

United States Patent

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[54] APPARATUS TO FACILITATE SEALING OF ARTERIAL PUNCTURES

4 Claims, 5 Drawing Figs.

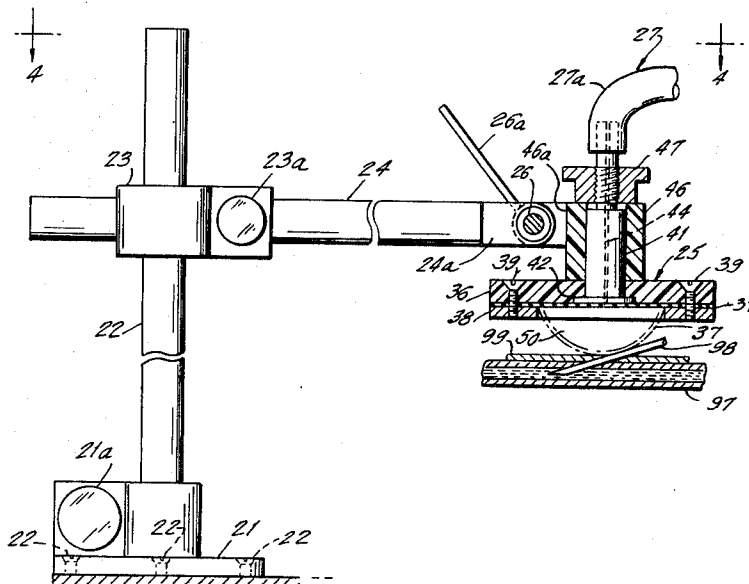
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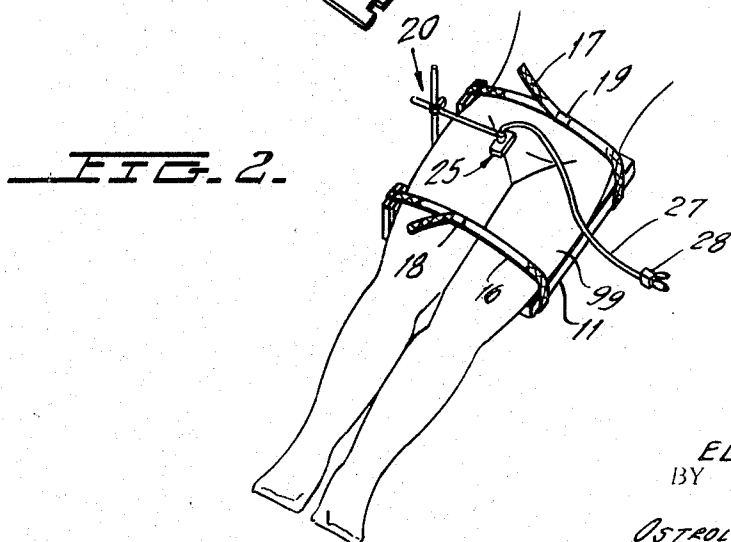
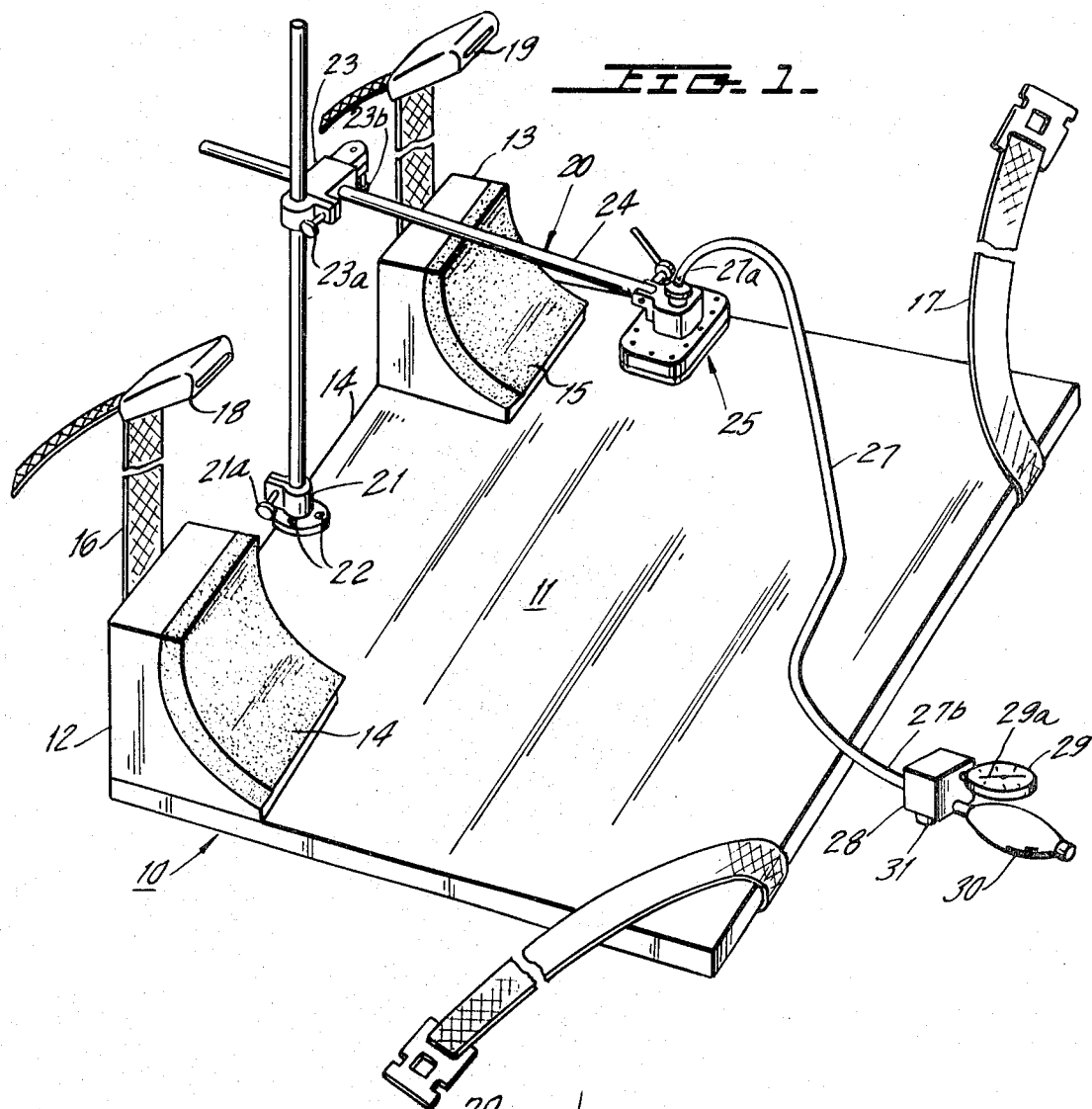
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ABSTRACT: A device for arterial compression to promote formation of a blood clot or thrombus which closes an arterial puncture is constructed with an inflatable transparent expandable pad unit. An adjustable support means mounted to a base supports the transparent pad in its required operative position. The patient is properly located by body-positioning pads located on the base with a pair of belts maintaining the patient in such operative position. After the unit is placed over the arterial opening, the unit is inflated to a point where blood does no more than merely ooze from the arterial opening and pulsing indications of blood pressure within the artery in question become observable on a gauge connected to read pressure within the transparent chamber. The arterial compression is observable through the pad and the clot is usually formed properly a short time after blood stops oozing.





