

Oct. 18, 1966

A. W. SCHENKER
LIMB ENCIRCLING DEVICE

3,279,459

Filed Dec. 14, 1964

3 Sheets-Sheet 1

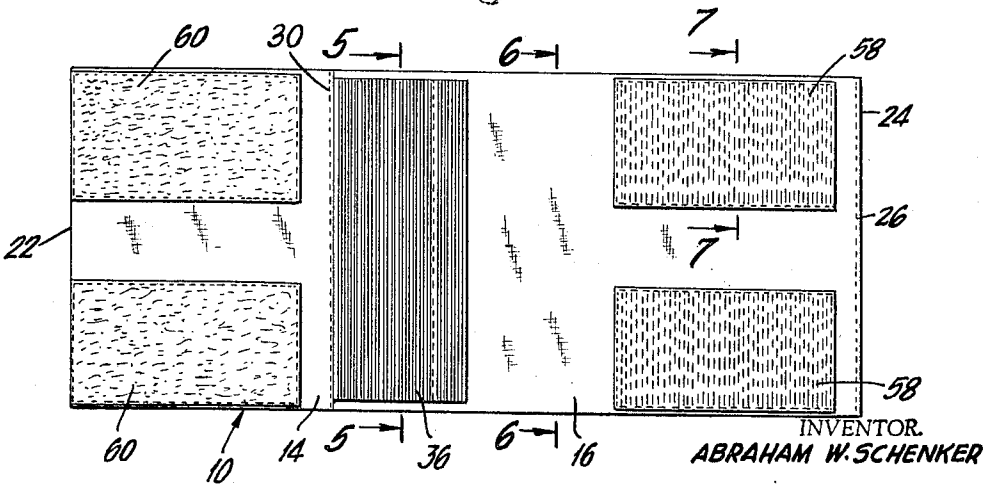
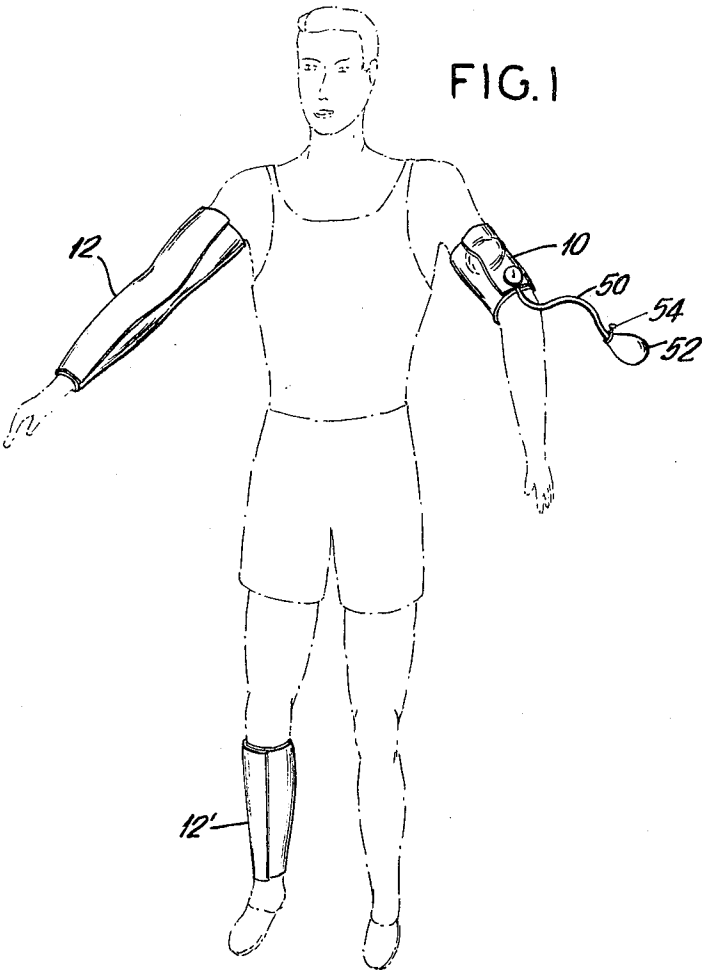


