

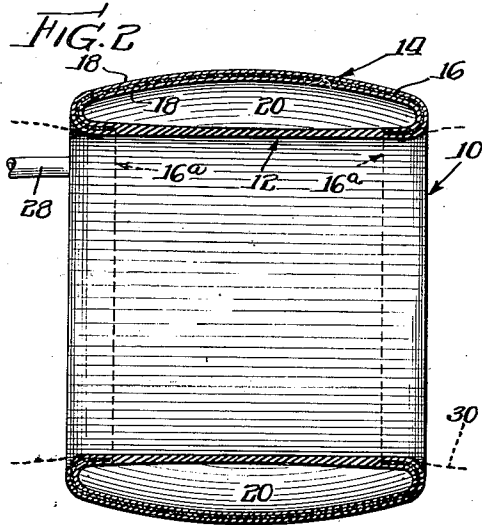
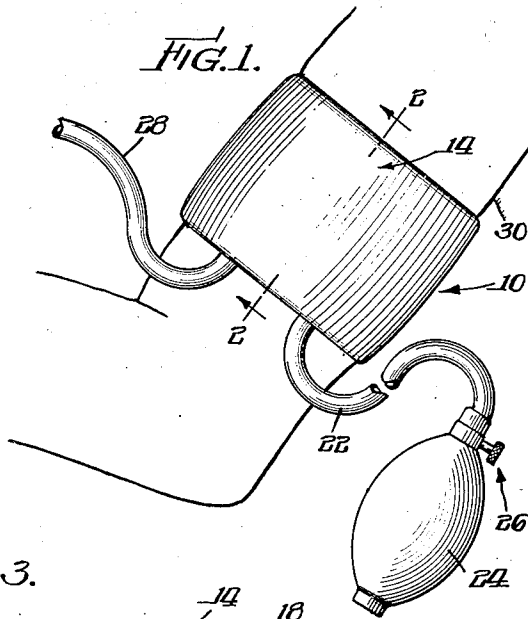
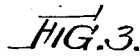
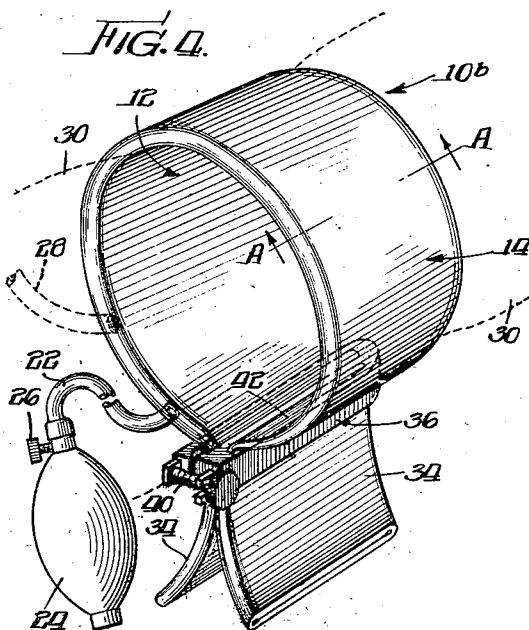
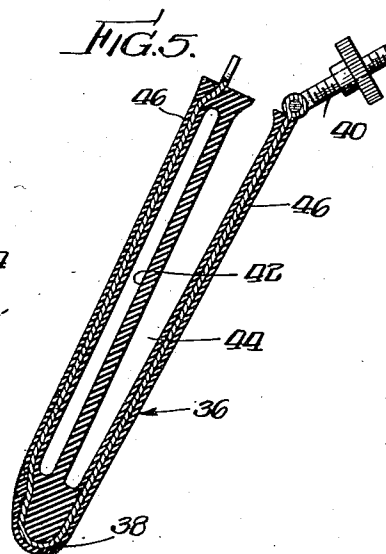
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PNEUMATIC APPLIANCE

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PNEUMATIC APPLIANCE

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5 Claims. (Cl. 128—327)

My invention relates generally to pneumatic appliances adapted for use with blood pressure apparatus and also for use as a tourniquet. More particularly, the invention contemplates the provision of improved pneumatic means or sleeves adapted for convenient application to a patient's limb.

