Oct. 16, 1951 W. R. LIVINGSTON ET AL 2,571,461

TOURNIQUET

Filed Dec. 30, 1949

FIG. 1

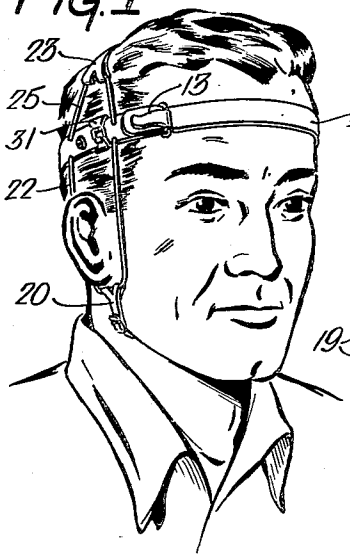


FIG. 2

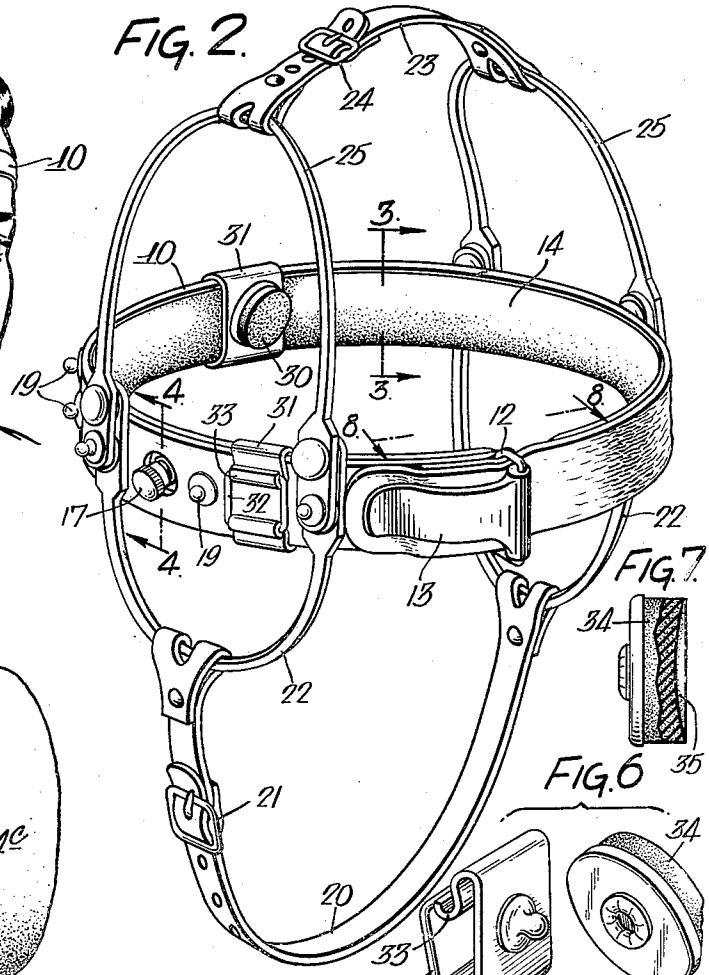


FIG. 7

FIG. 3

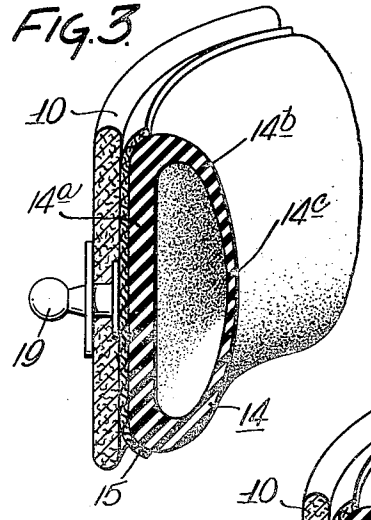


FIG. 6

FIG. 4

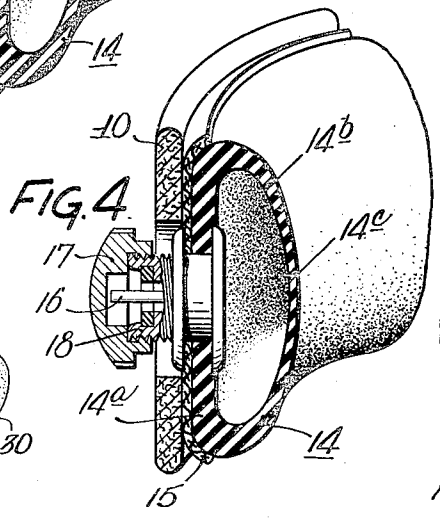


FIG. 5

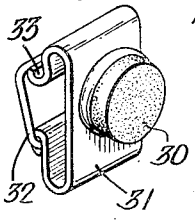
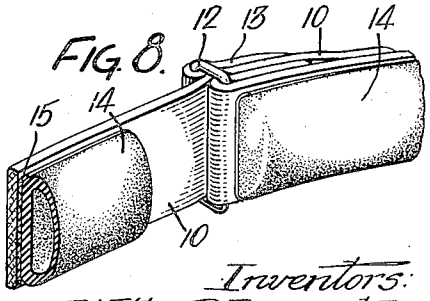


FIG. 8.