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FIG. 4.

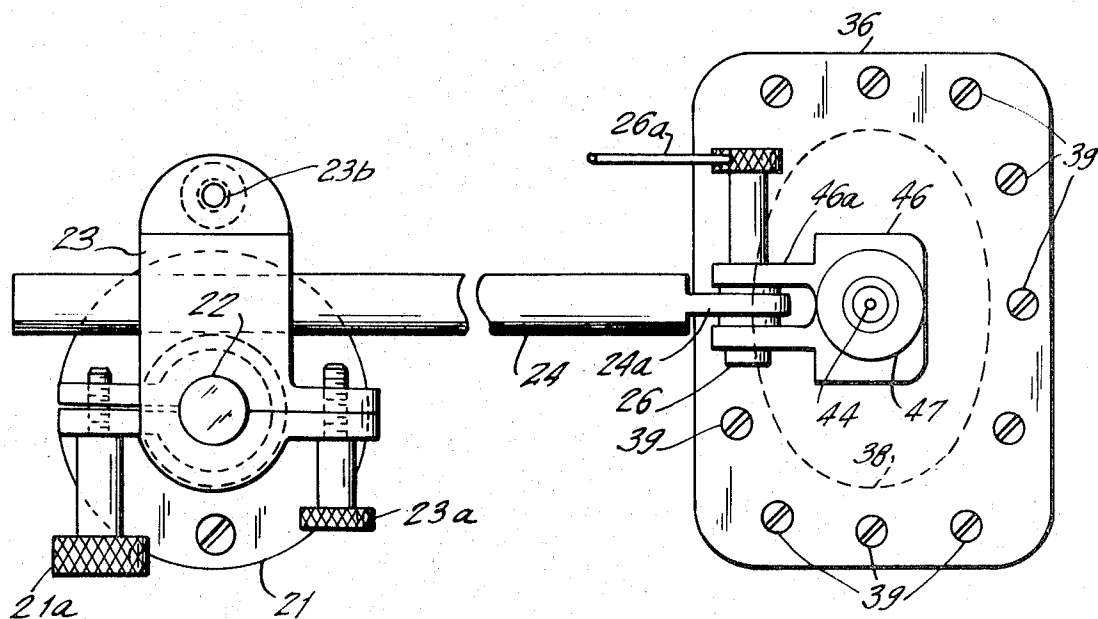


FIG. 3.

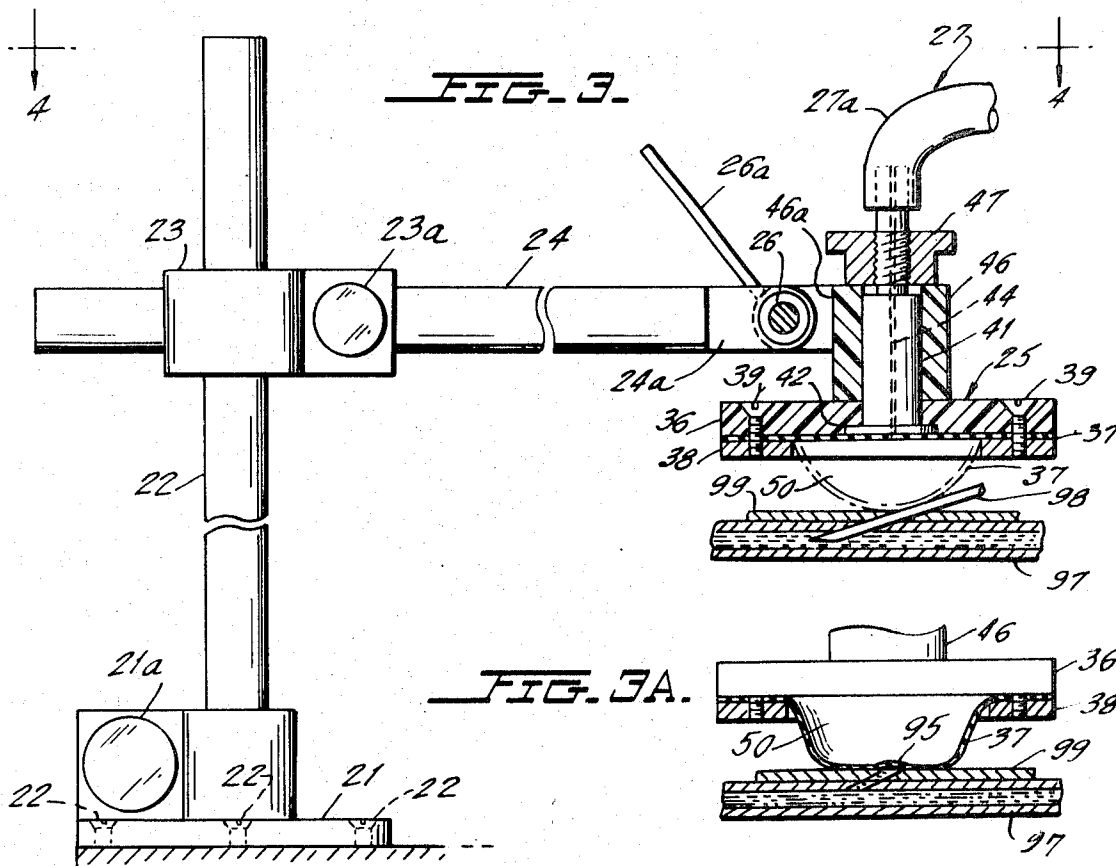
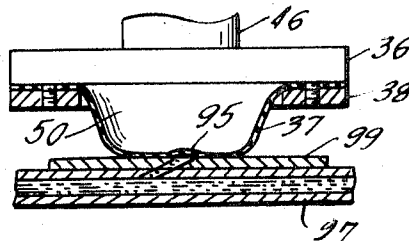


FIG. 3A.