Conventional types of blood pressure apparatus, commonly referred to as sphygmomanometers, are usually equipped with a pneumatic device consisting of a rubber bladder enclosed within a fabric bag. One end of the bag is formed with a bandage section which is designed to be wrapped around the patient's limb, such as the arm, and the free end of the bandage is tucked under the wrappings to secure the bladder in proper position. The bladder is then inflated to cause an expansion thereof toward the arm. Experience has shown that not infrequently the wrapping and securing operation presents a decided inconvenience to the physician inasmuch as it requires considerable time and effort, and, if the bladder is not applied in exactly the proper position on the patient's arm, the reading will not correctly indicate the patient's blood pressure. In other words, these conventional appliances have inherent disadvantages, and it is one of the important objects of the present invention to provide a pneumatic appliance which will overcome the above mentioned and numerous other disadvantages and inconveniences heretofore experienced.

The invention is not only adapted for use with blood pressure apparatus, but is also adapted to be used as a tourniquet which has many advantages over conventional appliances with which I am familiar.

I propose to provide a tourniquet of a pneumatic type which is particularly adaptable for use in making intravenous injections, and to this end I provide a unitary expansible device composed preferably of rubber and suitable non-elastic material.

More specifically, it is an object of my present invention to provide a pneumatic appliance, as set forth above, which may be conveniently slipped over the patient's limb without wrapping, tying, or buckling, and to this end I propose to provide an annular or sleevelike structure composed of a yieldable or rubber section adapted to directly engage the patient's limb and an annular non-elastic or fabric section formed as a unit therewith, the combined elements being adapted for quick and convenient application with a minimum amount of effort and skill.

It is a further object to provide a device, as above described, which is so constructed as to positively insure against slipping or shifting along the limb after it has been inflated.

The invention also contemplates a pneumatic appliance in which the non-elastic or fabric section is combined with the resilient or rubber section in such a manner as to preclude the formation of surface irregularities, such as bulging or ballooning, and in a manner to insure the uniform application of pressure by the resilient section over the entire circumferential extent of the patient's limb.

Another object of the invention is to provide a pneumatic appliance of the type referred to above whereby the device may be applied by the physician with one hand and the inflation or deflation controlled with the other.

Still more specifically, my invention contemplates a pneumatic appliance wherein combined annular sections of rubber and non-elastic material, such as fabric, are so disposed that the width of the rubber section adapted to circumferentially impinge the patient's limb is less than the width of the non-elastic section, to thereby insure the positive location of the appliance and the even distribution of the effective pressure.

The invention also contemplates a tourniquet having the structural features, as mentioned above, with the exception that the combined rubber and non-elastic sections, before application, are adapted to present a straight tubular structure.

The foregoing and numerous other objects and advantages will be more apparent from the following detailed description when considered in connection with the accompanying drawing, wherein—

Figure 1 is a side elevational view of a pneumatic appliance which is representative of one embodiment of my invention, said appliance being shown in operative association with the limb or arm of a patient;

Figure 2 is an enlarged transverse sectional view of the device taken substantially along the line 2—2 of Figure 1;

Figure 3 is an enlarged transverse sectional view of a pneumatic appliance of the type shown in Figures 1 and 2, opposite margins of the device being provided with flanges to counteract tendency for the appliance to shift or roll when inflated;

Figure 4 discloses a modified construction which is particularly adaptable for use as a tour-

niquet, said device being shown in perspective with the clamp in gripping position; and

Figure 5 is an enlarged sectional view taken longitudinally of the clamp to more clearly illustrate the structural characteristics thereof.

Referring now to the drawing more in detail wherein like numerals have been employed to designate similar parts throughout the various figures, it will be seen that one embodiment of my invention includes a device or appliance designated generally by the numeral 10 in Figures 1 and 2. This device comprises a flexible tubular structure which includes an inner expandible wall section 12 formed preferably of rubber and another outer wall section 14. The wall section 14 includes a section 16 of non-elastic material or fabric which serves to render the entire wall section 14 non-elastic. In the disclosed embodiment the non-elastic section 16 is covered on both sides by a suitable rubber coating 18.

