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STETHOSCOPE

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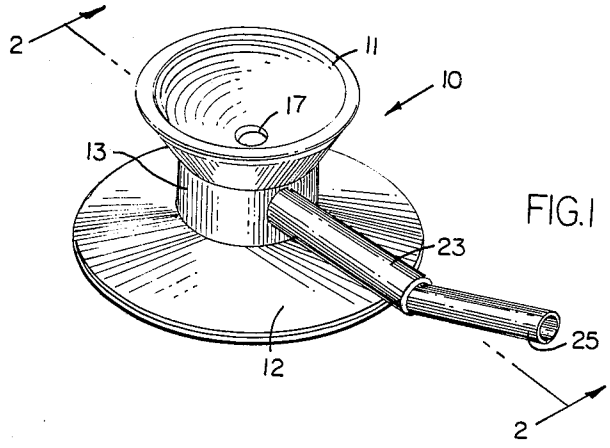


FIG. 1

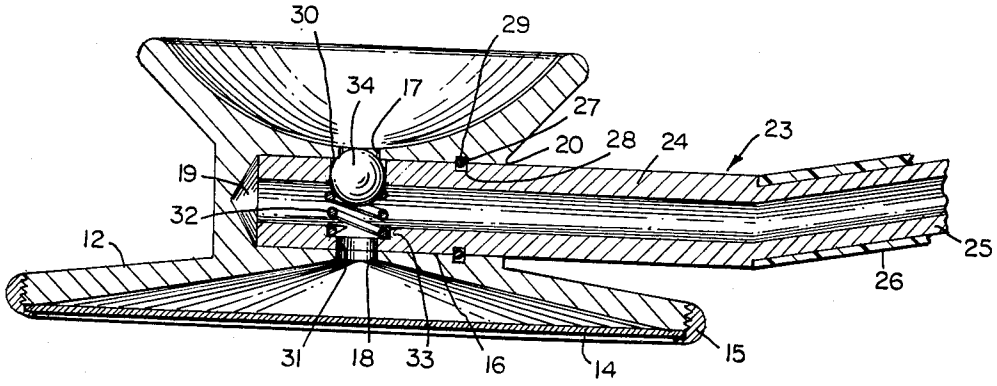


FIG. 2

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The present invention relates to a new and improved dual receiver stethoscope construction and more particularly to a two-microphone stethoscope head having novel and improved means for selectively connecting one of the two microphones to a sound tube.

Dual receiver stethoscope head constructions are well known in the art and frequently have a stem or shaft secured in a body member of the head for rotation into positions where an opening in the stem selectively connects an apex of one of the microphones with a sound tube engaged with the stem. Such stethoscope constructions frequently require relatively complex and costly means for mounting and rotation of the stem, often involving a series of boring, broaching and reaming manufacturing steps. In some cases spring locating means are used externally of the stem and such means are subject to high stresses sometimes shortening the operative life span of the stethoscope head constructions.

An important object of this invention is to provide a dual microphone medical stethoscope head construction having relatively easily constructed novel means for connecting one of the two microphones to a sound tube.

Another object of this invention is to provide a stethoscope head construction in accordance with the preceding object which has a relatively long life span and substantially eliminates freezing of the stem and breaking stresses on a spring means incorporated in the stem.

Still another object of this invention is to provide a stethoscope head construction in accordance with the preceding objects which contains a stop and locating means to both locate the shaft in an operative position and urge the shaft into a position where one of the two microphones is positively closed off and another of the two microphones is connected to a sound tube of the stethoscope through a gastight sealed connecting opening which is substantially leakproof.

According to this invention, a stethoscope head construction has a body member defining opposed microphones and a substantially centrally located cylindrical bore or recess interconnected with the two microphones by openings at the apex of each microphone. The microphone openings are preferably circular and lie on a coincident axis substantially normal to an axis of the cylindrical recess. The cylindrical hollow shaft or stem is snugly and slidably positioned in the recess and has opposed substantially circular openings lying on an axis coincident with the axis of the microphone openings in one position of the stem. A spring means is mounted within the stem with one end of the spring means carrying a stop. The spring means resiliently urges the stop partially outwardly of one stem opening to block one microphone opening while allowing interconnection of a sound tube connected to the stem with a second microphone opening upon selective positioning of the stem. Preferably the stem is secured against axial movement.

