unit stethoscope which would be adapted for both general and local auscultation and which would be wholly free of any removable parts which the physician might lose or misplace. I further perceived that, to be really efficient, such a stethoscope would have to be small and highly compact, so that a physician could comfortably carry it in a breast pocket, and which he could manipulate in a perfectly convenient manner by the use of one hand.

Accordingly it is an object of the invention to provide a stethoscope which shall avoid the difficulties and drawbacks above referred to and which realize in full the advantages desired.

Another object of the invention is to provide a compact stethoscope having few and simple parts, of improved arrangement and construction so as to be adapted for both general and local auscultation and for different degrees of sound amplification.

Another object of the invention is the provision of such a structure which shall be free of any moving parts and adapted for manipulation by one hand in obtaining the different degrees of amplification and in use for general and local auscultation.

Other objects and advantages of the invention will become apparent as the specification proceeds.

With the aforesaid objects in view, the invention consists in the novel combinations and arrangements of parts hereinafter described in their preferred embodiments, pointed out in the subjoined claim, and illustrated in the annexed drawing, wherein like parts are designated by the same reference characters throughout the several views.

In the drawing:

Figure 1 is a view in side elevation showing the head of a stethoscope embodying the invention with the dotted lines showing the manipulating hand and a portion of the patient's body.

Fig. 2 is a view in front elevation thereof.

Fig. 3 is an enlarged sectional view taken on the line 3—3 of Fig. 2.

The advantages of the invention as here outlined are best realized when all of its features and instrumentalities are combined in one and the same structure, but, useful devices may be produced embodying less than the whole.

It will be obvious to those skilled in the art to which the invention appertains, that the same may be incorporated in several different constructions. The accompanying drawing, therefore, is submitted merely as showing the preferred exemplification of the invention.

Referring in detail to the drawing, 10 denotes a head of a stethoscope embodying the invention. The same may comprise a sound chamber 11 which may illustratively comprise a wall 12 having a threaded annular flange structure such as 13 for connection thereto of a ring member 14 having an annular flange 15 for screw connection to the flange 13. Positioned or clamped between the wall member 12 and the ring member 14 is any suitable sound diaphragm 16 which is in the form of a disc of the normal size employed in stethoscopes. Thus there is provided an enclosed sound compartment 17, with the diaphragm 16 being so fully exposed by the ring 14 that the diaphragm forms a face wall for the

chamber 11. The latter may have any connection 18 for a hose 19 that leads to an ear piece which need not be shown herein. Hence these elements 18 and 19 may be referred to as ear tubes. The connecting tube 18 is preferably affixed to the wall 12 in the usual manner; generally it is connected to the center of the wall 12, but in the present case, it is connected at a marginal portion of the wall for a reason that will hereafter appear.

It will be understood that the ring 14 may be made of metal, hard rubber, Catalin or Bakelite; and that the bell 20, hereinafter described, may be made of like materials or even of soft rubber.

Connected to the sound chamber 11 is a bell 20 of any suitable conventional form adapted for local auscultation. Preferably this bell is directly connected to the wall 12, as at 20a, and is in general alinement with the sound chamber and on an opposite side thereof relative to the diaphragm 16. The bell 20 is substantially smaller in size than the diaphragm 16 and is of such small height as to permit of a high degree of compactness as where the device 10 is to be carried in the pocket. It is noted that the bell 20 for this reason, may constitute an integral part of the wall 12 to save space. The marginal portion 21 of the bell is adapted for close annular contact with the patient's body, while the flared inner surface affords a seat 22 for a finger 23 which may close the bell as later described.

Intercommunicating the bell 20 with the sound compartment 17 and hence with the diaphragm 16 is an opening 24 which may be in central relation to the bell. A distinctive feature of this invention is that the opening 24 is of the size of a vent, in contradistinction to the much larger openings heretofore used for a bell. Another important purpose in the size of the opening 24 is that it serves as a sound control for the bell 20, as will hereafter appear. Preferably this opening 24 may be only approximately one-sixteenth of an inch in diameter. In general, the vent opening is such as to moderate the amplification caused by the sound diaphragm 16 and yet not so small as to render inaudible sounds obtained through the bell. The proper size for the opening 24 is best obtained by experimentation.

