

[54] **DISPOSABLE COMBINED
SPHYGMOMANOMETER CUFF AND SOUND
CHAMBER**

[76] Inventors: **Alexander Goldblat**, 210 Central
Park South, New York, N.Y. 10019;
Raymond Miller, 315 E. 86th St.,
New York, N.Y. 10028

[22] Filed: **Aug. 27, 1971**

[21] Appl. No.: **175,488**

[52] U.S. CL.... **128/2.05 G, 128/2.05 C, 128/2.05 S,**
181/24

[51] Int. Cl..... **A61b 5/02**

[58] Field of Search..... **128/2.05 C, 2.05 G,**
128/2.05 S, 2.05 P, 2.05 R; 181/24

[56] **References Cited**

UNITED STATES PATENTS

3,621,845	11/1971	Oates.....	128/2.05 S
3,473,525	10/1969	Hanafin.....	128/2.05 C
3,621,831	11/1971	Pisacano.....	128/2.05 C
2,981,251	4/1961	Berman.....	128/2.05 C
3,416,516	12/1968	Cohen et al.	128/2.05 S
3,603,304	9/1971	Maier.....	128/2.05 C
3,315,662	4/1967	Buffington.....	128/2.05 G
3,258,009	6/1966	London.....	128/2.05 C
2,753,863	7/1956	Bailey.....	128/2.05 G

