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SPHYGMOMANOMETRIC CUFF

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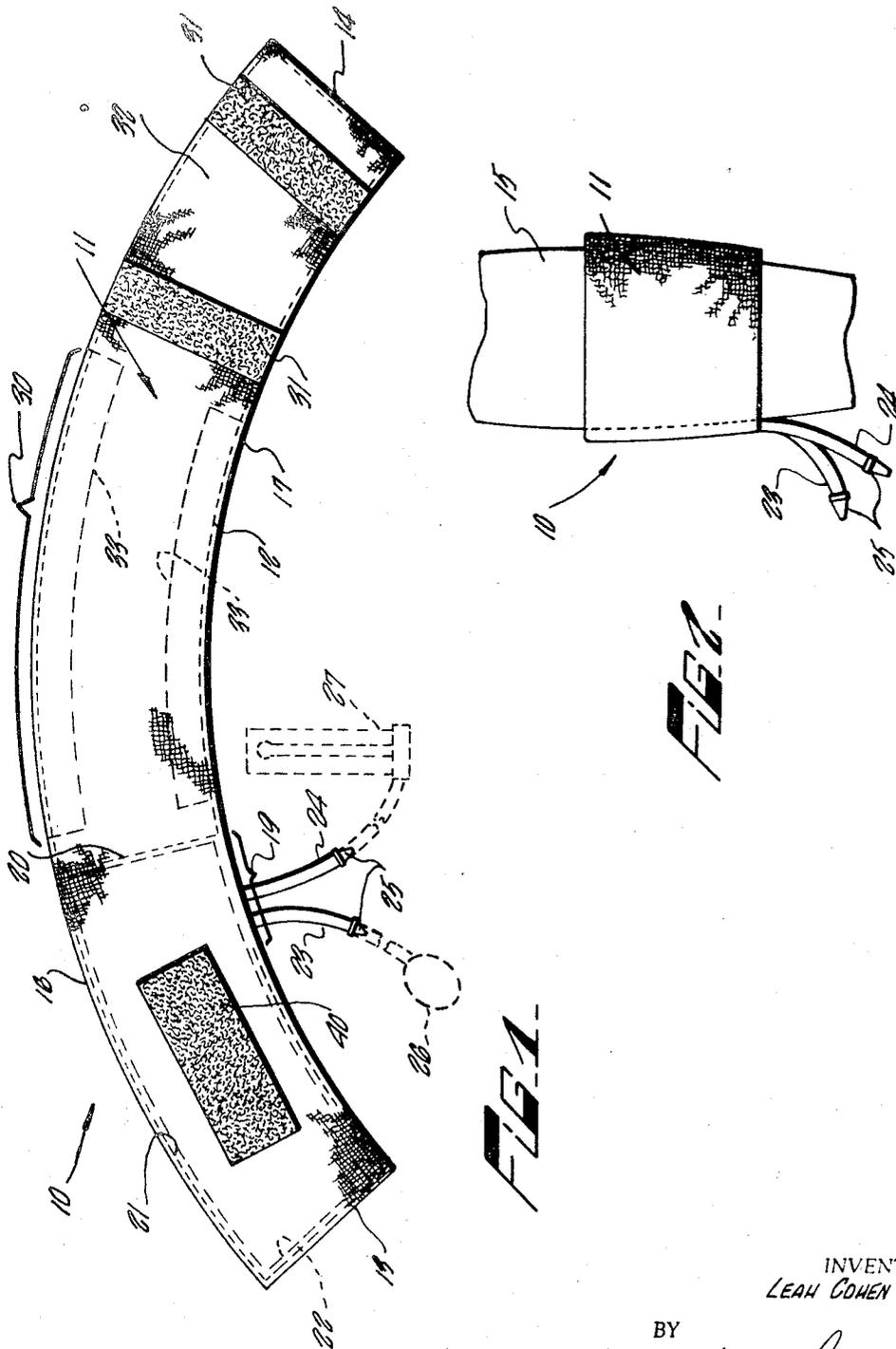


FIG. 2

FIG. 1

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SPHYGMOMANOMETRIC CUFF

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8 Claims

ABSTRACT OF THE DISCLOSURE

A sphygmomanometric cuff in which an elongate flexible cuff body is curved transversely of its length to be useful in obtaining accurate blood pressure measurements when the cuff body is wrapped around a tapering thigh or forearm of an obese person, for example.