The operation of the stethoscope head 10 will now be briefly described. With ordinary use, for heart and lung indications, the head 10 is placed against the body 25 of the patient so that the diaphragm 16 is in close proximity thereto and is directly energized, the sound vibrations being transmitted to the physician by the ear tubes 18, 19. The diaphragm 16 may be sufficiently sensitive for proper action with the vent 24 open. In special cases, as of disease or the like, where greater amplification of sound is required, as where the heart beats are weak, the physician, while holding the stethoscope head in one hand 26, places the finger 23 in the bell seat 22 to tightly close the bell 20 and hence the vent opening 24, whereby no part of the sound vibrations are bled out. If local auscultation is desired, the same hand 26 merely reverses the stethoscope head 10 to bring the bell 20 against the body 25 permitting the bell to be pressed between the ribs of the patient for accurate indication of faint sounds. I have observed that with the present device I can obtain in general much greater, or increased audibility than has heretofore been possible, probably because of the closer proximity of the connection 18 to the diaphragm adjacent to the marginal portion thereof.

The physician usually exercizes considerable care in choosing a stethoscope, for its sound conducting qualities. Direct use of the diaphragm is made for high pitched murmurs, whereas the bell 20 is used for low pitched murmurs. Different indications must generally be taken in examining a single patient. The present invention avoids the inconvenience of removing and replacing the "aurals," as would be necessary if different stethoscopes are used.

In examining the heart, it is often desirable to have little or no amplification, and yet to clearly hear the sounds, while in exploring the front and rear chest walls, amplification is needed. The invention is highly useful for these conditions, and the vent opening 24 may also be considered a sound control opening. Thus different diminished amplification effects are obtainable by using the bell 20 and by directly using the diaphragm 16 with the vent 24 open. It may be mentioned that sounds or murmurs are intensified in children and in certain cardiac diseases, and hence a diminished amplification may be desirable. And yet, my instrument will permit perception of faint foetal heartbeats, and the amplification may be sufficiently powerful for noting heartbeats through the patient's clothing as is sometimes the practise of the country doctor who may be working in cold weather. In general, the loudest indication may be obtained by direct use of the diaphragm 16, with the bell 22 closed by the finger 23; an intermediate loudness, by opening the bell; and the lowest sound by using the bell directly, instead of the diaphragm. In conclusion, my stethoscope is a stethoscope that has proven to have advantages over all others in auscultating the heart and lungs, giving the proper amplification where the sounds are inaudible and muffling the sound where it is intensified. It enables one to detect faint murmur, slight clicking or harshness of the valve sounds and the quality of an extremely weak first sound with greater facility than with any other instrument.

It will thus be seen that I have provided a stethoscope wihch fulfills the objects of the invention and is well adapted for practical use. In the language of the medical practitioner, when the diaphragm 16 is applied to the patient's body with the vent 24 left open, the sound of a Ford is obtained, when the bell 20 is closed with the index finger 23, an amplified sound is obtained that is more sensitive and louder than that of the ordinary Bowles. With a turn of the instrument, the Ford bell 20 may be applied to the body, whereupon a sound is obtained lower than that of the Ford stethoscope, and adapted for examination of the naturally accelerated hearts of children and accelerated hearts of adults who may suffer from fever or certain heart diseases, where any material amplification of sound from a Bowles and even from a Ford may be undesirable.

I claim:

A stethoscope having a circular wall which is gradually curved from its central to its marginal portion to form a front concave face and a rear convex face, a ring of angular cross section having one flange threadedly secured to the said marginal portion, a sounding diaphragm for general auscultation secured between the latter and the other flange to overlie the concave face and form a sound chamber therewith, a bell for local

auscultation coaxial with said wall and disposed at the rear face thereof, central means directly connecting said bell and said wall including an axial portion forming an opening of such sufficiently small size as to constitute a permanent vent of fixed size to substantially eliminate amplification of vibrations for auscultation at the heart without impairing sound audibility, said vent opening being adapted to be closed by the placing of the operator's finger in the bell for amplified auscultation of the chest, said vent rendering the bell responsive to the diaphragm, and an ear piece connection for said wall closely adjacent to the margin at the convex face thereof so as to lie spaced inside of the outer plane of the bell to avoid interference therewith, and said ear tube connection being within said ring.

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