

[54] VASCULAR CLAMP

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[51] Int. Cl. **A61b 17/12**

[58] Field of Search **128/346, 325, 326, 303**

[56] References Cited

UNITED STATES PATENTS

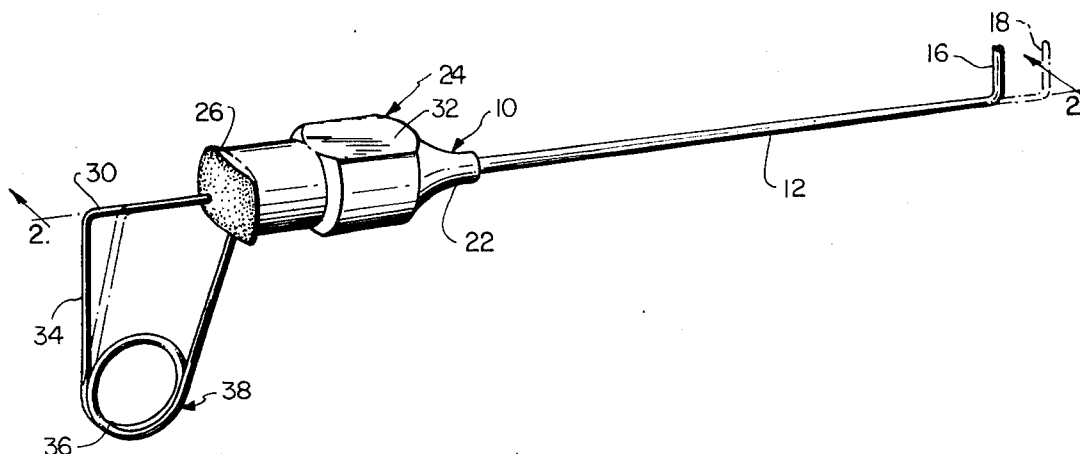
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[57] ABSTRACT

A clamping instrument for use for occluding blood vessels and other fluid ducts in an animal or a human body has a slender tubular shaft provided at one end with a lateral clamping jaw and at its other end with a hand piece. A thin wire is slidably disposed in the shaft and has a lateral clamping jaw at one end disposed in confronting clamping relation with the fixed jaw on the shaft. The wire is slidable through the hand piece and extends rearwardly therefrom with such extension being mounted or attached to the hand piece to prevent turning movement thereof and spring means biasing the movable jaw on the wire into clamping relation with the fixed jaw.

