

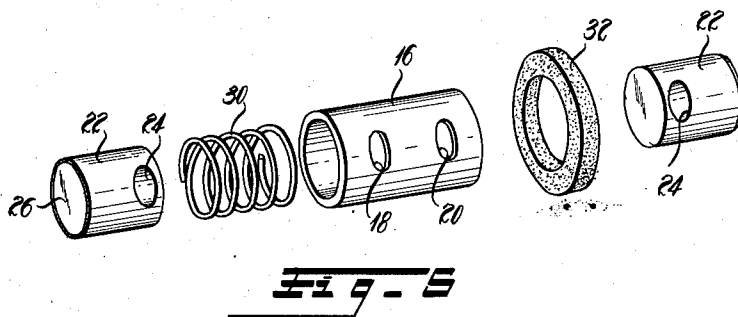
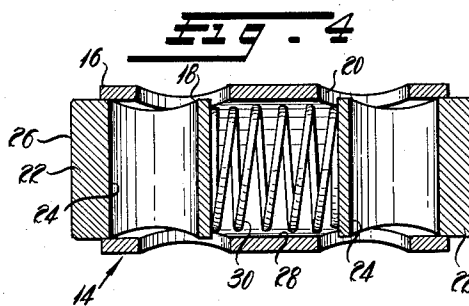
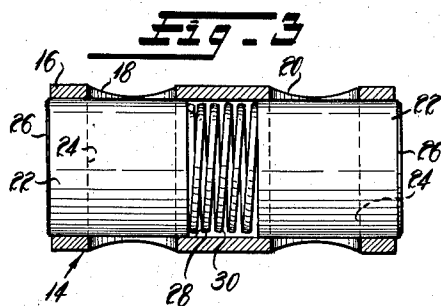
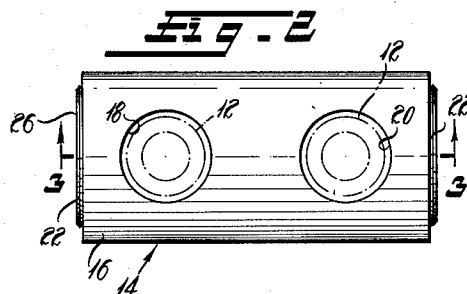
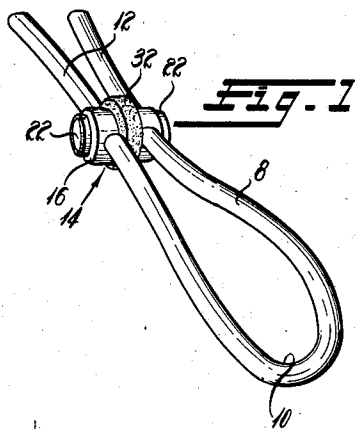
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M. EICHINGER

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CLAMPING DEVICE

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INVENTOR

MAXIMILIAN EICHINGER

BY

Strauch, Hoken & Heale

ATTORNEYS

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CLAMPING DEVICE

Maximilian Eichinger, Maxingstrasse 62,

Vienna XIII/89, Austria

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This invention relates to a clamping device and is more particularly related to a clinical clamping device with flexible lines, such as tourniquet tube, and a mechanical clamp.

In the administration of intravenous injections or taking of blood samples, for example from the arm vein of humans, it is virtually necessary to provoke a vascular engorgement of the vein to facilitate insertion of a tubular needle. This engorgement is achieved by tying the limb with a strap or the like. When using a flexible tube for tying, a physician generally fixes the tube ends in a half knot between the limb and tube to prevent slackening of the tension. This can sometimes be painful for the patient.

Flexible tube clamps have been previously proposed, as shown in U.S. Patents No. 1,532,229 and No. 1,387,358, as well as in German Patent No. 645,126. Such previously known clamping devices incorporate, e.g., a pipe in which the flexible tube is inserted and clamped by a sliding bolt laterally shiftable in oblique slots, or the flexible tube is fixed by a comparatively intricate device having many components. Compared to the previously known devices the subject clamping device of this invention is remarkable for its particularly simple construction and the fact that clamping and adjusting may be accomplished in a particularly easy manner.

The proposed clinical clamping device according to the present invention permits rapid and positive tightening and fixing of a flexible elongated material arranged to form a loop, especially for tying a limb by means of a flexible tube for administration of intravenous injections and the like, without causing pain to the patient. It provides for similar rapid positive release of the clamp. The clamp is simple and foolproof and can be completely disassembled for sterilization, merely by slipping it off the flexible loop material.

Accordingly, a primary object of this invention resides in providing a novel tourniquet with a flexible loop and a simple sliding mechanical clamp device with provision for rapid easy release of clamping action.

