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## DISPOSABLE SPHYGMOMANOMETER CUFF

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### ABSTRACT OF THE DISCLOSURE

Disposable cuffs of sphygmomanometers. The subject cuff is an elongated, flexible envelope which is readily separable from the inflatable bag it is adapted to enclose. Because of the improved structure of the subject envelope and the material of which it is made, cuffs of this invention are inexpensive. Accordingly, it is convenient and economically practical to discard the envelope-cuff after one use thereof.

### BACKGROUND OF THE INVENTION

#### Field of the invention

This invention pertains to cuffs of sphygmomanometers, the cuffs being adapted to encircle a person's arm in measuring blood pressure, and more particularly to an improved envelope-cuff from which an inflatable bag or bladder may be readily separated.

#### Description of the prior art

Sphygmomanometers have become standard instruments for measuring blood pressure, as a factor in diagnosing the condition of persons in both good and ill health. Many ill persons have contagious skin disorders or diseases which might contaminate the cuff. Others have sores or other ailments which soil the cuff, and failure to clean cuffs after each use greatly raises the possibility of cross-infection between patients.

Regular cleaning or sterilizing such cuffs has proven to be impractical, because in most cuffs of the prior art, the essential inflatable bag had to be removed before and re-inserted after each cleaning or sterilization, which was both time consuming and expensive due to the cost of labor. Alternatively, the bag was either permanently secured within the cuff envelope or was an integral part of the cuff material. These and other cuffs were designed for repeated use; consequently, they were relatively expensive, and to discard them after use was economically impractical.

Sphygmomanometer cuffs have been improved in a variety of ways, generally for the purpose of producing more accurate measurements or of being easier to apply to a person's arm or thigh. Particularly, there has been much development of novel means for releasably securing one end of the cuff strip to the remote end it overlaps when wrapped around the arm or thigh. These changes and variations have greatly benefited the users, but a significant undesirable result has been the increased cost of the product. This development toward more sophisticated cuffs leads away from a solution to the problem posed above; thus no prior art cuffs have met the operational standards required, while also being inexpensive enough in design and cost of both component material and manner of manufacture, to be economically disposable after a single use.

The standards required for sphygmomanometer apparatus, cuffs and method of pressure measurement are to insure accurate and reliable measurements, regardless of who the patient and physician are, and when the measurement is taken. Typically, the cuff is a fabric strip wrapped around a person's upper arm with a bladder in

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or attached to the strip and positioned on the inside of the arm next to the body. The flexible cuff and bladder conform to the shape of the arm, with the approximate midpoint of the bladder's circumferential length being adjacent the brachial artery for which the blood pressure is measured. Air under pressure usually produced by a bulb inflates the bladder which causes the cuffs to tighten about the arm, constricting the brachial artery until its blood flow is stopped. Subsequently, the systolic and diastolic pressures are determined in a manner well known to those acquainted with the subject matter.

To achieve accurate pressure measurements, it has been determined that substantially uniform pressure should be applied to the arm through the cuff. The bladder must cover a proper area of the arm, which for an adult is approximately 23 cm. in circumferential length by 13 cm. in width. The cuff width corresponds closely to the bladder width and has been so selected because width too wide or too narrow will produce inaccurate pressure readings too low or too high respectively.

The present invention satisfies all of these standards, while utilizing an entirely new type of cuff envelope which encases and supports the bladder as required, but is easily openable and separable from the bladder. Furthermore, it has been discovered that a reinforced paper material functions satisfactorily as the component material of this new form of envelope which is consequently so inexpensive to manufacture, that it is economically practical to discard the cuff after a single use. More specifically, the cost of manufacture could be substantially less than the labor expense to clean a prior art cuff.

