United States Patent

Gauthier

[15] **3,675,657**

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[54] TOURNIQUET

[72] Inventor: **Oscar Gauthier**, Ville Brossard, Province of Quebec, Canada

[73] Assignee: **Clebel Inc.**, L'Ange-Gardien, Co. Rouville, Queen, Canada

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[52] **U.S. Cl.** **128/327**, 128/138

[51] **Int. Cl.** **A61b 17/12**, A61f 5/42

[58] **Field of Search** ..... 128/79, 138 A, 138 R, 327

[56] **References Cited**

UNITED STATES PATENTS

2,045,750	6/1936	Buschenfeldt	128/327
2,468,133	4/1949	Sullivan	128/327
2,604,098	7/1952	Kranc	128/327
2,882,903	4/1959	Ramien	128/327

FOREIGN PATENTS OR APPLICATIONS

615,801	7/1935	Germany	128/325

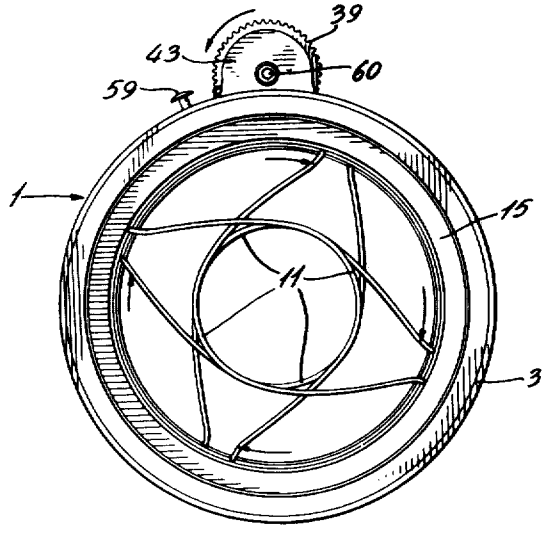
Primary Examiner—Channing L. Pace

Attorney—Raymond A. Robic

[57] **ABSTRACT**

A tourniquet in the form of a ring in which the inner wall is a membrane of latex rubber forming a toroidal chamber with its support. Inside the chamber, there are provided a series of strings, each having one end secured to the support of the ring while the other end is secured to a toothed annular member inside the chamber. A pinion operable from outside the ring, is in mesh with this toothed member so that when rotated in one direction, the strings act on the inner rubber wall to expand it inwardly and thus close the ring opening.