This invention relates to a sphygmomanometric cuff which, in its opened condition, is arcuately curved so that, when applied to a tapering appendage of a human and the like, it exerts uniform pressure against the appendage across its width and does not work loose on the appendage.

Existing sphygmomanometric cuffs, i.e., strips of fabric used to apply an inflatable bladder to an arm or to a leg for the measurement of blood pressure, are basically and essentially straight lengths of fabric sufficiently long that they may be wrapped at least once about the desired appendage. For general use, as in taking a single blood pressure reading on a given patient, existing cuffs are readily useful and are satisfactorily constructed for such use. Existing cuffs, however, are not wholly satisfactory for use during operations, as where the cuff is in use for an extended period by an anaesthesiologist, for example.

In the use of a sphygmomanometric cuff, it is desirable that the cuff be so positioned on an arm or a leg that the cuff, across its width, exerts substantially uniform pressure on the appendage when the inflatable bladder carried by the cuff is inflated. When the pressure applied by the cuff is uniform across the area covered by the applied cuff, the systolic and diastolic blood pressure measurements obtained are more accurate than when the cuff tends to pinch the appendage at one edge of the cuff. Also, when a series of blood pressure measurements must be obtained on a particular patient, as during a surgical operation or in an intensive care ward, it is desirable that all measurements be made under essentially identical conditions. The arms, particularly the upper arms, and the thighs of most humans have a tapering rather than a cylindrical shape. As a result, when an existing straight cuff is applied to these human appendages, the cuffs (when inflated) exert greater pressure on the appendage along one edge thereof than along the other edge of the cuff. As a result, the blood pressure measurements obtained by the use of existing cuffs are not always accurate. More importantly, the non-uniform pressure conditions associated with existing cuffs cause the cuff to work downwardly along the tapering appendage as the bladder in the cuff is repeatedly inflated and deflated, as is the case during surgical operations and the like. For this reason, blood pressure measurements obtained with existing cuffs during operations are very likely to be obtained under different conditions because of movement of the cuff along the patient's arm or leg. Movement of an existing cuff along an arm or leg may be impeded by taping the cuff to the leg, but the use of tape to hold a cuff in place often introduces additional non-uniform pressure conditions into the operation of the cuff.

This invention provides an improved sphygmomanometric cuff which, when inflated, exerts uniform pressure upon a tapering appendage to which the cuff is applied.

The blood pressure measurements obtained by the use of the cuff are accurately indicative of actual blood pressure conditions. Also, the cuff does not tend to move along the appendage as the cuff bladder is repeatedly inflated and deflated.

Generally speaking, the invention resides in an improved configuration for a sphygmomanometric cuff. The cuff has an elongate, flexible body which has a length sufficient to be wrapped at least once around a desired appendage. The body either includes an inflatable bladder adjacent one end thereof or is provided with means for securing an inflatable bladder to the body adjacent one end of the body. The body, for along at least a major portion of its length, is arcuately curved to a selected radius of curvature. As a result, when the body is placed against a tapering human appendage or the like so that the concave edge of the body opens toward the narrow end of the appendage, when the body is wrapped around the appendage and secured to itself, and when the wrapped body is tensioned on the appendage, the body exerts substantially uniform pressure upon the area of the appendage covered by the body. The cuff also includes connector means carried by the body for securing the end of the body opposite from the bladder to an intermediate portion of the body in overlying relation of the end of the body to the intermediate portion when the body is wrapped around the appendage.

The above-mentioned and other features of the invention are more fully set forth in the following detailed explanation of the invention, which explanation is presented with reference to the accompanying drawing, wherein:

FIG. 1 is a plan view of a sphygmomanometric cuff according to this invention; and

FIG. 2 is an elevation view of the cuff in place on a human thigh, for example.