9 Claims, 5 Drawing Figures



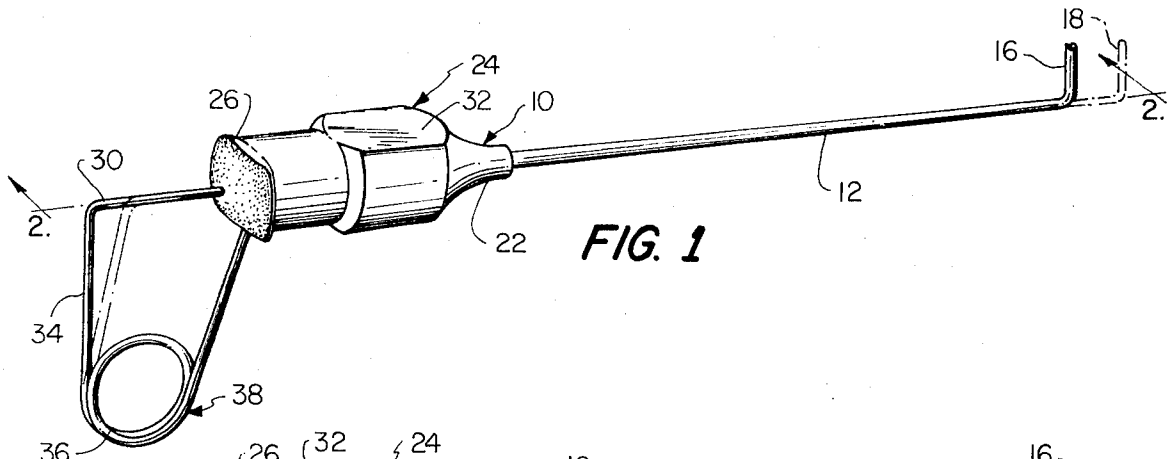


FIG. 1

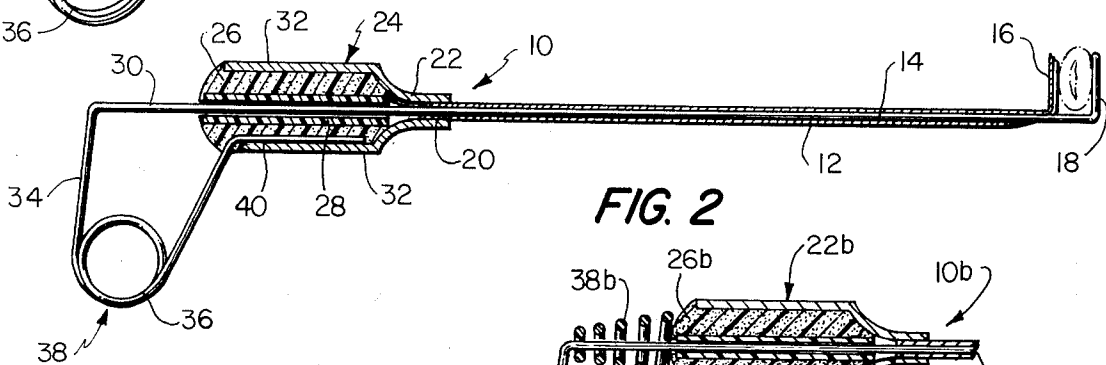


FIG. 2

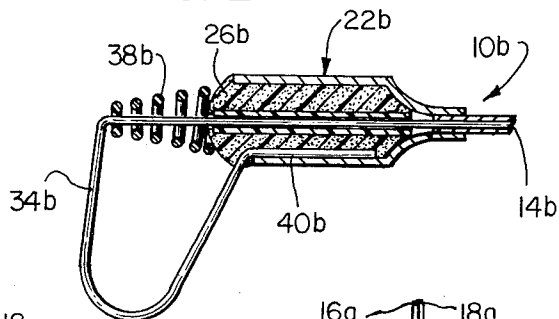


FIG. 5

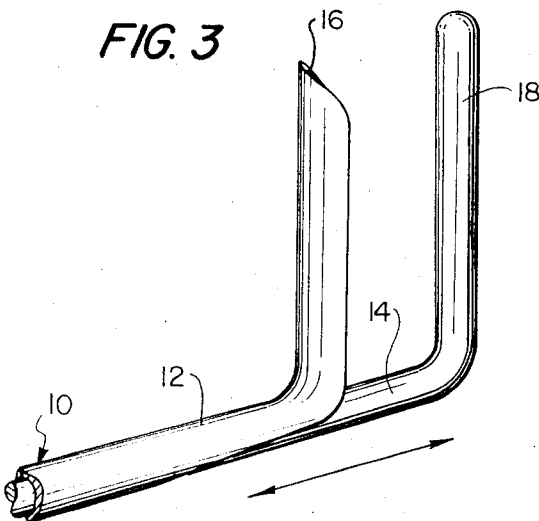


FIG. 3

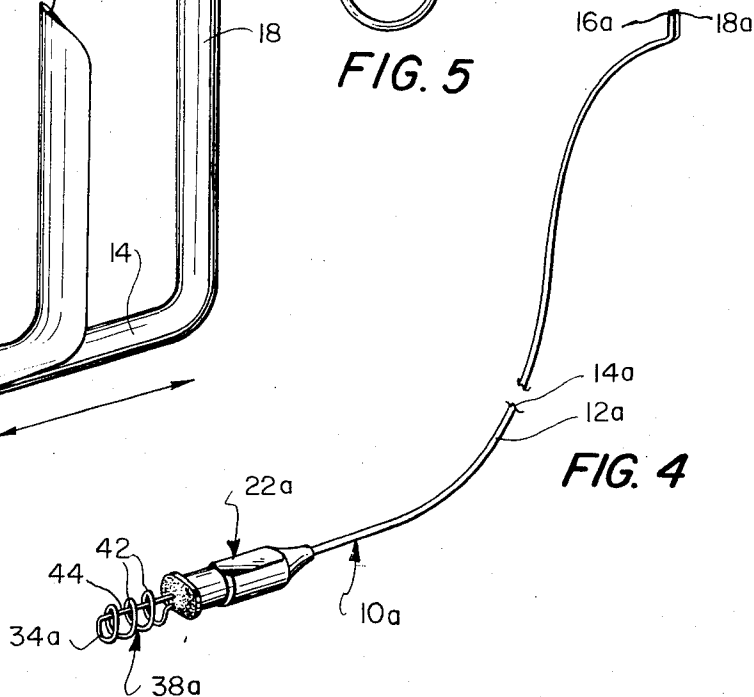


FIG. 4

VASCULAR CLAMP

The invention described herein was made in the course of work under a grant or award from the Department of Health, Education and Welfare.

BACKGROUND OF THE INVENTION

1. Field of the Invention:

This invention generally appertains to new and useful improvements in clamping devices, especially those designed for temporarily closing or shutting off flexible tubular conduits, and is particularly directed to a new and useful clamping instrument for use for non-permanent occluding blood vessels and other fluid ducts in an animal or a human body.

2. State of the Art:

Devices currently available and in use as vascular or hemostatic clamps are clips or clamps that are often difficult and cumbersome to handle and position and may not possess a quick sealing and effective closing action. The majority of conventional clamps have clamping jaws that are of a relatively large size and usually have parallel faces. Such jaws engage a greater area of the blood vessels than may be necessary for occlusion and produce a rather extensive flattened section of a vessel.

On the other hand, there are clamps which have jaws that may tend to have a shearing effect on blood vessels unless great care is exercised in the placement of the jaws on the vessels and the closing action of the jaws is controlled.

With many such known clamps, applier instruments must be employed to position and apply the clamps on a blood vessel or the like fluid duct. The use of such an instrument sometimes tends to obstruct the surgical field of vision and the use of such an applier instrument is not desirable at all when performing surgery with an operating microscope.

SUMMARY OF THE INVENTION

An important object of the present invention is to provide a vascular or the like clamp that can be easily positioned onto a blood vessel or the like without using any applier instrument and which has a quick and sturdy closing action to produce an effective clamping pressure on a blood vessel without causing widespread flattening of the vessel and with creating a minimum of shearing action so that the blood vessel is occluded in the desired quick and safe manner.

