Nov. 5, 1957 H. E. HIPPS ET AL 2,811,970

INFLATABLE TOURNIQUET

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FIG. 2

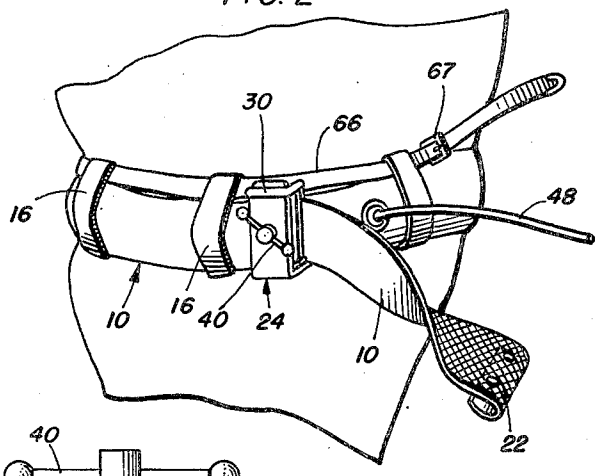


FIG. 3

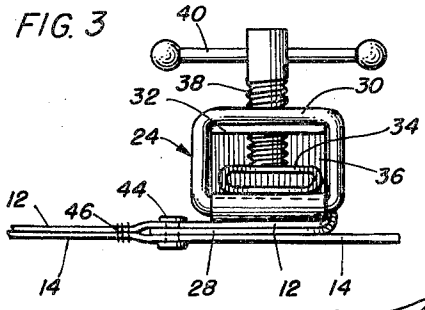
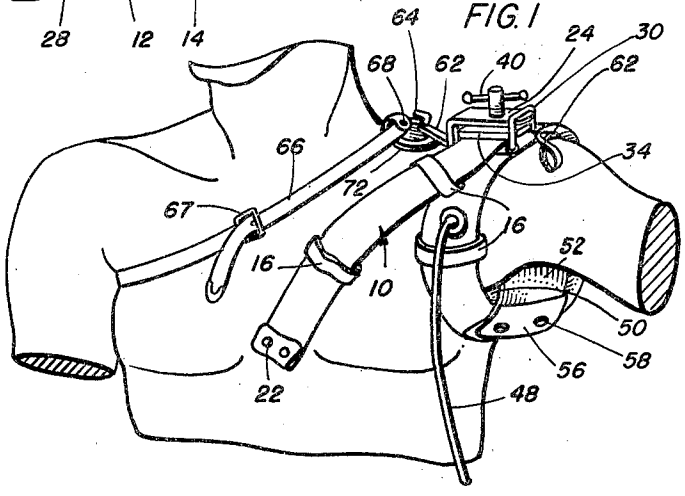


