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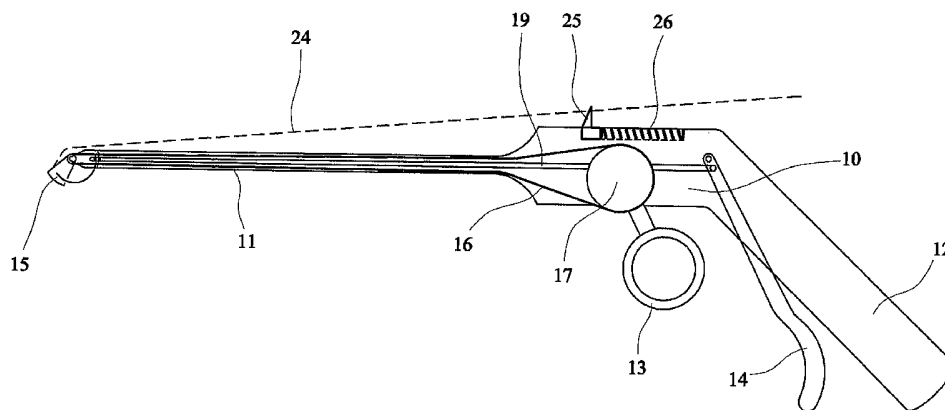
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(54) Title: SUTURING DEVICE



(57) Abstract: A suturing device is provided comprising a body (10) shaped to be held in one hand, first holding means (15) ar-
rangeable to hold the butt end of a needle (23), to which a suture (24) is attached, such that the body (10) can be manoeuvred to
pass the pointed end of the needle (23) into and then out of tissue to be sutured, the device also having second holding means (19)
operable to hold the pointed end of the needle (23) after the pointed end of the needle (23) has emerged from the tissue, the device
being such that the needle (23) can then be drawn away from the first holding means and the tissue, to pull one end of the suture (24)
out of the tissue so that after the needle (23) has been removed from the suture (24) the two ends of the suture (24) can be tied as
desired. The invention enables suturing to be carried out single-handedly.

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SUTURING DEVICE

The invention relates to suturing devices.

5 Traditionally, suturing of living tissue was carried out entirely by hand, using needles and thread. It is now common practice to utilise specialised sutures which are manufactured already attached to the butt end of a needle. Once the suture has been passed through the tissue using the needle, the needle is removed by cutting the suture and the free ends of the suture can then be tied
10 in any desired manner.

Suturing devices are known to assist in passing a needle through tissue to be sutured, particularly when the wound to be sutured lies within a body cavity, for example during arthroscopic surgery, but known suturing devices still require
15 the use of two hands. It may for example still be necessary to hold a device in one hand and forceps in the other.

The invention solves one of the problems associated with known suturing devices by providing a suturing device which can be operated single-handedly.

20

The invention provides a suturing device comprising a body shaped to be held in one hand, first holding means arrangeable to hold the butt end of a needle, to which a suture is attached, such that the body can be manoeuvred to pass the pointed end of the needle into and then out of tissue to be sutured, the
25 device also having second holding means operable to hold the pointed end of the needle after the pointed end of the needle has emerged from the tissue, the device being such that the needle can then be drawn away from the first holding means and the tissue, to pull one end of the suture out of the tissue so that after the needle has been removed from the suture the two ends of the
30 suture can be tied as desired.

Preferably the first and second holding means are mounted at the leading end of an elongated nose which extends from the body.

5 The first holding means may comprise a socket in which the butt end of the needle can be located.

The device may be such that the butt end of the needle can be retained in the socket by applying tension to the suture.

10 The body may have means to maintain tension on the suture.

The means to maintain tension may comprise a tension spring to which the suture is attachable.

15 The first holding means may be movable with respect to the body to facilitate movement of the needle through the tissue.

The first holding means may be rotatable with respect to the body.

20 The first holding means may be rotatable by operation of a first trigger on the body.

Movement of the first trigger may cause rotation of a first rotatable drive member, the first rotatable drive member being drivingly connected to a
25 second rotatable drive member on the first holding means.

The first and second rotatable drive members may be connected together by a continuous drive member, for example a drive cord, drive belt or drive chain.

30 The first trigger may be arranged to be operated by one finger of the operator.

The second holding means may comprise a locking member movable to press the pointed end of the needle against a fixed part of the device.