FIG. 2

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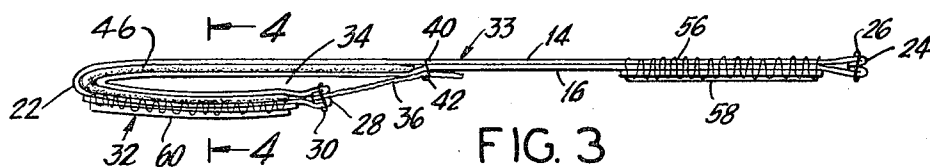


FIG. 3

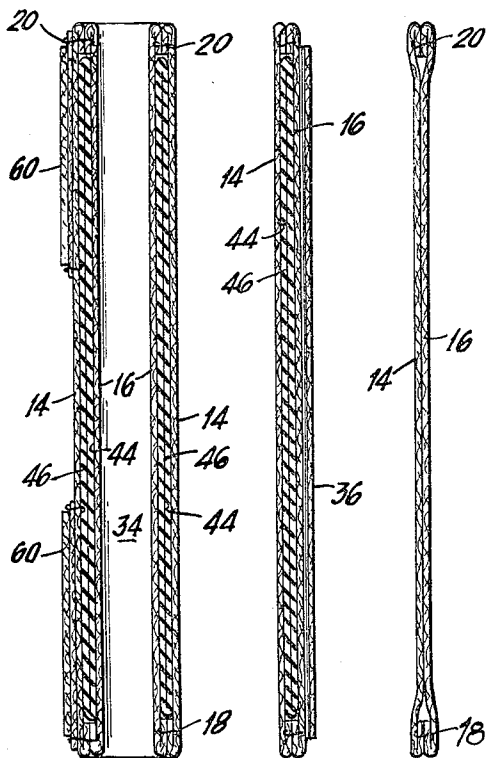


FIG. 4 FIG. 5 FIG. 6

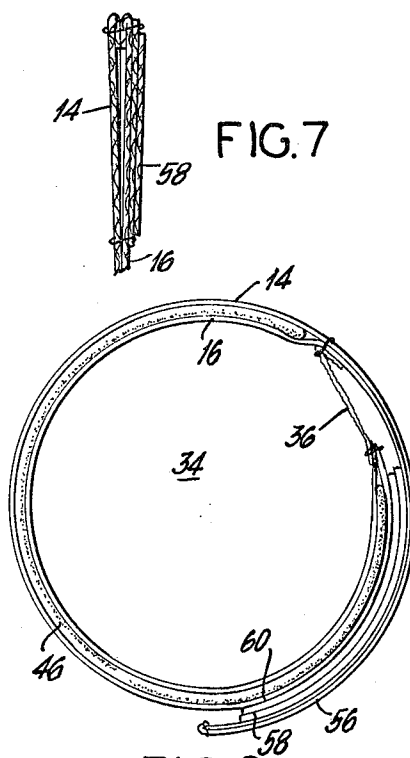


FIG. 8

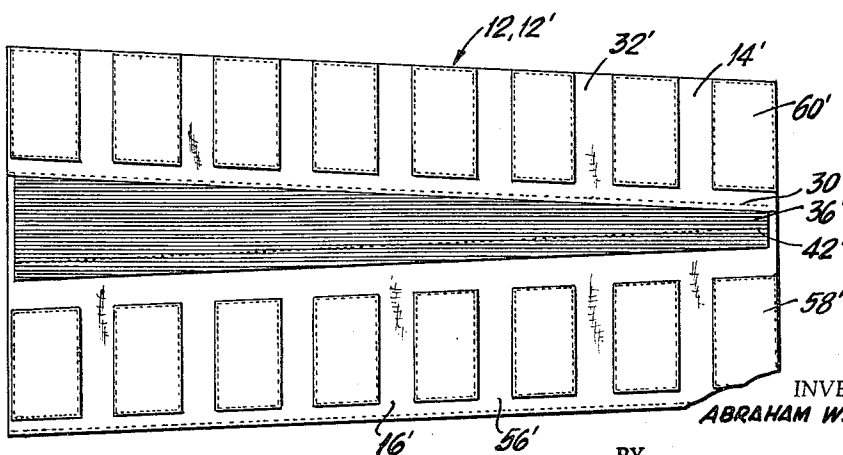


FIG. 9

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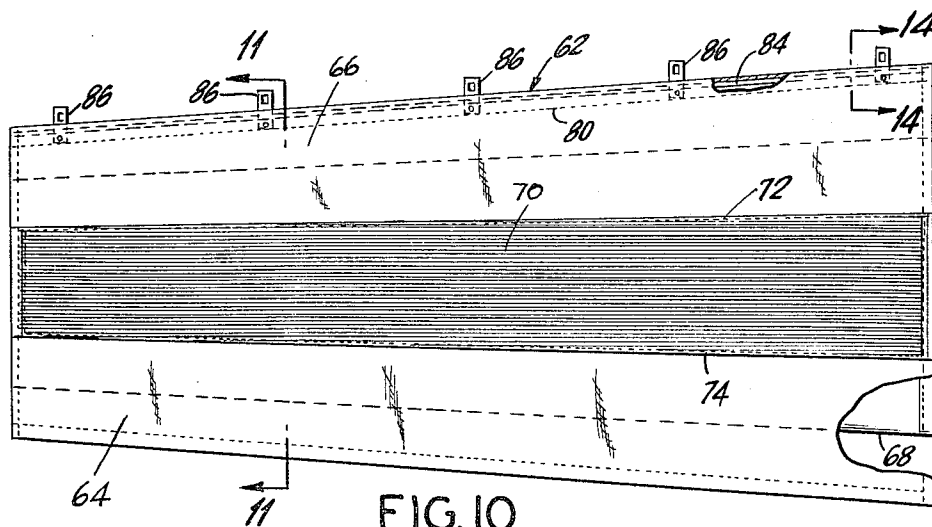