A further object resides in the provision of a loop of flexible tubular material and a simple novel clamp device having provision for the ends of the tubular material to project in sliding relation through separate clamping passages in the device. In conjunction with this object a still further object resides in the provision of a small number of component parts in the clamp device maintained in assembly by cooperation with the flexible material.

Still another object resides in the provision of a novel clamping device having provision for separately receiving and providing coordinated clamping action on two spaced portions of material.

Further novel features and other objects of this invention will become apparent from the following detailed description, discussion and the appended claims taken in conjunction with the accompanying drawings showing a preferred structure and embodiment, in which:

FIGURE 1 is a perspective view illustrating a flexible tubular tourniquet loop the ends of which are clamped in a small releasable clamp, as a preferred example of this invention;

FIGURE 2 is a side view of the clamping device shown in FIGURE 1 with the plungers disposed in a position

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enabling free sliding of the loop ends which are shown in phantom line for convenience of illustrating clamp component details.

FIGURE 3 is a section view taken on line 3—3 of FIGURE 2 illustrating the interior details of the clamping device disposed in release position;

FIGURE 4 is a view similar to FIGURE 2 but illustrating the clamp device in its clamping position; and

FIGURE 5 is a perspective view illustrating the disassembled components of the clamp device enabled by removing the tourniquet loop ends.

In general, the invention is exemplified by a clinical tourniquet 8 (FIGURE 1) consisting of a flexible tube 10 arranged in a loop with its ends 12 projected through a clamp device 14. Briefly, the clamping device 14 consists of a tubular sleeve member with two plungers disposed for sliding within the sleeve member between the plungers. The sleeve member and the two plungers are provided with transverse bores which are in alignment when the spring is completely compressed (the innermost position of the plungers, FIGURES 2 and 3).

The ends 12 of the flexible tube 10, which can be any of many elongated flexible materials and not necessarily tubular, arranged to form a loop, project through respectively aligned cross bores in the mechanical clamp and prevent the plungers from being displaced out of the sleeve.

The manipulation of the clamping device according to the invention can be understood by viewing FIGURES 3 and 4, FIGURE 3 showing the plungers in the innermost position, which is accomplished by squeezing the plungers with thumb and forefinger, where clamping action is prevented and FIGURE 4 showing the plungers disposed by spring bias in an outer clamping position.

In the specific illustrated example, the clamp device 14 consists of a cylindrical sleeve 16 which has two spaced apart transverse bores 18 and 20 symmetrically arranged in relation to the center of sleeve 16. Two free sliding cylindrical plungers 22 are arranged symmetrically within opposite ends of sleeve 16 and each plunger 22 is provided with a transverse bore 24 having diametral dimensions similar to the sleeve cross bores 18 and 20. The bores 18 and 20 of sleeve 16 are in alignment with associated bores 24 of plungers 22 when the faces 26 of the plungers are substantially flush with the ends of the sleeve 16. In this position a cavity or chamber 28 is provided within the sleeve 16 between the plungers 22 and disposed in chamber 28, and engaging both plungers 22, is a substantially completely compressed helical spring 30. In this compressed position of the helical spring 30 and inner positions of the plungers 22, obtained by compression between thumb and forefinger of one hand, the ends 12 of the flexible, elongated material 8, the tourniquet tube, can be easily projected through the two sets of common aligned transverse bores of sleeve 16 and plunger 22, and/or the clamping device 14 may be freely shifted on the flexible tube 8, to decrease or enlarge the size of loop 10. When the desired position is obtained (e.g., the flexible tube fits tightly around the limb to be tied) clamping of the tube 8 is achieved by releasing the plungers 22 which were pressed together. This clamping position may be maintained for an optional time. Clamping is immediately released by pressing the plungers 22 together between thumb and forefinger, whereupon the clamping device again may be freely shifted on the tube. Note, release is dependent only upon pressure on the plungers 22 and not upon momentary further tightening of the loop, as in some previously proposed devices.

An auxiliary ringlet 32 of soft spongy material, e.g., foam rubber, if desired, can be placed around sleeve 16 between cross bores 18 and 20 to prevent the hard surface of the clamp from bearing directly on the limb to which

the tourniquet is applied, or the ringlet can be used to apply pressure on a pressure point.

The sleeve and plunger components of the clamp 14 can be made from any desirable hard rigid material, such as an aluminum alloy, stainless steel, Bakelite or many of the new plastic compounds. The sleeves and plungers need not be cylindrical, e.g., they could be square or of some other polygonal cross-section, or the outer surface of the sleeve could be made of an infinite variety of cross-section shapes with a cylindrical bore and cylindrical plungers.