The continuous wall sections 12 and 14 cooperate to form a continuous expansion or inflation chamber 20. The chamber 20 communicates with an air conducting conduit 22, the extremity of which is coupled with a conventional pumping device or bulb 24. Such conventional bulbs are equipped with suitable valves 26 which serve to control the release of air from the chamber 20. A second conduit or tube 28 communicates at one end with the chamber 20 and is adapted at its opposite end for connection with a suitable blood pressure instrument (not shown).

In use, the tube structure is slipped over the patient's arm 30 to the position shown in Figure 1. The chamber 20 is then inflated through the agency of the bulb 24. The air pressure within the chamber 20 causes the resilient or expandible wall section 12 to impinge the arm 30 over the entire circumferential extent thereof. Under such conditions the non-elastic strip or section 16 cooperates to prevent the outward enlargement or expansion of the tube structure, all of the expansion being experienced by the wall section 12. In this manner the non-elastic wall section 16 cooperates to insure the uniform impingement of the wall section 12 against the arm 30.

Attention is directed to the fact that opposite margins 16a of the fabric section 16 extend toward each other a sufficient distance to prevent the tube structure from bulging or ballooning when it is inflated. That is to say, by having the strip 16 wider than the wall section 12, the marginal portions 16a of the section 16 will extend along the arm 30 a distance which is sufficient to set up counter-action to any tendency for the section 12 to bulge outwardly.

In Figure 3 I have disclosed an enlarged cross-sectional view of a tube structure indicated generally by the numeral 10a. This structure is similar in every respect to the device 10, with the exception that marginal flanges 32 are provided. These flanges 32 function to counteract any tendency for the tube structure when inflated upon the arm 30 to shift or roll. Any tendency for the tube to roll would cause said tube to shift axially on the arm, a condition which would present a decided inconvenience to the physician.

Thus far I have described the practical application of my invention for use with blood pressure apparatus. It should be understood that the above described structure is adapted also for use as a tourniquet. This can be accom-

plished by simply removing or plugging the conduit 28.

In Figures 4 and 5 I have shown a further modification of my invention. The device or appliance designated generally by the numeral 10b in Figures 4 and 5 includes a tubular structure which is not of the endless or continuous type shown in Figures 1 to 3, inclusive. A cross-sectional view of the tube structure 10b taken along the line A—A of Figure 4 would correspond with the structure shown in Figure 2. The tube structure 10b, however, is provided with free extremities 34 which are adapted to be clamped together by means of a clamping device 36.

This clamping device includes a resilient member or leaf spring 38 adapted to be clamped together at its opposite free ends by means of a clamping screw 40. One arm of the leaf spring 38 is formed with a recess or aperture 42 to receive one of the tube extremities 34. In this manner the clamping device 36 is always secured in position to one of the tube extremities, and it is only necessary to clamp the other extremity within the area designated by the numeral 44 in Figure 5.

The appliance 10b is shown as a tourniquet and hence is coupled with a single tube or air conduit 22. To render the device useful for blood pressure apparatus, it is only necessary to add the second conduit 28 (shown by dotted lines in Figure 4). I also prefer to cover the leaf spring structure of the clamping device 36 with a suitable coating 46, such as rubber. The recess or aperture 42 is small enough in width to cause the walls thereof to impinge the external surface of the flexible tube structure 10b (as shown in Figure 4), and thus secure the tube structure and clamping device against relative movement.

The device shown in Figure 4 has the advantage of being adjustable to accommodate various sizes of limbs. Also, said device may be applied in instances where it is not convenient or advisable to slip the tubular structure over the end of the limb. I also prefer to seal the free extremities 34 of the tube structure. When the appliance is used as a tourniquet, it may be advisable in some instances to reduce the axial width as compared with the width when used for determining blood pressures.

From the foregoing it will be apparent that my invention contemplates an improved blood pressure or tourniquet appliance, which eliminates many of the inconveniences and disadvantages heretofore experienced in using conventional pneumatic devices. My invention precludes the necessity of wrapping and tucking in extremities of a fabric bag or extension. It will be obvious that my improved ring type cuff or sleeve can be used as a tourniquet to control or regulate the flow of blood resulting from accidents to any of the limbs, and that it also can be used to control the flow of blood in surgical operations on the limbs and for the control of the flow of blood in intravenous medication. When the cuff or sleeve is in position for use as a tourniquet, it may be easily manipulated with one hand; that is, inflated, deflated, or desired pressure maintained, especially while giving intravenous medication. Once the sleeve or cuff has been located upon the limb, it will not slip or shift. The combined rubber and non-elastic or fabric structure cooperates in an effective manner to cause a uniform impingement over the entire circumferential extent of the patient's limb, all of the expansion or wall movement resulting from