FIG. 1



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FIG. 4

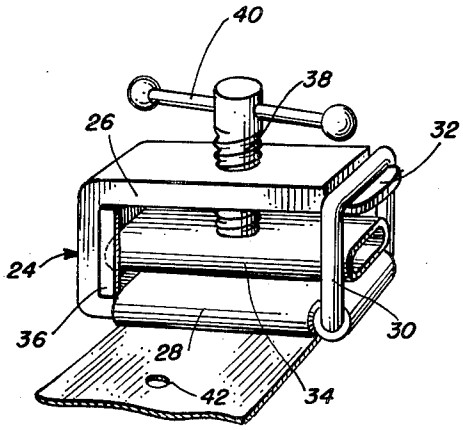


FIG. 5

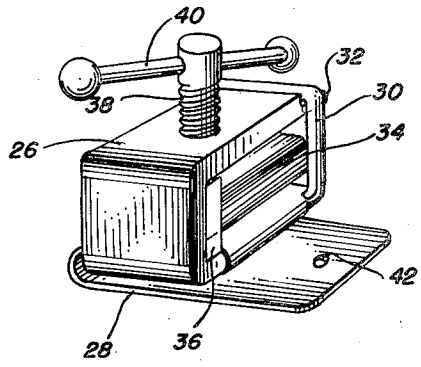


FIG. 6

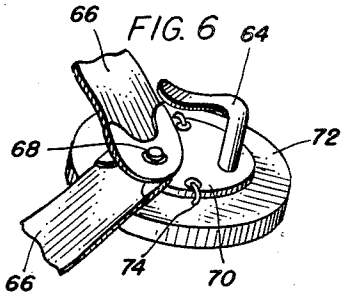


FIG. 7

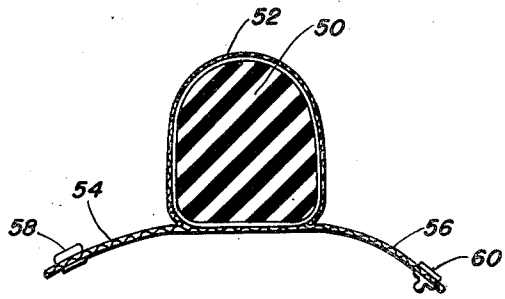
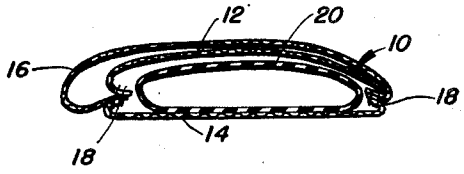


FIG. 8



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INFLATABLE TOURNIQUET

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14 Claims. (Cl. 128—327)

This invention relates in general to an inflatable tourniquet of the strap type adapted to be placed around the limb of a patient and particularly applicable to body locations where it is difficult to maintain a tourniquet in the proper position for accomplishing the intended result.

Inflatable tourniquets are commonly used in cuff form which are applied to the wrist, arm, or ankle of a patient and in wrap-around form for use with sphygmomanometers, but these are difficult to apply in all locations, and they are practically inapplicable for use at the axilla and also in contact with an extremely tapered arm or a fat thigh where an ordinary tourniquet has a tendency to roll and to become displaced.

In the present invention, an inflatable strap is provided with a quickly releasable clamp attached to one end and through which the other end of the strap is inserted after encircling a limb to which it is applied, and special means is attached to the strap for holding it in place high on a shoulder and also to prevent it from a tendency to roll upon tapered surfaces.

An important object of the invention is to provide an inflatable strap tourniquet having a quick releasable clamp for fastening it in place.

A further object of the invention is to provide an adjustable axilla pad for engagement in the arm pit of a patient.

Still a further object of the invention is to provide means engageable with the strap for holding it in place in addition to the normal pneumatic clamping action.

Still a further object of the invention is to provide a retainer which engages loops secured to the inflatable strap for holding the strap at one side to prevent it from slipping off from a shoulder and also to prevent it from rolling on an extremely tapered portion of a limb to which it is applied.

Other objects of the invention will appear in the specification and will be apparent from the accompanying drawings in which

Fig. 1 is a perspective view of an inflatable tourniquet in accordance with this invention as applied to the upper portion of a body and particularly for confining an axilla pad in the arm pit and holding the tourniquet in a high position on the shoulder;

Fig. 2 is a perspective view illustrating the application of the tourniquet to an extremely tapered portion of a limb;

Fig. 3 is a side elevation showing the connection of the tourniquet clamp to one end of the tourniquet strap;

Figs. 4 and 5 are perspective views of the tourniquet clamp at different angular positions;

Fig. 6 is a perspective view of the shoulder strap buckle as shown in Fig. 1;

Fig. 7 is an elevational view of a removable axilla pad; and

Fig. 8 is a sectional view of the tourniquet strap showing an inner inflatable tube, the fabric cover therefor and one of the retainer straps, all in their respective positions.

The ordinary wrap around or cuff types of tourniquets may be inflatable and easily applicable to the arm of a patient for measuring blood pressure, but they are not suitable for use as tourniquets in special instances. The present invention provides a strap type of inflatable tourniquet which is adapted to be used with a sphygmomanometer apparatus and also is of such a construction that it may be applied quickly and easily for special purposes such as on a fat or a highly tapered portion of an arm or leg where it is difficult to attach an ordinary tourniquet, and also in the arm pit of a patient in which the ordinary tourniquet cannot make the proper axillar contact.

