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STETHOSCOPE WITH O-RING CONSTRUCTION

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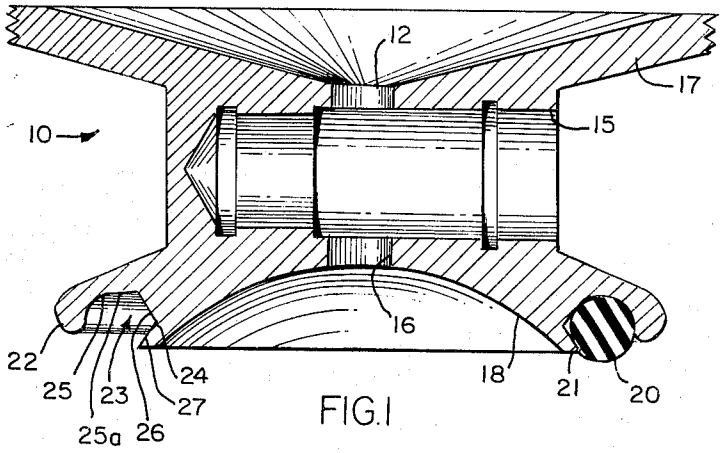

FIG.1

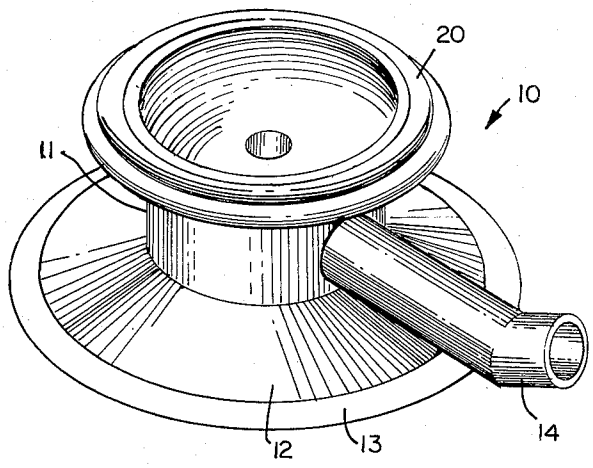

FIG.2

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STETHOSCOPE WITH O-RING CONSTRUCTION

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The present invention relates to metallic stethoscopes and more particularly to an improvement in medical stethoscopes which enhances comfort when they are applied to the body.

Medical stethoscope heads are conventionally made of metal materials since metals are extremely durable, give good sound reproduction and can be machined into precise microphone shapes. Normally such metal stethoscope heads have one major disadvantage well-known to patients and particularly young children. The metal material gives a chill or cold sensation when applied to the body such that many patients are made uncomfortable by their use. This problem is particularly acute in pediatrics where young children are frequently upset by the cold sensation of a probing metallic stethoscope head.

It has been found that insulating materials such as rubber do not give a chill sensation when applied to the skin. However, many problems are involved in utilizing insulating materials in a stethoscope head. Such materials are frequently unsuitable for microphone construction. If the materials are used as a layer between a metallic microphone and the body of the user, problems arise as to placement of the insulating materials so as not to interfere with sound detection. Such materials are frequently less durable than the metallic head and it is preferred to minimize their usage when combined with metallic microphone heads. For example, when a nonmetallic O-ring is used with a metallic stethoscope head, it must be carefully positioned and attached to the microphone to prevent lateral shifting during sliding motions of the stethoscope head over the body and displacement forces exerted by the fingers of the operator in use of the stethoscope head.

It is an important object of this invention to provide a nonmetallic, nonchilling contact surface in a stethoscope head construction having a metal microphone.

It is another important object of this invention to provide a stethoscope head construction in accordance with the preceding object that is extremely durable and not easily subject to misalignment or displacement of the nonmetallic contact surface due to forces exerted by the operator's fingers or lateral shifting of the stethoscope head over the surface of a body.