Inventors:
Walter R. Livingston
Burton W. Hancox
by their Attorneys
Howson & Howson

Patented Oct. 16, 1951

2,571,461

UNITED STATES PATENT OFFICE

2,571,461

TOURNIQUET

Walter R. Livingston, Upper Darby, and
Burton W. Hancox, Springfield, Pa.

Application December 30, 1949, Serial No. 136,082

4 Claims. (Cl. 128—327)

1

This invention relates to surgical appliances and more particularly to an improved tourniquet which is provided with means for controlling and localizing the pressure applied.

A tourniquet constructed in accordance with the present invention is characterized by a flexible non-elastic band having an inflatable rubber tube secured on one side thereof. The ends of the band may be fastened to each other by means of suitable clasps to provide a pressure-tight, encircling member for some part of the anatomy. The rubber tube may be inflated through a suitable valve and localized pressure is achieved by means of one or more slidable carriers having detachable buttons. Where a tourniquet in accordance with the present invention is intended to be applied to a patient's head, suitable head and chin supporting straps may be readily attached to the tourniquet so that it may be properly maintained in position.

We have found that a tourniquet in which the pressure may be gradually controlled, especially when the tourniquet is deflated, particularly lends itself to many forms of intravenous transfusions in securing laboratory blood specimens. With the ordinary tourniquet customarily employed, it frequently happens that the sudden release of pressure in the tourniquet dislodges the hypodermic needle with very serious consequences. When pressure can be gradually controlled, the possibility of such dislodgement taking place is reduced to a minimum.

A primary object of the invention therefore, is to provide in tourniquet construction a flexible non-expanding band or backing member to which there is secured around its inner periphery a hollow resilient tube member which can be inflated or deflated at will through suitable valve means.

A further object of the invention is to provide in a tourniquet of the type disclosed, an improved resilient pressure-applying member having a relatively thin pressure-applying face and a relatively thick back wall.

A further object of the invention is to provide an improved head tourniquet assembly having suitable localized pressure-applying means and suitable head and chin straps.

Further objects will be apparent from the specification and drawings in which:

Fig. 1 shows a head tourniquet constructed in accordance with the invention, as applied to a patient;

Fig. 2 is a perspective of the head tourniquet shown in Fig. 1;

2

Fig. 3 is an enlarged sectional detail as seen at 3—3 of Fig. 2;

Fig. 4 is an enlarged sectional detail as seen at 4—4 of Fig. 2;

Fig. 5 is a perspective of the button and carrier by which localized pressure may be obtained;

Fig. 6 is an exploded view of a modified form of the button of Fig. 5;

Fig. 7 is a side elevation partly sectioned, of the button shown in Fig. 6; and

Fig. 8 is a fragmentary perspective, as seen at 8—8 of Fig. 2.

Referring now more particularly to the drawings, a tourniquet assembly constructed in accordance with our present invention comprises an outer backing band or strap 10 which is of leather or of a similar flexible but non-elastic material. The ends of strap 10 are provided with a suitable clasping and adjusting means such as an eye 12 and a clamp 13. A hollow inflatable tube 14 is vulcanized to a canvas backing member 15 which is in turn cemented to the inner face of band 10, as seen in the drawings.

The cross-sectional structure of the tube 14 (Figs. 3 and 4) is of particular importance in eliminating "roll" of the tourniquet. The outer wall 14a of the tube 14 is substantially flat and relatively thick in cross-sectional area. The inner wall 14b is of a convex structure and the thickness thereof gradually tapers to a minimum at the apex or lateral center 14c of the wall. When the tourniquet is applied to the patient's head or some other part of the anatomy, it is important that the tourniquet remain in its proper position. If there is a tendency for the inflated tube to roll or move in a lateral direction, the value of the tourniquet is obviously lost. We have found that the particular shape and configuration of the resilient rubber tube eliminates any tendency for the tourniquet to roll and in addition, enhances stability since the deformation of the tube as pressure is applied is such that the outer wall 14a tends to hold its shape and there is only a slight widening of the contact area between the inner wall 14b and the patient's anatomy. This characteristic is enhanced by the fact that inner wall 14b is progressively thinner towards the apex of the tube as seen in Figs. 3 and 4.

