

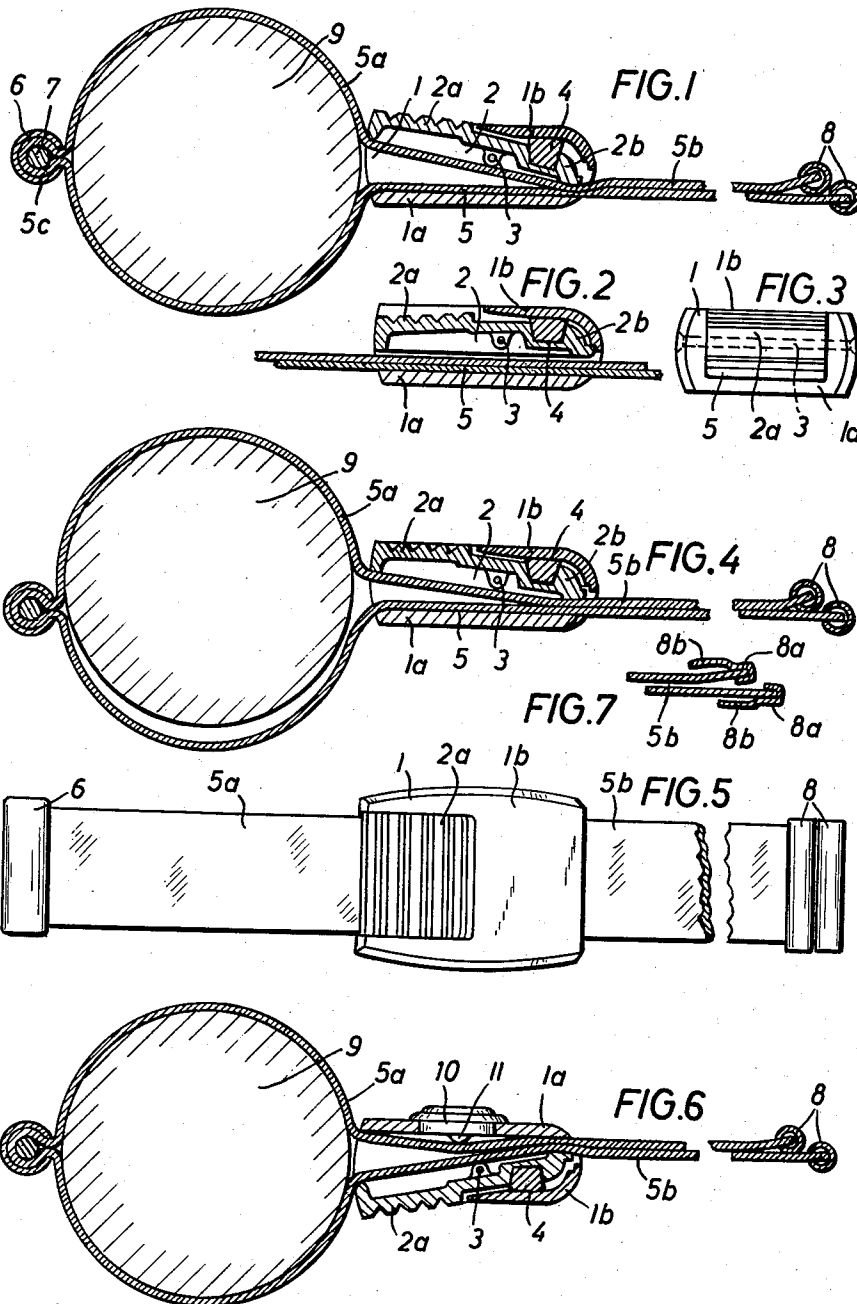
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TOURNIQUET

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TOURNIQUET

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This invention relates to a tourniquet device for use on parts of the body, and is adapted to apply a tourniquet effect rapidly, simply and painlessly in order to block the flow of blood or to drain off blood.

Known devices of this kind have a buckle which is fixed to one end of a rubber belt and through which the other end of the belt is pulled between a milled or serrated roller and a clamping lever which is adapted to be rocked by thumb pressure and by means of which the loop thus formed can be secured in any position or released. The disadvantages of these known tourniquet devices are that the skin of the part of the body engaged by the tourniquet during the tightening thereof is pressed together into folds in a painful manner. Also when the buckle is released, the necessary pressure of the thumb on the buckle lever makes itself felt in an unpleasant manner on the part of the body, and finally when the belt is detensioned suddenly, there is an undesirable release of the pent-up blood in the veins and a jerky movement of the part of the body.

Tourniquet devices are also known wherein the belt forms a loop and both belt parts are guided through a displaceable closure which is provided with a clamping lever subjected to the influence of spring pressure. In this arrangement the clamping device comprises belts that are pressed apart from one another by means of a wedge as they issue from the device which means that both hands are required for operating the device. This is particularly true of tensioning. If only one hand is used in releasing the device, it is impossible to avoid jerky detensioning. This renders manipulation of the device difficult and makes it unsuitable for practical use.

