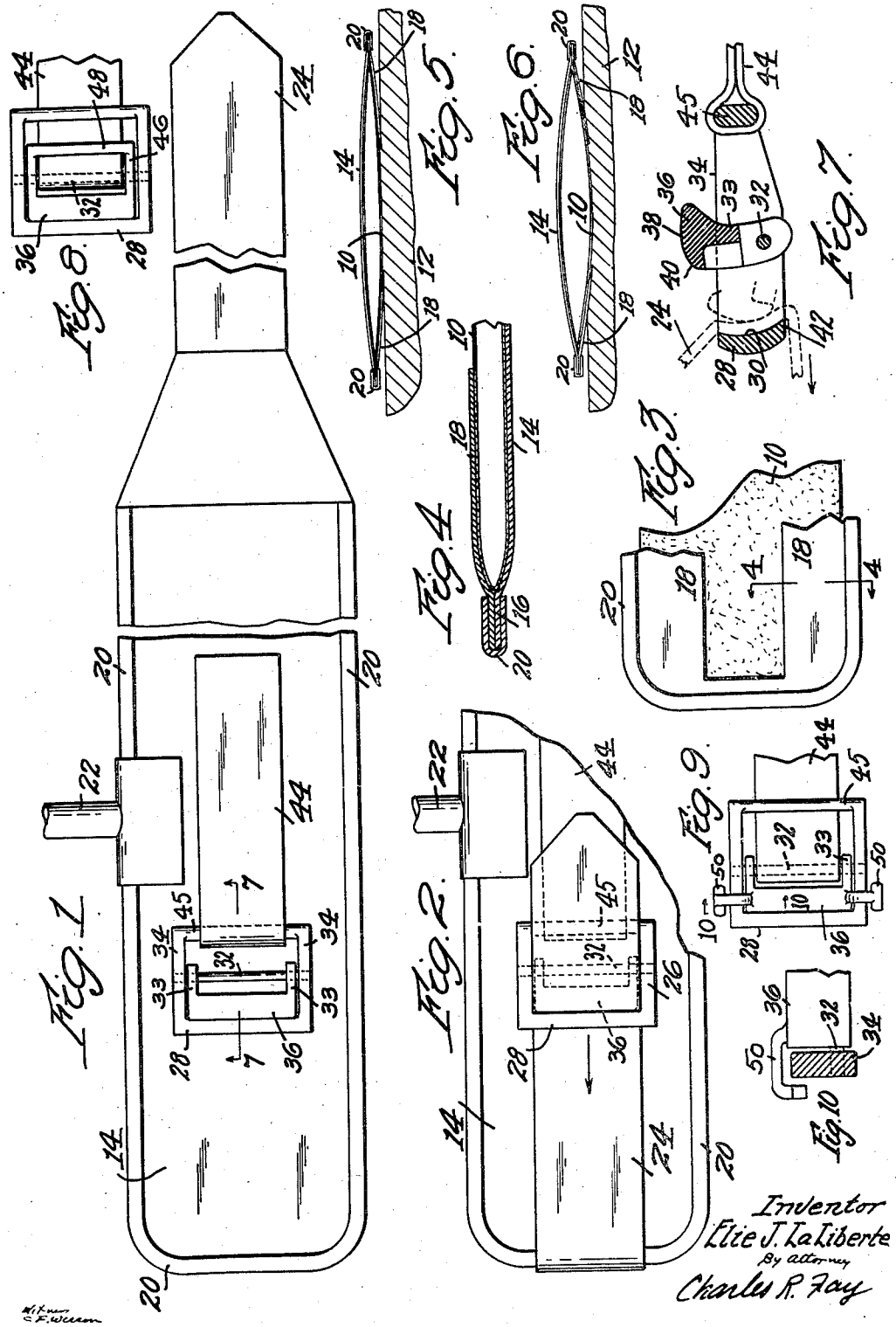
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INFLATABLE TOURNIQUET AND FASTENER THEREFOR

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INFLATABLE TOURNIQUET AND FASTENER THEREFOR

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4 Claims. (Cl. 128—327)

This invention relates to inflatable tourniquets and fasteners therefor.

Objects of the invention include the provision of an arm or leg band for use as a tourniquet and blood pressure measuring device which may be applied to the limb and securely fastened in place, the band being in the form of a bag which is inflatable by pump or other means to obtain desired pressure on the limb to interfere with or stop either the veinous or arterial flow as desired; the provision of such a bag in which at least a part of the side to be applied to the member, i. e., the inner side, is relatively thin and stretchable so as to be flexible enough to transmit heart beats to and thru the contents of the bag when inflated, whereby any interference with and stopping of either veinous or arterial flow may be easily determined so as to render any procedure desired easier of accomplishment; the provision of a bag for the use described wherein the side opposite the inner side is made of relatively inextensible and stronger material and extends over and overlaps the inner side or has an attached side strip for this purpose, to eliminate lateral stretching of the inner side at its edges; the provision of a fastener for the bag to securely and positively attach it to a limb, with no possibility of slacking, and in which a strap attached to the bag may be positively secured at any point along its length; and the provision of a strap fastener which will securely hold any strap no matter how thin, and which is simple and effective in operation.