The foregoing description discloses a new tourniquet and clamp combination useful in many clinical applications. In veterinary applications it has been used for castration. The clamp device itself is simple, rugged and easily manipulated for positional adjustment to and from clamping position.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A tourniquet device comprising: a flexible tubular strap having two ends and arranged in a loop formation; a clamp device on the two ends of said strap comprising a tubular sleeve, two plungers disposed in said sleeve, engaged with and separated by a resilient compression means so the ends of said plungers are biased outwardly and project respectively from the opposite ends of said sleeve, said sleeve and each of said plungers having cross bores which can be substantially aligned in two spaced apart sets by forcing said plungers into said sleeve against the bias of said compression means; the ends of said strap being projected through respective ones of said sets of cross bars and adapted to be selectively slidable or clamped therein; and means provided on said sleeve providing an outward projection between the sleeve bores.

2. A tourniquet device comprising: a flexible tubular strap having two ends and arranged in a loop formation; a clamp device on the two ends of said strap comprising a tubular sleeve, two plungers disposed in said sleeve, engaged with and separated by a resilient compression means so the ends of said plungers are biased outwardly and project respectively from the opposite ends of said sleeve, said sleeve and each of said plungers having cross bores which can be substantially aligned in two spaced apart sets by forcing said plungers into said sleeve against the bias of said compression means; said sleeve having a substantially constant and similar area interior cross section throughout its length and said plungers and resilient means having an exterior shape enabling free sliding movement within and to pass completely out of said sleeve; the ends of said strap being projected through respective ones of said sets of cross bores and adapted to be selectively slidable or clamped therein; and said sleeve, plungers and resilient means being maintained in assembly by engagement of said plungers and said sleeve with portions of said tubular strap projecting through said sets of cross bores.

3. A tourniquet device comprising: a flexible strap having two ends and arranged in a loop formation; a clamp device on the two ends of said strap comprising a tubular cylindrical sleeve, two cylindrical plungers slidably disposed in said sleeve, engaged with and separated by a resilient compression means within said sleeve so the ends of said plungers are biased outwardly and project respectively from the opposite ends of said sleeve, said sleeve and each of said plungers having cross bores which can be substantially aligned in two spaced apart sets by forcing said plungers into said sleeve against the bias of said com-

pression means; and the ends of said strap being projected through respective ones of said sets of cross bores and adapted to be selectively slidable or clamped therein by manipulation of said plungers.

4. A tourniquet device as defined in claim 3 wherein said resilient means is a compression coil spring which is substantially fully compressed when said plungers are pushed into said sleeve to a position where both sets of cross bores are aligned.

5. A clamping device for use in combination with two elongate portions of flexible materials, comprising: an elongate tubular sleeve member with a substantially constant area cylindrical through passage and two spaced apart transverse cross passages through which the elongate portions of flexible material will project; two cylindrical plungers shaped to enable passage of said plungers completely through said sleeve, slidably disposed in the through passage of said sleeve member; a coiled compression spring disposed in said through passage between said plungers and exerting a force biasing said plungers out of said through passage; a transverse cross passage in each of said plungers, each of the plunger cross passages being adapted to align with an associated one of the cross passages in said sleeve member upon forced movement of said plungers toward each other against the bias of said compression spring; and a ring means mounted around said sleeve member providing an enlargement between the sleeve member cross passages.

6. A tourniquet device comprising a flexible strap having two ends and arranged in a loop formation; a clamp device on the two ends of said strap, comprising: a short tubular sleeve, the through passage of which has a constant transverse cross section area throughout the entire length of the passage, said sleeve having two spaced apart sets of transverse cross passages in the sleeve wall; two plungers of approximately the same cross section as the passage through said sleeve disposed in, and having a close free sliding fit relative to, the passage through said sleeve; a coiled compression spring, disposed in said sleeve through passage between and engaging said plungers and exerting a force biasing and tending to move the plungers out of said through passage; a transverse cross passage in each of said plungers; individual ends of said strap projecting through a respective set of transverse passages in said sleeve and the transverse passage in an associated plunger, being clamped by spring force against said plungers and by cooperation between said sleeve and said plungers maintaining said clamp device in assembly; each of the plunger cross passages being adapted to align with an associated one of the cross passage sets in said sleeve upon forced shifting movement of said plungers toward each other against the bias of said compression spring to thereby unclamp the end portions of said strap; the coils of said spring being compressed fully upon shifting movement of said plungers to positions where both sets of cross passages align; and each of said plunger having ends extending away from said spring, normally projecting from said sleeve and, upon said forced shifting movement to fully compress said spring, being substantially wholly within said sleeve and having end surfaces lying approximate the ends of said sleeve.

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