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(54) Suturing machine for use in
 medical treatment

(57) A suturing machine for sewing up incisions in medical treatment employs a needle thread and a shuttle thread. One construction comprises a pair of grips 2, 3 pivotted to form tongs and adapted to grip a curved needle 17 carrying thread 11 from a bobbin 5 carried on grip 2. The thread 11 passes along the needle in a groove (not shown in Figure 1) and thence through an eye 17d in the pointed end of the needle. The grip 3 is formed with an elongate guide groove 3d which slidably carries a part 22a of a shuttle holder 22 (Figure 4). The shuttle itself is shown under reference 24 and carries a shuttle thread 28. In use, the shuttle is passed through a loop in the needle thread formed during the making of a stitch by sliding the shuttle holder along the groove 3d.

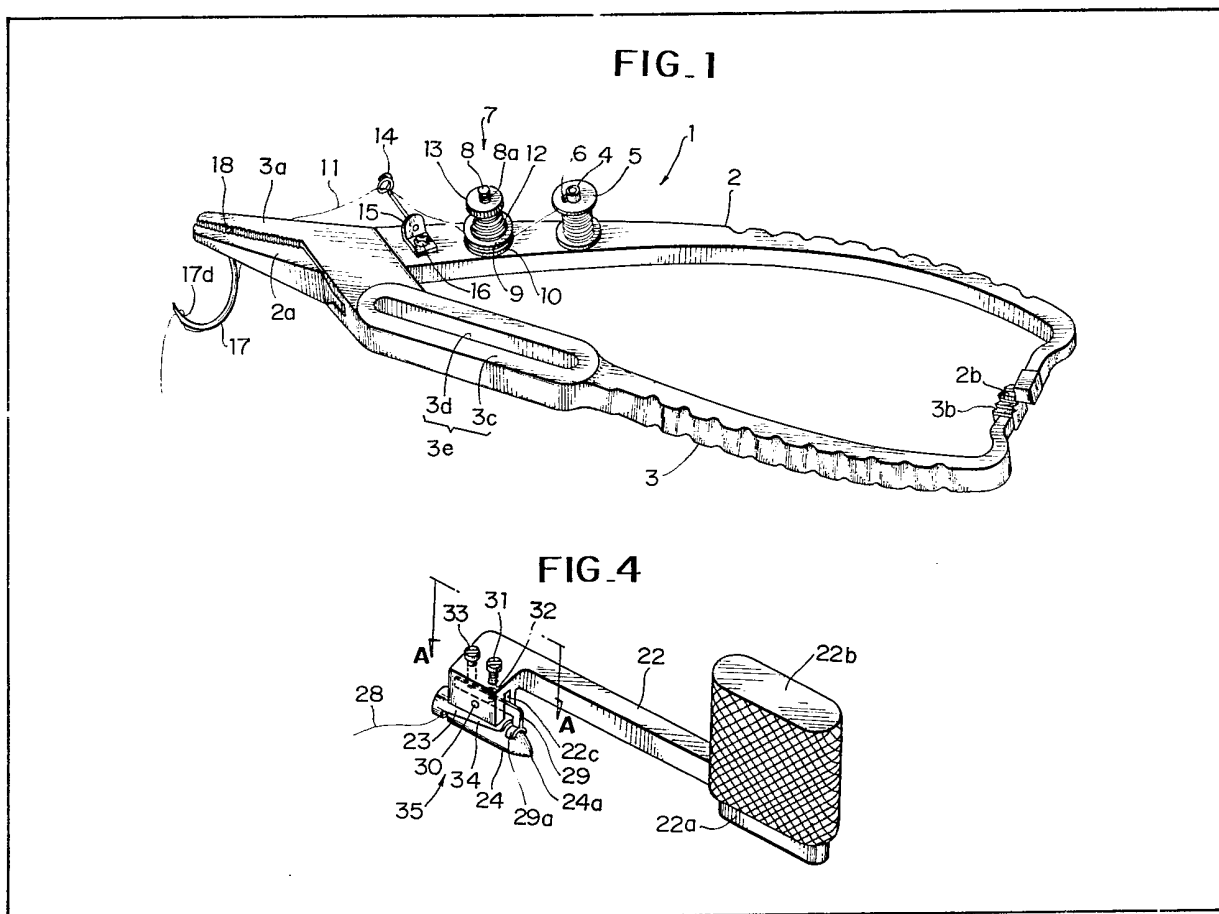


FIG. 1

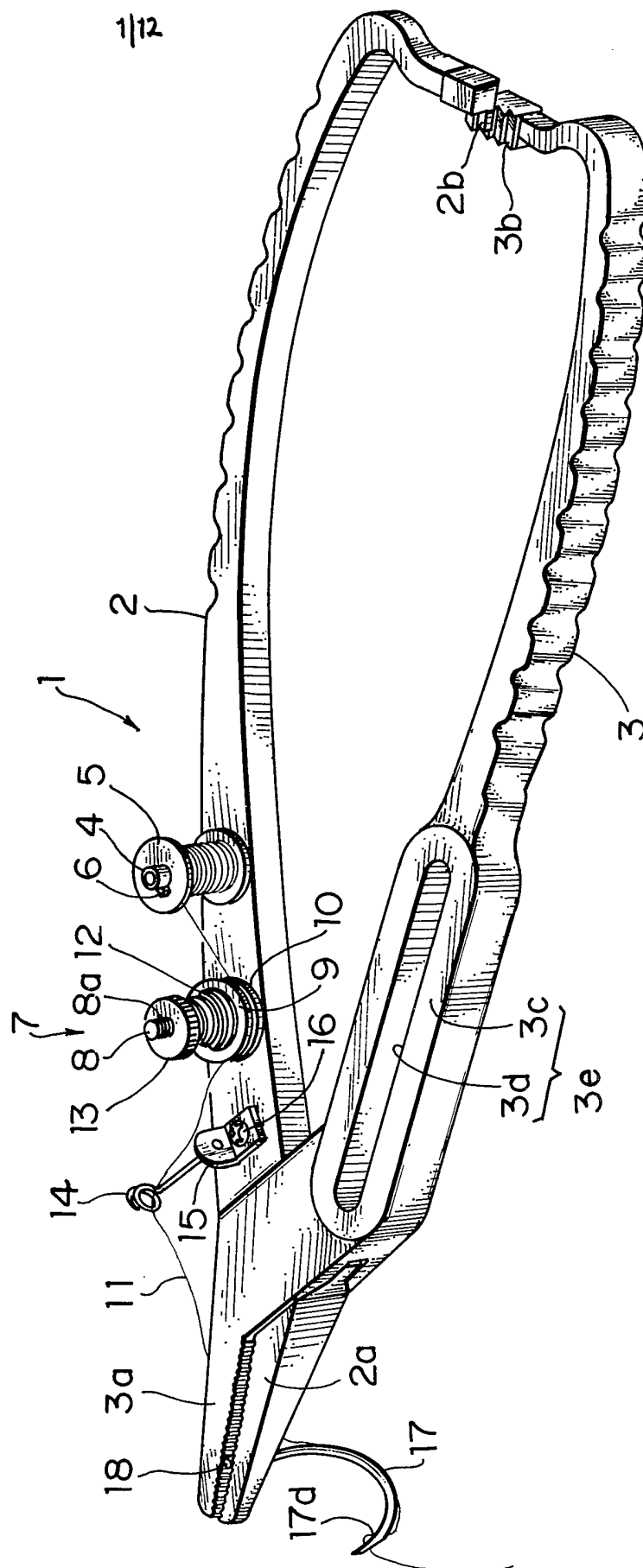


FIG. 6

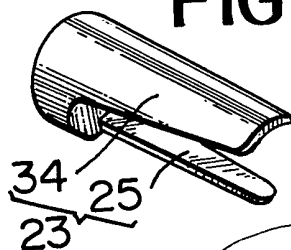
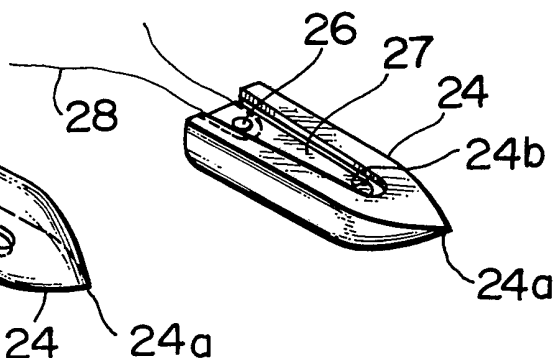