### SUMMARY OF THE INVENTION

In accordance with the teachings of the present invention, a novel cuff for use with a sphygmomanometer is formed as an envelope comprising three overlying fabric layers within which an inflatable bag or bladder is readily insertable and removable. The layers or panels may be three separate elements adhered together, or a single sheet having its borders folded in mutually overlying relationship. In the former case the layers include a central longitudinal portion, a second layer lying generally flat against the central portion with one side edge of each being adjacent and secured together, and a third layer overlying the first two layers and having one edge adjacent and secured to the remaining free edge of the central portion. In either case, the end parts of all three layers are secured together, while the unsecured side edges of the second and third layers are openable from each other and from the first layer to define an opening for insertion and removal of the bladder. An aperture is provided in the envelope for connection to the bladder from an air source; and means are provided on at least one end part of the cuff for detachable connection to the remaining part when the cuff is encircled about a person's limb in fixed conforming position.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a sphygmomanometer cuff embodying the invention with the cuff partially opened for the purpose of showing the bag encased therein;

FIG. 2 is a fragmentary perspective view of the cuff encircling a person's arm;

FIG. 3 is a fragmentary perspective detail of one end of the assembled cuff;

FIG. 4 is a version of the detail of FIG. 3;

FIG. 5 is a fragmentary perspective view of the paper fabric used in the cuff; and

FIG. 6 is a plan view of the fabric blank for a cuff.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 the preferred embodiment of this invention is shown, wherein the cuff envelope 1 is partially opened and encases a bladder 2. Prior to fabrication, the envelope is formed of a single sheet of flexible material which is a rectangular blank 4, as shown in FIG. 6. The blank has a central longitudinal panel 5 bounded by end parts 5a and 5b, and border panels 6 and 8. These three panels have between them longitudinal, intersectional fold lines 7 and 9, and the borders have end parts 6a, 6b, 8a and 8b, respectively. A band of adhesive 10 lies along the surface of the end parts of all three panels.

When the envelope is fabricated from blank 4, central panel 5 becomes a first layer, panel 6 is folded as a second layer against panel 5, and panel 8 is folded as a third layer against the first two layers. In this fabricated form, end parts 6a and 6b of panel 6 are adhered to end parts 5a and 5b respectively of panel 5, and end parts 8a and 8b of panel 8 are adhered to adjacent parts 5a, 5b, 6a and 6b. Edge 14 of the second fabric layer is curved or cut away to provide easier access to the envelope's interior for insertion or removal of the bladder. Apertures 13 through which the inlet and outlet air tubes 17 of the bladder extend, are about 1/2 inch in diameter and spaced 1 3/8 inches apart.

In a variation of this embodiment a pocket is formed within the envelope by securing panel 6 to panel 5 along two parallel lines, spaced apart a distance approximately equal to the bag length, each line being generally normal to the longitudinal axis of the cuff panels. One of the two lines defining the side edges of this pocket might be the junction line of end parts 6a and 5a.

The front and rear surfaces of the pocket are formed by portions of the three panels in their mutually overlying relationship, the pocket's bottom and top edges being portions of the fold lines 7 and 9 respectively. The pocket is approximately 9 1/8 inches long by 5 3/8 inches high, these dimensions being about 1/4 inch greater than a corresponding standard size bladder. Panel 6 might be further secured to panel 5 along a longitudinal line if greater stability of the envelope is desired.

The end parts of the three layers may be secured together with adhesive, as shown in FIG. 3, in the position resulting from the original folding of borders 6 and 8 into overlying relation, or as shown in FIGURE 4, in their position after being further folded for a more secure joint. Sewing is another satisfactory method for joining the panels.

It should be noted that with the end parts of the three layers being secured together, the envelope (when encircling an arm) will provide radial support for the front and rear surfaces of the bladder to prevent it from ballooning as pressure develops during inflation. Furthermore, friction develops between the overlapped panels inhibiting their separation. The length and width dimensions of the pocket, if utilized, are slightly greater than those of the bladder to provide substantial convenience for insertion and removal of the bladder; however, the fit is still reasonably close to provide support on all sides from stretching in these directions during inflation.