6 Claims, 5 Drawing Figures



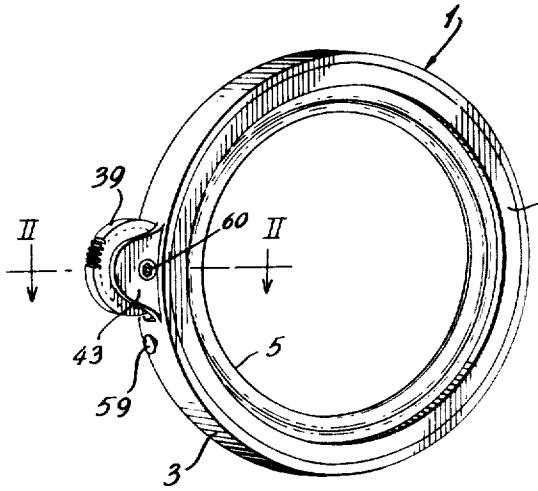


Fig. 1

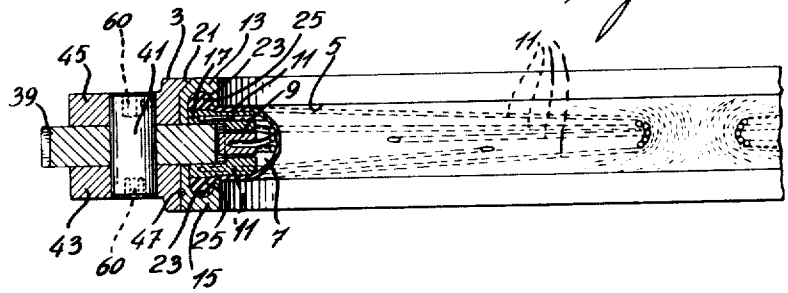


Fig. 2

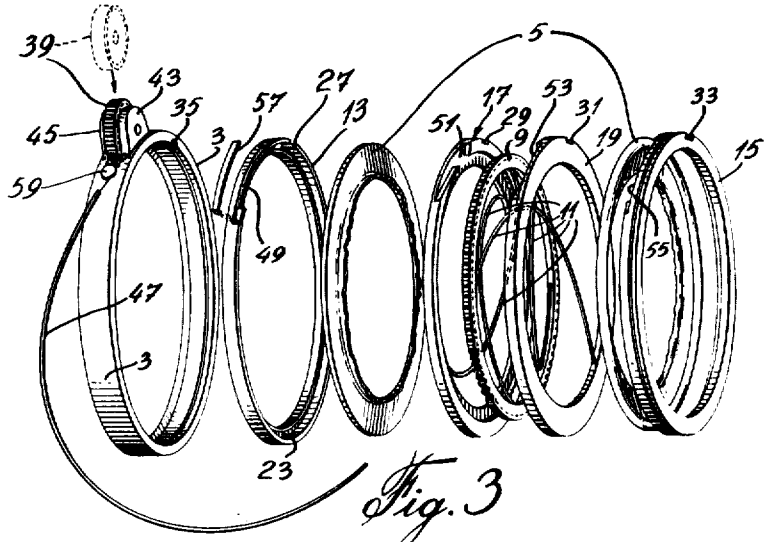


Fig. 3

INVENTOR
Oscar GAUTHIER.

Raymond & Robin

ATTORNEY

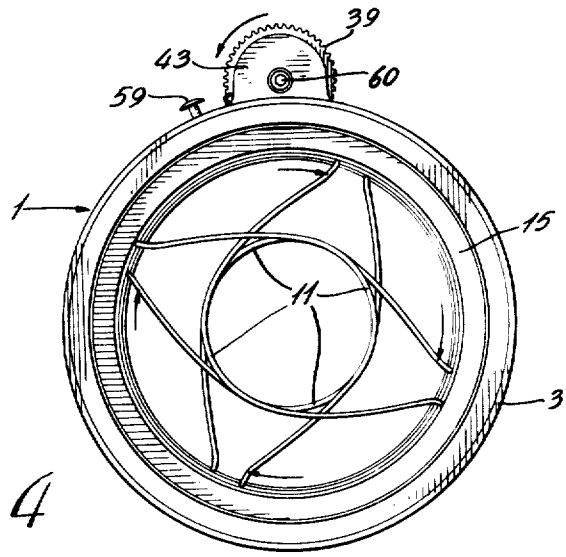


Fig. 4

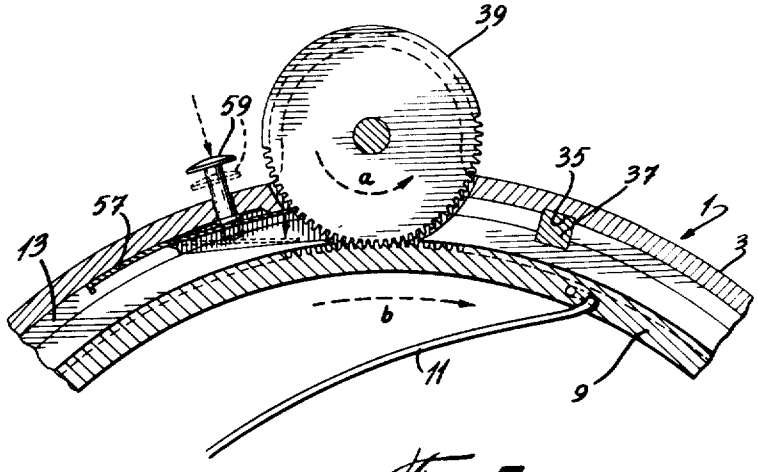


Fig. 5

INVENTOR
Oscar GAUTHIER

Raymond A. Robic
ATTORNEY

TOURNIQUET

The present invention relates to tourniquets, that is to a device intended to be mounted around a limb to stop bleeding. The device is also adaptable for mounting around the male organ of generation to restrict blood circulation therethrough in order to cause erection thereof in the case of an impotent or semi-potent male.

The main object of the invention lies in the provision of such a device: (a) capable of applying a pressure distributed uniformly around the limb or organ; (b) that can easily be pressurized and readily released; (c) that positively and safely lock into the desired closing position; and (d) that is simple in construction as well as in use.

Many devices of this general type have been proposed throughout the years. In some of these, such as the ones disclosed in U.S. Pat. Nos. 1,073,525 and 1,225,000, particularly intended for use over and around a male organ, the pressure is applied at localized points around the organ and thus provides an unsatisfactory control of the blood circulation through the organ and further tends to be painful to the user.

In a more recent development disclosed in U.S. Pat. No. 2,604,098, specifically intended to be used to completely stop or restrict the flow of blood through a limb, the pressure is applied slightly more uniformly but still tends to concentrate on two opposite points of the limb, giving rise to imperfect blood circulation control. The device of this patent operates by tightening a belt around a limb much in the same manner as is the case with a waist belt. Apart from the tendency to concentrate the pressure at localized points, such a device would likely crimp and pinch the skin and would thus be painful to the user.