APPARATUS TO FACILITATE SEALING OF ARTERIAL PUNCTURES

This application relates to medical devices in general, and more particularly relates to means for facilitating the closure of an opening in an artery.

Certain medical procedures, including procedures in vascular radiology, require the insertion of a catheter into a main artery. When the catheter is withdrawn a relatively large clot must be formed in order to close the artery puncture through which the catheter was inserted. In the prior art, finger pressure was applied to the artery for 10 to 15 minutes on the average to assist the formation of the arterial puncture sealing blood clot. Since a reasonable degree of skill was required in order to apply the proper amount of pressure of the required time, it was necessary to employ trained personnel. But, even through trained personnel performed this procedure, the danger of collapsing the artery was present if too much pressure was applied. In particular, collapse of the artery encouraged the formation of a large thrombus at the collapsed region with such large thrombus being capable of forming a permanent block in the artery.

The instant invention provides a procedure and apparatus which eliminates the manual operation described above and, at the same time, all but eliminates the possibility that an artery will be collapsed. In particular, the device of the instant invention utilizes a transparent expandable pad which is partially inflated and placed in contact with the region of the body where the catheter has entered. The catheter is then withdrawn and the pad further inflated to a point where bleeding stops. Pumping of blood through the artery is indicated by a meter which indicates pressure within the pad. On average, 5 to 10 minutes after the pad is applied a satisfactory clot will have formed. If the clot is not satisfactory this is indicated by the oozing of blood around the clot as pressure in the chamber is reduced. Such oozing is observable before removing the pad since the latter is constructed of a rigid transparent plate and a transparent rubber membrane sealed along its edges to the transparent plates.

Accordingly, a primary object of the instant invention is to provide a novel procedure and apparatus to facilitate the formation of a blood clot for closing an arterial opening after withdrawal of a catheter.

Another object is to provide an expandable pressurized pad mounted to an adjustable support for blocking an arterial opening during formation of a clot thereat.

Still another object is to provide a transparent expandable pressurized pad for placement over an arterial opening to facilitate formation of a clot thereat.

These objects as well as other objects of this invention will become readily apparent after reading the following description of the accompanying drawings in which:

FIG. 1 is a perspective of apparatus constructed in accordance with teachings of the instant invention for facilitating the formation of a clot at an opening in an artery after withdrawal of a catheter.

FIG. 2 is a fragmentary perspective of a human body with the apparatus of FIG. 1 operatively applied thereto.

FIG. 3 is a side elevation of the inflatable transparent pad means and adjustable support therefor with the former being shown in cross section.

FIG. 3A is a fragmentary portion of FIG. 3 showing the pad inflated during the clotting period.

FIG. 4 is a plan view of the elements of FIG. 3 looking in the direction of arrows 4,4 of FIG. 3.

Now referring to the figures. Medical device 10 includes rectangular platelike base 11 having body-positioning blocks 12,13 secured on the upper surface thereof and adjacent to edge 14 thereof. Curved, generally vertical surfaces of blocks 12,13 are covered with resilient pads 14,15, respectively. A pair of belts 16,16 and 17,17, provided with respective adjustable and quick release buckles 18,19, are secured to base 11 and are positioned to extend thereacross.

Adjustable support means 20 is secured to base 11 and extends thereabove. Support means 20 includes collar 21

secured by screws 22 on the upper surface of base 11. The lower end of vertical rod 22 extends into collar 21 and is held against rotation by the action of clamping screw 21a. The upper end of vertical rod 22 extends through a vertical passage in double clamping member 23. The vertical and angular position of member 23 with respect to rod 22 is maintained by clamping screw 23a. One end of horizontal rod 24 extends through a horizontal passage in member 23 and is maintained against both longitudinal and angular movement through the action of clamping screw 23b. Inflatable expandable transparent pad unit 25 is secured to the other end of horizontal rod 24 and is pivotally positionable about clamping pin 26 as a center.

End 27a of flexible tube 27 is connected to pad unit 25 while end 27b of tube 27 is connected to check valve 28 having meter 29, hand pump 30 and thumbscrew-operated release valve 31 mounted thereto. Check valve 28, meter 29, hand pump 30, and valve 31 form an assembly of the type used in a conventional sphygmomanometer used for blood pressure measurement.