FIG. 10

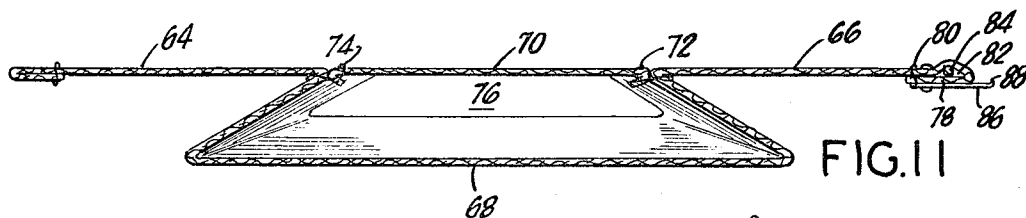


FIG. 11

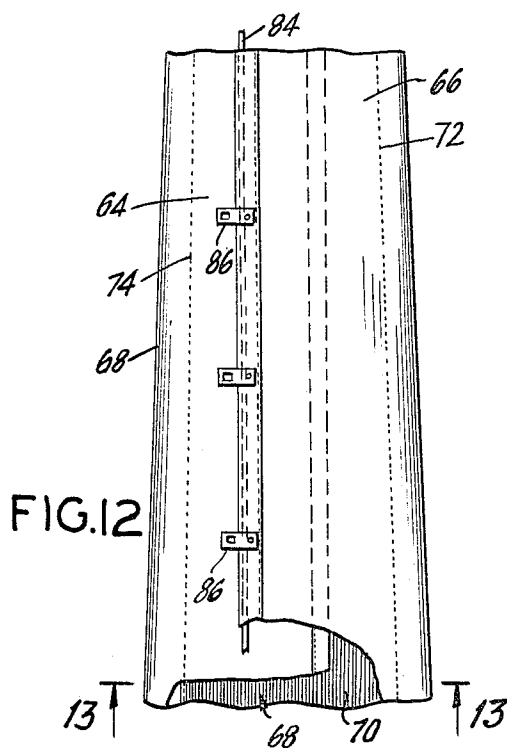


FIG. 12

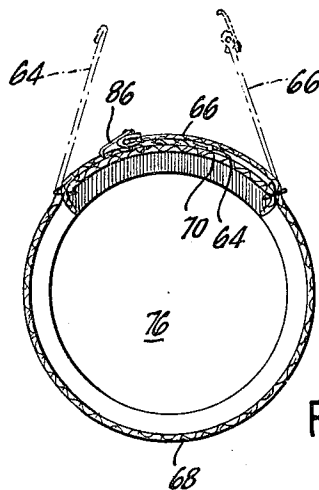


FIG. 13

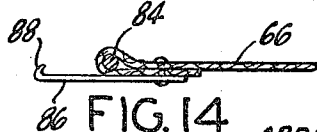


FIG. 14

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LIMB ENCIRCLING DEVICE

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6 Claims. (Cl. 128—2.05)