Another important object of the present invention is to provide a vascular clamp which is practical in a rather minute but extremely sturdy and effective form that can be used under an operating microscope without obstructing the field of view.

Another important object of the present invention is to provide a vascular clamp that has clamping jaws or tips which can range in size from smaller than anything presently available to sufficiently large for major human blood vessels and wherein the shaft structure for the jaws can be straight or curved and can be long or short and wherein the clamping pressure can be varied from gentle to very firm.

A further object is to provide a vascular clamp of such simple design and construction which should allow it to be a disposable item and which provides clamping tips at the end of a shaft which, compared to the tip size, is slender and long.

Generally considered, the clamp of the present invention is composed of a slender tubular shaft which has a laterally offset end which may be of an arcuate cross-section. Such end defines a fixed clamping jaw. A movable clamping jaw is defined by a laterally offset end on a relatively thin wire that is slidably housed within the shaft. The movable jaw may be round and if so of a radius in relation to the arcuate fixed jaw so that it can be seated within the semi-circular confines of the fixed jaw.

In a preferred embodiment, the opposite end of the shaft is fixed to a hand piece which may house a tubing of polyethylene or the like material within which the wire slides. The wire projects rearwardly from the hand piece and may be bent upon itself in a given configuration to produce a spring action which tends to urge the wire rearwardly, that is toward the hand piece, and thereby bias the movable jaw toward the fixed jaw and means, such as an epoxy or silicone rubber cement, for immobilizing the free end of the wire in a portion of the hand piece. The rearward extension of the wire adjacent the spring formation constitutes a finger piece or trigger to be pressed whereby the wire will be moved forwardly, that is away from the hand piece, and thereby move the movable jaw forwardly away from the fixed jaw against the urging of the spring.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of the clamp of the present invention with the same being shown in a full line closed or clamping position and in a dash-dot open or non-clamping position.

FIG. 2 is a side elevational view, partly in longitudinal section, of the clamp.

