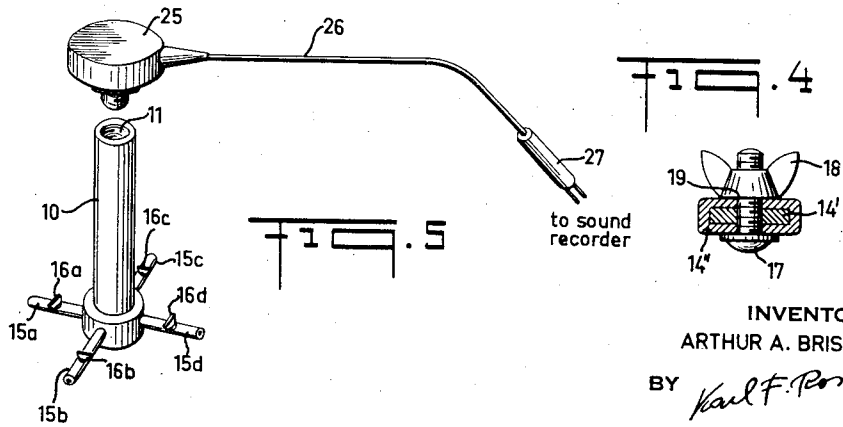
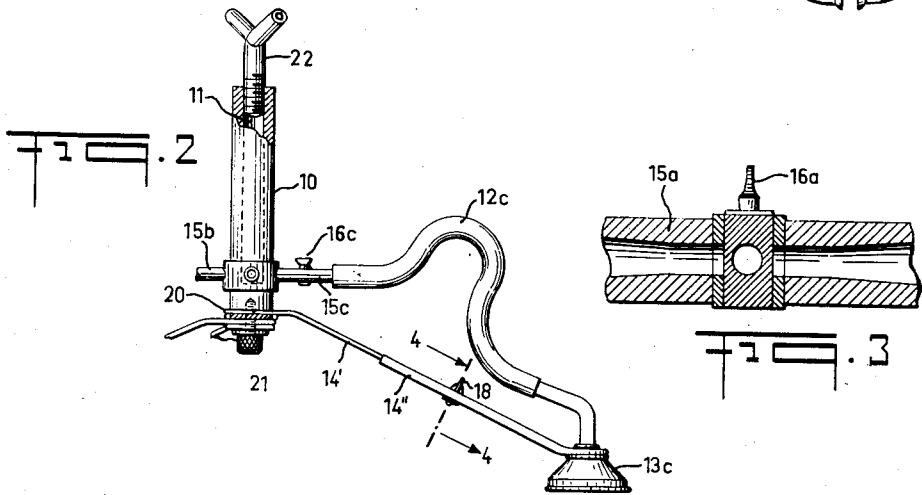
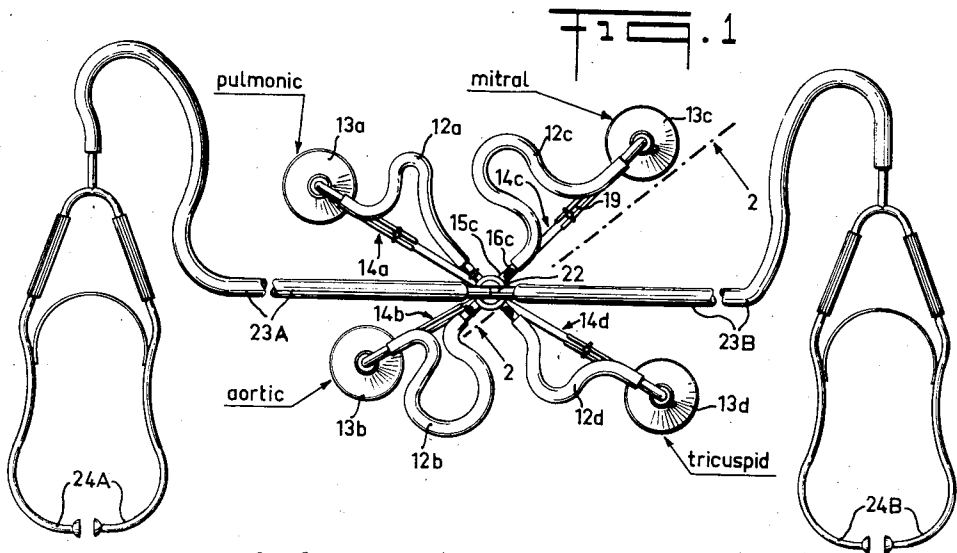


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MULTIPLE STETHOSCOPE
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MULTIPLE STETHOSCOPE

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My present invention relates to a multiple stethoscope, i.e. to a device enabling the simultaneous auscultation of several regions of the human heart.

