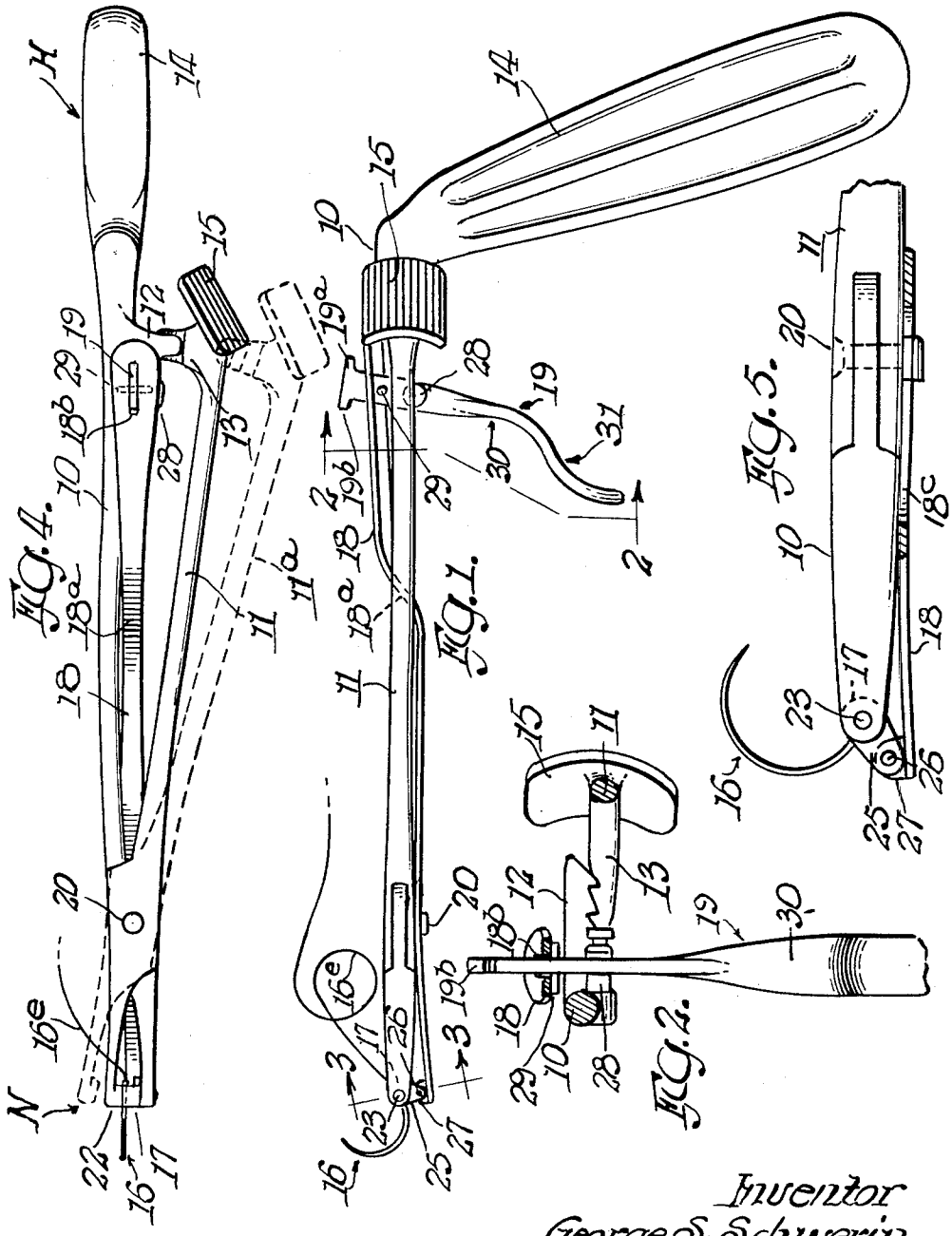
June 30, 1964 G. S. SCHWERIN 3,139,089

NEEDLE MANIPULATING DEVICE

Filed Nov. 16, 1961 2 Sheets-Sheet 1

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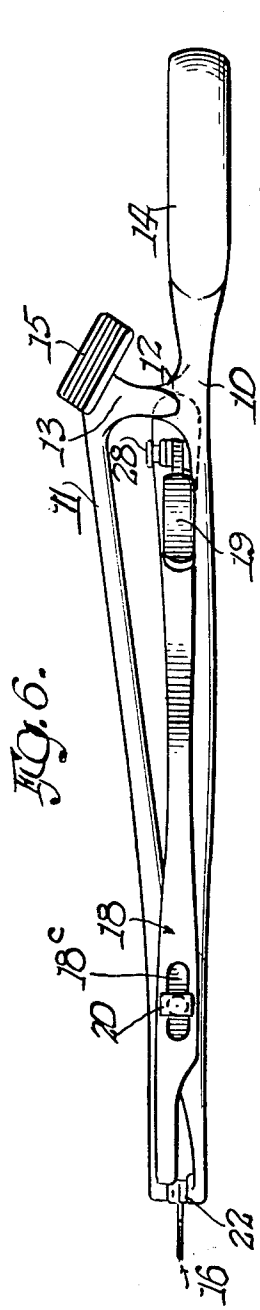


FIG. 6.

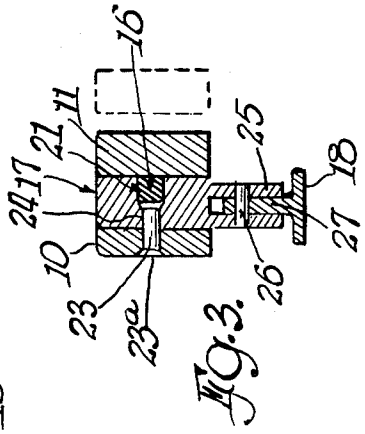


FIG. 3.

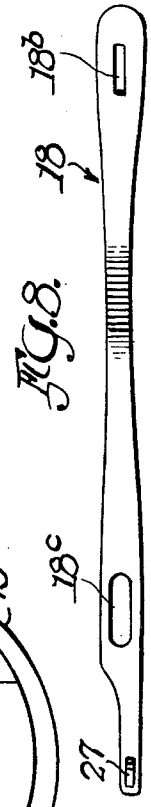


FIG. 8.