Other objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawing, in which

Fig. 1 is a top plan view of the bag and fastener as seen when laid out straight;

Fig. 2 is a view similar to Fig. 1, with part broken away, but showing the fastener in operation;

Fig. 3 is a bottom plan view of the bag with parts broken away;

Fig. 4 is an enlarged section on line 4—4 of Fig. 3, showing the construction of the bag;

Fig. 5 is a section thru the bag when in position on a limb with just enough air pressure to separate the bag walls;

Fig. 6 is a section thru the bag showing its action with high pressure;

Fig. 7 is a section on line 7—7 of Fig. 1 on an enlarged scale;

Fig. 8 is a top plan view of a modified fastener;

Fig. 9 is a top plan view of a further modified fastener; and

Fig. 10 is a section on an enlarged scale on line 10——10 of Fig. 9.

The inner surface 10 of the band or bag is formed of a thin, stretchable and flexible material which may be in the form of a sheet or of a tube or bag as here shown. The material is preferably a rubber membrane or other membranous substance which will readily transmit the cardiac and pulse action to the gas contents of the bag. This thin bag or sheet is adapted to be placed directly against the surface 12 of a limb to be tourniqueted, as indicated in Figs. 5 and 6. The outer surface 14 of the bag is formed of a relatively strong inextensible strip of rubber or fabric material, such strip being somewhat longer and wider than the membranous bag or sheet 10, and strip 14 overlaps the latter at its side and end edges as at 16, see Fig. 4, thus forming a strong joint which will not tend to pull apart under interior pressure as would be the case were the sheet 10 and strip 14 co-terminous and flatly connected. At the overlapping portions 16, there are like but narrow strips 18 co-terminous with strip 14, and these strips are secured together as shown in Fig. 4, in flat relation beyond the edges of sheet or bag 10 as by vulcanization or other desired means. The bag 10, or strip as may be, is likewise secured to strips 18, and if the bag is used, it may be secured to strip 14 also. A cover strip 20 may be utilized to bind the edges of strips 14 and 18. A nozzle 22 is set into the strip 20 and thru the secured edges of strips 14, 18 for the purpose of inflating the bag and exerting pressure on the limb. This nozzle may be Y-shaped to accommodate the blood pressure gauge, or two nozzles could be used.

One end of the bag is provided with a strap 24 to cooperate with a fastener 26 to secure the bag to a limb. Fastener 26 is in the form of a buckle having a continuous rectangular or square frame. One end 28 of this frame has an interior curved surface 30 of which the center of curvature is in a line parallel to and above a hinge pintle 32 secured in the side members 34 of the frame, so that the curved surface extends between the side members. Surface 30 may be on the arm of a circle but is not necessarily so, it being important to note that the pintle 32 is well below the general focus of lines extending normal to surface 30. In any case, this side and its surface forms a fixed jaw of a friction clamp of which element 36 is the movable jaw.

Jaw 36 is pivoted on the pintle 32 on legs 33 and hence will swing from solid line position to dotted line position, in Fig. 7, such swinging bringing it closer and closer to surface 30, finally striking the latter near its bottom unless the strap 24 is interposed, in which case of course it strikes the strap as shown. The clamp face 38 of jaw 36 is provided with a curved surface which is flatter than curve 30, so that the former will strike the latter near the bottom of surface 30 and near the top of surface 38, when no material is between the jaws. Pintle 32 is set off to

one side of the center of curvature of surface 38. This construction provides for a clamping action no matter how thin the strap is or becomes thru use, and as a matter of fact, tissue paper can be securely held in this fastener. The heel 40 of jaw 36 is designed to just miss the lower corner 42 of fixed jaw 28 when the clamp is empty, but as shown in Fig. 7, a strap between jaws will prevent further pivoting downwards of jaw 36, and of course, the more tension in the direction of the arrow in this figure, the more tightly the strap is clamped. Also, by utilizing the relative curvatures shown, and the hinge pintle 32 being offset from the center of curvature of curve 30, the jaw elements will tend to contact along a band, and not along a line, thus giving a greater clamp area. A short strap 44 secured to the bag and folded over arm 45, as in Fig. 1, or between legs 33 on the pintle 32, is used to hold the fastener to the bag.