When the cuff is in use as shown in FIG. 2, the end of the envelope containing the bladder is placed against the side of the arm, the air inlet and outlet tubes extend downward, and the remainder of the strip is wrapped around until the remote end overlaps the first end. This remote end is adhered in its overlying relationship by an adhesive 18, which until use is covered and protected by an easily removable strip 19 shown in FIG. 1. Obviously, any one of a variety of other connection means might be employed, a common one being Velcro fastening material, which utilizes two mating parts, one having a plurality of tiny, flexible hooks and the other having a plurality of loops.

In accordance with an object of this invention, to provide a cuff that is economically disposable after a single use, it was necessary that the fabric material have strength and flexibility comparable to cloth of prior art cuffs, be very inexpensive in cost and be practically adaptable for fabrication into the structure described above. A material found suitable for these requirements is a laminate of cellulose sheets and a web of strong threads, sold under the trademark, Kaycel (made by Kimberly-Stevens Corporation, with offices at 261 Madison Avenue, New York, N.Y.). Kaycel is a fabric comprising a matrix or web of threads, with that least one layer of cellulose sheet material bonded to each side of the thread matrix. This thread matrix comprises one layer of spaced, parallel threads normal to and overlying or woven with a second similar layer. Since the cellulose selected has a soft texture, the resulting product appears and feels similar to cloth. In the direction of the threads, the fabric has tensile strength corresponding primarily to the thread diameter and base material, examples of which might be nylon, cotton and rayon. The sheet material may be selected from many materials, including cloth, plastic and non-woven fabrics with the preference being a soft-textured cellulose sheet, treatable for water repellency and abrasion resistance. A flexible sheet material without an additional thread matrix might be used where its physical characteristics are suitable.

Because this Kaycel fabric is basically cellulose and thread, it is particularly lightweight, while being substantially stronger than ordinary paper, tissue or even cloth fabric having threads less strong than those of the threaded matrix of this reinforced material. Furthermore, because the layers are bonded together about the matrix there is little likelihood of raveling, separation of the layers, or disarrangement of the threads. A fragmentary portion of the Kaycel material is shown in FIG. 5 where elements 20 and 21 represent a double layer of cellulose sheet material, 22 is a matrix of nylon yarns, and 23 and 24 represent another double layer cellulose sheet material. These five elements are bonded together, forming a cloth-like fabric that has high tensile strength in both directions that the yarns lie.

As mentioned above, in order for the final product to be economically disposable, it was necessary that this inexpensive material be adaptable for particularly inexpensive means of fabrication, and for this purpose the Kaycel fabric or its equivalent is particularly well suited. Surfaces of the envelope blank formed from this paper-type fabric are easily secured to each other by ordinary adhesives. For the type of cuff envelope described above and disclosed in the drawings of this invention, the cuff blank can have bands of adhesive applied in selected areas, which when folded to lie against each other, will remain secured merely upon pressure contact. In one adhesive-securing arrangement a removable cover strip protects each band of adhesive until the time of fabrication when the strip is easily removable immediately before the surfaces are joined. Even the end part of the strip which is wrapped around the arm and overlapped with the remainder of the envelope, may be adhered with this same type adhesive.

The adhesive described above is quite suitable for securing this paper material and is inexpensive in contrast to other fabrics which are not adapted to adhesive-securing means, and require instead, more expensive connection means such as hooks or other hardware or Velcro connectors. Furthermore, each of the above-mentioned connection means, other than adhesive, requires mating parts, one part being on each surface to be joined. As indicated above, the adhesive for the present invention need be placed on only one surface, to be totally effective.

It will be understood that the above description of the present invention is susceptible to various modifications, changes, and adaptations, and the same are intended to be comprehended within the spirit of the invention and

within the meaning and range of equivalents of the appended claims.