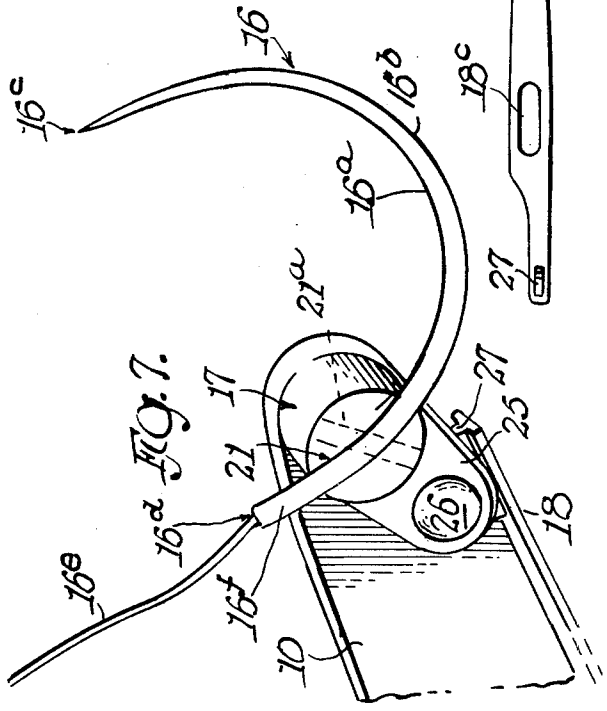


FIG. 7.

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3,139,089

# NEEDLE MANIPULATING DEVICE

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10 Claims. (Cl. 128—340)

This invention relates to a needle manipulating device and, more particularly, to a device adapted to move a suture needle through a circular arc.