One object of the invention is that both belt portions of the loop are guided unilaterally between the clamping lever and the bottom of the housing, and that the handle end of the clamping lever is constructed as a press key and is directed towards the loop. Moreover, the short clamping arm of the two-armed lever is wholly and the press-key arm partially concealed by the cover of the housing.

Such a construction of a tourniquet enables the whole device to be held in a substantially different manner than has been the case heretofore, and thus allows more skillful and gentle or more sensitive handling. In most cases, a tourniquet is used by the doctor when he has to make an injection, in which case his whole attention must be directed to the place of injection, the injection needle and its manipulation. Hand in hand with the injection there may be a further constriction on the part of the body, or a gentle relaxation and possibly further tightening, depending on what substance and what quantity is being injected. When the tourniquet is applied, it must be possible to find and grasp the device again reliably and securely without glancing away from the needle. This is possible with the construction of the tourniquet according to the invention. The blocking device and the belts can be held in one hand at the same time, and in such manner that it is possible not only to slacken the

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device but also to apply a more intensive constricting effect if necessary. This is possible since the same hand can grasp both the constricting device and also the belt ends, in such a fashion that the device can be moved slowly relatively to the belt in both directions, i.e. corresponding to release and further constriction. The constricting device is held between thumb and index finger, and if necessary with the assistance of the middle finger, in the left hand. The two other fingers engage about the projecting belt ends and can press them against the palm of the hand. This is done simply by grasping the device inside the hand. Thus it is possible to slide the clamping lever mechanism delicately along the two belts, which are held together by the other two fingers, the thumb operating the press key. In this way the intensity of constriction can be adjusted easily at any time. The mechanism can be shifted smoothly and in a sliding manner.

According to a further feature of the invention, when the two-armed lever is situated in the depressed position, limited by a stop, it lies parallel to the bottom of the housing, providing a through opening corresponding to twice the thickness of one layer of belt. The ridged key of the press arm of the lever and the upper side of the housing advantageously lie in the same plane when the device is in the position of rest. In this condition the superjacent belt portions are subjected to a light clamping effect. This is achieved by suitable dimensioning of the spring element, which is constructed more particularly as a rubber pad. As a result, when the key situated on the long arm of the lever is pressed downwardly, an independent counter-pressure is present which makes release of the belt clamping system difficult, so that the speed of opening the closure, i.e. the speed of detensioning the belt and therefore relaxing the constriction, depends on the force of finger pressure applied. Thus the rate of detensioning can easily be regulated.

One constructional example of the subject of the invention is illustrated in the drawings, wherein:

Fig. 1 is a side sectional view of the device, with the loop tightened and the housing in the clamping position.

Fig. 2 is a side sectional view of the housing fully opened by pressure on the press arm until movement thereof is limited by a stop.

Fig. 3 is a front sectional view of the opened housing with the two belt ends;

Fig. 4 is a side sectional view of the device with the belt detensioned and the housing in the position of rest.

Fig. 5 is a plan view of the device.

Fig. 6 is a side sectional view of the device provided with a pressure meter, with the loop tensioned and the housing in the clamping position.

Fig. 7 shows a modified constructional form of the stops situated on the belt ends.

According to the invention, the two ends 5b of the belt 5 are both pulled through the housing 1, between lever 2 and housing bottom 1a, so that in front of one closure aperture, the loop 5a for surrounding the part of the body 9 is formed, while the belt ends 5b lie adjacent one another outside the opposite aperture of the housing 1.

The lever 2 is pivotally mounted on the pin 3 mounted in the housing 1 and comprises the long press arm 2a at the loop side and the short clamping arm 2b at the pulling side. The housing 1 has a cover 1b which encloses the clamping arm 2b and part of the press arm 2a, which is only exposed at one end which is in the form of a ridged key adapted to be operated by finger pressure.

The spring element 4 comprising a rubber pad or a compression spring, which is interposed between clamping arm 2b and cover 1b, presses the clamping arm 2b against the belt 5 and the bottom 1a of the housing 1. The rubber belt 5 consists of two or more layers sur-

rounded by fabric material, woven together at the edges. This doubling, and using a great number of fine rubber filaments, produces a fine-mesh smooth surface which slides painlessly over the skin of the part of the body being constricted, with slight adhesive power, and which travels smoothly through the closure. At the same time the doubling gives the rubber belt 5 the requisite high tensile strength.