FIG. 7



B

FIG. 8

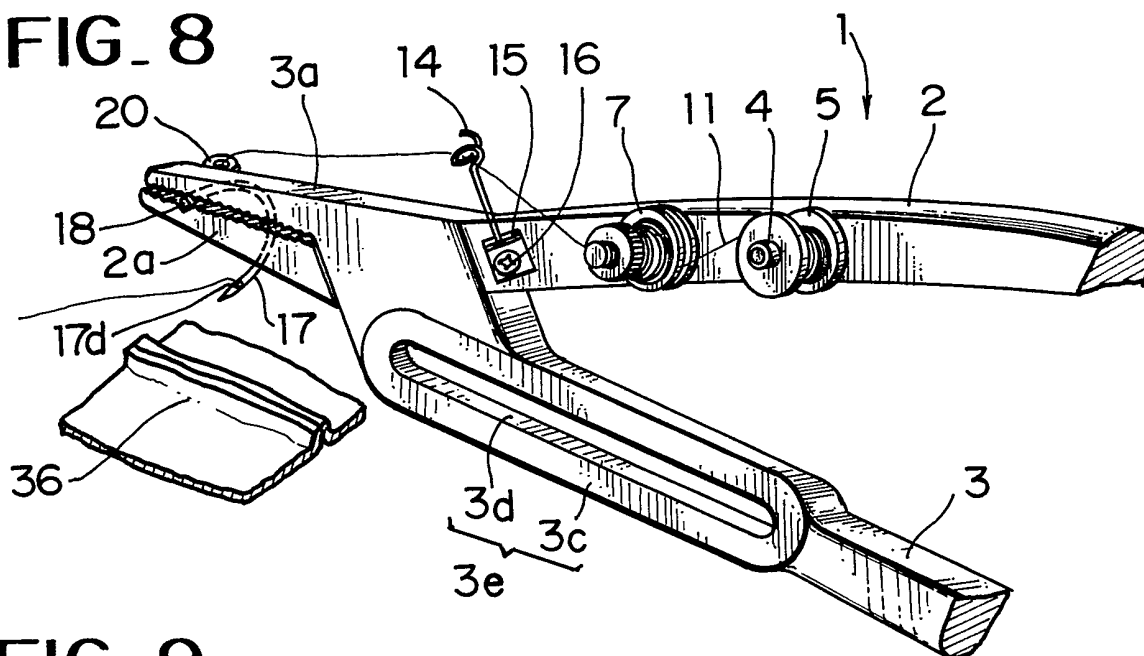
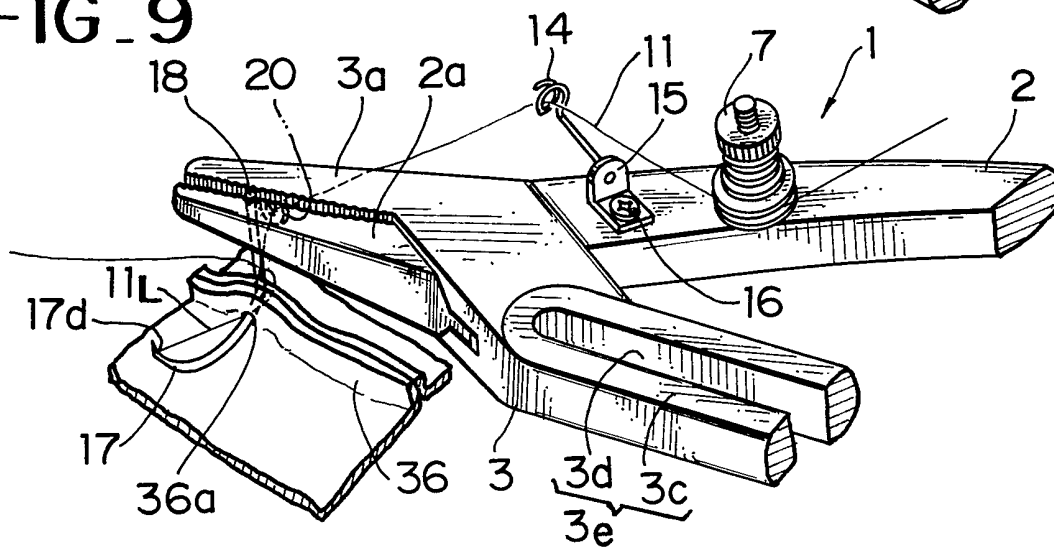