5 The locking member may have an aperture therethrough to receive the pointed end of the needle.

The second holding means may be operable by a second trigger mounted on the body.

10 The second trigger may be pivotally mounted on the body, the locking member being pivotally connected to the second trigger between its pivot point and its free end, so that pivotal movement of the second trigger brings about longitudinal movement of the locking member within the device.

15 The device may be generally pistol shaped, with a hand grip portion, the first trigger being arranged to be operated by a trigger finger of the user, and the second trigger lying adjacent to the hand grip for operation by one or more other fingers of the user.

20 The invention includes a method of suturing tissue using a suture attached to the butt end of a needle, the method comprising holding the butt end in a first holding means of a suturing device, passing the needle into and out of tissue, holding the pointed end of the needle with a second holding means of the suturing device, drawing the needle and suture through the tissue, and away
25 from the first holding means, removing the needle, and tying the free ends of the suture.

By way of example, a specific embodiment of suturing device according to the invention will now be described, with reference to the accompanying drawings
30 in which:

Figures 1 to 6 are side views of the embodiment of suturing device, showing various stages in the suturing method;

Figures 1A to 5A are views of the leading end of the suturing device, showing
5 the same stages as Figures 1 to 5, but to a larger scale; and

Figure 6A is a plan view of the suturing device as shown in Figure 6.

The suturing device shown in the figures comprises a distal like device which
10 can be operated single-handedly. Existing suturing devices require the use of two hands.

The device comprises a body 10 from which projects an elongate nose 11. The body 10 has a handle 12 and fitted to the body is a finger trigger 13 and a
15 lever trigger 14.

At the leading end of the device there is a pivotally mounted, sector-shaped, needle holder 15. When the finger trigger 13 is moved, this causes rotation of the needle holder 15 via a drive cord 16 which passes tightly around a first
20 roller 17 rotatable by movement of the finger trigger 13 and a second roller 18 attached to the needle holder 15.

Pivoting the lever trigger 14 causes a locking bar 19 to move backwards or forwards within the elongate nose 11. The leading end of a locking bar 19 has
25 a vertical aperture 20 therethrough, best seen in Figure 2A. This aperture 20 lies in the vicinity of a bulkhead 21, also best seen in Figure 2A.

The needle holder 15 has a curved socket 22 therein, best seen in Figure 5A. A needle 23 can be held in place in the needle holder by inserting the butt end
30 of the needle 23 into the socket 22 and applying tension to a suture 24 to hold the needle against the closed end of the socket.

At the start of the suturing method, the suturing device has the configuration shown in Figures 1 and 1A. The needle 23 is held securely in the needle holder 15, which is pivoted into the position best shown in Figure 1A, in which the pointed end of the needle passes through the aperture 20 in the locking bar 19. The needle is locked in this safe position by moving the lever trigger 14 such that the locking bar 3 holds the tip of the needle against the bulkhead 2.

Tension is maintained on the suture 24 and if desired this can be achieved without permanent use of one or more fingers of the operator by snagging the suture 24 in a tapered slot within a clip 25 attached to a tension spring 26 mounted in the top of the body 10 of the device.

With the device in this safe condition, the leading edge of the device can be offered up to tissue to be sutured, for example as shown at 27 in Figure 2A where a wound 28 in the tissue has to be closed by suturing.

The steps shown in Figure 2 and Figure 2A then takes place. Once the leading edge of the device is within the body cavity and adjacent to the tissue to be sutured, the lever trigger 14 is moved to release the pointed end of the needle. The finger trigger 13 is then moved to rotate the needle holder 15 from the position shown in Figure 1A to the position shown in Figure 2A. in this position, the pointed end of the needle lies immediately adjacent the tissue to be sutured. The needle holder 15 rotates through approximately 180°.

During the stage shown in Figures 3 and 3A, the finger trigger 13 is moved in the opposite direction to start rotating the needle holder 15 back in an anti-clockwise direction as viewed in the figures, driving the needle 23 through the tissue.

Rotation is continued as shown in Figures 4 and 4A until the pointed end of the needle 23 re-emerges from the tissue 27 and passes back through the

aperture 20 in the locking bar 19. The lever trigger 14 is then pivoted to move the bar 19 to lock the tip of the needle once again against the bulkhead 21.