Referring now more particularly to the drawings, a tourniquet strap 10 is preferably made of an upper strip 12 and a lower strip 14 sewn together at their edges by turning the edges inwardly and including between them at spaced distances the ends of a plurality of strap loops 16 which are longer than the transverse width of the strap 10 so that the loops are loose upon the outside of the strap 10. The strips 12 and 14 and the ends of the loops 16 are secured together at the edges by stitches 18 or other suitable fastening means. The lower strip 14, which is normally in contact with the body of a patient, is cut on the bias as represented at the back of the strap as shown in Fig. 2 so that the strap will conform readily to uneven and tapering sites.

Within the strap 10 is an air tube 20 of inflatable material such as rubber or other plastic sealed at the ends, and at one end, the strip parts are turned over and secured together by suitable fastening means such as rivets 22.

At the other end of the strap 10 is a releasable clamp 24 having a resilient U-shaped receiver 26, preferably of metal, with a sheet metal plate 28 bent around one side of the member and pivotally mounting a rectangular hook 30 at the end thereof, the outer portion of which is adapted to snap over a reduced portion 32 at the end of the opposite side of the clamp to hold it in closed position. Within the clamp is a contact block member 34 which extends substantially parallel with the sides of the clamp and at the inner end thereof, and projecting from each side of the clamp is a guard plate 36 which is substantially channel shaped and extends across between the sides of the clamp and outwardly beyond the inner end of the contact member 34 to prevent the tourniquet strap from catching between the contact member and the clamp. A screw 38 is threaded through the side of the clamp opposite the pivotal mounting hook 30 and the inner end engages the contact block member 34 for pressing it inwardly. The outer end of the screw has a cross bar 40 extending through it for applying pressure to the contact member 34.

The plate 28 which is secured to one side of the clamp 24 extends outwardly from one side of the clamp and around the outside of and parallel to this same side of the clamp with the extremity having a hole 42 and projecting beyond the opposite side of the clamp and inserted in the open end of the strap 10. A rivet or other fastening means 44 is inserted through the opening 42 and the opposite sides of the strap 10 to hold the clamp and the strap tightly together. In order to further strengthen and seal the end of the air tube 20, multiple rows of stitches 46 are applied beyond the end of the metal plate 28 thus forming a pocket into which the metal plate is tightly secured. The lower strip 14 may project a distance beyond the end of the upper strip 12 which engages the bent portion of the metal plate 28 as shown in Fig. 3, thus providing a fabric contacting portion at the underside of the clamp which engages the body of a patient.

Connected to the air tube 20 near the clamp 24 is a

supply hose 48 which extends to a pump and a pressure indicator (not shown), if desired, and in accordance with the pressure tourniquet practice. To apply the tourniquet to an ordinary location, the free end of the strap 10 is wrapped about the limb of a patient and this end is inserted through the clamp between the plate 28 and the contact member 34. The strap is drawn up tightly, and the clamp is applied by means of the screw 38 holding the tourniquet in place, and pneumatic pressure is applied through the supply hose 48.

To quickly apply the tourniquet strap 10 to the clamp 24, the hook 30 may be disengaged from one side of the clamp and the strap 10 is inserted between the plate 28 and the contact member 34 in the clamp. Thereupon the hook may be closed upon the reduced engaging portion 32, and the fastening screw 38 may be applied to press the contact member 34 against the strap 10.

The strap 10 may also be inserted through the clamp 24 with the hook 30 closed, by backing off the screw 38 so that the free end of the strap may be inserted between the block member 34 and the plate 28.

To quickly release the tourniquet, this operation may be reversed, or the hook 30 may be disengaged from the portion 32 without operating the screw. In both cases, the strap 10 may be inserted and removed from the clamp 24 in an edgewise direction, thus making the operation quicker and easier.

To apply the tourniquet to the arm pit, an axilla pad 50 (Figs. 1 and 7) of the proper size, preferably of sponge rubber or of similar material, is enclosed in a fabric bag 52 having opposite flaps 54 and 56 of suitable length to extend around the tourniquet strap 10 and having cooperating fastener parts 58 and 60 in the flaps to releasably and adjustably position the pad upon the strap.