FIG. 9



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FIG. 10

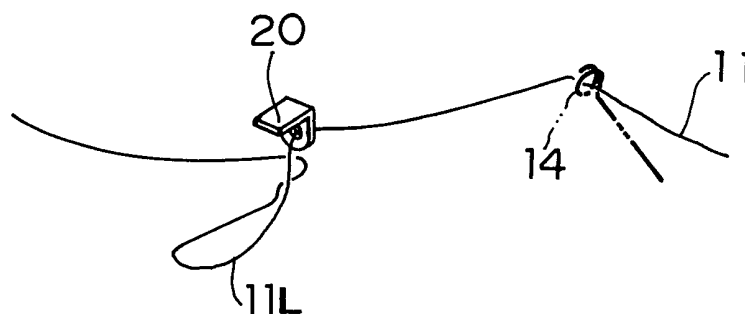


FIG. 11

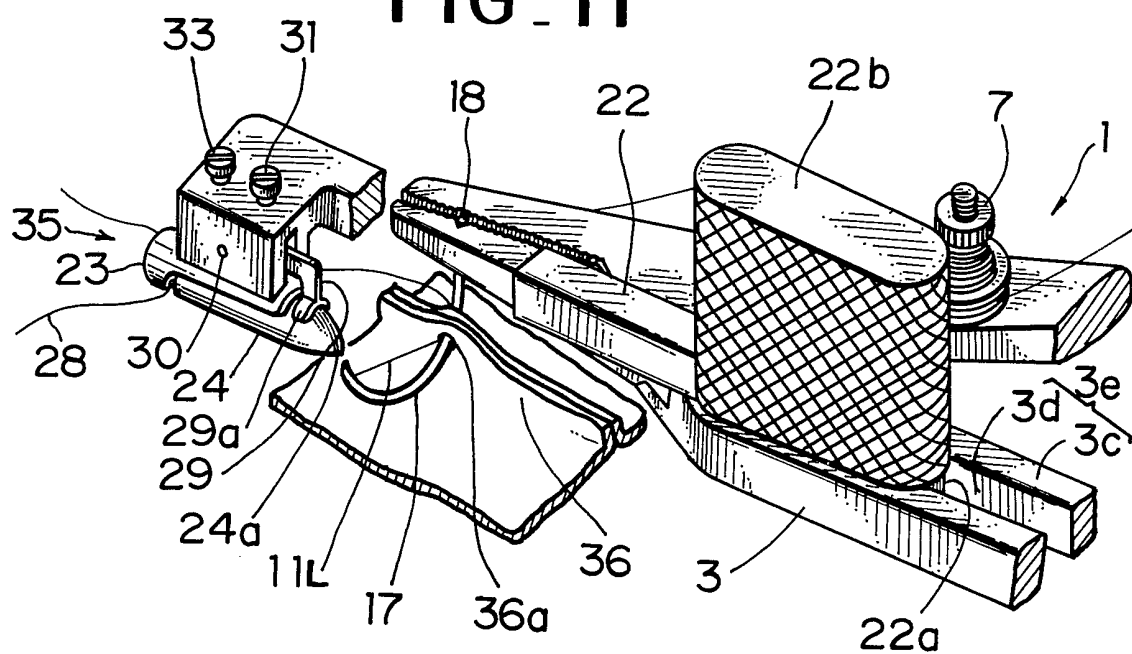
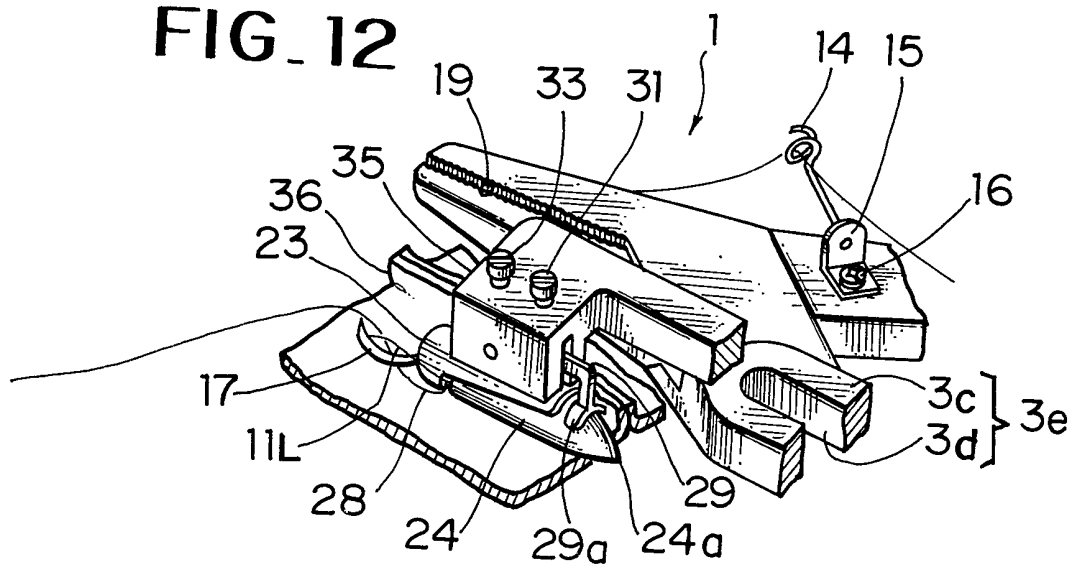