The clamping sleeves 8 which are pressed on to the ends of the rubber belt 5 and are formed with toothed slots, serve as stops for preventing the belt from being pulled out of the closure, as does the non-toothed slit push-on sleeve 6, which is fitted on to an end loop 5c of the loop 5a of the rubber belt 5 after the pin 7 has been inserted in said end loop. These stops reliably couple the closure and belt together and enable them to be ready for use at any time. Accidental pulling of the rubber belt 5 from out of the closure in either direction is prevented by the stops. To replace the belt, the push-on sleeve 6 is pulled off, the pin 7 falling out of the belt loop 5c, and the loop side 5a of the old belt is pulled out of the closure, whereupon the replacement belt is introduced at the pulling side of the closure, pulled through, and the pin 7 and push-on sleeve 6 fitted in position.

In using a device according to the constructional form described hereinbefore, the operations of tightening and releasing proceed as follows:

After putting the part of the body 9 through the loop 5a, in the rubber belt 5, and grasping with one hand the closure consisting of the housing 1 and key 2, the other hand grasping the two belt ends 5b, pulls exerted on the latter obtain the desired tension in the loop 5a. Then, with the rubber belt 5 in this tensioned position, the closure is pushed against the part of the body and the closure and belt are released. The rubber belt 5 is thus clamped fast immovably in the desired constricting condition of tension. The clamping effect is exerted by the tension of the stretched loop 5a, the effect being greater at the end of the long press arm 2a of the lever 2 in proportion as the constricting tension is higher. The tractive force presses the clamping arm 2b with increased power against the bottom 1a of the housing 1. The belt ends 5b lying therebetween are thus clamped fast so strongly by the smooth end of the clamping arm 2b that the tractive force of the tensioned loop 5a does not suffice to release the clamping arrangement.

The belt ends 5b are unclamped by pressing on the key of the long press arm 2a which is exposed in the housing 1. In this operation the independent closing pressure, to which the short clamping arm 2b is additionally subjected by the spring element 4, acts as a counter-pressure which makes opening of the closure difficult. Through this counter-pressure, the rate of opening the device and thus the rate of relaxing the constricting effect are dependent on the particular force exerted through finger pressure. Thus the device makes it possible to relax the constricting effect at a rate which can be infinitely adjustable, as required, between rapid and slow.

The belt ends 5b, which could also be connected together without impairing the tensioning and releasing operations, are left separate to show clearly by means of the closed loop 5a at one side of the closure and the open, separate belt ends 5b at the other end, how the device is to be applied to the part of the body, and to show this in such a way as to exclude the possibility of confusion which would be present owing to the second loop which would be formed if the belt ends 5b were joined together.

Separate belt ends 5b have the further advantage that, after the belt 5 has been pulled back as far as the stop 6, if the belt is wound about the closure the said ends can be shifted without causing tension, so that the wound device has a smooth outline with a view to being placed in a container of restricted size.

The key on the long press arm 2a of the lever 2 is so

fashioned that its upper surface and the upper surface of the cover 1b lie in the same plane when the device is not in the clamped condition, but when the device is under tension a closed guide channel is still guaranteed by means of the high end face of the key, despite the key's projecting from the housing 1.

During full opening, by pressing on the key until the clamping arm 2b abuts on the cover 1b, the two opposite apertures of the closure channel have like rectangular cross-sections, so that the belt ends can move freely through the closure channel and be fully de-tensioned when the device is opened.

The front end of the press arm 2a and the end of the housing 1 lie in a common cylindrical plane curved about the pivot pin 3, so that when the device is in the constricting position the closure is only in punctiform contact with the part of the body and, when the device is opened, the key does not as a result of its pivotal movement about the pin 3 issue from the end of the housing 1 and press on the part of the body.

It is possible to arrange in the bottom 1a of the housing 1 a pressure meter 10 which, by means of a knob 11 projecting into the interior of the housing 1, receives and registers the transverse pressure of the rubber belt which is lying tensioned in the housing, and the dial scale can indicate the effective longitudinal tension proportionate to the transverse pressure.

Fig. 7 shows another construction of the stops which are arranged at the ends of the belt. The stops 8a consist of sheet metal strips which engage flat about the belt ends and between whose arms a short section of belt end is held fast by a clamping effect. The extension 8b, which is advantageously rounded when seen in plan view, is bent away slightly from the belt surface. When the belt ends are pulled down to the housing 1, the lifted ends 8b slide on the round part of the housing 1 and bring the end pieces 8a into inclined positions, stopping further movement. But if, when the belt ends are pulled through the housing, the stop extensions 8b are pressed against the belt surface, the belt can be pulled through the device without removing the stops 8a, 8b. This has the advantage that the stops 8a, 8b can be left on the belt.

It will be apparent to those skilled in the art that various changes and modifications may be made in the construction as disclosed without departing from the spirit of the invention, and it is intended that all such changes and modifications shall be embraced within the scope of the following claims.