the inflation of the sleeve being in a direction toward the limb, the fabric or non-elastic wall structure serving to prevent outward movement or expansion. In surgical operations on limbs where considerable loss of blood is anticipated, the tourniquet may be conveniently and quickly applied and manipulated, and the pressure increased or decreased remotely from the field of operation, without having to disturb the limb or any of its sterile coverings.

While I have disclosed certain practical embodiments of my invention in the present application, it will be apparent that the invention is not limited to these embodiments, but is capable of other modifications and changes without departing from the spirit and scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a pneumatic appliance of the class described, combined wall sections including an expansible wall section adapted to encircle and circumferentially impinge a user's limb, a non-elastic wall section circumferentially cooperating with said expansible section to form an inflation chamber, said non-elastic wall section positioned externally of said expansible section to insure the uniform impingement of the expansible wall section over substantially the entire circumferential extent of a user's limb, a flange provided along at least one margin to facilitate proper positioning upon a user's limb, and air conducting means communicating with said inflation chamber.

2. In a pneumatic appliance of the class described, combined wall sections providing an inflation chamber, one of said wall sections being expansible and adapted to encircle and circumferentially impinge a user's limb, the other of said wall sections being substantially non-extensible and circumferentially cooperating with said expansible section to form said inflation chamber, said non-extensible wall section extending from the marginal portion of the expansible wall section at the point where said marginal portion is adapted to engage the user's limb to the corresponding opposite marginal portion of said expansible wall section, said non-extensible wall section at said marginal portions being adapted when said chamber is inflated to be pressed against the user's limb whereby to counteract tendency for the appliance to experience axial shifting when inflated and to counteract axial bulging, and air conducting means communicating with said inflation chamber.

3. In a pneumatic appliance of the class described, combined circumferentially continuous wall sections providing an inflation chamber, one of said wall sections being expansible and adapted to encircle and circumferentially impinge a user's limb, the other of said wall sections being sub-

stantially non-extensible and circumferentially cooperating with said expansible section to form said inflation chamber, said non-extensible wall section extending from the marginal portion of the expansible wall section at the point where said marginal portion is adapted to engage the user's limb to the corresponding opposite marginal portion of said expansible wall section, said non-extensible wall section at said marginal portions being adapted when said chamber is inflated to be pressed against the user's limb whereby to counteract tendency for the appliance to experience axial shifting when inflated and to counteract axial bulging, and air conducting means communicating with said inflation chamber.

4. In a pneumatic appliance of the class described, combined wall sections providing an inflation chamber, one of said wall sections being expansible and adapted to encircle and circumferentially impinge a user's limb, the other of said wall sections including flexible relatively non-extensible material and circumferentially cooperating with said expansible section to form said inflation chamber, said non-extensible wall section extending from the marginal portion of the expansible wall section at the point where said marginal portion is adapted to engage the user's limb to the corresponding opposite marginal portion of said expansible wall section, said non-extensible wall section at said marginal portions being adapted when said chamber is inflated to be pressed against the user's limb whereby to counteract tendency for the appliance to experience axial shifting when inflated and to counteract axial bulging, and air conducting means communicating with said inflation chamber.

5. In a pneumatic appliance of the class described, combined wall sections providing an inflation chamber, one of said wall sections being expansible and adapted to encircle and circumferentially impinge a user's limb, the other of said wall sections being substantially non-extensible and circumferentially cooperating with said expansible section to form said inflation chamber, said non-extensible wall section extending from the marginal portion of the expansible wall section at the point where said marginal portion is adapted to engage the user's limb to the corresponding opposite marginal portion of said expansible wall section, said non-extensible wall section at said marginal portions being adapted when said chamber is inflated to be pressed against the user's limb whereby to counteract tendency for the appliance to experience axial shifting when inflated and to counteract axial bulging, the opposite margins of said non-extensible section when inflated being substantially U-shaped in axial cross section, and air conducting means communicating with said inflation chamber.

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