The instant invention has utility for placing a curved surgical needle into tissue at the deep end of a narrow and restricted surgical field. A few devices for this purpose have been available to the surgeon but each has been characterized by limitations, among which are complicated actuating mechanism, large needle eye at the tip of the needle, bulky needle guards, non-reversible sewing machine action, restriction to one size needle, and in general, lack of simplicity for cleaning and reassembly.

It is therefore an object of this invention to provide a device which overcomes these prior art shortcomings.

Another object is to provide a novel device capable of supporting a needle in a releasably clamped condition and wherein the device, through simple straight forward mechanism is adapted to move the needle through a curved arc.

Still another object is to provide a needle manipulating device wherein a novel trigger mechanism is associated with a unique clamp for moving a surgical needle through comparatively inaccessible tissue and wherein the surgeon needs only to use one hand.

Other objects and advantages of the invention may be seen in the details of construction and operation set down in the specification.

The invention will be described in conjunction with an illustrated embodiment in the accompanying drawing in which—

FIG. 1 is a side elevational view of the inventive device shown gripping a suture needle;

FIG. 2 is an enlarged fragmentary sectional view of the device of FIG. 1 as would be seen along the sight line 2—2 as applied to FIG. 1;

FIG. 3 is an enlarged sectional view taken along the line 3—3 of FIG. 1;

FIG. 4 is a top plan view of the device of FIG. 1 with an alternate position or condition of the instrument seen in dotted line;

FIG. 5 is an enlarged fragmentary view of the left hand end (needle gripping portion) of FIG. 1 and in which the needle is seen to be in an alternative position;

FIG. 6 is a bottom plan view of the device of FIG. 1;

FIG. 7 is an enlarged perspective view of one of the needle clamping elements of the inventive device; and

FIG. 8 is an elevational view of the linkage bar seen most clearly in FIGS. 1 and 6.

It is believed that the invention can be most quickly understood by appreciating the fact that the basic frame of the instrument utilizes a forceps-like action. For this purpose, two elongated rigid members **10** and **11** are provided. These members are approximately coterminous at one end designated N (only in FIG. 4) which is the needle holding end. Adjacent the other end (designated H and only in FIG. 4, corresponding to the handle end) each member is equipped with an inwardly extending projection designated **12** and **13** respectively. The function of these projections can be appreciated most readily from a consideration of FIG. 2 where it is seen that the projections **12** and **13** on the members **10** and **11**, respectively, are vertically offset and equipped on their confronting surfaces with serrations for a releasable locking action—characteristic of many haemostats.

The member **10** is equipped with a depending pistol grip



type handle **14** (see especially FIG. 1) while the so-called H end of member **11** is equipped with a thumb grip **15**. It will thus be apparent that a surgeon holding the device in his right hand and about the handle **14**, has his thumb positioned to engage the grooved surface of grip **15** for disengaging the projections **12** and **13**—the disengaged position being designated **11***a* in FIG. 1 where the member **11** is seen in dotted lines.

When the member **11** is in the **11***a* condition, not only are the projections **12** and **13** disengaged but also the N ends of the two members are spaced apart as is also seen in FIG. 4. It will be appreciated that the device is constructed of a metal such as stainless steel and that although such a device is essentially rigid, there is a certain inherent resiliency or deflectability so as to permit greater or less pressure between the members at the ends thereof when the projections **12** and **13** are lockingly engaged—this again being characteristic of haemostat operation.

*Operation in General*

The operation in general contemplates positioning a needle **16** (compare FIGS. 1 and 5) between the members **10** and **11** at the ends thereof, and engaging the projections **12** and **13** so as to have the needle firmly clamped between the members **11** and **12**. One of the clamping elements (generally designated **17**) is rotatable by virtue of a linkage bar **18** and a trigger **19** to move the needle from the FIG. 1 position to the FIG. 5 position—wherein the tip describes an arc of about 170°. Since the members **10** and **11** are essentially in one plane, being restricted thereto by virtue of a pivot pin **20** (and disregarding the handle **14**), the needle **16** moves through a path generally perpendicular to this plane.