In a preferred embodiment of this invention, the spring means comprises a loaded coil spring having a first end surrounding a first stem opening and a second end urging a metallic ball stop partially outwardly of the second opening in the stem to seat in one microphone opening on selective rotation of the stem. It is a feature of this invention that the spring means urges the stop against the rim surrounding a first microphone opening and simultaneously urges a portion of the stem surrounding the second stem opening into tight engagement with a rim portion of the microphone surrounding the second microphone opening to provide a leak proof construction. Surprisingly, even though the spring means surrounds the stem opening, it does not adversely affect sound transfer from a microphone to the sound tube of the stethoscope.

These and other features, objects and advantages of the invention will be better understood and appreciated from the following detailed description of one embodiment thereof selected for purposes of illustration and shown in the accompanying drawing, in which:

FIG. 1 is a top perspective view of a stethoscope head construction in accordance with this invention; and

FIG. 2 is a cross-sectional view thereof taken through line 2—2 showing a portion of a sound tube connected to the stethoscope head.

With reference now to the drawing, a metallic stethoscope head construction is illustrated generally at **10** in FIG. 1 having a conventional opened bell microphone **11** and an opposed diaphragm microphone **12** forming portions of a cylindrical body member **13**. The diaphragm microphone is of conventional construction comprising a diaphragm **14** extending across the mouth of the microphone **12** and secured by a threaded lock ring **15**. At the apex of each microphone **11** and **12** there is located a circular opening **17** and **18** preferably of equal diameters and each preferably having a coincident axis. A cylindrical recess or bore **16** extends through the body member **13** to an end **19** from a mouth portion **20**. Preferably the cylindrical recess **16** has a single diameter throughout its axial extent thus rendering its construction simple with a single sized drill bit.

A stem **23** is snugly and slidably received within the cylindrical recess **16** and has an inner end bearing against the end **19** of the recess **16**. The stem **23** comprises a first tubular cylindrical hollow shaft **24** with an integral offset angular reduced diameter shaft **25**. The shaft portion **25** is frictionally engaged with an overlying end of a sound tube **26**. The sound tube **26** preferably comprises a conventional Y-shaped sound tube having binaural ear pieces in accordance with known practice in the art. Preferably the axis of shaft **24** is substantially normal to the coincident axis of openings **17** and **18**. Preferably a substantially rectangular circular groove **27** is provided on an inner wall of the recess **16** and a corresponding circular groove **28** is provided on the outer bearing surface of the shaft **24**. Grooves **27** and **28** contain a lock ring **29** which may be a rubbery O-ring or a metallic ring. The lock ring **29** prevents axial movement of the shaft in the recess while allowing rotation of the shaft about its axis.

Shaft **24** has 180° opposed preferably circular openings **30** and **31** preferably each having an axis coincident with the axis of microphone openings **17** and **18** in the position of the shaft shown in FIG. 2. The diameter of opening **31** is preferably equal to the diameters of openings **17** and **18**. The diameter of opening **30** is preferably greater than the diameter of opening **31** permitting a cylindrical spring seat to be drilled in the shaft at **33**.

A coil spring 32 lies transversely of the shaft 24 wholly within the shaft and has a first end mounted on seat 33 with a second end carrying a stop 34 which is preferably a ball bearing having a spherical surface and a diameter such that it is urged against the rim of opening 17 or 18 in selected positions of the stem. The diameter of the ball stop is preferably slightly smaller than the diameter of opening 30 and equal to the outer diameter of spring 32 allowing these elements to be positioned through opening 30. However, the ball stop 34 is snugly surrounded by the rim of opening 30 thus preventing lateral motion of the stop with respect to the stem and the microphone. The spherical surface of the steel ball 34 acts to provide a locating means locating one shaft opening in alignment with one microphone opening while simultaneously closing the other microphone opening. Thus as seen in FIG. 2 the diameter of ball 34 being larger than circular bore 17, the outer surface of the ball is larger than and blocks the opening 17 upon selective rotation of the stem. The coils of the spring 32 are spaced apart when the spring is loaded and in compression so as to allow passage of sound to the sound tube 26. Surprisingly, even though the coil spring 32 has an axis coincident with the axis of openings 17, 18, 30 and 31, the coils do not detrimentally affect passage of sound from a microphone to the sound tube.