It is still another object of this invention to provide a stethoscope head construction in accordance with the preceding objects which is relatively easily constructed and does not interfere with the sound reproducing ability of the microphone of the stethosope head.

According to the invention, a stethoscope head construction is provided having a metal microphone defining a continuous peripheral rim lying in a plane spaced outwardly of a central aperture defined by the microphone. A resilient non-metallic O-ring encircles the peripheral rim of the microphone and has a minor portion thereof extending beyond the rim plane and a major portion thereof extending inwardly of the rim plane towards the aperture. An outer, encircling edge wall is spaced outwardly of the O-ring and extends short of the rim plane preferably a distance less than the radius of the O-ring cross section. The outer encircling edge wall and an outer wall portion of the microphone peripheral rim cooperate to form an annular groove seating the O-ring so that the O-ring acts to prevent substantial contact of the metal of the microphone with a body in use and the O-ring is resistant to displacement during use.

Preferably the O-ring is a neoprene or other rubber material and the annular groove has a substantially arcuate across section greater than 180°.

These and other objects, features and advantages of the invention will be better understood and appreciated from the following detailed description read in connection with the accompanying drawing, in which:

FIG. 1 is a cross-sectional view taken through the center of a stethoscope head showing the improvement of this invention; and

FIG. 2 is a perspective view thereof.

With reference now to the drawing, a metallic stethoscope head **10** is shown with a conventional diaphragm microphone **17** in back-to-back relationship with a bell-shaped open microphone **18** separated by an intermediate body portion **11**. At the apex of each microphone are aligned apertures **16** and **12** extending perpendicular to a bore **15** which snugly receives a conventional stem **14** which in turn in adapted to rotate within the bore **15** to interconnect either of microphones **17** or **18** upon proper rotation. The stem **14** is adapted to be connected to a conventional Y-tube and ear pieces of any well-known type. The structure described to this point is known in the art and more fully described in United States Patent No. 3,108,652 issued October 29, 1963.

The specific stethoscope head construction may vary greatly in accordance with known practice and in some cases a single bell-shaped microphone such as **18** may be used in the practice of this invention rather than a dual microphone head.

The bell microphone **18** has a continuous peripheral rim **21** which lies substantially in a plane spaced outwardly from the central aperture **16**. A resilient, nonmetallic O-ring **20** encircles the peripheral rim **21** and extends beyond the plane of the rim **21** from a minor portion of its thickness and inwardly of the plane for a major portion of its thickness. The O-ring **20** is preferably made of a neoprene material which is found to be extremely durable and has the required resilient properties for use in this invention. However, insulating materials such as polyethylene, Teflon, nylon and others may also be used. Preferably the O-ring **20** has a circular cross section as best seen in FIG. 1 in which the left hand portion of the O-ring has been omitted in order to better illustrate the device.

An outer encircling edge wall or lip **22** extends downwardly from the body **11** and is spaced outwardly from the O-ring. The lowermost edge of the outer edge wall or lip **22** is preferably spaced a short distance from the plane of the rim **21** and preferably a distance less than the radius of the O-ring cross section.

Preferably the outer continuous edge wall **22** and the outer wall portion **24** of the bell microphone **18** cooperate to form an annular groove **23** which acts as a seat for the O-ring and extends completely about the bell-shaped microphone. Groove or seat **23** has a cross section generally defining an arcuate path greater than 180°. The specific cross-sectional configuration of the outer edge wall **22** and groove **23** illustrated in FIG. 1, are preferred for firmly holding the O-ring in position. Preferably an arcuate outer wall inner surface **25** is provided joined to a planar inner surface **26** which in turn meets with a second planar surface passing to the plane of the rim **21**. The arcuate surface **25** has a flattened tangential portion **25***a* joined to a planar surface **26** substantially parallel to the plane of the rim **21**. Planar surface **26** meets the second planar surface **27** preferably at a 120° angle, while the second planar surface **27** preferably meets the plane of the rim **21** at a 120° angle. This specific structure has been found to be most effective

in preveinting unwanted removal or displacement of the O-ring **20** from the annular groove **23**.