A sphygmomanometric cuff 10, shown in plan view in FIG. 1, includes a body 11 which has an elongate, arcuately curved planiform configuration when laid out flat on a table or the like. The body is basically inelastic and has substantial width transversely of its elongate extent. Preferably the body is made from two plies of woven nylon fabric or the like, the plies being stitched together, as at 12, along the periphery of the body. If desired, however, the body may be made from two plies of a flexible plastic such as a vinyl-base plastic film, secured together by fusing along their peripheries. The body has sufficient length between opposite ends 13 and 14 that it can be wrapped around a human appendage, such as thigh 15 shown in FIG. 2, at least once. The body has a convex edge 16 which is longer than opposite concave edge 17.

Stitching 12 is discontinuous, as at 19, for a selected distance along edge 17 adjacent to but spaced from end 13 of the body. A line of stitches 20 extends across the body at the end of area 19 toward end 14 of the body to secure the plies of the body together. Between stitching 20 and end 13, the body defines an internal pocket 21 open at 19 and sized to receive an inflatable sphygmomanometric bladder 22. The bladder preferably is made of an elastomeric material and may be inserted into the pocket through opening 19. The bladder includes two tubes 23 and 24 which extend from it to the exterior of the body through the opening of the pocket. The tubes carry suitable fittings 25, such as male Luer fittings, by which the tubes may be connected to a bulb 26 for inflating the bladder and to a suitable pressure gage, such as a mercury manometer 27, by which the air pressure in the bladder may be measured.

In the event that body 11 is made from two plies of air impervious plastic film, the bladder may be defined by forming a chamber between the plies adjacent one end of the body; the chamber would be equipped with suitable fittings for tubes 23 and 24.

Preferably, the bladder has sufficient length along the body that it extends around a substantial portion of the circumference of a human appendage or the like to which the cuff is applied as described below. Also, the body may be straight along the portion of its length which carries the inflatable bladder, but such a construction of a cuff in accord with this invention is not presently preferred; instead, it is preferred the bladder be shaped to match the shape of the body, the body being arcuately curved along its entire length, as illustrated.

The body of cuff 10 carries multi-directionally and multipositionally effective fastening or connector means for securing body end 14 relative to an intermediate portion 30 of the body. In the presently preferred cuff shown in the drawing, the fastening means is a Velcro fastener including two spaced strips of Velcro pile material 31 secured to one face 32 of the body transversely of the width of the body adjacent end 14. The fastening means also includes two arcuately curved strips of Velcro hook material 33 (the hook material being composed of a multitude of small barbs secured to a fabric backing) secured to the opposite face of the body along intermediate portion 30 adjacent to and parallel to body edges 16 and 17. Such a fastener, i.e., the pile and hook materials, is manufactured by American Velcro Company, Manchester, N.H. It should be understood, however, that any other suitable fastening means may be used in a cuff according to this invention without departing from the scope of the invention. A Velcro fastener is preferred, however, since it is infinitely adjustable and may be reused almost an infinite number of times.

Cuff 10 is used in a manner similar to the way in which a conventional sphygmomanometric cuff is used, but to great advantage, particularly upon a tapered human appendage such as an arm or thigh 15. The opened cuff is applied to the thigh, for example, at the desired location with convex edge 16 of the cuff disposed toward the thicker part of the thigh. The portion of body face 32 adjacent bladder 22 is placed against the thigh; the body is then wrapped around the thigh and secured on the thigh by use of the fastening means. The arcuate configuration of the body causes the applied cuff to conform closely to the contour of the tapered thigh. Ideally the cuff should be applied to the thigh so that the same degree of looseness between the thigh and the cuff exists along edge 16 as along edge 17. As a result, the pressure exerted by the cuff upon the thigh is substantially uniform over the entire area covered by the cuff when the bladder is inflated; if a conventional cuff were used, the cuff would be tighter toward the thicker part of the thigh adjacent the hip than toward the narrow portion of the thigh adjacent the knee. Because the pressure applied to the thigh by the cuff is uniform, the cuff does not tend to work itself downwardly along the thigh as the bladder is repeatedly inflated and deflated.