This invention relates to cuffs, sleeves and leggings for encircling the limbs of a person for determining blood pressures or for the prevention and treatment of edema.

Hypertension or elevated blood pressure is an extremely common ailment especially among older persons although younger persons are by no means exempt. There are various forms of hypertension but in all cases the onset is insidious so that in the early stages no symptoms are present and the patient normally is unaware of its existence unless the patient happens to be undergoing a routine physical examination. If the hypertension is sufficiently advanced, symptoms will develop which will bring the patient to the doctor who then apprises the patient of his condition.

When elevated blood pressure is diagnosed, it is customary for the doctor to place the patient on a regimen of medication and diet and the patient is advised to see the doctor at regular intervals for the checking of his blood pressure. Medication and diet are then adjusted in accordance with the progress of the patient which requires frequent doctor visits that are usually inconvenient and costly.

One of the objects of the present invention is to provide means whereby the patient can take his own blood pressure without any assistance thereby enabling more frequent determinations of blood pressure without the inconvenience and expense of frequent visits to the doctor. The patient can thus not only determine in advance whether his blood pressure is within normal limits, but can also determine if it is raised beyond the normal limits and communicate his findings to his doctor who now need not see the patient as frequently as was necessary heretofore.

A more specific object of my invention is to provide a blood pressure cuff which is so constructed that the patient himself can slip it on to his upper arm with his free hand and then releasably lock it in position, thereby enabling him to inflate the cuff without any assistance to take his own blood pressure.

During development of my blood pressure cuff, I discovered that it could be modified to a sleeve or legging for treatment of edema conditions. As is well known among doctors, following the radical surgical removal of the breast, usually because of cancer, the whole upper extremity on the side of the breast frequently becomes edematous, often very severely so. Edema may set in within hours after surgery. After edema has developed it may persist for varying lengths of time and prolonged treatment may be required before the edema subsides.

A further object of the invention is to provide means to prevent the development of immediate post operative edema. This is accomplished by applying my sleeve around the involved upper extremity as soon as the patient returns to the ward from the recovery room.

In congestive heart failure or severe renal disease, edema of the lower extremity is one of the cardinal signs. Similar signs accompany severe venous stasis and in some cases of arthritis involving the lower extremities. Edema also invariably results for fractures of the long bones. In all of these cases, the edema is markedly lessened or absent in the morning after a night's rest in bed. The edema which sets in shortly after arising becomes progressively more marked as the day wears on while the patient is in the upright position and physically active.

Another object of the invention is to provide means to

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prevent the spreading of edema by applying the legging of the invention around the lower extremity immediately upon arising in the morning from the recumbent overnight position.

A further object is to provide an expansible sleeve or legging which can be easily positioned around the upper or lower limb, as desired, and then readily locked in such position to prevent further expansion of the sleeve or legging due to filling of the limb with edematous fluid.

The above and other objects, features and advantages of the invention will be more fully understood from the following description of the invention considered in connection with the accompanying drawings of illustrative embodiments of the invention.