FOREIGN PATENTS OR APPLICATIONS

1,068,749 5/1967 Great Britain 128/2.05 C

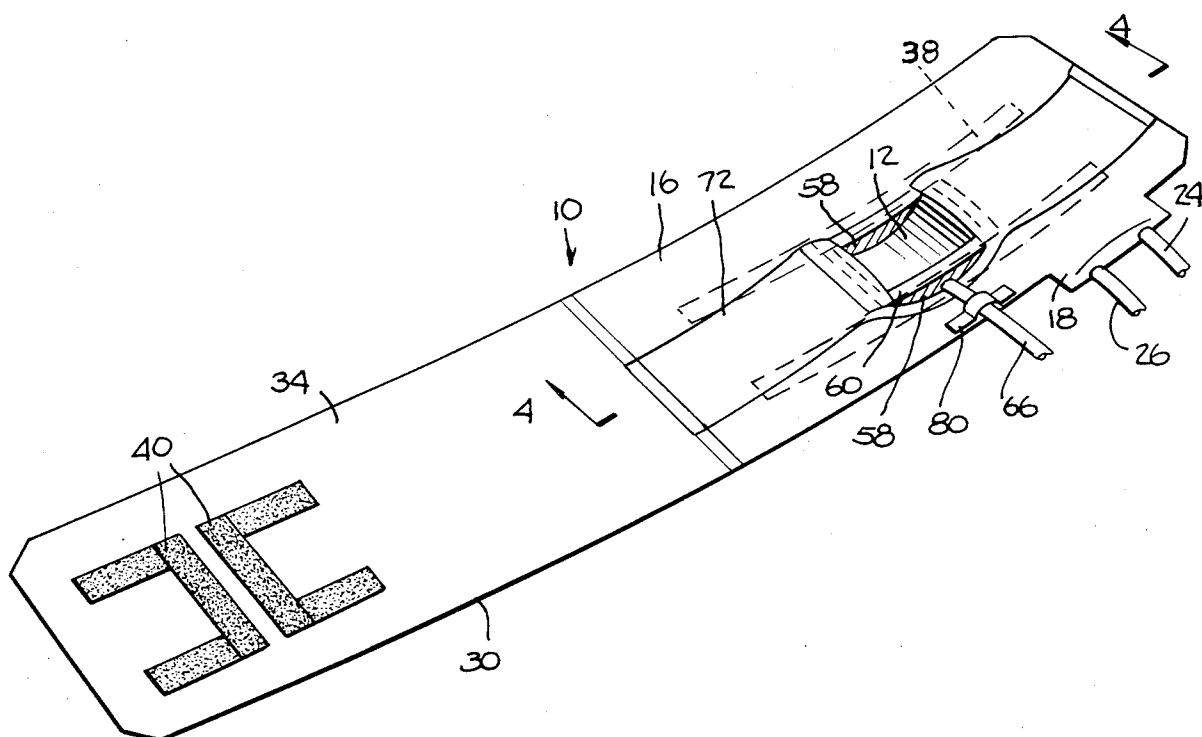
Primary Examiner—Kyle L. Howell

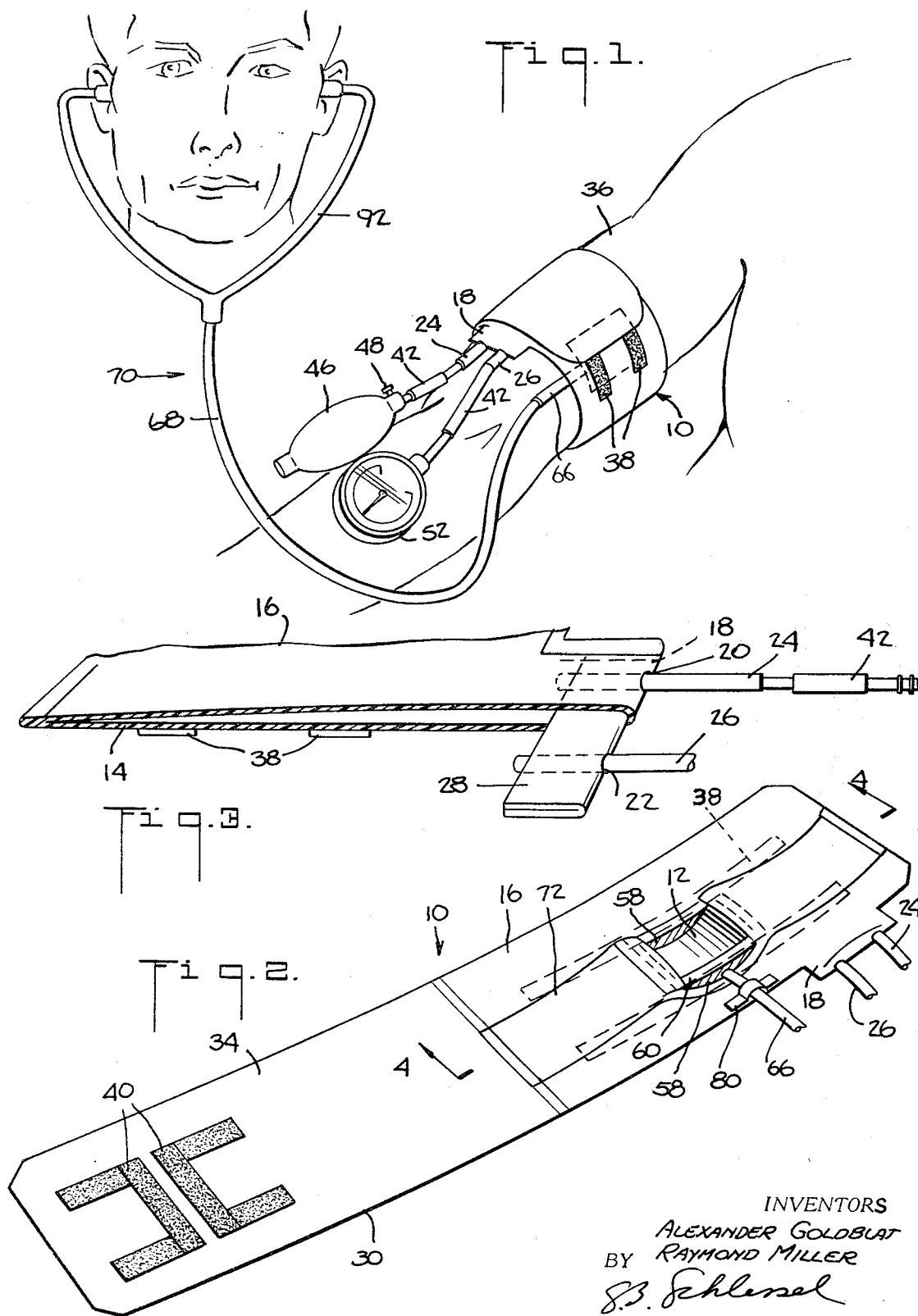
Attorney—Sydney B. Schlessel

[57] **ABSTRACT**

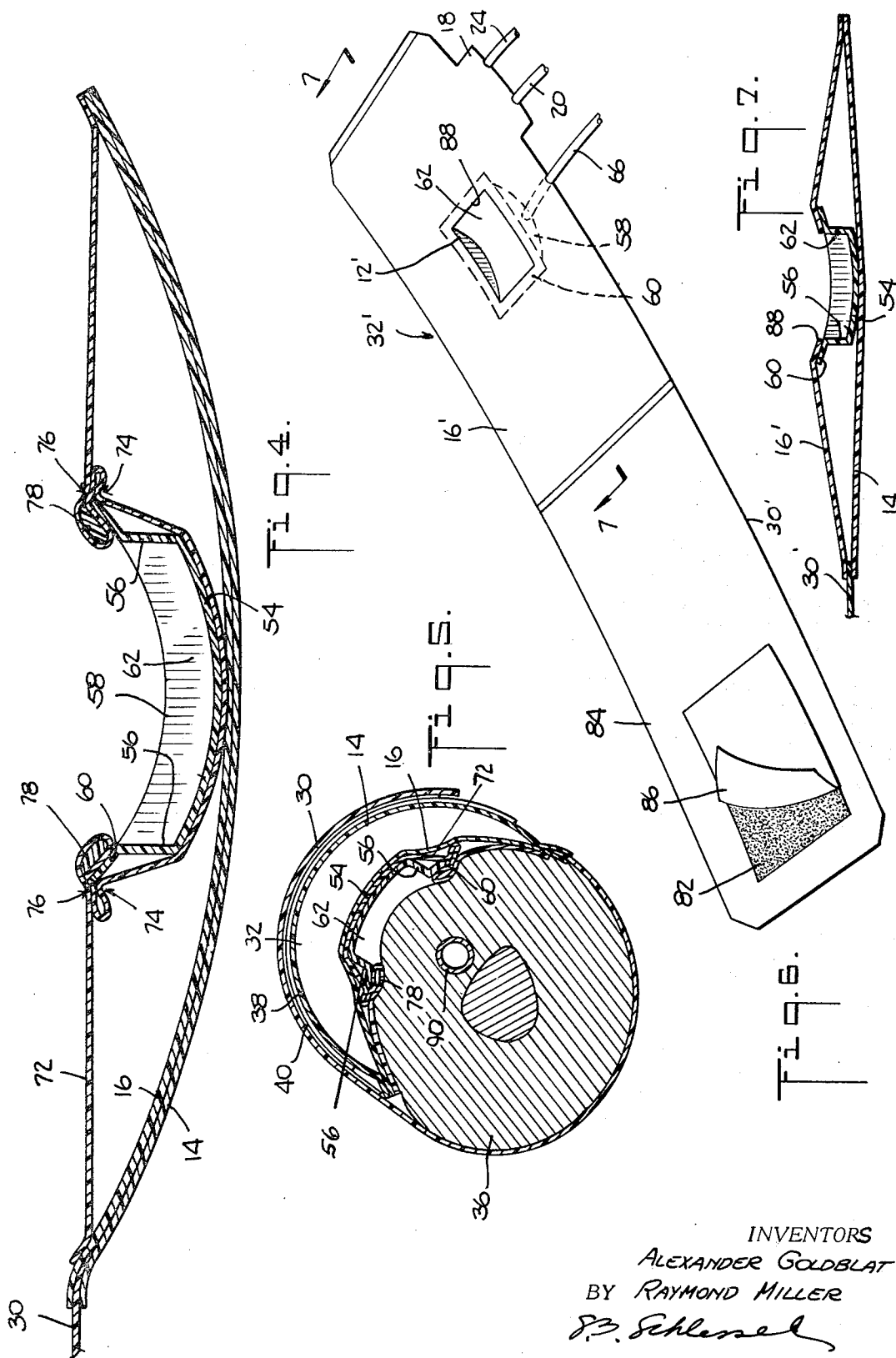
A sphygmomanometer cuff and sound chamber combined as a unit. The cuff embraces a pliant plastic bladder integral with a wrap-around plastic sleeve. Two air tubes extend from the bladder interior for engagement, respectively, with an air bulb and a manometer. The sound chamber comprises an arcuate shell of rigid plastic greater in length in the direction of curvature, with extending walls to define an open cavity, with a peripheral lip extending outwardly from the wall edges. A tube extends from a side wall of the chamber affording sound communication between the chamber interior and a stethoscope secured to the free end of the tube. A sling is bonded to the shorter sides of the bladder undersurface to which the chamber is bonded centrally around its lip, with the cavity exposed. In another embodiment the chamber is recessed within a window in the bladder undersurface, with its cavity exposed. The cuff is secured adhesively.