Conventional stethoscopes comprise a single chest piece or microphone adapted to pick up sounds from one relatively limited region only. The examining physician, in order to obtain a complete picture of the operation of the patient's heart, must therefore successively displace this pick-up element over the entire heart area in order to detect murmurs or other irregularities at any one of the four cardiac foci. This process is not only time-consuming but also somewhat unreliable since it may mislead the physician as to the nature and the severity of an irregularity detected, owing to the fact that not all murmurs are well localized and the same disturbance may sometimes be heard at different locations.

The general object of the present invention is to provide an improved stethoscope adapted to pick up sounds simultaneously from all four cardiac foci.

Another object of this invention, allied with the preceding one, is to provide means for selectively operating such stethoscope so that the attending physician may listen to the sound of any one cardiac focus or of two or more such foci simultaneously, thereby enabling convenient study, comparison and/or recording for ready determination whether a particular irregularity is due to a single murmur or to several murmurs from one or more sources.

A further object of my invention is to provide a multiple stethoscope of the aforescribed character in which the relative position of the four separate inputs can be adjusted to fit hearts of different sizes and configurations.

A feature of my invention resides in the provision of a central sound channel terminating in four branches extending in different directions, there being mounted an individual pick-up device at the end of each branch. The other end of the central channel leads to an acoustic output element such as a pair of stethoscopic ear pieces or an electro-acoustic recording device; if desired, more than one such output element may be connected to this channel.

Another feature of this invention involves the provision of individually adjustable supporting arms for the several pick-up devices; still another feature is the provision of valve means for selectively blocking the sound path from any of the pick-up devices to the central channel.

The invention will be described in greater detail with reference to the accompanying drawing in which:

Fig. 1 is a plan view of a multiple stethoscope embodying the invention;

Fig. 2 is a fragmentary view taken on the line 2—2 of Fig. 1, drawn to a slightly larger scale;

Fig. 3 is an enlarged detail view representing a section through one of the branches of the stethoscope and showing a sound-control valve inserted in such branch;

Fig. 4 is an enlarged sectional view taken on the line 4—4 of Fig. 2; and

Fig. 5 is a perspective view of part of a modified

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stethoscope according to the invention, adapted for use with an electro-acoustic recording device.

In the drawing I have shown a multiple stethoscope comprising a central stem 10 whose bore 11 represents a common sound channel communicating with individual branch channels formed by four flexible tubes 12a, 12b, 12c, 12d. These tubes terminate in respective chest pieces 13a, 13b, 13c, 13d each representing an acoustic pick-up device; the opposite end of each tube is connected to channel 11 through a rigid nipple 15a, 15b, 15c, 15d (see Fig. 5) containing a valve 16a, 16b, 16c, 16d, respectively, and extending radially outward from stem 10.

As shown, the chest pieces 13a and 13b may be used to pick up sounds from the base of the heart (aortic and pulmonic areas) and the chest pieces 13a, 13d may be similarly used for the apex of the heart (mitral and tricuspid areas), respectively, as indicated by the legends in Fig. 1.

The chest pieces 13a, 13b, 13c, 13d are adjustably mounted on extensible supports generally designated 14a, 14b, 14c, 14d. As particularly shown in Figs. 2 and 4, each of these supports comprises a pair of telescoped arms 14', 14'' held together by a bolt 17 and a wingnut 18, the bolt 17 passing through a hole in inner arm 14' and through a slot 19 extending the length of outer arm 14''. The free end arm 14' is formed into an eye 20 traversed, together with corresponding eyes on all the other supports, by a retaining screw 21 which is threaded into the bottom of stem 10 beneath the lower end of bore 11. By means of this arrangement it is possible to place the supports 14a, 14b, 14c, 14d in various angular positions relatively to one another, this adjustability together with the extensibility of the supports enabling the pickup devices 13a etc. to be accurately positioned adjacent the auricular and ventricular chambers of the widest variety of hearts.

The elements so far described are common to the embodiments of Figs. 1—4 and to the modification of Fig. 5. In the first embodiment, as shown in Figs. 1 and 2, a bifurcate connecting nipple 22 is screwed into the upper end of stem 10 and has its two outlets attached to flexible tubes 23A, 23B leading to conventional ear pieces 24A, 24B, respectively. In Fig. 5 the nipple 22 has been replaced by a microphone 25 from which a lead 26 extends to a plug 27 adapted to be connected to a conventional sound recorder not shown, e.g. a magnetic-tape recorder and/or a graphic recorder serving to produce visual sound tracings as described in my co-pending application Ser. No. 274,201, filed February 29, 1952.