In the drawings:

FIG. 1 is a perspective view of a patient with the cuff, sleeve and legging of the present invention in operative encircling position on the limbs of the patient;

FIG. 2 is a top plan view of the cuff of the present invention with the cuff in open extended position;

FIG. 3 is a view edgewise of the cuff of FIG. 2;

FIG. 4 is a sectional view taken on line 4—4 of FIG. 3;

FIG. 5 is a sectional view taken on line 5—5 of FIG. 2;

FIG. 6 is a sectional view taken on line 6—6 of FIG. 2;

FIG. 7 is a sectional view taken on line 7—7 of FIG. 2;

FIG. 8 is an end view of the cuff in its limb encircling position;

FIG. 9 is a top plan view of a modified cuff, forming a sleeve or legging, in open extended position;

FIG. 10 is a top plan view of another form of sleeve or legging, in open extended position;

FIG. 11 is a cross section taken on line 11—11 of FIG. 10;

FIG. 12 is a top plan view of the sleeve or legging of FIG. 10 in an operative limb encircling position;

FIG. 13 is a cross section taken on line 13—13 of FIG. 12; and

FIG. 14 is a sectional view taken on line 14—14 of FIG. 10.

Referring now to the drawings in detail, the cuff in FIG. 1 is identified by the reference numeral 10, the sleeve by the reference numeral 12, and the legging by the reference numeral 12'. The cuff comprises two longitudinally extending strips 14 and 16 of nonstretchable material which are in confronting face-to-face relation and are sewn to each other along their opposite longitudinal edges by rows of longitudinal stitching 18 and 20. The strips are rectangular in form and are made of a suitable fabric, for example cotton, muslin, linen, nylon, etc. At one end of the cuff, the strips are folded over along fold 22 (FIG. 3) and extend back in the opposite direction toward the opposite end 24 of the cuff. The ends of strips 14 and 16 forming end 24 are stitched to each other by a transverse row of stitching 26. The opposite ends 28 of strips 14 and 16 are also stitched to each other by a transverse row of stitching 30. The folded over portion 32 of the cuff extends about one-third of the length of the cuff toward its end 24 and is in confronting relation with the opposite part of the main body part 33 of the cuff and is separate therefrom to form circular passage 34 through which the limb of the patient may extend, as will be more clearly seen hereinafter. A stretchable strip of material 36 interconnects end 28 of the cuff with the main body part 33 of the cuff at a position 40 which is slightly less than midway of the length of said body part. A transverse row of stitching 42 joins one end of the stretchable strip 36 to body part 33 and the opposite end of the strip is joined to end 28 by stitching 30. Stretchable strip 36 permits passage 34 to be expanded to accommodate various limb diameters.

The space formed between strips 14 and 16 and ex-

tending from stitching 30 to stitching 42 forms a pocket 44 for a conventional inflatable bladder 46 having the usual tube 50, the inflating hand bulb 52 and valve 54. Inflation of the bladder causes tightening of the encircling cuff around the limb. The bladder is removable from and insertable in pocket 44 through an opening (not shown) in stitching 20.

Means are provided to removably secure the flap end 56 of main body part 33 of the cuff to folded over portion 32 thereby preventing further stretching of strip 36 so that the cuff is easily converted from an expansible condition to a non-expansible condition to permit the inflation of the bladder and the resulting application of pressure around the upper part of the arm for the taking of the patient's blood pressure. It is to be observed that the cuff is expansible to accommodate different diameter arms and thereafter when it has been placed in position by the patient, it is easily converted to a non-expansible cuff.

The securing means comprises the material known by the trademark "Velcro" of Velcro S. A., Fribourg, Switzerland, and is illustrated and described in U.S. Patent No. 2,717,437 issued Sept. 13, 1955. A pair of Velcro patches 58 are suitably sewn to the inner surface of flap 56 and comating a pair of Velcro patches 60 are suitably sewn to the outer surface of the folded over portion 32. To removably secure flap 56 to portion 32, the flap is brought into surface contact with portion 32 so that patches 58 and 60 are in surface-to-surface contact and thereby engage with one another to releasably hold flap 56 to portion 32, as best illustrated in FIG. 8, thereby rendering stretchable strip 36 inoperative. Thereafter the cuff, which is now non-expansible, may be inflated by operating hand bulb 52. It will be readily apparent that the patient can easily perform the above described functions without any assistance from others.

A modification of cuff 10 is shown in FIG. 9 so that it is suitable as a sleeve or legging 12, 12'. In the form shown in said figure, there is no need for an inflatable bladder since the sleeve or legging is placed by the patient around his limb and is thereafter fixed in position by joining flap 56' to part 32' in the exact same manner as previously described with respect to cuff 10. No air inflation is necessary. It is to be noted that all parts of the sleeve or legging may be tapered or shaped to accommodate the varying contours of the arm or leg. In all other respects the sleeve or legging is similar to the cuff and corresponding parts have been designated by corresponding numbers which are primed.