I claim:

1. A disposable cuff of flexible fabric material adapted to encase and retain the inflatable bag of a sphygmomanometer in operative relation to a human limb and to encircle the limb in fixed conforming position thereon, comprising:

- (a) first, second and third elongate panels in mutually overlying relationship, each panel having two longitudinal side edges and two ends,
- (b) the second panel having one of its side edges and its ends secured to the corresponding parts of the first panel,
- (c) the third panel having one its side edges secured to the free edge of the first panel, and its ends secured to the corresponding joined ends of the first two panels, and
- (d) the second and third panels extending inwardly of the edges of the first panel, forming an envelope with the unsecured edges of the second and third panels being openable to define an opening enabling the insertion and removal of the inflatable bag between the panels, at least one panel of said envelope having an aperture providing a connection to the inflatable bag from an air source.

2. A cuff as defined in claim 1 wherein said three panels comprise a single sheet of fabric, the first panel being a central elongate portion of the sheet, the second and third panels being border portions of the first panel folded inwardly in said mutually overlying relationship.

3. A cuff as defined in claim 1 wherein portions of the first and second panels comprise the rear and front surfaces of a pocket for said inflatable bag, said surfaces being secured together along two spaced junction lines transverse to the panel length defining the side edges of the pocket, the secured ends of said panels defining one of the transverse junction lines, and portions of the secured longitudinal edges of the panels defining the top and bottom edges of the pocket, the length and width dimensions of said pocket conforming closely to corresponding dimensions of said bag.

4. A cuff as defined in claim 3 wherein at least one of each pair of said secured edges or surfaces includes a pressure sensitive adhesive, whereby said pairs of edges or surfaces are secured together upon pressure contact thereof.

5. A cuff as defined in claim 1 wherein the fabric is an inexpensive cellulose-base material having tensile strength adequate to prevent deformation of the cuff from its basic envelope configuration when the encased bag is inflated the structure of this cuff, and the fabric adaptable for

said structure rendering the cuff economically discardable after a single use.

6. A cuff as defined in claim 5 wherein the fabric of said panels is a laminate comprising at least two sheets of cellulose-base material and a web of threads secured between said sheets, the threads having tensile strength relatively greater than said sheet material.

7. A cuff as defined in claim 6 wherein said threads are generally parallel to and equally spaced from each other in the longitudinal and transverse axes, and said threads are synthetic material.

8. A cuff as defined in claim 6 wherein said cellulose-base material is cellulose wadding providing a cloth-like texture to said fabric.

9. A cuff as defined in claim 1 wherein the second and third panels are overlapped along their length, the width of the overlap being at least one inch, thereby providing frictional contact surfaces resistant to separation when the bladder is inflated, while still permitting the bladder to be readily separable from the envelope.

10. A cuff as defined in claim 1 wherein

(a) the three panels comprise a single sheet of fabric, the first panel being a central elongate portion of the sheet, the second and third panels being border portions of the first panel folded inwardly in said mutually overlying relationship,

(b) the fabric is a laminate comprising at least two sheets of inexpensive cellulose-base material, and bonded between them a web of spaced, longitudinal spaced, transverse threads, the fabric having adequate tensile strength to prevent deformation of the cuff from its basic envelope configuration when the encased bag is inflated,

(c) the ends of said cuff are overlapped when said cuff encircles a limb, and a pressure-sensitive adhesive is provided on at least one surface of the overlapping ends for detachably securing them together, and

(d) said structure, and said fabric adaptable for such structure rendering the cuff economically discardable after a single use.

#### References Cited

##### UNITED STATES PATENTS

|           |         |                |             |
|-----------|---------|----------------|-------------|
| 2,249,320 | 7/1941  | McGehee        | 128—2.05    |
| 2,332,488 | 10/1943 | Newton         | 128—2.05 XR |
| 2,540,163 | 2/1951  | Brosene et al. | 128—2.05    |
| 2,582,123 | 1/1952  | Heitz          | 128—2.05    |
| 2,678,040 | 5/1954  | Poole et al.   | 128—2.05    |

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