What is claimed is:

1. A tourniquet comprising a housing open at both ends, a looped belt extending through the housing, a clamping lever pivoted between the side walls of the housing and overlying the belt with the looped portions of the belt guided unilaterally between the lever and bottom wall of the housing, that part of the lever directed towards the looped end of the belt constituting a press arm, a cover overlying the housing at the end spaced from the belt loop and spaced from the press arm, and the other end of the lever constituting a clamping arm underlying the cover and said press arm being longer than the clamping arm.

2. A tourniquet as in claim 1 characterized by the lever when in a depressed position lying parallel to and spaced from the bottom of the housing to provide an unobstructed opening for the passage of the two layers of the looped belt.

3. A tourniquet comprising a housing open at both ends, a looped belt extending through the housing, a clamping lever pivoted between the side walls of the housing and overlying the belt with the looped portions of the belt guided unilaterally between the lever and bottom wall of the housing, that part of the lever directed towards the looped end of the belt constituting a press arm, the free end of the press arm and adjacent end

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of the housing lying in the same arc and centered on the lever pivot.

4. A tourniquet comprising a housing open at both ends, a looped belt extending through the housing, a clamping lever pivoted between the side walls of the housing and overlying the belt with the looped portions of the belt guided unilaterally between the lever and bottom wall of the housing, that part of the lever directed towards the looped end of the belt constituting a press arm, a cover overlying the housing at the end spaced from the belt loop and spaced from the press arm, and the other end of the lever constituting a clamping arm underlying the cover and said press arm being longer than the clamping arm, the free end of the press arm and adjacent end of the housing lying in the same arc and centered on the lever pivot.

5. A tourniquet as in claim 1 characterized by the lever when in a depressed position lying parallel to and spaced from the bottom of the housing to provide an unobstructed opening for the passage of the two layers of the looped belt, the free end of the press arm and adjacent end of the housing lying in the same arc and centered on the lever pivot.

6. A tourniquet comprising a housing open at both ends, a looped belt extending through the housing, a clamping lever pivoted between the side walls of the housing and overlying the belt with the looped portions of the belt guided unilaterally between the lever and bottom wall of the housing, that part of the lever directed towards the looped end of the belt constituting a press arm, the upper face of the press arm being ridged and said upper face and upper side of the housing cover lying in the same plane when the tourniquet is in a position of rest and a tensioning element interposed between the clamping end of the lever and the cover of the housing.

7. A tourniquet comprising a housing open at both ends, a looped belt extending through the housing, a clamping lever pivoted between the side walls of the housing and overlying the belt with the looped portions of the belt guided unilaterally between the lever and bottom wall of the housing, that part of the lever directed towards the looped end of the belt constituting a press arm, a cover overlying the housing at the end spaced from the belt loop and spaced from the press arm, and the other end of the lever constituting a clamping arm underlying the cover and said press arm being longer than the clamping arm, the upper face of the press arm being ridged and said upper face and upper side of the housing cover lying in the same plane when the tourniquet is in a position of rest and a tensioning element interposed

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between the clamping ends of the lever and the cover of the housing.

8. A tourniquet as in claim 1 characterized by the lever when in a depressed position lying parallel to and spaced from the bottom of the housing to provide an unobstructed opening for the passage of the two layers of the looped belt, the upper face of the press arm being ridged and said upper face and upper side of the housing cover lying in the same plane when the tourniquet is in a position of rest and a tensioning element interposed between the clamping end of the lever and the cover of the housing.

9. A tourniquet comprising a housing open at both ends, a looped belt extending through the housing, a clamping lever pivoted between the side walls of the housing and overlying the belt with the looped portions of the belt guided unilaterally between the lever and bottom wall of the housing, that part of the lever directed towards the looped end of the belt constituting a press arm, and a pressure meter carried by the bottom wall of the housing and engaged with the belt to indicate pressure of the tensioned belt.

10. A tourniquet comprising a housing open at both ends, a looped belt extending through the housing, a clamping lever pivoted between the side walls of the housing and overlying the belt with the looped portions of the belt guided unilaterally between the lever and bottom wall of the housing, that part of the lever directed towards the looped end of the belt constituting a press arm, a cover overlying the housing at the end spaced from the belt loop and spaced from the press arm, and the other end of the lever constituting a clamping arm underlying the cover and said press arm being longer than the clamping arm, and a pressure meter carried by the bottom wall of the housing and engaged with the belt to indicate pressure of the tensioned belt.

11. A tourniquet comprising a housing open at both ends, a looped belt extending through the housing, a clamping lever pivoted between the side walls of the housing and overlying the belt with the looped portions of the belt guided unilaterally between the lever and bottom wall of the housing, that part of the lever directed towards the looped end of the belt constituting a press arm, and stop means at the free ends of the belt and at the looped portion of the belt to prevent removal of the housing from the belt.

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