It will be understood that while the sleeve has been shown as extending from the wrist to the axilla, it is within the scope of the invention to extend it only to the elbow or from the elbow to the axilla. Similarly, while the legging has been shown as extending only to the knee, it is within the scope of the invention to extend it to the thigh. The sleeve or legging may also be applied around the foot. The foregoing also applies to the form of the sleeve or legging 62 illustrated in FIGS. 10 to 14.

Sleeve or legging 62 is similar to sleeve or legging 12, 12' except that another flap 64 is provided to which flap 66 is secured to render the sleeve inelastic or nonexpansible. Additional differences will become clearer as the description progresses. The sleeve or legging comprises a tapered strip of a suitable nonstretchable fabric 68, for example cotton, muslin, linen, nylon, etc. About one-fifth of the distance inwardly from each outer longitudinal edge of strip 68, a tapered strip 70 of a suitable stretchable fabric is secured, in confronting relation, to strip 68, by longitudinally extending rows of stitching 72 and 74. As a result, a converging circular passage 76 is formed by stretchable strip 70 and the portion of nonstretchable strip 68 between stitching 72 and 74, and the remaining portions of strip 68 provide outwardly and oppositely extending flaps 64 and 66. Passage 76 is for the person's

limb and the contour of the passage is for accommodating and conforming to the convergence of the limb.

The longitudinal edge 78 of flap 66 is turned over and is secured by a longitudinal row of stitching 80 to form a longitudinally extending channel 82 for a stiffening member or rod 84. A series of longitudinally spaced metal closure clips 86 having sharp fabric engaging teeth 88 are riveted to the edge of flap 66. Rod 84 distributes the closure force of clips 86 evenly along the edge of flap 66 so that an even limb encircling force is applied along the length of the limb.

In the use of sleeve or legging 62, the patient places his limb through passage 76 which accommodates itself to the contour of the limb because of the stretch fabric 70. After the sleeve or legging is in place, flap 64 is folded against strip 70, as illustrated by FIG. 13, and then flap 66 is folded against flap 64 and the pointed ends 88 of clips 86 engage flap 64 and hold flap 66 tightly in place. The two layers of material provided by flap 64 and stretch fabric 79 insure that the sharp ends of the clips do not touch the patient's skin.

While I have shown and described the presently preferred embodiments of the invention, it will be understood that the invention may be embodied otherwise than as herein shown or described and that changes may be made in accordance with the scope of the claims. For example, the flap 56' of the sleeve or legging 12, 12' of FIG. 9 may be provided with slits positioned between one or more of the patches 58' to prevent gathering of the material of the flap along its longitudinal edge when the sleeve or legging is locked in position around the wearer's limb. Other changes will be obvious to those skilled in the art.

What is claimed is:

1. A device for encircling the limb of a wearer comprising: a pair of confronting strips of nonstretchable fabric secured to each other along their edges to form a nonstretchable fabric strip, a strip of stretchable fabric having opposite side edges secured to said nonstretchable strip in confronting relation therewith to form an expansible passage for the wearer's limb, said nonstretchable strip having a flap portion extending from one side edge of said stretchable strip and movable to a position in covering overlying relation with said stretchable strip and the portion of said non-stretchable strip extending from the opposite side edges of said stretchable strips, an inflatable bladder positioned between said confronting strips of non-stretchable fabric, and means on said flap to secure it in said covering overlying position to said last mentioned portion of said nonstretchable strip to thereby render said passage nonexpansible.

2. A device for encircling the limb of a wearer comprising: a pair of rectangular shaped nonstretchable confronting strips of fabric secured to each other along their periphery to form a rectangular shaped strip of nonstretchable fabric, a portion of said strip being folded over into confronting relation with a portion of the remaining part of said strip, a strip of stretchable fabric having opposite side edges, one of said side edges being secured to the end of said folded over portion and the opposite side edge being secured to said remaining part of said nonstretchable strip at a position inwardly from the end of said remaining part to form an expansible passage for the wearer's limb, said portion of said remaining part of said nonstretchable fabric between said end thereof and said position providing a flap which is movable into a position overlying and covering said stretchable strip and a portion of said folded over portion, and means on said flap for releasably securing it to said last mentioned portion of said folded over portion in said overlying covering relation to thereby render said passage inexpandible.