5 In the stage of the method shown in Figures 5 and 5A, the tip of the needle 23 remains locked in position, the needle holder 15 is rotated clockwise once again, by movement of the finger trigger 13, and as the needle holder moves clear of the butt end of the needle, tension on the suture 24 having been released by freeing it from the catch 25, the leading end of the device can be
10 drawn away from the tissue 27 to complete pulling of the suture 24 through the tissue 27.

The final position is shown in Figures 6 and 6A. The needle end and free end of the suture 24 can now be cut to release the device and the cut ends of the suture can be knotted in any desired manner. Alternatively, from the position
15 shown in Figure 6 and 6A, the steps can be repeated, to pass the needle 23 back through the tissue 27, at a location adjacent to the first stitch, thus forming any desired number of continuous rolling stitches along the length of the wound, the suture thus taking up a generally helical configuration.

20 The invention is not restricted to the details of the foregoing embodiment. For example, it is often necessary to form a stitch sometimes referred to as a mattress stitch, in which a suture passes across a wound, the ends of the suture passing down into the tissue at each side of the wound, through some of the tissue, back up through the tissue at a different location, the ends of the
25 sutures then being tied across the wound so that the wound is held closed by two portions of the same suture, the tied portion of the suture being spaced slightly along the wound from the central part of the suture.

The device shown in the figures can be adapted to carry out such a stitch. The
30 stitch is formed using a suture which has a needle at each end. The device is adapted to have two needle carriers so that the two needles can be passed through the tissue simultaneously. After the needles have been passed

through the tissue they are cut away from the suture and the cut ends of the suture are then tied.

5 Attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

10 All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

15 Each feature disclosed in this specification (including any accompanying claims, abstract and drawings) may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

20

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the
25 steps of any method or process so disclosed.

CLAIMS

1. A suturing device comprising a body shaped to be held in one hand, first holding means arrangeable to hold the butt end of a needle, to which a suture is attached, such that the body can be manoeuvred to pass the pointed end of the needle into and then out of tissue to be sutured, the device also having second holding means operable to hold the pointed end of the needle after the pointed end of the needle has emerged from the tissue, the device being such that the needle can then be drawn away from the first holding means and the tissue, to pull one end of the suture out of the tissue so that after the needle has been removed from the suture the two ends of the suture can be tied as desired.
2. A suturing device as claimed in Claim 1, in which the first and second holding means are mounted at the leading end of an elongated nose which extends from the body.
3. A suturing device as claimed in Claim 1, in which the first holding means may comprise a socket in which the butt end of the needle can be located.
4. A suturing device as claimed in Claim 3, such that the butt end of the needle can be retained in the socket by applying tension to the suture.
5. A suturing device as claimed in Claim 4, having means to maintain tension on the suture.
6. A suturing device as claimed in Claim 5, in which the means to maintain tension comprises a tension spring to which the suture is attachable.
7. A suturing device as claimed in Claim 1, in which the first holding means is movable with respect to the body to facilitate movement of the needle through the tissue.

8. A suturing device as claimed in Claim 7, in which the first holding means is rotatable with respect to the body.

9. A suturing device as claimed in Claim 8, in which the first holding means
5 is rotatable by operation of a first trigger on the body.

10. A suturing device as claimed in Claim 9, in which movement of the first trigger causes rotation of a first rotatable drive member, the first rotatable drive member being drivingly connected to a second rotatable drive member on the
10 first holding means.

11. A suturing device as claimed in Claim 10, in which the first and second rotatable drive members are connected together by a continuous drive member, for example a drive cord, drive belt or drive chain.
15

12. A suturing device as claimed in Claim 9, in which the first trigger may be arranged to be operated by one finger of the operator.

13. A suturing device as claimed in Claim 1, in which the second holding means comprises a locking member movable to press the pointed end of the
20 needle against a fixed part of the device.