1 Claim, 7 Drawing Figures





INVENTORS
 ALEXANDER GOLDBLAT
 BY RAYMOND MILLER
S.B. Schlessel
 ATTORNEY



INVENTORS
 ALEXANDER GOLDBLAT
 BY RAYMOND MILLER
R. B. Schlessel
 ATTORNEY

DISPOSABLE COMBINED SPHYGMOMANOMETER CUFF AND SOUND CHAMBER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to the field of medicine and more particularly to the blood pressure measurement of patients by means of a sphygmomanometer employed in combination with a stethoscope. The standard sphygmomanometer comprises a cuff containing an inflatable bladder, which is secured around a main artery, usually the brachial artery, of a patient with the bladder disposed directly over the artery, an air tube leading into the bladder from an air bulb or similar air pumping device by means of which the bladder is inflated, and an air tube communicating the interior of the bladder with an air pressure gauge, or manometer, for the measurement of the pressure in the bladder as air is pumped into the bladder and released therefrom. The customary procedure for the physician or other qualified operative using the device is to secure the cuff around the patient's arm with the bladder disposed over the brachial artery, inflate the bladder by successive compressions of the air bulb until the flow of blood through the artery is completely stopped and the needle of the manometer registers a designated air pressure within the bladder, and then slowly to release, or bleed, the air from the bladder by means of an air leak or bleeder valve mounted on the bulb, meanwhile applying the audio pickup of the stethoscope over the constricted area of the artery, listening to the changing sounds, known as Korotkoff's sounds, as the blood again begins to flow through the artery with the reduction of air pressure in the bladder, and noting the changes of pressure as indicated on the manometer, to determine the systolic and diastolic blood pressures of the patient.

The novelty of the present invention lies in the provision of a disposable combination of sphygmomanometer cuff and integral sound chamber as a single unit. The sound transmitting tube of a standard stethoscope is attachable to a tube extending from the sound chamber prior to commencement of the procedure.

2. Prior Art.

In the present state of the art sphygmomanometer cuffs are generally made of a fabric material with an insertable inflatable bladder of rubber, a combination too expensive to discard after a single use, and consequently used over and over again with a vast succession of patients, with the inherent and obvious danger of contamination and communication of infection between patients. Regular and frequent cleaning and sterilization has been found to be impractical, expensive and time consuming. A further disadvantage with such devices is that the audio pickup button of the standard stethoscope is not always placed over the identical area of the constricted artery, which may lead to inconsistent and possibly inaccurate readings, particularly where the blood pressure of the same patient must be taken with frequent regularity, as during an extended surgical procedure. In such latter instances the customary taping or strapping of the stethoscope audio pickup to the patient's arm tends to cause irritation and soreness to the area, as well as discomfort to the patient. A further disadvantage is to be found with present types of cuffs in that the fabric tends to deteriorate, and the

rubber bladder and tubing to dry out and become brittle with long periods of disuse, as when stored in emergency medical boxes or in military field equipment, and the like.

Improvements have heretofore been developed in this field to overcome the foregoing disadvantages, but these improvements have been limited in scope and benefit. For example, cuffs of disposable material have been devised, but these are not provided with disposable sound chambers, and must be used with standard stethoscopes using button-type audio pickups. Again, a separate blood pressure sound chamber, or transducer has heretofore been devised for use with a conventional type of cuff, but this transducer is a separate unit of expensive construction, intended for multiple re-use, with the consequent attendant hazards of communication of infection and contamination between patients.