In particular pad unit 25 includes rectangular support plate 36 constructed of rigid clear plastic. Transparent rubber membrane 37 covers the lower surface of plate 36 and is held in place by clamping ring 38 secured to plate 36 by a plurality of screws 39. Nipple 41 extends through a central aperture in plate 36 with annular lip 42 at the lower end of nipple 41 extending into a complementary depression in the lower surface of member 36. The portion of nipple 41 extending above member 36 passes through a vertical bore in support member 46 and is held in place by nut 47 which bears against the upper surface of support 46 and engages the threaded outer surface portion of nipple 41 located at a point intermediate the ends thereof. The upper end of nipple 41 extends into end 27a of tube 27 and is held in place by friction. Hole 44 extending longitudinally through nipple 41 provides a connecting passage between tube 27 and the expandable chamber formed below transparent support 36 by membrane 37.

Bifurcated lateral extension 46a of support 46 sandwiches flattened tip 24a of horizontal rod 24 with pin 26 extending through extension 46a and tip 24a. In a manner well known to the art crank 26a extends radially from pin 26 and operates a cam-type clamping means which holds pad unit 25 in a selected angular position about pin 26 as a center.

Device 20 is utilized by placing it on a patient-support table (not shown) with base 11 below the appropriate portion of the patient's body 99 which will enable pad 25 to block the arterial opening where the clot is to be formed (see FIG. 2). Base 11 is moved to a position where pads 14,15 rest against body 99 and thereafter the sections of straps 16 and 17 brought together over body 99 and drawn tight enough so that body 99 does not move relative to base 11. Just before catheter 98 is to be removed, rods 22 and 24 are adjusted in length and their angular positions fixed together with the angular position of pad unit 25 so that inflation of pad unit 25 through the action of hand pump 30 expands membrane 42 into contact with body 99 at the point where catheter 98 enters artery 97 (phantom position of FIG. 3). Catheter 98 is then removed from artery 97 and additional pressure is built up in chamber 50 causing further expansion of membrane 37 so that a more extensive area thereof lies against body 99 (FIG. 3A). Vibratory motion of meter needle 29a indicates that sufficient pressure is present in chamber 50.

Since elements 36 and 37 are transparent clot 95 that forms below element 37 is viewable. This is particularly important when pad unit 25 is about to be removed. That is, when pressure in chamber 50 is being reduced by gradual opening valve 31, the observation of oozing blood indicates that the clot is unsatisfactory. Under such conditions pressure in chamber 50 is built up again to a point where the oozing stops and pad unit 25 is maintained in operative position for an additional appropriate period of time.

Thus, it is seen that the instant invention provides a novel method and apparatus to facilitate the formation of a blood

clot at an arterial puncture. The apparatus previously described substantially reduces the skill required for the operator in order to assure that the artery is not collapsed. Even further, during the period when clotting is taking place the skilled person is free to engage in other necessary activities.

It is noted that the term "transparent" as used in the following claims is intended to cover not only members having the light-transmitting properties of clear glass, but is also intended to include members that are translucent. The only limitation intended is that sufficient light be transmitted to permit visual observation of the area being contacted by the transparent element.

Although there have been described preferred embodiments of this novel invention, many variations and modifications will now be apparent to those skilled in the art. Therefore, this invention is to be limited, not by the specific disclosure herein, but only by the appended claims.

We claim:

1. A medical device for applying controlled pressure to a localized area of a body comprising a base having body-positioning means, a securing means for holding a body on said body-positioning means, a pad unit including an expandable pressure chamber partially defined by a extendable, flexible, transparent membrane and partially defined by a transparent rigid support for said membrane, an adjustable support means for

mounting said transparent rigid support relative to said base, means for securing said adjustable support means in adjusted position; a pump means connected to said chamber for inflation thereof whereby said membrane is expanded into engagement with said localized area of the body when said support means positions said chamber adjacent said localized area; means connected to said chamber for indicating pressure changes therein; a one-way valve means interposed between said pump means and said chamber to permit pressure buildup in the latter; whereby conditions at the localized area of the body are viewable through said transparent rigid support and said membrane while said membrane is in operative engagement with such localized area.

2. A medical device as set forth in claim 1 in which includes support means permitting linear movement of said unit in first and second mutually perpendicular planes and for permitting universal pivotal movement of said unit.

3. A medical device as set forth in claim 1 in which one end of said support means is secured to said base and said unit is secured to the other end of said support means.

4. A device as set forth in claim 1 in which the pad unit also includes a framelike member holding the periphery of said transparent membrane clamped against the transparent rigid support.

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