As indicated hereinbefore, the member **10** at its needle holding end is equipped with a needle holding jaw element generally designated **17** and which can be seen in perspective view in FIG. 7. The element **17** is equipped with a needle receiving groove **21** which is generally arcuate in its lengthwise dimension so as to accommodate the curved needle **16**. The needle **16** has a generally flat upper surface **16***a* and a generally flat lower surface **16***b* extending over most of its length from the needle tip **16***c* but terminating short of the suture receiving end **16***d*, the suture itself being designated by the numeral **16***e*. For a short portion of its length adjacent the suture end **16***d*, the needle **16** has a generally round cross sectional configuration as at **16***f*. This stems from the swaging operation employed to fix the suture **16***e* within the hollow suture receiving end **16***d* of the needle **16**. Preferably, the needle **16** is gripped by the device in the non-circular cross section area so as to restrict the needle from twisting when it is mounted between the members **10** and **11**. Thus, a portion of the needle projects upwardly in FIG. 7, the actual gripping being at an intermediate portion of the length of the needle but substantially adjacent to the suture end **16***d*.

Cooperating with the jaw element **17** is a fixed jaw element **22** (best seen in FIG. 4) provided as an integral part of member **11** and at the needle gripping end thereof. The jaw element **22** is essentially smooth and is adapted to press the needle **16** into the slot **21** and thus immobilize the needle relative to the jaw element **17**. However, the jaw element **17** is adapted to rotate under the influence of the trigger **19** and thus there is needle rotation relative to the fixed jaw element **22**. For this purpose, the jaw element **22** is equipped with a relatively finished surface.

The rotation of the needle **16** is provided by the rotation of the jaw **17** and for this purpose, the jaw **17** is equipped with an outwardly extending stub shaft **23** (best seen in FIG. 3). The shaft **23** is fixed within a bore **24** within the jaw **17** and is equipped with an en-

larged head 23*a* so as to prevent detachment of the jaw 17 from the member 10. The member 10 is equipped with a bore 24 serving as a bearing for the shaft 23. Thus, the jaw 17 rotates around the longitudinal axis of the shaft 24 and this rotation is induced by an eccentric linkage including a bell crank element 25 (see FIG. 7). For this purpose, the jaw element or pad 17 is equipped with a pair of aligned, parallel depending projections 25 (see FIG. 3) which support a pin 26. Pivotally affixed to the pin 26 is a lug 27 upstanding from the bar 18 (see especially FIG. 5). Thus, as the bar 18 is reciprocated longitudinally of the device, the bell crank or eccentric linkage 25 rotates over an arc causing corresponding rotation of the needle 16.

The bar 18 at the handle end of the device is connected to the trigger 19 as can be appreciated from a consideration of FIG. 1. For this purpose, the handle 18 is offset as at 18*a* (thereby having a Z or S configuration) and is equipped with a slot 18*b* (see FIGS. 4 and 8). The longitudinal movement of the bar 18 relative to the members 10 and 11 is achieved through the provision of a second slot 18*c* (see FIGS. 6 and 8) in which the pivot pin 20 is received.

The slot 18*b* receives the upward projection 19*a* of the trigger 19 and as the trigger 19 is rocked, the upward projection 19*a* provides a generally horizontal movement to the bar 18. The trigger 19 is pivotally secured to the member 10 by means of a pivot shaft 28 and the trigger 19 is further equipped with a stop projection or pin 29 which limits, in conjunction with the ears 19*b*, the vertical movement of the bar 18 during rotational movement of the trigger 19.

The trigger 19 is also seen to be S-shaped and provides a first surface as at the point generally designated 30 for engagement with the index finger of the surgeon. Retraction of the trigger under the influence of index finger pressure results in moving the needle 16 from the FIG. 1 position to the FIG. 5 position. In the FIG. 1 position (also seen in FIG. 7), the shank of the needle 16 and hence the slot 21 is arranged at an angle of about 45° to the general plane of the device with the shank end pointing upwardly. In this condition, the surgeon is able to see the tip 16*c* of the needle. Retraction of the trigger 19 forces the bar 18 outwardly, i.e., toward the needle end, and the needle 16 to the position seen in FIG. 5 where the shank end of the needle 16, i.e., the suture end 16*b* is in the dotted line position designated at 21*a* in FIG. 7.