14. A suturing device as claimed in Claim 13, in which the locking member has an aperture therethrough to receive the pointed end of the needle.
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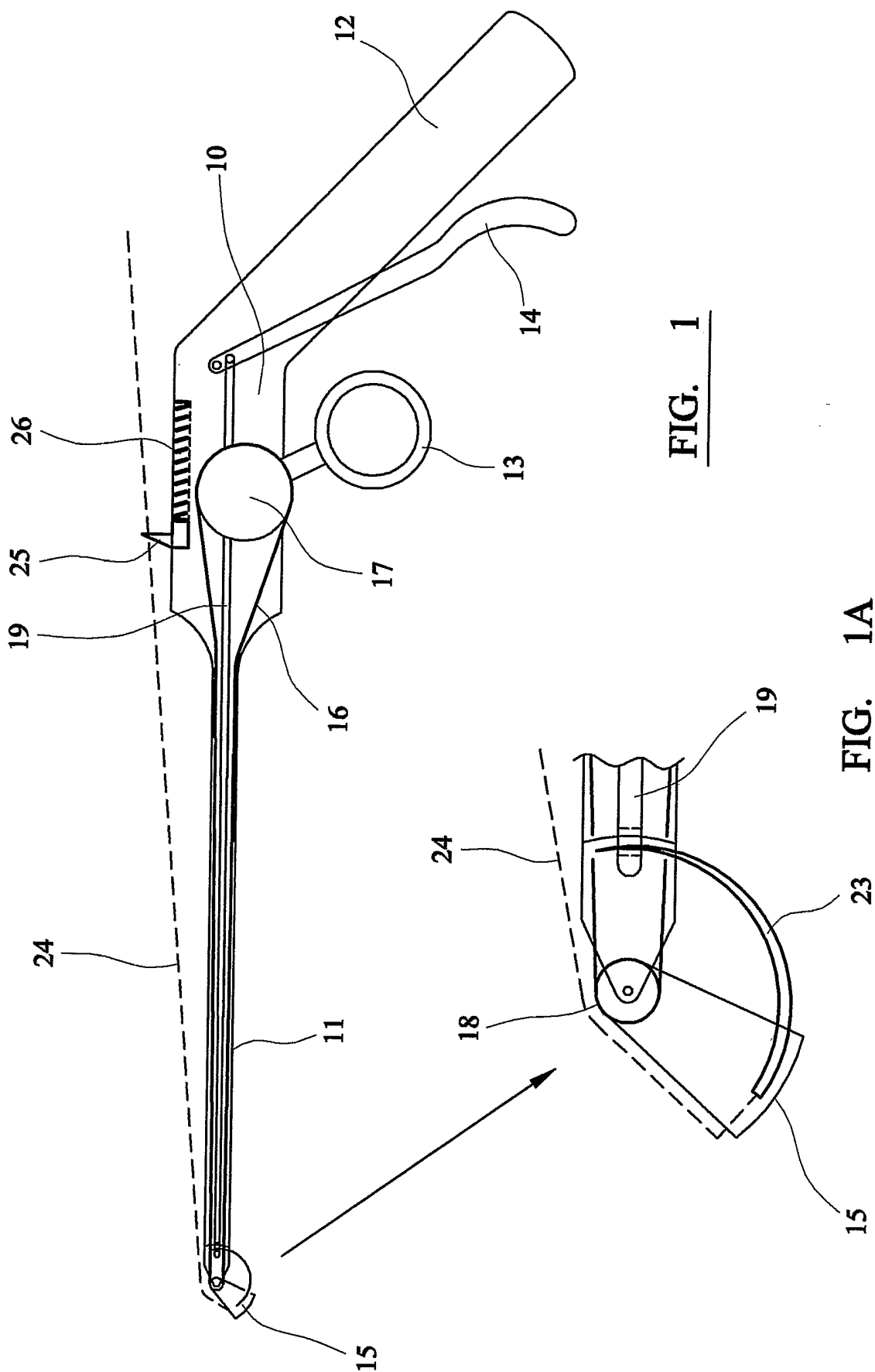
15. A suturing device as claimed in Claim 13, in which the second holding means is operable by a second trigger mounted on the body.

16. A suturing device as claimed in Claim 15, in which the second trigger is
30 pivotally mounted on the body, the locking member being pivotally connected to the second trigger between its pivot point and its free end, so that pivotal

movement of the second trigger brings about longitudinal movement of the locking member within the device.

17. A suturing device as claimed in Claim 15, the device being generally
5 pistol shaped, with a hand grip portion, the first trigger being arranged to be operated by a trigger finger of the user, and the second trigger lying adjacent to the hand grip for operation by one or more other fingers of the user.