BRIEF SUMMARY OF THE INVENTION

The novelty of our invention resides in the unique provision of a combined, or unitary, sphygmomanometer cuff integral with an improved sound chamber, all constructed of an inexpensive material, such as plastic and the like, and hence disposable after use on a single patient because of the nominal cost. The cuff comprises an inflatable bladder extending into a non-inflatable, or flat, segment adapted to be secured around the patient's arm by adhesive means, with air tubes in communication with the interior or the bladder and extending therefrom, one for communication with and connection to an air bulb, and the other for communication with and connection to an air pressure gauge, or manometer. The sound chamber is integral with the bottom surface of the bladder, and is arcuate to define a hollow cup or cavity, with a tube extending from the side wall of the chamber for connection to the sound transmitting, or audio, tube of a standard stethoscope, to provide communication of sounds within the chamber to the stethoscope ear piece.

This novel construction provides numerous advantages over the previously discussed art, and the elimination of the disadvantages heretofore mentioned. Some of the major advantages are worth noting herein.

The principal object of our invention, therefore, lies in the provision of a combined sphygmomanometer cuff and sound chamber, which is disposable after use on a single patient, thereby eliminating the possibility of cross-infection between patients.

A second important object of our invention lies in the provision of a combined cuff and sound chamber as above described in which the sound chamber is adapted to cover a greater segment of tissue over the artery than is possible with the button-type of audio pickup of standard stethoscope, thereby insuring a better quality of sound and thereby greater accuracy of blood pressure measurement.

A third important object of our invention lies in the provision of a unitary sphygmomanometer cuff and sound chamber combination which is lightweight and comfortable, and which can therefore be left in deflated state on the patient's arm for long periods of time, as during surgery, without discomfort or soreness to the patient's arm, to be successively inflated whenever blood pressure measurement is required.

A fourth important object of our invention lies in the provision of a combined cuff and sound chamber as above described which, in cases of repeated use on the

same patient, as during surgery, maintains the sound chamber in the same position on the patient's arm for successive readings, thereby insuring the proper correlative accuracy of the readings.

Still another important object of our invention lies in the provision of a combined cuff and sound chamber which can be stored for long periods of time without disintegration or diminution of efficiency.

These and other salient objects, advantages and functional features of our invention, together with the novel features of construction, composition and arrangement of parts, will become more readily apparent from an examination of the following specification, taken with the accompanying drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a preferred embodiment of our invention, shown secured around a patient's arm and in engagement with an air bulb, manometer and stethoscope, preparatory to taking a blood pressure reading;

FIG. 2 is an enlarged bottom view of the embodiment of FIG. 1;

FIG. 3 is an enlarged cross-sectional view, partly fragmented, showing the construction of the tube members leading into the inflatable bladder;

FIG. 4 is a cross-sectional view, taken on lines 4—4 of FIG. 2;

FIG. 5 is an enlarged cross-sectional view of the combined cuff and sound chamber engaged around a patient's arm, as shown in FIG. 1;

FIG. 6 is a bottom, perspective view, similar to FIG. 2, of a modified embodiment of our invention; and

FIG. 7 is a cross-sectional view, taken on lines 7—7 of FIG. 6.

Similar reference characters designate similar parts throughout the different views.

DETAILED DESCRIPTION OF THE INVENTION

Illustrative of the embodiment shown by FIGS. 1—5, our invention comprises a sphygmomanometer cuff 10 integral with a sound chamber 12. The cuff 10 consists of a sheet of pliable plastic material folded over along one side to form top and bottom surfaces 14 and 16, having a length of approximately 28 cm and a width of approximately 16 cm. The fold edge has an extension 18 provided centrally with two spaced openings 20 and 22, and is provided for by a cut-out pattern of plastic sheeting. A pair of flexible plastic tubes 24 and 26, sealed in parallel, spaced relationship to each other within a flap 28, are disposed through the respective openings 20 and 22, with the flap 28 within the fold of the extension 18 and the tubes 24 and 26 extending out therefrom, as shown. A sleeve 30 of plastic sheeting is disposed with its edge between the shorter edges of the surfaces 14 and 16, and the surfaces 14 and 16 are then bonded around their perimeters, the edges of the extension and on either side of the edge of the sleeve 30, by heat sealing or other suitable means, to define a closed pocket or bladder 32, whose internal measurements are at least 12 cm in width and 23 cm in length, with the tubes 24 and 26 extending therefrom and providing air communication with the interior, while the sleeve 30 extends from the side of the bladder 32 and measures at least 35 cm in length. The top surface 14 of the bladder 32, and the inner surface 34 of the sleeve 30 are provided with means to secure the cuff 10 around the