Other devices such as those of U.S. Pat. Nos. 2,045,750 and 2,468,133 make use of a flexible tube that is wound or placed around the limb, air being used to inflate and pressurized it. These devices obviate the drawback of localized pressure. However, one obvious disadvantage is that they require a source of fluid pressure, either from a pump or from a compressed air container, that is separate from the tourniquet proper. Furthermore, such a system is more prone to breakdown than the earlier mechanical contrivances of U.S. Pat. Nos. 1,073,525 and 1,225,000. These devices would also be totally unsuitable for use by impotent or semi-potent males.

I have overcome the above-mentioned difficulties by providing a completely self-contained tourniquet wherein the pressure can be applied uniformly around the limb or male organ by mechanical pressure-applying means and that can likewise be mechanically controlled to thus provide a highly reliable and readily controllable device. More specifically, the tourniquet of my invention comprises a ring which is formed of a rigid annular outer support and of an inner resilient wall, the support and the wall defining a toroidal chamber having a central opening. There is provided within the chamber a mechanical pressure applying means operative to apply a substantially uniform pressure on the resilient wall to cause it to contract against its own resiliency to thus reduce the diameter of the central opening. This pressure applying means comprises a plurality of strings within the chamber, the central portions of the strings being distributed around the central opening and being applied against the resilient wall with the free ends extending in the direction of the rigid annular support. The pressure applying means further comprises rotary means in the chamber to which the free ends of the strings are fixed, this rotary means being operative upon rotation to cause the strings to become taut around the resilient wall and force it into an iris-type closure. Finally, the pressure applying means comprises an actuator which is operable from outside the ring to rotate the rotary means.

A better understanding of the invention will be afforded by the following description having reference to the appended drawings wherein:

FIG. 1 is a perspective view of a tourniquet made according to the invention, in released position;

FIG. 2 is a cross-sectional view along line II—II of FIG. 1;

FIG. 3 is an exploded view of the tourniquet of FIG. 1;

FIG. 4 is a side elevation view of the tourniquet with the resilient membrane removed;

FIG. 5 is a transverse partial sectional view on an enlarged scale through the pressure control means.

Referring now to the drawings, it will be seen that the preferred embodiment of the invention comprises a ring 1 formed of an outer rigid annular support 3 and of a inner wall 5 on the inward side thereof whereby to define a toroidal chamber 7. The inner wall 5 to be more fully described hereinafter, is an endless resilient membrane, U-shaped in cross-section, which is preferably made of latex rubber. In FIG. 3, membrane 5 is shown as split, into two parts, through the bight of the U, for purpose of illustration.

As mentioned previously, mechanical pressure applying means is provided within the chamber 7 and is operative to apply a substantially uniform pressure all around the resilient membrane 5 to cause its contraction, against its own resiliency, and thus reduce the diameter of the opening. In this manner, blood circulating through a limb or organ may be controlled or completely stopped. The pressure applying means comprises rotary means including an annular member 9 mounted for rotation inside of and relative to the support 3. As best illustrated in FIG. 3, the annular member 9 is toothed along the outer periphery thereof. A series of strings 11 provides the required pressure for inwardly deflecting the resilient wall 5. One end of each string is fixed to the annular member 9, in any convenient manner, to thus be brought into rotation therewith. The other ends of strings 11 are connected to stationary members that can be considered as forming part of the annular support 3 and that will be referred to more specifically hereinafter.

Strings 11 are preferably made of short lengths of piano wire covered with a nylon tube.

The said rotary means further includes a groove on the inner surface of the annular support 3 for the reception of the rotary member 9. This guiding groove is formed by a pair of outer rings 13 and 15 and a pair of inner rings 17, 19. The outer ring 13 is formed with a beveled edge 21 that sits against a corresponding inclined shoulder of the annular support 3, proper. The inner lateral wall of outer ring 13 has a semi-circular groove 23 into which a correspondingly shaped lobe 25 of the resilient wall 5 is nested. The inner ring 17 is made to rest against this lobe 25 to lock the same in the groove 23. The ends of alternating strings 11 is secured into this ring 17.

A similar construction is provided on the opposite side of annular support 3 relative to the rotary member 9. Thus, there are successively provided the other inner ring 19 to which the ends of the other alternating strings 11 are fastened and the second outer ring 15 provided with a likewise semi-circular groove 23 for the reception of the lobe 25 along the other edge of the resilient inner wall 5.