18. A method of suturing tissue using a suture attached to the butt end of a
10 needle, the method comprising holding the butt end in a first holding means of a suturing device, passing the needle into and out of tissue, holding the pointed end of the needle with a second holding means of the suturing device, drawing the needle and suture through the tissue, and away from the first holding means, removing the needle, and tying the free ends of the suture.



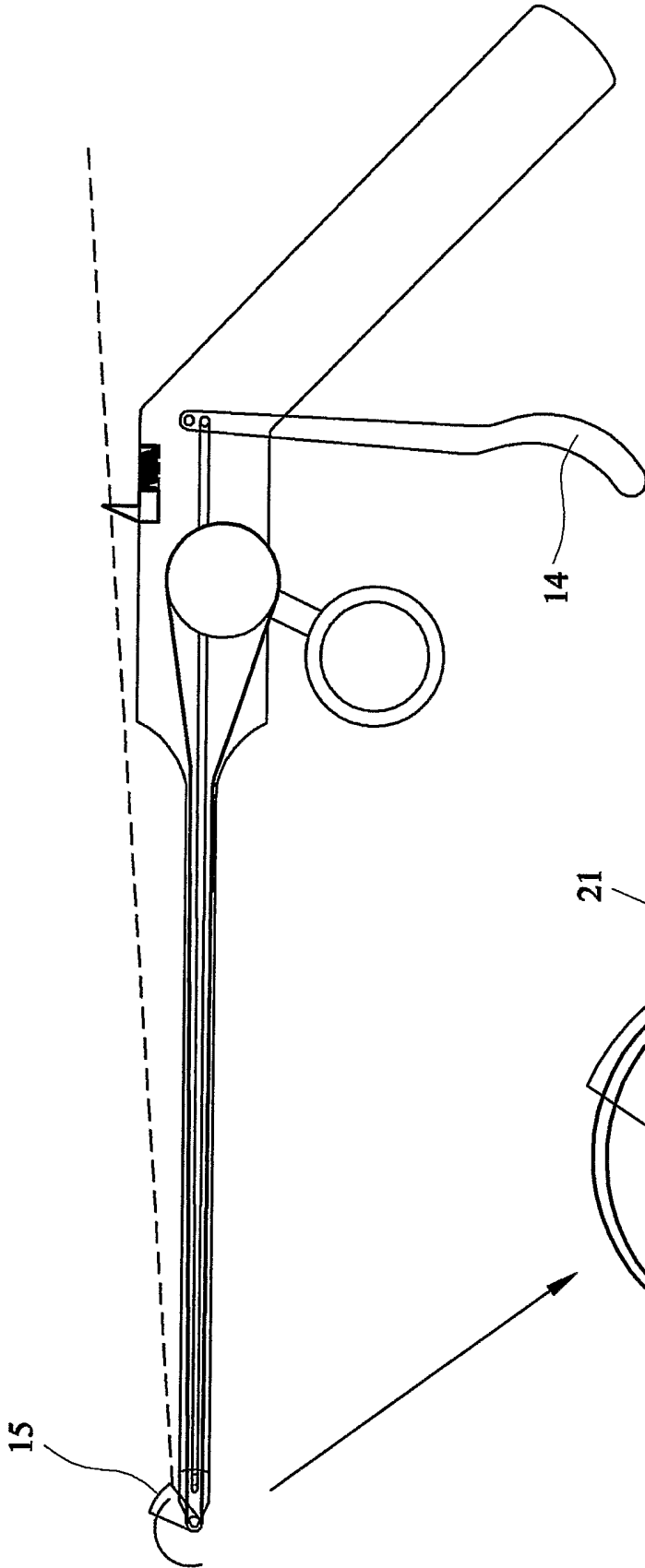


FIG. 2

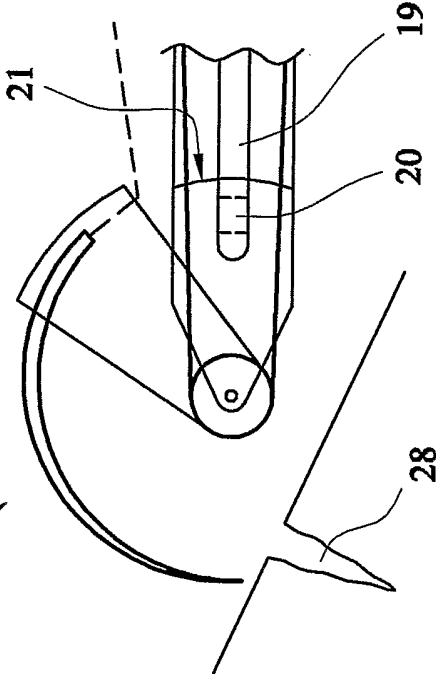
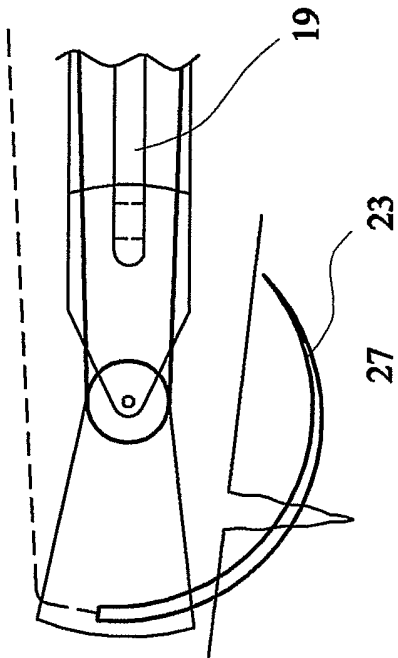
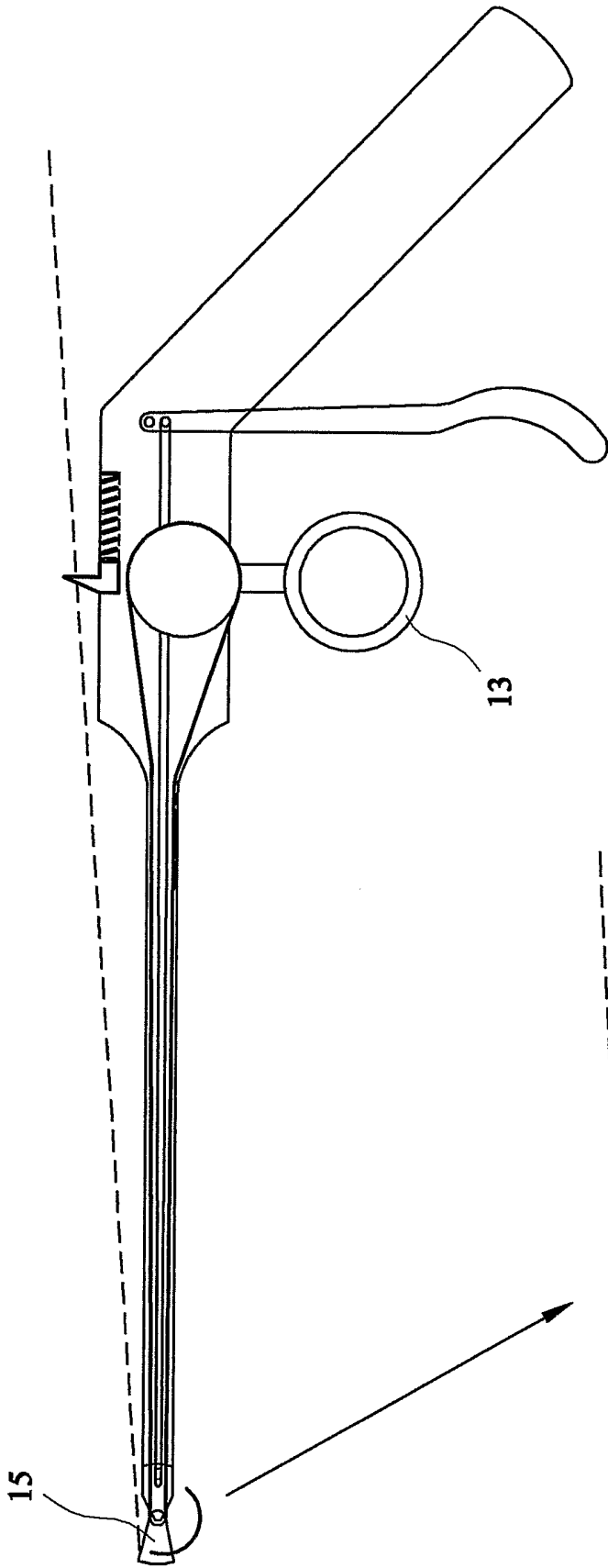