patient's arm 36 in encircling relationship, as shown in FIG. 1, and in the embodiment shown comprises strips of pile material 38 bonded to the top surface 14 of the bladder 32, and cooperating strips of barb material 40 bonded to the inner surface 34 of the sleeve 30, the combined strips 38 and 40 releasably engageable to secure the cuff 10 to the patient's arm 36, and comprising a fastening material known by the trademark Velcro.

The open ends of the tubes 24 and 26 are each provided with a coupling 42, one of which is adapted to be secured to the flexible tube 44 of an air bulb 46 provided with an exhaust valve 48, and the other to the flexible tube 50 of a manometer 52, both of which are too well known in the art to require further elaboration and description.

Referring now more particularly to FIGS. 2 and 4, the sound chamber 12 is composed of a single piece of rigid plastic material and is formed, either by compression, injection or vacuum molding, as an arcuate shell extending greater in length in the direction of its curvature, having an arcuate base 54 extending into upright end walls 56, and side walls 58, thereby to define an open pocket or cavity 62, with a peripheral lip 60 extending outwardly from the edges of the walls 56 and 58, the lip 60 forming a smooth, flat and arcuate surface adapted to simulate the contour of a human limb. An opening 64 is provided in one of the side walls 58, through which there is secured a flexible plastic tube 66 which extends therefrom at right angles to the wall 58, to provide communication between the interior and exterior of the cavity 62, and whose free end is provided with a coupling 42 by which it may be connected to the hearing tube 68 of a standard stethoscope 70. As shown more graphically by FIG. 4, the sound chamber 12 is centrally nested in a flexible plastic sling 72, the ends of which are bonded to the sides of bottom surface 16 of the bladder 32, so that the sound chamber 12 rides freely between these sides, with its cavity 62 opening in a direction away from the bottom surface 16, the chamber 12 being disposed closer to the side of the bladder 32 from which the tubes 24 and 26 extend, and the length of the sling 72 being slightly shorter than the distance between the sides of the surface 16 to which it is attached, whereby, in the curvature of the cuff 10 in placement around the patient's arm 36 (see FIG. 5), the sling 72 will fit smoothly and without slack. Prior to bonding of the sling 72 to the surface 16 the sound chamber 12 is secured to the sling 72 by the underlap and overlap of the sling 72 along the shorter sides of the sound chamber 12 and heat sealing, as at 74 and 76, to imprison some air within the overlaps to define air cushions 78 adapted to cushion the sound chamber lip 60 from contact with the patient's arm 36. As shown by FIG. 2, the tube 66 is secured to the bottom surface 16 of the bladder 32 by an adhesive strip 80, to lie parallel with, and on the same plane, as the tubes 24 and 26.

Coming now to FIGS. 6 and 7, there is shown a modified embodiment of our invention, wherein the Velcro fastener 38, 40 is replaced by a coating 82 of hot-melt adhesive disposed on the inner surface 84 of the sleeve 30', and which is provided with a protective strip 86 adapted to be peeled off when the cuff 10' is ready to be used. In this embodiment the sound chamber 12' is bonded to the bottom surface 16' of the bladder 32' by securing it through a window 88 cut in said bottom surface 16', the edges of the window 88 being heat sealed upon and around the lip 60' of the sound chamber 12'

to provide an air-tight bladder 32'. In this embodiment, therefore, the sling 72 has been eliminated.