FIG. 12



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FIG. 13

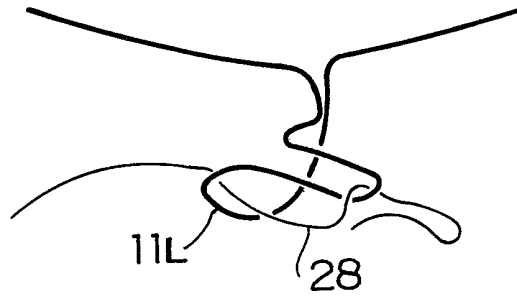


FIG. 14

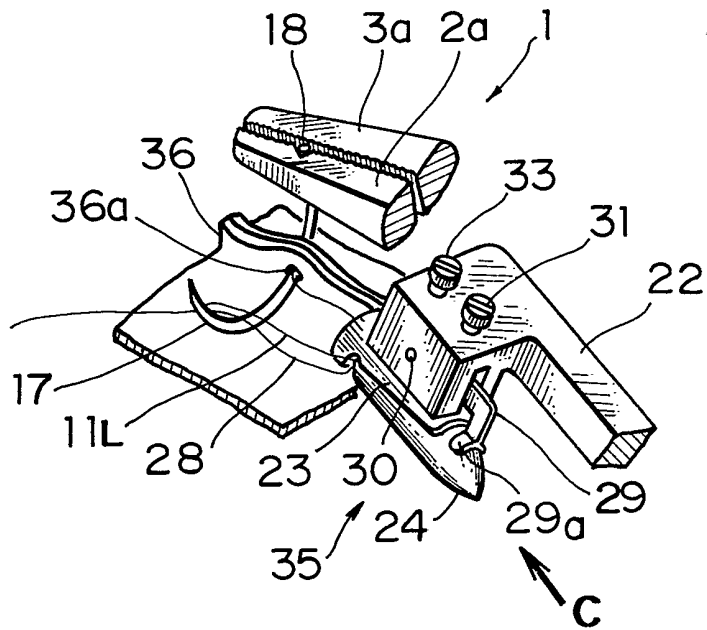


FIG. 15

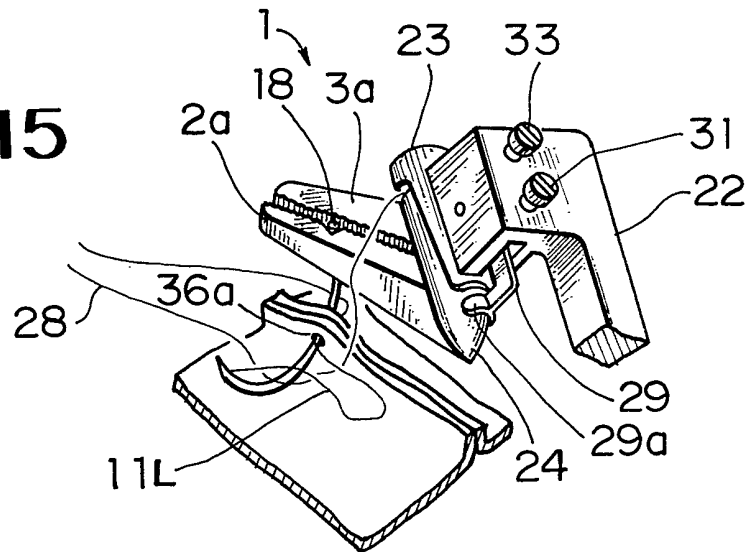