FIG. 2A



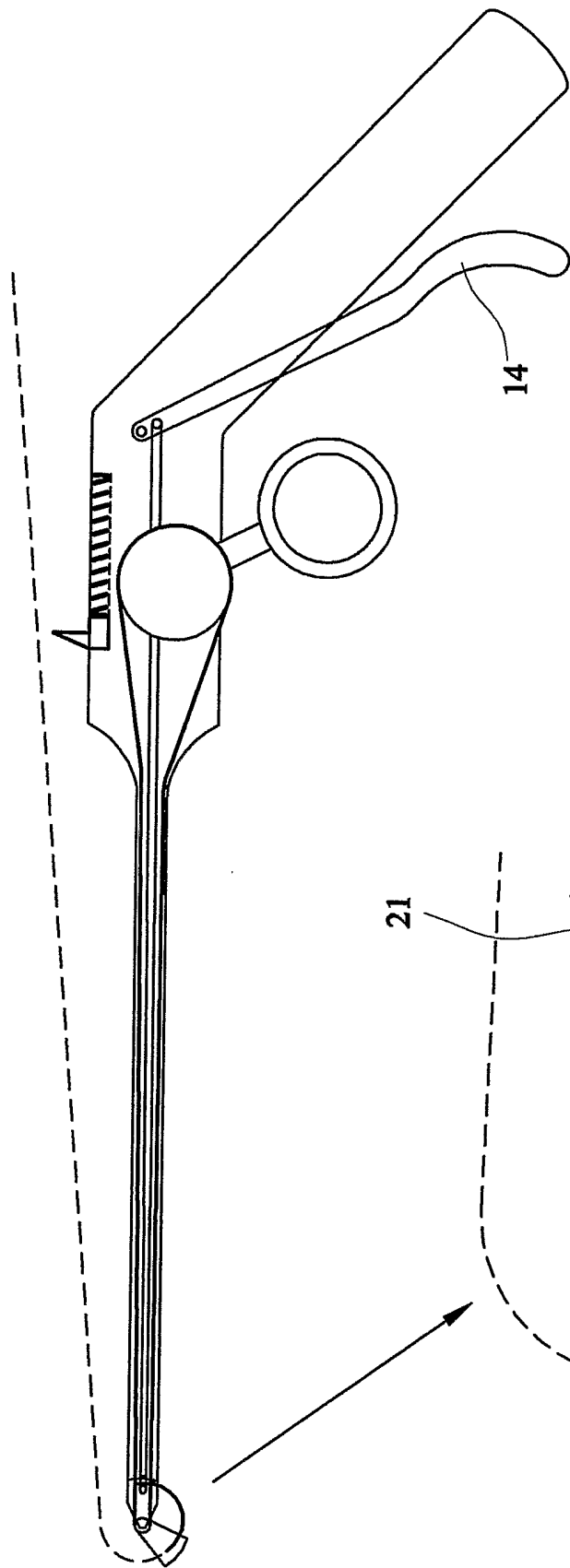


FIG. 4

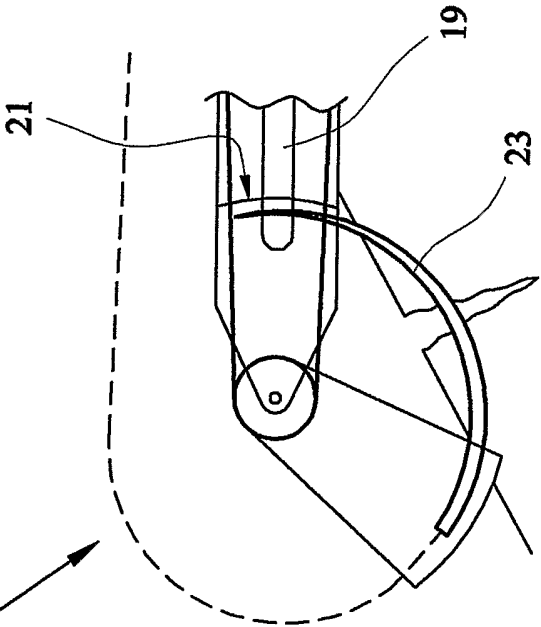