OPERATION OF THE INVENTION

In the operation of the embodiment shown by FIGS. 1-5, the bladder 32 is placed over the patient's arm 36, as shown in FIG. 5, so that the sound chamber 12 is centrally disposed across the brachial artery 90, the sleeve 30 being then wound snugly around the arm 36 and the bladder 32, and secured in place by the engagement of the fasteners 38 and 40. The air bulb 46 is secured to tube 24, the manometer 52 to tube 26, and the hearing tube 68 of the stethoscope to the tube 66, as shown in FIG. 1. The physician then compresses the air bulb 46 with successive compressions to inflate the bladder 32 until the flow of blood through the artery 90 is completely occluded by the air pressure within the bladder 32, this pressure being noted on the manometer 52 by the physician, who then slowly exhausts air from the bladder 32 by means of the valve 48, meanwhile listening through the stethoscope to the sounds made as the blood begins to flow again through the artery 90, and noting the pressure readings on the manometer 52 with the sound changes, to determine the systolic and diastolic blood pressures of the patient. The identical procedure is followed with the use of the embodiment shown by FIGS. 6 and 7.

It is to be particularly noted here that in the employment of our invention during surgery, where frequent and repeated measurements of the patient's blood pressure are required, the cuff 10 remains on the patient's arm 36 in deflated state at all times, between readings, so that the sound chamber 12 remains in the identical position at all times, thereby assuring complete accuracy of successive readings. Where the standard stethoscope audio pickup button is used it cannot always be placed on the identical area of the patient's arm 36, thereby leading to possible errors and inaccuracies in successive readings, unless the button is taped or strapped to the arm 36, in which event soreness and discomfort may result, both from the button pressure and the tapes or straps.

COMPOSITION OF THE INVENTION

In the construction and composition of our invention the sleeve 30, bladder 32, flap 28 and sling 72 are preferably made of polyvinyl chloride homopolymer or copolymer resins or films having a thickness of approximately 0.005 inch to 0.008 inch. Polyethylene and polyolefin polymers, including polypropylene and polybutenes may be used, as well, or any of the other and numerous plastic resins presently available. These will provide satisfactory strength and tear resistance, and can easily be heat sealed. They can also be produced in a glossy, matte or embossed state, either transparent or opaque, and in colors.

The sound chamber 12 can be made from rigid polyolefin, but can as well be made from similar resins. Polyolefin is preferred for compression, injection or

vacuum molding operations to produce such units, which can then be heat sealed, either to the sling 72 in the embodiment of FIGS. 1-5, or to the bottom surface 16' of the bladder 32', in the embodiment of FIGS. 6 and 7.

As is apparent from the foregoing, our combined sphygmomanometer cuff and sound chamber can be produced at a nominal cost per unit, including sterilization and packaging in a sealed container, so that they are economically disposable following use on a single patient, thereby avoiding the possibility of cross-contamination or infection between patients, and encompassing the further advantages previously noted.

It is also clearly obvious from the foregoing that the preferred embodiments shown and described are by way of illustration and not of limitation, and that various changes may be made in the construction, composition and arrangement of parts without limitation upon or departure from the spirit and scope of the invention or sacrificing any of the advantages thereof inherent therein.

Having described our invention, we claim:

1. In combination with a stethoscope tube, an air introducing and exhausting means and a pressure indicating means, for the measurement of blood pressure, a disposable combined sphygmomanometer cuff and sound chamber composed of plastic material, the cuff comprising a pair of substantially rectangular pliant sheets overlying one another and secured together along their abutting edges to define an air-tight inflatable bladder, together with an elongated pliable sheet secured to one end of the bladder and adapted to encircle a human limb in overlying relationship to the bladder; means to releasably secure the cuff around the limb, tubular means secured through one side of the bladder and extending therefrom and adapted to provide communication between the bladder interior and the air introducing and exhausting means and between the bladder and the pressure indicating means, the sound chamber comprising an arcuately shaped member of rigid plastic greater in length in the direction of its curvature, having an arcuate base and end walls, and side walls extending therefrom to define an open cavity, a peripheral lip extending outwardly from the wall edges on a plane parallel with the base, tubular means secured through a side wall of the chamber and extending outwardly therefrom in the direction of the tubular means of the bladder and adapted for engagement with the stethoscope tube to provide some communication with the interior of the chamber, and means to secure the sound chamber centrally of the bottom surface of the bladder with its cavity facing outwardly therefrom, comprising a pliant plastic sling secured along its edges to the ends of the bladder undersurface, the intermediate portions of the sling being lapped under and over the ends of the peripheral lip of the chamber and secured thereto, with air imprisoned within the overlaps to define cushions for the sound chamber.

* * * * *