FIG_16

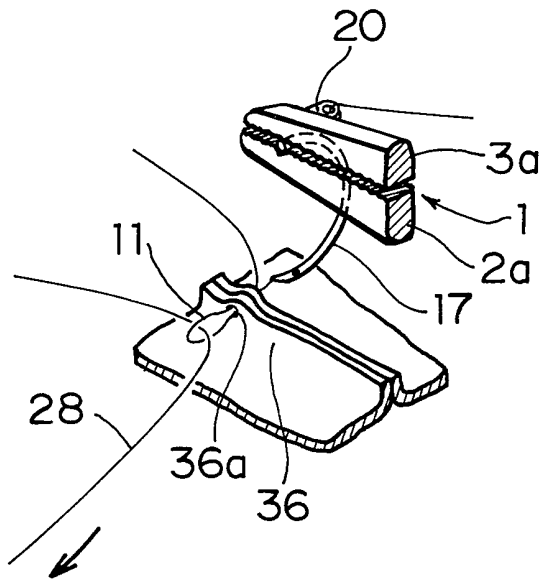


FIG_17

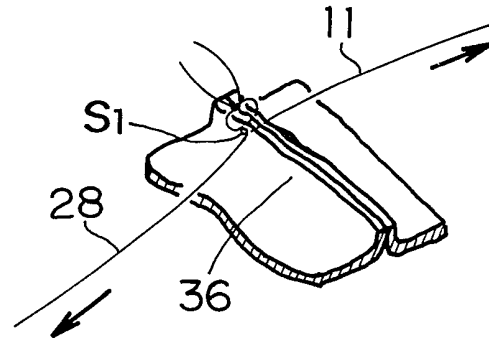


FIG_19

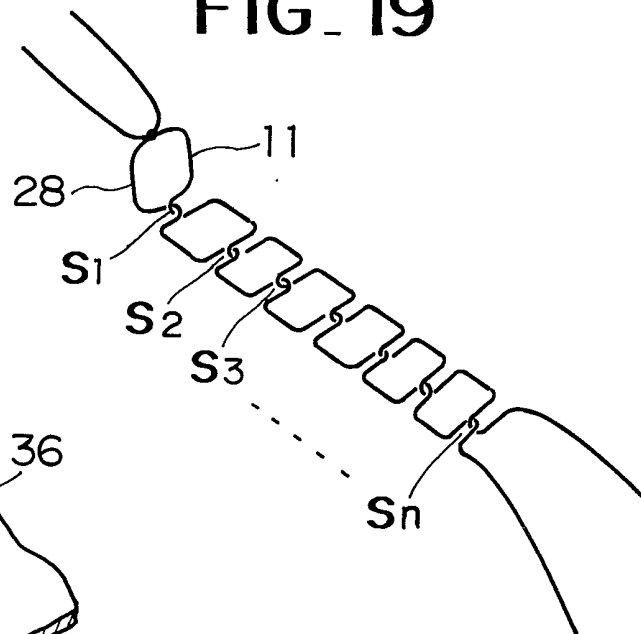
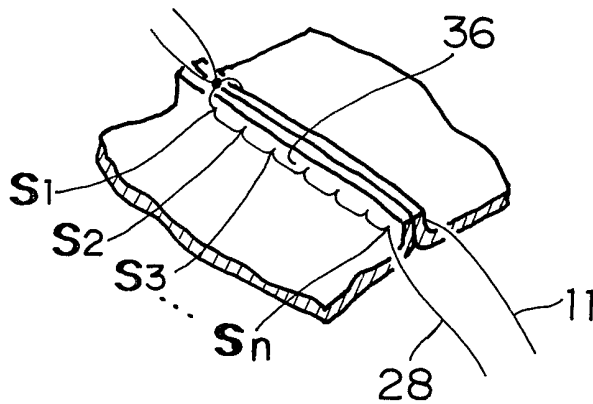