3. A device for encircling the limb of a wearer comprising: a pair of rectangular shaped nonstretchable confronting strips of fabric secured to each other along their periphery to form a rectangular shaped strip of non-

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stretchable fabric, a portion of said strip being folded over into confronting relation with a portion of the remaining part of said strip, a strip of stretchable fabric having opposite side edges, one of said side edges being secured to the end of said folded over portion and the opposite side edge being secured to said remaining part of said nonstretchable strip at a position inwardly from the end of said remaining part to form an expansible passage for the wearer's limb, said portion of said remaining part of said nonstretchable fabric between said end thereof and said position providing a flap which is movable into a position overlying and covering said stretchable strip and a portion of said folded over portion, an inflatable bladder positioned between said pair of nonstretchable confronting strips and extending between said side edges of said stretchable strip, and means on said flap for releasably securing it to said last mentioned portion of said folded over portion in said overlying covering relation to thereby render said passage inexpandible.

4. A device for encircling the limb of a wearer comprising: a pair of rectangular shaped nonstretchable confronting strips of fabric secured to each other along their periphery to form a rectangular shaped strip of nonstretchable fabric, a portion of said strip being folded over into confronting relation with a portion of the remaining part of said strip, a strip of stretchable fabric having opposite side edges, one of said side edges being secured to the end of said folded over portion and the opposite side edge being secured to said remaining part of said nonstretchable strip at a position inwardly from the end of said remaining part to form an expansible passage for the wearer's limb, said portion of said remaining part of said nonstretchable fabric between said end thereof and said position providing a flap which is movable into a position overlying and covering said stretchable strip and a portion of said folded over portion, an inflatable bladder positioned between said pair of nonstretchable confronting strips and extending between said side edges of said stretchable strip, and cooperating means on said flap and on said last mentioned portion of said folded over portion for releasably securing said flap to said last mentioned portion in said overlying covering relation to thereby render said passage inexpandible, said cooperating means comprising pieces of fabric.

5. A device for encircling the limb of a wearer comprising: a tapered elongated strip of nonstretchable fabric, a tapered elongated strip of stretchable fabric in confronting relation with said nonstretchable strip and having a width less than the width of said nonstretchable strip

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and having opposite longitudinal side edges positioned inwardly of the opposite side edges of said nonstretchable strip, said side edges of said stretchable strip being secured to said nonstretchable strip inwardly of said side edges of said nonstretchable strip to form a longitudinally extending converging passage for the wearer's limb and to form opposite flap portions of nonstretchable fabric extending from said side edges of said stretchable strip, and fastening means attached to one of said flap portions along the side edge thereof, said flap portions being movable to overlying superimposed positions covering said stretchable strip for releasably securing said one flap portion to said other flap portion in said overlying covering position to thereby render said passage inexpandible.

6. A device for encircling the limb of a wearer comprising: a tapered elongated strip of nonstretchable fabric, a tapered elongated strip of stretchable fabric in confronting relation with said nonstretchable strip and having a width less than the width of said nonstretchable strip and having opposite longitudinal side edges positioned inwardly of the opposite side edges of said nonstretchable strip, said side edges of said stretchable strip being secured to said nonstretchable strip inwardly of said side edges of said nonstretchable strip to form a longitudinally extending converging passage for the wearer's limb and to form opposite flap portions of nonstretchable fabric extending from said side edges of said stretchable strip, and fastening means attached to one of said flap portions along the side edge thereof, said flap portions being movable to overlying superimposed positions covering said stretchable strip for releasably securing said one flap portion to said other flap portion in said overlying covering position to thereby render said passage inexpandible, said fastening means comprising, a series of longitudinally spaced clips having fabric engaging teeth to engage said other flap portion, and an elongated stiffening member extending longitudinally of said clips along said one flap portion side edge and secured to the latter.

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