With the device of Fig. 1 the attending physician and his assistant, listening in on the ear pieces 24A and 24B, will be able to obtain first a general impression of the performance of a patient's heart by keeping all four valves 16a—16d in open position; if an irregularity is perceived, the same can then be localized by the closure of all the valves and the subsequent opening of one valve at a time. Should a murmur be detected at two or more foci, e.g. at the mitral and aortic areas served by chest pieces 13c and 13b, the corresponding valves may be opened individually and also simultaneously so that a determination can be made as to the degree of coincidence between the irregularities picked up by each of these chest pieces. If the system of Fig. 5 is used, the same determination can be made in the absence of the patient by the aural and/or visual inspection of the record produced.

It will be understood that an electro-acoustic transducer, such as the microphone 25 of Fig. 5, may also be substituted for one of the two headsets 24A, 24B of Fig. 1 so as to enable simultaneous recording and listening-in by the operator. An electro-acoustic transducer

such as microphone 25 may also be substituted for each of the chest pieces 13a-13d of Figs. 1 and 2. Various other adaptations and modifications will be apparent to persons skilled in the art and are intended to be embraced within the scope of this invention as defined in the appended claims; thus it may be mentioned, by way of example, that one of the supports 14a-14d may remain fixed without impairing the relative adjustability of the pick-up elements 13a-13d.

I claim:

1. A stethoscope comprising an elongated tubular member having a longitudinally-extending bore therein operative as a sound channel and opening at one end of said tubular member; a thumb screw threaded into the other end of said tubular member; four adjustable supporting arms pivotally mounted on said tubular member substantially radially of said tubular member and clampingly retained in desired angular adjustment on said tubular member by said thumb screw; four acoustic pick-up elements, each mounted on the outer end of a respective one of said supporting arms; four flexible tubes each acoustically linking a respective one of said pick-up elements with the bore of said tubular member; four independent valves, each in a respective one of said tubes for selectively opening and blocking the path of sound waves between the pick-up element connected to said respective one of said tubes and the bore of said tubular member; and output means connected to said open one end of said tubular member for enabling response to the sound that passes from the pick-up elements into the bore of said tubular member; said adjustable supporting arms each comprising a substantially flat inner bar pivotally mounted on said tubular member, a bolt passing through said inner bar and having a wingnut thereon, and a surrounding outer member telescoped upon said inner member and slotted so as to slide relative to said bolt, said bolt and wingnut clamping said inner bar and outer member in longitudinally-adjusted position, the outer end of each outer member carrying one of said pick-up elements such that the pick-up elements face in the same direction and lie in substantially the same plane.

2. A stethoscope as defined in claim 1, wherein said output means comprises a plurality of headsets connected in parallel to said bore of said tubular member.

3. A stethoscope as defined in claim 1, wherein said output means comprises electro-acoustic transducer means, adapted to be connected to reproduction means.

4. In a stethoscope, in combination, a plurality of acoustic pick-up means; at least one acoustic output means; and a combined acoustic and mechanically adjustable connecting means, said combined means connecting each of said acoustic pick-up means to said acoustic output means for transmitting to the latter sound picked up the former, said combined means also interconnecting

said plurality of acoustic pick-up means substantially rigidly to each other for maintaining the same substantially immovable relative to each other in any one of a plurality of different positions wherein said plurality of acoustic pick-up means occupy different spatial relations relative to each other, respectively, said combined means comprising, a rigid tubular member closed at one end; a plurality of carrier arms each attached at one end thereof to said rigid tubular member in the region of said closed end thereof, each of said carrier arms carrying in the region of its free end one of said plurality of acoustic pick-up means and each of said carrier arms being so constructed and arranged and so attached to said rigid tubular member that the position of the free end of each respective carrier arm relative to said tubular member, and consequently the relative position of the respective acoustic pick-up means carried by each carrier arm, is adjustable; a plurality of flexible tubular means placing each of said plurality of acoustic pick-up means in acoustic communication with the interior of said tubular member in the region of said closed end thereof; and additional tubular means placing said acoustic output means in acoustic communication with said tubular member in the region of the opposite end thereof.

5. The combination defined in claim 4 wherein each of said carrier arms is attached to said tubular member for turning movement relative thereto about the axis thereof, and wherein each carrier arm is composed of at least two parts which are mounted for movement relative to each other in longitudinal direction so that the spacing between the ends of each carrier arm, and consequently the spacing between the respective acoustic pick-up means carried by each arm and said rigid tubular member, can be adjusted.

6. The combination defined in claim 5 wherein the two parts of each arm are in telescoping relationship, and wherein means are provided for maintaining the two parts in any desired longitudinally adjusted position.

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