The operation of the stethoscope head of this invention is extremely simple. The stem 23 can be rotated by hand from the position shown in FIG. 2 to a position where the diaphragm microphone 12 is closed off or blocked by ball stop 34 and the bell microphone 11 is interconnected with the sound tube 26. As the ball 34 slides along the circumferential path it may burnish a path within the recess and tend to gradually smooth the sharp edges normally formed by the drilling of holes 17 and 18. When the ball 34 is rotated 180° with the shaft 24 it snaps into position in the rim of opening 18 thus closing this opening. Spring pressure resiliently urges the rim of the shaft opening 31 against the rim of opening 17 in gastight, hermetic relationship to prevent leakage between the shaft and the body member at the openings 17 and 31. Thus, the stop 34 acts as a locating means as well as a stop and blockage means for closing off one microphone while interconnecting a second microphone.

While the preferred embodiment of this invention has been shown and described, it should be understood that many variations thereof are possible. For example, while it is preferred to form all parts of the stethoscope head of metal, in some cases the ball stop 34 may be constructed of plastic or other material and the shape of the stop 34 may vary so long as it acts to close one opening upon selective positioning. While shaft 24 may have an open inner end as shown, it is also possible to provide an end cap (not shown) closing the innermost end of the shaft.

In view of the many variations possible within the scope of this invention, the present invention is to be limited only by the spirit and scope of the appended claims which follow:

What is claimed is:

1. A stethoscope head construction comprising,
a body member forming diametrically opposed diaphragm and open microphones,
said body member having a cylindrical recess symmetrically interposed between said microphones,
means forming aligned openings from the apex of each of said microphones through said member,
a tubular shaft,
means rotatably securing said shaft within said recess against axial movement,
means forming an opening through the wall of the shaft adapted on rotation of said shaft to be aligned selectively with either of said two openings of said microphones,
and spring means mounted within said shaft and comprising a stop means for closing one of said microphone openings upon alignment of another said openings with said shaft opening.

2. A stethoscope head construction comprising,
a body member forming diametrically opposed microphones,
said body member having an elongated cylindrical recess interposed between said microphones,
said microphones each having an apex and each defining openings on an axis substantially normal to the axis of said cylindrical recess,
a cylindrical shaft with means rotatably securing said shaft in said recess,
said shaft defining a first and second opening therein with said first and second shaft openings each being axially aligned with said apex openings in at least one position of said shaft,
means for selectively closing one of said apex openings mounted within said shaft and comprising a stop member,
said closing means further comprising a resilient spring urging said stop member outwardly of said shaft and simultaneously urging one opening of said shaft into gastight relation with an apex opening.

3. A stethoscope head construction in accordance with claim 2 wherein said spring is a loaded coil spring having an axis substantially coinciding with said apex openings axis.

4. A stethoscope head construction in accordance with claim 2 wherein said stop member comprises a spherical surface and said spring is a loaded coil spring having an axis coincident with said axis of said microphone apex openings.

5. In a stethoscope head construction having a body member defining opposed microphones,
a cylindrical recess in said body member lying between said microphones and a stem snugly received in said recess for selectively interconnecting one of said microphones with a sound tube of said stethoscope head, aligned openings in said body member extending from said recess into said microphones,
the improvement comprising,
said stem comprising a cylindrical hollow shaft having a first opening and a second opening each lying on a common axis normal to the axis of said shaft,
a spring means having a first end mounted within said shaft,
a second end of said spring means carrying a stop,
said spring means resiliently urging said stop partially outwardly of said second opening whereby upon rotation of said stem said stop alternately opens one body opening and simultaneously closes another body opening provided between said microphones.

6. The improvement of claim 5 wherein said spring means comprises a coil spring having an axis coincident with said axis of said openings.

7. A stethoscope head construction comprising,
a body member forming diametrically opposed diaphragm and open microphones,
said body member having a cylindrical recess symmetrically interposed between said microphones,
means forming aligned openings from the apex of each of said microphones through said member,
a tubular shaft rotatably secured in said recess against axial movement,
said shaft defining openings therein,
said shaft openings being located on said shaft for alignment with said microphone openings,
a coil spring mounted within said shaft having a first end surrounding one of said shaft openings and a second end carrying a stop means urged towards said second shaft opening,
said second shaft opening having a diameter larger than the diameters of said microphone openings,
said stop means being resiliently urged against and closing one of said microphone openings while a second

of said microphone openings is connected to another shaft opening in gastight relationship in a selected position of rotation of said stem.

8. A stethoscope head construction in accordance with claim 7 and further comprising said stop means being a ball, said ball having a diameter greater than the diameters of said microphone openings and less than the diameter of said second shaft opening, and

a seat located adjacent said one shaft opening for retaining said coil spring.

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LEO SMILOW, *Primary Examiner.*