The bottom portion of the S-shaped trigger as at the point designated 31 provides a pressure surface for engagement with the surgeon's large finger or middle finger and pressure exerted by that finger serves to retract the needle and bar 18 by forcing the trigger 19 forwardly. This is of particular utility in the event an improper puncture is made on the first attempt.

It is believed that a more specific description of the operation of the device will be further helpful in understanding the invention and for that purpose, the following is set down:

*Operation*

The inventive device serves as a primary needle holder in tonsillectomies where there is a restricted field for work spaced some distance from the place where the surgeon has his hand. The device also is effective as a primary instrument in prostatic surgery, vaginal and abdominal hysterectomies, biliary surgery, cardiac surgery, etc.—all of which are characterized by requiring minimum distortion of the anatomy during surgery.

To use the instrument, the proper size suture needle 16 is selected and is mounted in the slot 21 (see FIG. 7) of the rotatable jaw element 17 provided as part of the handle equipped member 10. During installation of the needle 16, the jaw 22 of the cooperating member 11 is spaced away from the jaw 17 as in the dotted line condition of element 11 designated 11*a* in FIG. 4. Thereafter, the surgeon exerts pressure on the thumb grip 15 forcing it from its dotted position in FIG. 4 to the solid line position in which the pad or jaw 22 bears against the needle 16 forcing the same into an immobilized position within the slot 21 of movable jaw 17.

Thereafter, and with the trigger 19 positioned in its most forward position, the surgeon inserts the assembled needle and device (as seen in FIG. 1) into the operating field. At this time, the tip 16*c* of the needle 16 is in full view and can be positioned for engagement with whatever tissue is desired. When the tip 16*c* of the needle 16 is positioned at the point of needle puncture, the surgeon thereupon retracts the trigger 19 as by applying pressure through his right forefinger (not shown) at the point designated 30 in FIG. 1. This causes the needle 16 to move upwardly through a generally circular arc and if the trigger 19 is completely retracted, the needle 16 ultimately assumes the position seen in FIG. 5. However, it will be appreciated that the needle can be stopped at an intermediate position as desired. Once the needle is properly positioned in the tissue, the surgeon applies pressure through his right thumb to the thumb pad 15 to move the jaws 17 and 22 apart and thus release the needle from the grip thereof. The instrument is then removed from the surgical field and the needle moved further through the employment of a conventional forceps as by grasping the protruding end 16*c* and completing the sewing operation.

If, for any reason after tissue puncture and before the device is detached from the needle 16 the surgeon wishes to make a different puncture, the needle can be re-rotated to its FIG. 1 position merely by applying pressure through the surgeon's middle finger as at 31 to move the trigger forwardly.

Thus there is provided a direct approach needle holder which grasps the needle with its plane held straight in line with the long axis of the instrument, and a trigger-push bar-eccentric pivot mechanism rotates the needle through an arc of about 170°, with the plane of the arc remaining in line with the instrument's long axis. This allows placement of a needle with its suture at the distal end of a surgical field one inch in diameter and five inches in depth.

The device accommodates various sizes of needles and the needles are not an integral part of the instrument, the needle point or tip being always in the direct view of the surgeon. The needle is firmly held within the slot 21 which conforms in curvature to the needle, thereby maintaining the needle in the plane of the long axis of the holder and offers resistance to side swing or side rotation. The confronting surface of the stationary jaw 22 also offers resistance to turning of the needle in the clamp by applying pressure along the length thereof which I determine to be at three points.

It has been found that no unusual mechanical ability is required to correctly employ the inventive holder. It places sutures with simplicity and ease, directly into the lateral walls, or into the upper and lower poles of tonsillar fossa for the ligation of hemorrhage points.