In order to hold the tourniquet at the top of the shoulder with the axilla pad 50 in the arm pit, a lateral holder (Figs. 1, 2, and 6) is provided comprising a loop 62 which extends around the strap 10 adjacent the clamp 24 and is engaged by a hook 64 of a shoulder harness which comprises a strap 66 having a tightening buckle 67 and extending around the neck across the chest and back and under the opposite arm and having perforated ends engaged by a projection 68 upon a plate 70, which also supports the hook 64. This plate is preferably of metal, and a washer 72 of felt or other material to engage the body of a patient is secured to the plate by stitches 74 or other suitable means. When the tourniquet is applied to a tapered portion of a limb, it is extremely difficult to hold it in place, particularly if this tapered portion is also fat, as it tends to roll or move to the smaller side when it is inflated. For such application, the harness strap 66 is inserted through the loose loops 16 at the higher or larger side of the tourniquet strap, and the harness strap 66 is as much in contact with the skin as possible and not in contact with the tourniquet, nor it is threaded through the clamp. After the tourniquet and the retainer are adjusted snugly in place, the air pressure is applied to the tourniquet in the ordinary manner.

To release the tourniquet quickly, the clamp hook 30 may be snapped outwardly from engagement with the reduced portion 32, and the free end of tourniquet may be pulled laterally out of the clamp 24. The air pressure may also be reduced in the supply hose 48 or at a pump which will reduce the pressure of the tourniquet. The pressure in the arm pit may be varied for different applications by axilla pads 50 of different sizes which are quickly detached and removed from the tourniquet strap 10.

With this construction, it is therefore possible not only to apply this tourniquet for ordinary applications and uses, but also to make special applications of it for results which are not possible with or contemplated by other forms of tourniquets.

While a preferred embodiment has been described in some detail, it should be regarded as an example or embodiment of the invention and not as a restriction or limitation therein as many changes may be made in the construction and arrangement of the parts without departing from the spirit and scope of the invention.

We claim:

1. In an inflatable tourniquet, a flexible strap having opposite side strips secured at their edges, an inflatable tube extending lengthwise between the strips and connected means for inflating it, means securing the strips together at one end, means securing the strips together at a distance from the other end to provide a pocket which opens at said other end, a clamp provided with a plate inserted in the pocket, and means securing the plate tightly to the strips near the inner end of the pocket, the clamp having a releasable hook at one side of the strap so that the strap applied to a limb may be inserted into and removed laterally from the clamp.

2. In a tourniquet in accordance with claim 1, the plate extending from one edge of the clamp and turned reversely outward, around, and parallel to but spaced from an outer surface of the clamp with an end of the plate extending beyond the opposite edge of the clamp and the said extending end having a perforation for attaching it to the strips in said pocket.

3. In a tourniquet in accordance with claim 1, the strips fitting around the plate at both sides thereof and being composed of fabric cut on the bias so that the strap will conform more readily to a tapering body site to which the strap is applied and the material at the outside of the plate extending beyond the plate to contact directly with the patient's body in place of the plate.

4. In a tourniquet, a flexible strap having inflatable means extending longitudinally thereof, a clamp attached to one end of said strap and having means for engaging another part of said strap after said strap is wrapped around a limb, strap loops connected transversely to said strap at intervals, and means for engaging said loops and holding said strap against lateral movement from a selected body site.

5. In a tourniquet, a flexible strap having inflatable means extending longitudinally thereof, a clamp attached to one end of said strap and having means for engaging another part of said strap after said strap is wrapped around a limb, loops connected transversely to said strap, and a harness at one side of said strap for holding said strap against lateral movement from a selected body site, said harness being arranged for direct contact with the body of a patient to which said tourniquet strap is applied, and comprising a strap engageable with said loops.

6. In a tourniquet, a flexible strap having inflatable means extending longitudinally thereof, a clamp attached to one end of said strap and having means for engaging another part of said strap after said strap is wrapped around a limb, strap loops connected transversely to said strap at intervals, and a harness at one side of said strap and arranged for direct contact with the body of a patient to which said strap is applied, said harness including a strap engageable with said loops, a hook, and a loop arranged to pass about said tourniquet strap and be attached to said hook at said side of said tourniquet strap to hold said tourniquet strap from lateral displacement from a site to which it is applied.