The bag is wrapped once around the limb, strap 24 is threaded up thru the fastener, jaw 36 is pivoted to position, and a pull on the strap in the direction of the arrow will firmly lock the strap, which may then be threaded over jaw 36 and down under rear end member 45 in cases where strap 44 is on pintle 32. Any fluid material but preferably air is pumped into the bag thru the nozzle, and pressure is then exerted on the limb. This pressure produces a tension in strap 24 in the direction of the arrows, Figs. 2 and 7, and therefore the parts cannot slip. This structure provides a permanent, non-slipping tourniquet which can have sufficient pressure applied to stop the blood flow, and by use of a stethoscope or other indicator, further needless pressure may be dispensed with, and therefore avoid unnecessary bruising of tissues, which cannot be gauged by the ordinary tourniquet.

The construction of the device as recited above provides for many advantages in its use and operation. Fig. 4 is illustrative merely of the construction of the device while Figs. 5 and 6 show the operation thereof. In Fig. 5 the bag is shown as applied to the member 12 and has been secured fairly tightly as convenient by the strap 24 and buckle, and a slight air pressure has been introduced into the bag to set it firmly but not constrictively on the member. The stretchable membrane 10 is in close contact with the member whereas the non-stretchable strips 18 extend angularly away therefrom, and the short distance between the member 12 and the edges of strips 14 and 18 is to be particularly noted.

Upon the application of further pressure, the bag assumes the position of Fig. 6, the stretchable membrane 10 being forced into the member 12 to constrict it by indentation and the strip 14 is bowed outwardly to slightly greater degree than before. In spite of this, the edges at binder strip 20 do not move appreciably farther away from the surface of member 12 and the angles at which strips 18 are located with respect to member 12 are very slightly increased. These effects contribute to an important result; i. e., the device cannot roll over or become dislodged by rolling even if it is set on a muscle or on uneven surfaces, the joined edges of strips 14 and 18 acting in the manner of outriggers to positively prevent rolling. This means that the stretchable thin membrane 10 will not be dislodged from its position in Fig. 6, and that the tourniquet therefore will not fail.

Strips 18 have another important function in that they positively prevent any tendency for the thin membrane to blow outwardly to the sides of the bag. The member 12 itself will back up these strips and the membrane and will thus act to maintain the pressure where it is desired.

In Fig. 8, the legs 46 of the movable jaw 36 are shown as connected by an element 48, so that to loosen the clamp fastener it is only necessary to release the air pressure and press down on this element to raise the movable jaw. Figs. 9 and 10 illustrate a clamp fastener similar to that of Fig. 6, but having thumb pieces 50 extending over the sides 34 and downwardly, these pieces being easily grasped to pull the movable jaw upwardly to free the strap. Of course, a slight pull on the strap 24 will immediately release the fastener by raising the movable jaw 36, when the pressure is released from the bag.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:

1. As an article of manufacture, a bag adapted to be used as a tourniquet and comprising an inner membrane of thin flexible material, said bag having an outer wall of greater rigidity overlying said membrane and extending beyond its edges, strips associated with said outer wall at its edges underlying said edges of said membrane leaving a narrow central portion of the latter exposed, the latter being secured to said strips, and means in said bag adapted to admit fluid or air thereinto, the outer wall and said strips forming a reinforcement for said membrane at its lateral edges to prevent bulging thereof under pressure in the bag, when it is attached to a human limb, and to prevent rolling of said bag on the limb, the combined width of said strips and exposed portion of the membrane approximately equalling the width of the outer wall so that the bag is substantially flat when uninflated.

2. An article of the class described comprising a strip of flexible but relatively non-stretchable material, means including a thin stretchable membrane or the like associated with said strip and forming an inflatable bag, spaced strips of relatively non-stretchable material at the edges of said membrane and secured thereto in flat condition to leave a narrow central exposed portion thereof, all said strips extending laterally beyond said membrane, said spaced strips being secured to said first named strip laterally beyond the edges of said membrane, and means adapted for the admission of gas to said bag, said spaced strips and exposed portion of said membrane having a combined width approximately equal to said strip of relatively non-stretchable material, so that said bag will lie flat when uninflated.

3. An article of the class described as recited in claim 2 wherein said membrane is itself in the form of a tube.

4. An inflatable bag for use as a tourniquet comprising an outer side wall of relatively non-stretchable material, a generally parallel inner wall adapted to be applied directly to a member to be tourniqueted, said inner wall having a narrow central strip of relatively thin flexible material and lateral spaced strips of relatively non-stretchable material, the latter being associated with said outer wall at its edges to complete the bag, the widths of said outer and inner walls being approximately equal.

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