FIG. 4A

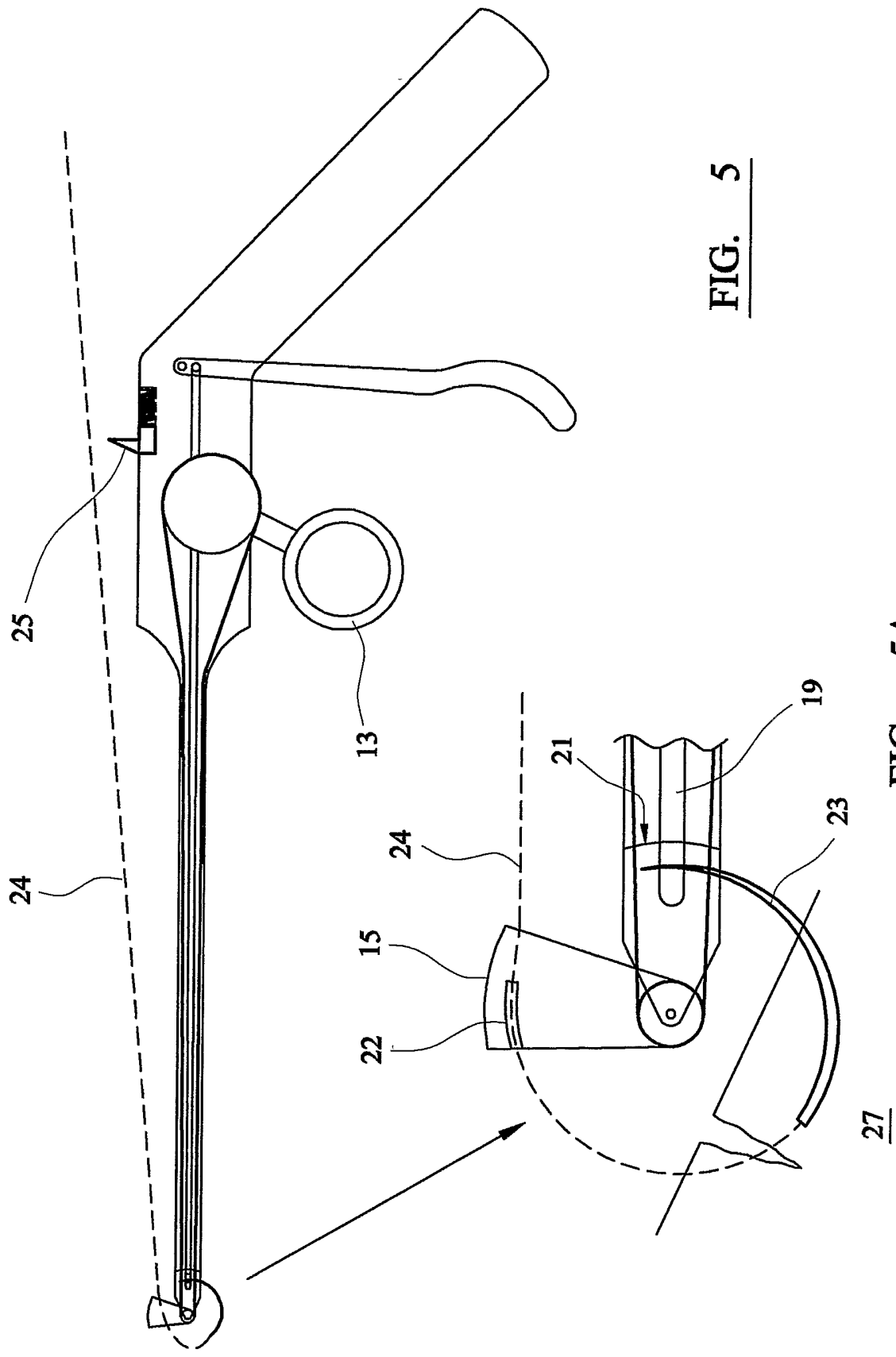


FIG. 5

FIG. 5A