Rings 13, 17, 19 and 15 are respectively formed with key slots 27, 29, 31 and 33 (FIG. 3) for the reception of a key 37 (FIG. 5) also receivable in a key slot 35 formed on the inner surface of the annular support 3 proper. In this manner, it will be understood that rings 13, 17, 19 and 15 are held against rotation with respect to support 3 and may be considered as forming part of this annular support providing the aforementioned guiding groove means. On the other hand, it will be appreciated that the rotary member 9 is free to rotate in the aforesaid guiding groove means, between the inner rings 17, 19.

There is provided an actuating means operable from outside the ring 1 to cause rotation of the rotary annular member 9. It comprises a pinion 39, the teeth of which are in mesh with the teeth of the annular member 9, and it is mounted for rotation on an axle 41 borne by a pair of spaced brackets 45 upstanding from support 3.

The assembly forming the guiding groove, referred to above, is held from slipping but of support 3 by a flexible string 47 slid into a circumferential groove formed on support 3 and outer ring 15, as shown in FIG. 2.

In order to allow for pinion 39 to reach rotary annular member 9, suitable slots 49, 51, 53 and 55 are formed on rings 13, 17, 19 and 15, respectively.

With special reference to FIGS. 4 and 5, it will be appreciated that whenever pinion 39 is rotated counterclockwise, according to arrow *a* of FIG. 5, it will drive the rotary annular member 9 into clockwise rotation according to arrow *b* forcing the ends of strings 11, secured thereto, to rotate and in view of the fact that other ends of strings 11 are attached to non-rotary elements and press on an annular resilient wall 5, the various strings will be forced to describe a circle as shown in FIG. 4, the circle getting smaller as pinion 39 is rotate further. In this manner, a closure of the iris-type is obtained causing an even distribution of the pressure all around the ring opening.

FIG. 5 particularly illustrates locking means intended to hold the resilient wall 5 in predetermined contracted position against its own resiliency, this means comprising a spring leaf pawl 57 held fixed at one end along the outer peripheries of rings 3 and 13 and having a length such as to become engaged with the teeth of the pinion 39 in a manner illustrated in FIG. 5. A push button 13, extending through support 3 and riveted at the inner end thereof to avoid its release from support 3, serves to disengage the leaf spring pawl 57 in the manner shown in dotted lines in FIG. 5.

For larger size tourniquets, it is suggested that the ends of axle 60 be formed with polygonal recesses for rotation of pinion 45 by means of a correspondingly polygonal key.

With the above mentioned combination, it will be appreciated that an extremely simple, efficient and safe tourniquet has been provided. By closing in the central opening of ring 1, the necessary pressure is applied to the limb or organ to provide the required control of the blood circulation. It will also be appreciated that if the pressure is great enough, the flow of blood will be stopped completely. Furthermore, if sufficient pressure is applied when the tourniquet is used on the human organ of generation, near the pubis, outflow of the sperm will be prevented, the tourniquet then becoming a contraceptive device.

I claim:

1. A tourniquet comprising:

a. a ring formed of a rigid annular outer support and an inner resilient wall, said inner wall being an endless resilient membrane having lateral edges secured to the lateral edges of said support whereby said support and wall define a toroidal chamber having a central opening;

b. mechanical pressure applying means within said chamber operative to apply a substantially uniform pressure on said resilient wall to cause contraction thereof against its resiliency to thus reduce the diameter of said opening, said pressure applying means comprising:

a plurality of strings within said chamber, the central portions of said strings being distributed around said central opening and being applied against said resilient wall with the free ends thereof extending in the direction of said rigid annular support;

rotary means in said chamber to which the free ends of said strings are fixed, said rotary means being operative upon rotation to cause said free ends to approach one another whereby said strings tighten around said resilient wall to force it into an iris-type closure, and

actuating means operable from outside said ring to rotate said rotary means.

2. A tourniquet as claimed in claim 1 wherein said actuating means includes releasable locking means to hold said resilient wall in predetermined contracted position against its own resiliency.

3. A tourniquet as claimed in claim 1 wherein said rotary means comprises:

means defining a groove on the inner surface of said support;

an annular member mounted in said groove for rotation relative to said annular support, and wherein one end of each of said strings is fixed to said annular member to be brought into rotation therewith and the other end is fixed to said annular support, said ends being spaced along the circumferences of said annular member and of said support.

4. A tourniquet as claimed in claim 11 wherein said annular member is toothed along the outer periphery thereof and said rotary means further comprises a pinion mounted for rotation on said annular support and in mesh with said annular member.

5. A tourniquet as claimed in claim 2 wherein said locking means is a spring leaf pawl secured at one end tangentially inwardly of said support for engagement by the other end thereof with said pinion.

6. A tourniquet as claimed in claim 5 including a releasing button freely extending through said annular support adjacent the end of said pawl engageable with said pinion; said button causing release, when pressed, of said pawl from said pinion by moving said pawl away from said pinion against its own resiliency.

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