Preferably the curvature of body 11 is the same as the curvature which would exist in a development of a truncated cone having a taper equal to the taper of an average thigh. Even if the thigh to which cuff 10 is applied in any given case has a taper differing from the taper of an average thigh, the cuff conforms to the shape of the thigh to a markedly greater extent than would a conventional cuff. The use of multi-directionally and multi-positionally effective fastener means in cuff 10 further increases the ability of the cuff to conform to the contours of thighs of widely varying size and shape.

The use of cuff 10 has been described above with reference to a human thigh. It will also be understood that the cuff can be used to great advantage on the upper arm of a human; the utility of the cuff is particularly apparent when the cuff is used on the upper arm of an obese person—the upper arms of obese persons have a pronounced taper. Also, the cuff can be used to great advantage in medical research work upon animals such

as upon dogs which have essentially triangular thigh shapes.

By way of example only, a presently preferred form of the invention is a thigh cuff having a straight-line distance of 42 inches between the opposite ends of cuff edge 17 and a cuff body width of $7\frac{1}{4}$ inches; the curvature of this cuff is 8 inches measured from the midpoint of edge 17 to a line between the opposite ends of this edge of the body.

Body 11 includes a quantity of Velcro pile material 40 secured to face 32 centrally of pocket 21 to adapt the cuff for use with a blood pressure cuff transducer manufactured and sold by Dupaco Incorporated, Arcadia, Calif., in connection with the trademark "Daisyst."

Modifications to the structure described above within the scope of the invention will be apparent to workers in the art to which the invention pertains. Thus, the foregoing description, which has been presented for the purposes of example and illustration, should not be considered as limiting the scope of the invention.

What is claimed is:

1. In a sphygmomanometric cuff for use on a tapered appendage of a living being and including an elongate body fabricated principally of flexible material, means adjacent one end of the body for mounting an inflatable bladder to the body, and connector means carried by the body at the other end thereof and intermediate the length of the body for securing the other end of the body to said intermediate portion when the body is wrapped around an appendage so as to place said other end in overlapping relation to said intermediate portion, the improvement comprising, with respect to the planform configuration of the body, the body being curved transversely of its elongate extent along at least a major portion of its length from the other end thereof in accord with a selected radius of curvature to define opposite concave and convex longitudinal edges of the body.

2. A sphygmomanometric cuff according to claim 1 wherein said selected radius of curvature has a value corresponding to the taper of a selected appendage.

3. A sphygmomanometric cuff according to claim 2 wherein the body is arcuately curved along its entire length.

4. A sphygmomanometric cuff according to claim 2 including an inflatable bladder carried by the body by said mounting means.

5. A sphygmomanometric cuff according to claim 4 wherein the means for mounting the bladder comprises a pocket defined internally of the cuff adjacent said one end of the body and elongated in the direction of the elongate extent of the body.

6. A sphygmomanometric cuff according to claim 2 wherein said connector means are multi-positionally effective.

7. A sphygmomanometric cuff according to claim 6 wherein the connector means includes a quantity of pile material disposed transversely of the body adjacent the other end thereof on one side of the body, and a quantity of hook material disposed along the intermediate portion of the body on the other side of the body, the hook material comprising a multitude of small hooks secured to a fabric backing.

8. A sphygmomanometric cuff according to claim 2 wherein the bladder mounting means comprises a pocket defined within the body adjacent the one end of the body and elongated in the direction of the elongate extent of the body, the pocket having an opening to the concave longitudinal edge of the body, an inflatable bladder disposed in the pocket and including tube means extending therefrom through the opening, and wherein the connector means includes a quantity of pile material disposed transversely of one side of the body adjacent the other end of the body and a quantity of hook material disposed along the other side of the body along the in-

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intermediate portion, the hook material comprising a multitude of small hooks secured to a backing sheet.

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