Fig. 4 also illustrates a valve which may be used for inflating and deflating the tube 14. This valve is provided with a stem 16 by means of which it may be opened to deflate tube 14. A suitable cap 17 is threaded on the valve body 18

in order to prevent accidental movement of valve stem **16**.

The outer periphery of band **10** is provided with a plurality of snaps **19**, **19** to which a positioning strap device may be attached. Naturally, the nature of the positioning strap depends upon the part of the patient's anatomy to which the tourniquet will be applied. We have however, illustrated the type of strap that would be used in the case of a head tourniquet. Such a positioning device comprises a chin strap **20** adjustable by means of buckle **21** and slidably secured to a pair of looped straps **22**, **22** which are in turn secured to the band **10** at spaced distances. The head strap **23** is also adjustable by means of buckle **24** and is similarly secured to a pair of looped straps **25**, **25** provided with snaps for direct attachment to the lower loops **22** or for direct attachment to snaps **19** on the periphery of the tourniquet.

Localized pressure on arteries or other limited anatomical areas is achieved by means of button **30** which is snapped to a carrier **31** in turn slidable around the periphery of the tourniquet. The carrier **31** may be removed entirely if desired, by squeezing it together and removing the ring **32** from the hook **33** (shown in Figs. 5 and 6). In addition, the round button **30** which is of rubber or of any suitable material, may be replaced by an oval button **34** which may or may not have a concave face **35**. It will be understood that a supply of buttons will be available with each tourniquet assembly so that the surgeon may select the proper size, shape and resiliency for the particular application. Also, any desired number of the carriers **31** and buttons **30** may be employed simultaneously.

Heretofore, no satisfactory tourniquet has been developed for application to a patient's skull, largely because a conventional tourniquet which has equal pressure around its entire circumference may lead to paralyzed nerves and crushed tissues. Such a tourniquet applied to the skull soon causes great pain and discomfort and in many cases is entirely ineffective due to the complexity of the arterial system and the surface contours of the skull.

In order to overcome the above disadvantage, we provide localized pressure by means of one or more of the carriers **31** and buttons **30** and we can control the pressure in the tourniquet to a degree heretofore impossible. One or more of the buttons **30** may be selected and so located that the exact artery or arteries involved may receive the desired pressure. This ability to localize and control the pressure in a skull tourniquet is of great importance and permits the tourniquet to be applied for greater lengths of time and also enables higher pressures to be employed. The looped construction of the head and chin strap assemblies is also desirable in permitting proper positioning of the tourniquet to various areas on the patient's head and also facilitates the ability to adjust the tourniquet to head sizes and shapes of great divergence.

We have thus described an improved tourniquet which is inexpensive to manufacture, suitable for a wide range of applications, readily portable and adjustable, and above all one which may be retained in the proper position for extended periods of time.

Having thus described our invention, we claim:

1. A head tourniquet assembly comprising a flexible non-elastic band, an inflatable resilient tube secured around the inner periphery of said band, means for circumferentially adjusting the diameter of said band and tube, valve means for inflating and deflating the tube, at least one looped strap detachably secured to said band, a flexible non-elastic head strap slidably attached to said looped strap at one end and connected to a diametrically opposite portion of the band at the other end, a looped strap detachably connected to the band and depending in an opposite axial direction from the band, and a chin strap slidably attached to said looped strap at one end and secured to a diametrically opposite portion of the band at the other end.

2. A tourniquet assembly constructed in accordance with claim 1, in which the resilient tube has a relatively thick annular wall adjacent the non-elastic band, and a relatively thin annular wall formed integrally with the thick wall and joined thereto by gradually tapering end walls integral with said thick and thin walls and gradually decreasing in thickness from said thick wall toward said thin wall, said thin wall adapted to press against the patient's head, whereby rolling of the tourniquet on the head is prevented.

3. In a tourniquet, a flexible non-elastic band, a resilient inflatable tube secured to the inner periphery of said band, said tube having a relatively thick flat annular wall adjacent the band and a relatively thin annular wall formed integrally with said relatively thick wall and joined thereto by gradually tapering end walls integral with said thick and thin walls and which gradually decrease in thickness from said thick wall toward said thin wall, said thin wall adapted to press against the patient's anatomy, whereby rolling of the tourniquet on the patient's anatomy is prevented, and valve means connected to said tube for inflating and deflating the same.

4. A tourniquet as defined in claim 3 in which the integral thin wall is arcuately convex with respect to said thick flat wall.

WALTER R. LIVINGSTON.
BURTON W. HANCOX.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
515,367	Rounseville	Feb. 27, 1894
2,045,750	Buschenfeldt	June 30, 1936

FOREIGN PATENTS

Number	Country	Date
12,486	Great Britain	Mar. 3, 1910