FIG. 3 is an enlarged fragmentary perspective view of the jaw end of the clamp and showing in detail the fixed and movable clamping jaws or tips.

FIG. 4 is a perspective view of a modified form of clamp wherein the shaft and wire are curved and are of a considerable length so that the clamping jaws are quite remote from the hand piece.

FIG. 5 is a fragmentary view, partly in longitudinal section of a further modified form of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now more particularly to the accompanying drawing and initially to FIGS. 1-3, the vascular clamp 10 is composed of a slender tubular shaft 12 within which a thin stainless steel wire 14 is slidably housed.

Preferably, but not exclusively, the tubular shaft 12 is formed from a 22 gauge hypodermic needle that has its beveled tip bent approximately 90° outwardly so as to define the lateral clamping jaw or tip 16 on the outer or front end of the shaft 12. After the tip is bent normal to the body of the needle then it is ground and polished to an acceptable shape with no sharp edges.

The jaw 16 on the outer or front end of the tubular shaft 12, irrespective of the material nature or original purpose of the shaft, constitutes a fixed clamping jaw which is, in the illustrated embodiment, arcuate in cross-section. It is adapted to complement and to receive a movable jaw 18 which is defined by a lateral offset outer end on the wire 14. Such movable jaw 18 is round, in accordance with the nature of the wire stock,

and is of a radius to seat within the semi-circular confines of the fixed jaw, as can be appreciated from FIG. 3.

The other or rear end 20 of the tubular shaft 12 is fixed within a collar 22 integrally formed on a hand piece or housing 24 which is composed of the covering enclosing a body 26 of suitable plastic or rubber cement. Suitable cement materials would be epoxy, urethane or silicone rubber.

In the illustrated embodiment, the shaft is fixed by such epoxy or the like cement to the housing and a length of polyethylene tubing 28 is embedded in the body 26 in axial alignment with the shaft 12 and through which the shaft slides.

The wire 14 is slidably disposed within the tubing 28 and the slidably encased portion of the wire may be lubricated with a suitable lubricating medium like a silicone release agent gel. The wire has a portion 30 which projects rearwardly from the hand piece or housing 24 that has flattened upper and lower finger gripping and holding faces 32. The rearwardly projecting portion 30 is bent downwardly substantially normal to the long axis of the wire so that it extends in an opposite direction from the tip or jaw 18 which projects upwardly. Such lateral offset portion 34 defines a finger push or trigger that moves the wire forwardly in the shaft to move the movable jaw 18 away from the fixed jaw 16.

At the lower end of the trigger 34 the wire is coiled upon itself in a series of convolutions 36 that provide an energy storage or spring means 38 which is operative to urge the wire rearwardly in the shaft 12 and thereby bias the movable jaw 18 toward and into clamping relation or nested seated engagement with the fixed jaw 16. From the convolutions 36 the wire is bent upwardly and forwardly and terminates in an anchoring portion 40 that is anchored in the body of cement 26.

It will be particularly noted that the energy storage or spring means 38 is at the opposite end of the clamping instrument or device 10 from the clamping tips or jaws 16 and 18. Thus, space occupied in the surgical field of view is minimized since the spring means 38 and operating trigger 34 are at the rear end of the device 10 and are disposed slightly rearwardly of the housing or finger piece 22 while the clamping jaws 16 and 18 are at the front end of the device. The distance of the clamping jaws 16 and 18 from the housing depends upon the length of the shaft 12 and its companion wire 14.

In the embodiment of FIGS. 1-3, the shaft is straight and of a length of about 1½ inches which is the normal length of a 22 gauge hypodermic needle that makes up the shaft 12. However, the shaft and its associated wire can be of any length.

Thus, the clamping device 10a of FIG. 4 has a very long and curved shaft 12a and wire 14a. Consequently, the fixed jaw 16a and its companion movable jaw 18a are disposed a considerable distance from the housing or finger piece 22a, and it will be noted that the fixed jaw 16a and movable jaw 18a present opposed flat clamping jaws in this form of the invention.

In the embodiment of FIG. 4, the energy storage or spring means 38a is made up of a series of helical convolutions 42 which encompass the straight rearward axial extension 44 of the wire 14a and which are joined thereto at the first coil by a trigger section 34a.