While in the foregoing specification a detailed description of an embodiment of the invention has been set down for the purpose of explanation thereof, many variations in the details herein given may be made by those skilled in the art without departing from the spirit and scope of the invention.

I claim:

1. In a device of the character described wherein two elongated rigid members are pivotally interconnected adjacent to but spaced from corresponding ends to provide a forceps, said members being equipped adjacent to but spaced from the other corresponding ends with releasable, interengaging lock projections for maintaining said corresponding ends in clamping relation, the improvement comprising

(A) an elongated bar mounted on one of said members

for longitudinal reciprocation generally parallel to the length of said one member,

(B) finger engageable means pivotably mounted on said one member and connected with said bar for translating pivotal motion of said means into bar movement, and a

(C) needle-mounting pad pivotally secured to said one member at the said corresponding end thereof, said bar being pivotally interconnected with said pad to translate bar movement into rotational movement of said pad.

2. The structure of claim 1 in which said pad is equipped with a laterally extending projection, said bar being pivotally interconnected with said projection to provide an eccentric.

3. The structure of claim 1 in which the other of said members is equipped with a smooth surface pad mounted in confronting relation with said needle-mounting pad.

4. The structure of claim 3 in which said needle-mounting pad is equipped with a slot adapted to receive a surgical needle.

5. In a needle holding device of the character described wherein two elongated rigid members are pivotally interconnected adjacent to but spaced from the needle holding ends thereof to provide a forceps, said members being equipped adjacent to but spaced from the handle ends thereof with releasable interengaging lock projections for maintaining said needle holding ends in clamping relation, the improvement comprising

(A) an elongated bar slidably mounted on the pivotal interconnection of said members for longitudinal reciprocation generally parallel to the length of said one member,

(B) a trigger pivotally mounted on said one member and connected with said bar for translating pivotal motion of said trigger into bar movement and a

(C) needle-mounting slotted jaw pivotally secured to said one member at the said needle holding end thereof, said bar being pivotally interconnected with said jaw to translate bar movement into rotational movement of said jaw.

6. The structure of claim 5 in which said trigger is equipped with an upstanding projection, said bar equipped with a slot receiving said projection whereby said projection is adapted to urge said bar in directions generally parallel with the length of said bar.

7. In a device of the character described, two elongated rigid members pivotally interconnected adjacent to but spaced from corresponding ends to provide a forceps, said members being equipped adjacent to but spaced from the other corresponding ends with releasable, inter-engaging lock projections for maintaining said corresponding ends in clamping relation,

a needle mounting pad pivotally secured to one of said members at the said corresponding end thereof,

a needle-clamping pad fixed to the corresponding end of the other member and equipped with a bearing face adapted to be brought into confronting relation with said needle-mounting pad when said corresponding ends are in clamped relation, and

means on said one member for rotating said needle-mounting pad in either direction about an axis generally perpendicular to said bearing face and in an arc generally parallel to the length of said one member.

8. In a device of the character described, two elongated rigid members pivotally interconnected adjacent to but spaced from corresponding ends to provide a forceps, said members being equipped adjacent to but spaced from the other corresponding ends with releasable, inter-engaging lock projections for maintaining said corresponding ends in clamping relation,

a needle-mounting pad pivotally secured to one of said members at the said corresponding end thereof,

a needle-clamping pad fixed to the corresponding end of the other member and equipped with a bearing face adapted to be brought into confronting relation with said needle-mounting pad when said corresponding ends are in clamped relation,

means on said one member for rotating said needle-mounting pad in either direction about an axis generally perpendicular to said bearing face and in an arc generally parallel to the length of said one member, said means including a trigger-equipped linkage mounted on one member, said trigger being positioned adjacent said lock projections.

9. The structure of claim 8 in which said one member is equipped with a pistol grip depending handle.

10. The structure of claim 8 in which said trigger has a general "S" shape, whereby said linkage is movable in different directions by pressure from adjacent fingers.

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