Preferably the O-ring has a cross-sectional diameter slightly larger than the opening formed between the lowermost portion of the outer edge wall **22** and the rim **21** as seen in FIG. 1, and an inner diameter only slightly less than the outermost diameter of the rim **21**. Thus, no substantial stretching and consequent thinning out of the O-ring occurs when it is positioned within the annular groove **23**. Moreover, the O-ring is resiliently deformed to enter the groove and because of the undercut surfaces of the groove provided by wall portions **26** and **27**, the O-ring substantially returns to its unstressed condition within the groove. It may be slightly compressed in cross section since the outer wall portion **25** tends to urge the O-ring against walls **26** and **27** and retain it in place. The lowermost portion of the O-ring illustrated in FIG. 1 which extends beyond the plane of the rim **21** is exposed sufficiently to assure contact of the O-ring with the body when the stethoscope is used and prevents contact of the rim **21** with the body in normal use.

In a typical example of this invention, a conventional neoprene Parker size No. 2–210 O-ring having a cross-sectional diameter of ⅛" and an internal diameter of ¾" was used in an annular groove as above described with the bell microphone **18** having a spherical surface on a radius of 0.5" with the width of the rim **21** in the outer plane being approximately .031". The edge of rim **21** forming a portion of the lip opening had a diameter of approximately $^{13}/_{16}$". The end of outer wall **22** was spaced approximately $^{1}/_{32}$" from the plane of rim **21**. The O-ring was snugly secured in the groove **23** as shown in FIG. 1 and a portion thereof extended approximately $^{1}/_{32}$" past the plane of rim **21**. This structure provided a nonchilling stethoscope with the contact surface provided by the O-ring being positively positioned and resistant to displacement during normal usage.

The rim **21** can be wider than ⅕" but is preferably less than ⅕" since if wider outermost edges of the rim are used, they may tend to touch the skin at areas inwardly of the points of contact of the O-ring with the skin or body of the user.

While a specific embodiment of this invention has been shown and described, it should be understood that many variations thereof are possible. An important feature of the invention is the use of an annular groove having an opening facing only in the direction of the outermost plane defined by the microphone rim to prevent fingers of an operator from dislodging the O-ring. Therefore this invention is to be limited only by the spirit and scope of the appended claims.

What is claimed is:

1. In a stethoscope head construction having a metal microphone with said microphone having a continuous peripheral rim lying substantially in a plane, said rim plane being spaced outwardly of a central aperture defined by said microphone, the improvement comprising,

a resilient, insulating material O-ring encircling said peripheral rim and having a minor portion thereof extending outwardly beyond said plane and a major portion thereof extending inwardly of said plane,

an outer encircling edge wall spaced outwardly of said O-ring and extending short of said plane by a distance less than the radius of the O-ring cross-section thus extending past a plane through the center of the O-ring parallel to the rim plane,

said outer encircling edge wall having an outer wall portion of said microphone cooperating therewith to form an annular groove seating said O-ring,

said annular groove in cross-section generally defining an arc of substantially more than 180 degrees,

said O-ring having an inside diameter smaller than the diameter of said groove at said plane and a cross-sectional diameter greater than the width of the mouth of said groove whereby said O-ring acts to prevent substantial contact of the metal of said head with a body in use and said O-ring is resistant to displacement during said use.

2. The improvement of claim **1** wherein said groove defines an arcuate first wall surface conforming to an arcuate cross section portion of said O-ring,

a planar inner surface meeting said arcuate first wall surface at one end and a second planar inner surface meeting said first mentioned inner surface at a second end thereof at a 120° angle,

said second planar surface meeting said rim plane at a 120° angle.

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LEO SMILOW, *Primary Examiner.*