G. F. MACHLUP

STETHOSCOPE WITH O-RING CONSTRUCTION

Filed Oct. 9, 1964
STETHOSCOPE WITH O-RING CONSTRUCTION

Gustav F. Machlup, Belmont, Mass., assignor to Cardiometrics Medical Instruments Corporation, Cambridge, Mass., a corporation of Massachusetts

Filed Oct. 9, 1964, Ser. No. 402,786

2 Claims. (Cl. 181—24)

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 in placement of the insulating materials so as not to interfere with sound transmission. Such insulating 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 non-metallic 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 stethoscope 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 a 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 drawings, 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 bore 15 which snugly receives a conventional stem 14 which in turn is 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 material.

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 over 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 22 defines Medical Instruments Corporation, Cambridge, Mass., a corporation of Massachusetts.

The annular groove 23 is formed by the outer wall 22 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 24 of a 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

This specific structure has been found to be most effective
in preventing 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 unstrained 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 3¼" 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 0.311". The edge of rim 21 forming a portion of the lip opening had a diameter of approximately ⅛". The end of outer wall 22 was spaced approximately ⅜" 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 ⅜" 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 ⅛" but is preferably less than ½" 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.

References Cited by the Examiner

UNITED STATES PATENTS
438,521 10/90 Roydston 181—24
2,258,743 10/41 Dax 181—24

FOREIGN PATENTS
821,374 8/37 France.

LEO SMILOW, Primary Examiner.