FIG_18



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FIG. 20

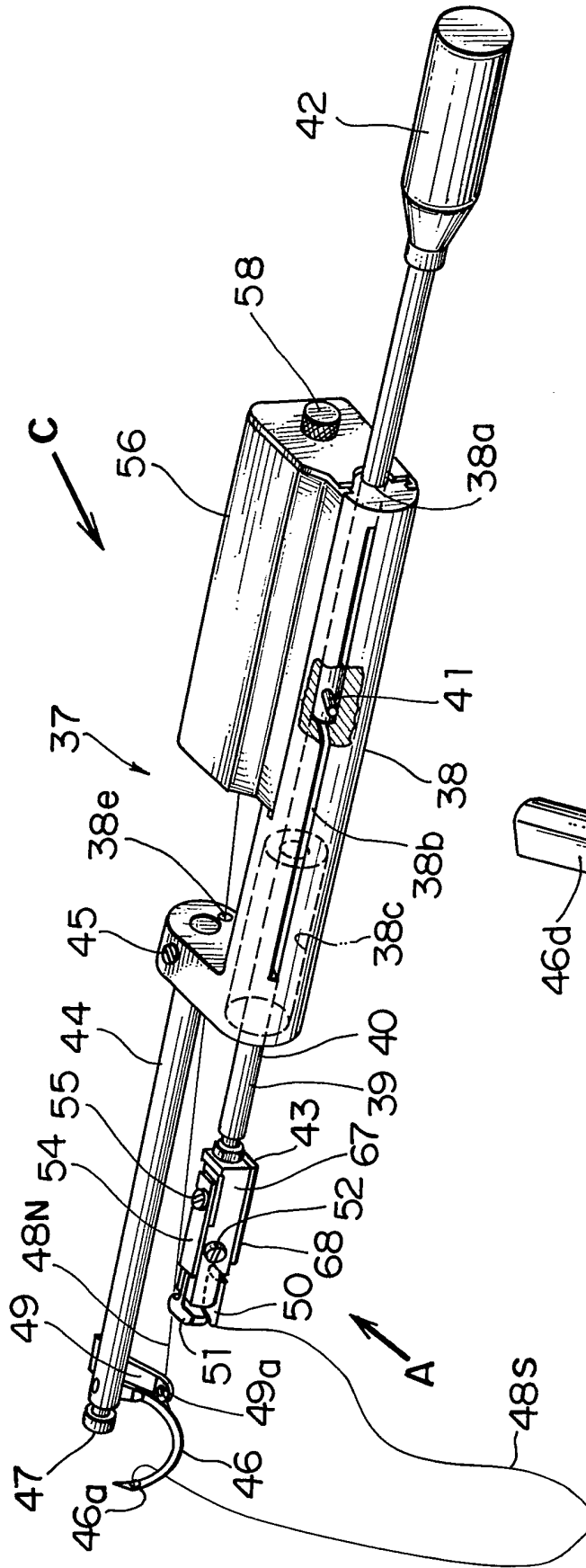


FIG. 21

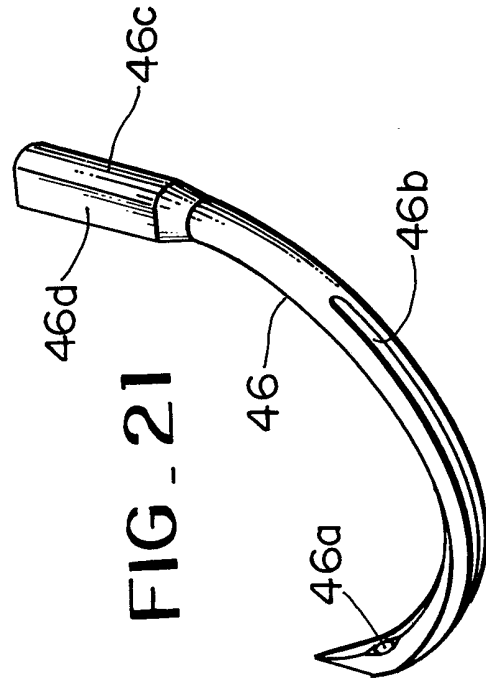


FIG. 22