Referring to FIG. 5 of the drawing 10b illustrates a modified form of the present invention wherein the

wire 14b is bent to provide an offset portion 34b which defines a finger push or trigger and a portion 40b that is anchored in the body of cement 26b. The clamp is held in the closed position by a helical spring 38b which bears at one end against the rearward portion of the hand piece 22b and at the other end against the wire 14b at the bend forming the offset portion 34b. Thus in this form of the invention the spring means 38b is non-integral with the wire 14b.

The clamps 10, 10a and 10b are used in the same fashion and manner. Thus, to clamp a blood vessel, the triggers 34, 34a or 34b are pushed to compress the spring means 38, 38a or 38b and open the clamping jaws or tips 16 and 18, 16a and 18a or 16b and 18b. The hand pieces 22, 22a or 22b are held to fit the clamping tips or jaws around a blood vessel. Manual pressure on the trigger means is released and the spring means act to move the movable jaws relative to the fixed jaws. Thus, the jaws clamp on a blood vessel, as shown in FIG. 2. To remove the clamps, the process is reversed.

As can be appreciated from a consideration of the showing and description of the embodiment of FIGS. 1-3, the clamping implement 10 is inexpensively fabricated from a conventional 22 gauge hypodermic needle and hand piece or adaptor of 1½ inches in length and 3 inches of 10 mil diameter stainless steel wire. Such make up the tubular shaft 12 and the slide member 14. The cost of such components is measured in cents. On a mass production basis, the cost would be so slight that it is intended that one model of the clamping implement would be of a disposable nature. It would be sold in a cellophane or the like package and after a single use, it would be thrown away.

While these two forms of the clamp and a specific use of occluding blood vessels have been described herein and shown in the drawings, such can only be considered as of an exemplary nature for the clamp in its various forms and environmental usages is only restricted by the spirit and scope of the appended claims.

I claim:

1. A clamping implement, especially suitable for use as a vascular or hemostatic clamp, comprising a tubular shaft having open opposing end portions, one of said end portions defining a fixed clamping jaw angularly related to and extending from the shaft and a hand piece supportively engaging the other end portion, an elongated member slidably housed in the shaft and having opposing end portions, one of said end portions defining a movable clamping jaw and being angularly related to and extending from the member and being disposed in confronting complementary clamping relation with the clamping jaw on the shaft, said other end portion of the member being slidably received by the hand piece and extending therethrough and therebeyond and means structurally associated with said extending portion of the member to continuously urge the movable clamping jaw into clamping relation with the fixed clamping jaw.

2. The clamping implement of claim 1, wherein said member is a wire.

3. The clamping implement of claim 2 wherein said means structurally associated with said extending portion of the member is an energy storage spring means.

4. The clamping implement of claim 3 wherein said spring means is non-integral with said wire.

5. A clamping implement, especially suitable for use as a vascular or hemostatic clamp, comprising a tubular

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shaft having open opposing end portions, one of said end portions defining a fixed clamping jaw angularly related to and extending from the shaft and a hand piece supportively engaging the other end portion, an elongated member slidably housed in the shaft and having opposing end portions, one of said end portions defining a movable clamping jaw and being angularly related to and extending from the member and being disposed in confronting complementary clamping relation with the clamping jaw on the shaft, said other end portion of the member being slidably received by the hand piece and extending therethrough and therebeyond and means structurally associated with said extending portion of the member functioning as an energy storage means serving to bias the movable clamping jaw into clamping relation with the fixed clamping jaw, wherein said energy storage means includes a spring means, and wherein said last means includes a spring means formed

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integrally with the extending portion of the member.

6. The clamping implement of claim 5 wherein said wire has a portion intermediate and connecting the rearwardly extending portion and the spring means which defines a trigger that can be pushed by a finger to move the movable clamping jaw on the wire away from the fixed clamping jaw on the shaft.

7. The clamping implement of claim 5 wherein said jaws are disposed substantially normal to the coaxially arranged shaft and member.

8. The clamping implement of claim 5 wherein said fixed jaw is arcuate in cross-section and the movable jaw is round and is of a radius to be seatingly received within the semi-circular confines of the fixed jaw.

9. The clamping implement of claim 5 wherein said fixed and movable jaws have flat opposed faces.

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