7. In a tourniquet, a flexible strap having inflatable means extending longitudinally thereof, a clamp attached to one end of said strap and having means for engaging another part of said strap after said strap is wrapped around a limb, strap loops connected transversely to said strap at intervals, and a harness at one side of said strap and arranged for direct contact with the body of a patient to which said strap is applied, said harness including a hook and a loop arranged to pass about said tourniquet strap and be attached to said hook at said side of said strap, said harness including a strap arranged to

be inserted through said loops and adjustable in length to apply tightly to the same body site to which said tourniquet strap is applied but arranged to engage the body at said side of said tourniquet strap, whereby to restrain said tourniquet strap against rolling movement when applied to a highly tapered body site.

8. In a tourniquet, a flexible strap having inflatable means extending longitudinally thereof, a clamp attached to one end of said strap and having means for engaging another part of said strap after said strap is wrapped around a limb, a resilient pad, and means for engaging said pad to hold it against one side of said strap, said means including oppositely extending flaps adapted to extend around to the opposite side of said strap and having interengaging means to hold said pad at any adjusted position along said strap.

9. In an inflatable tourniquet, a flexible hollow strap having a flexible inflatable tube therein and means for inflating it, and a clamp comprising a U-shaped member in and from which another portion of said strap may be inserted and removed edgewise after said strap is wrapped about a limb, one arm of said member being attached to said strap with the open end of said member at one edge of said strap, a hook pivoted to an arm of said member and being rotatable to engage the other arm of said member to confine said strap portion, a plate extending over said attached arm, a contact member loosely contained between said plate and the arm opposite said attached arm, and a pressure-applying screw extending through said opposite arm and engageable with said contact member to clamp said other portion of said strap between said plate and said contact member.

10. In an inflatable tourniquet, a flexible hollow strap having a flexible inflatable tube therein and means for inflating it, and a clamp comprising a U-shaped member in and from which another portion of said strap may be inserted and removed edgewise after said strap is wrapped about a limb, one arm of said member being attached to said strap with the open end of said member at one edge of said strap, a hook pivoted to an arm of said member and being rotatable to engage the other arm of said member to confine said strap portion, a plate extending over said attached arm, a contact member loosely contained between said plate and the arm opposite said attached arm, and a pressure-applying screw extending through said opposite arm and engageable with said contact member to clamp said other portion of said strap between said plate and said contact member, said plate being secured to said attached arm, and a guard at the bight of said member and extending around and at the sides of the inner end portion of said contact member to prevent said strap portion inserted in said clamp member from engaging the inner end of said contact member.

11. In an inflatable tourniquet, a flexible hollow strap

having a flexible inflatable tube therein and means for inflating it, and a clamp comprising a U-shaped member having a side opening in and from which another portion of said strap may be inserted and removed edgewise after said strap is wrapped about a limb, a plate attached to said strap and to an arm of said member with the open end of said member at one edge of said strap, said plate having a loop adjaient said edge, a hook pivoted in said loop and being rotatable to engage the other arm of said member to confine said strap portion, said plate extending over said attached arm, a contact member loosely contained between said plate and the arm opposite said attached arm, and a pressure-applying screw extending through said opposite arm and engageable with said contact member to clamp said strap portion between said plate and said contact member.

12. In an inflatable tourniquet, a flexible hollow strap having a flexible inflatable tube therein, means for inflating said tube, and a clamp attached to one end of said strap, said clamp having a side opening in and from which another portion of said strap may be inserted and removed edgewise after said strap is wrapped about a limb.

13. In a tourniquet, a flexible strap having inflatable means extending longitudinally thereof, a clamp attached to one end of said strap and having means for engaging the other end portion of said strap after said strap is wrapped around a limb, said clamp having a side opening in and from which said other end portion of said strap may be laterally inserted and removed, said clamp providing smooth surfaces between which said strap portion is received to be clamped.

14. In an inflatable tourniquet, a flexible hollow strap having a flexible inflatable tube therein and means for inflating it, and a clamp comprising a U-shaped clamp member in and from which another portion of said strap may be inserted and removed edgewise after said strap is wrapped about a limb, said clamp providing between the arms of said member smooth surfaces between which said strap portion is adapted to be clamped, one arm of said member being secured to said strap with the open end of said member at one edge of said strap, and a hook member pivoted to an arm of said member and being rotatable to engage the other arm of said member.

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