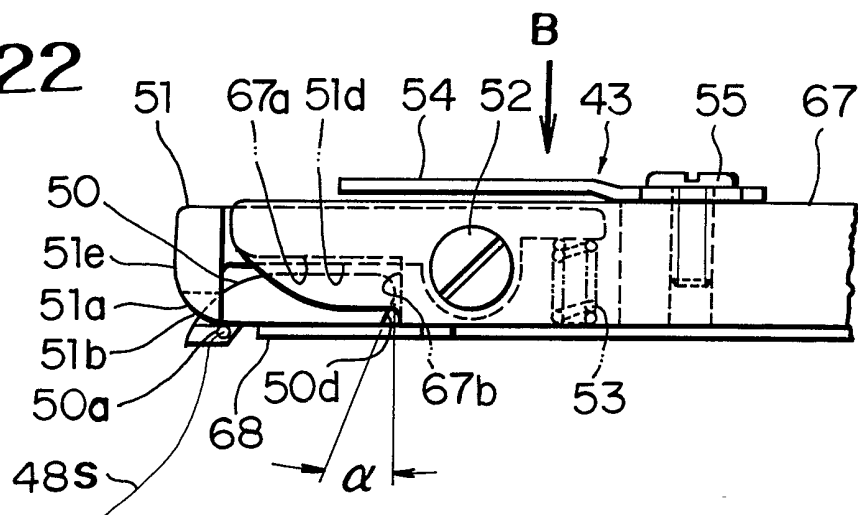


FIG. 23

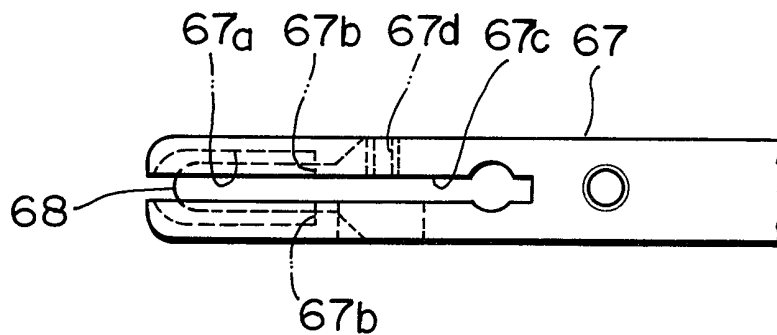


FIG. 24

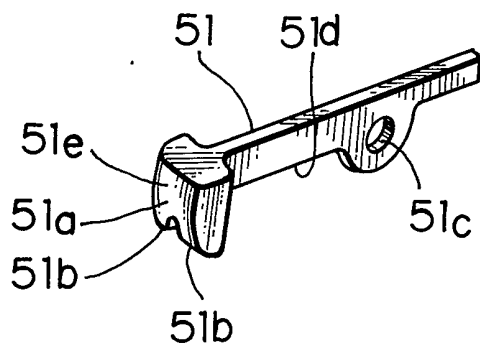


FIG. 25

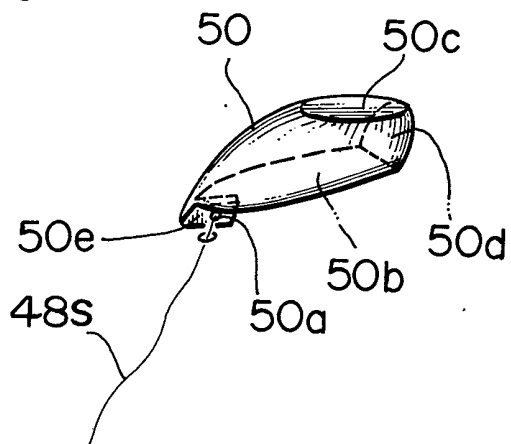


FIG. 26

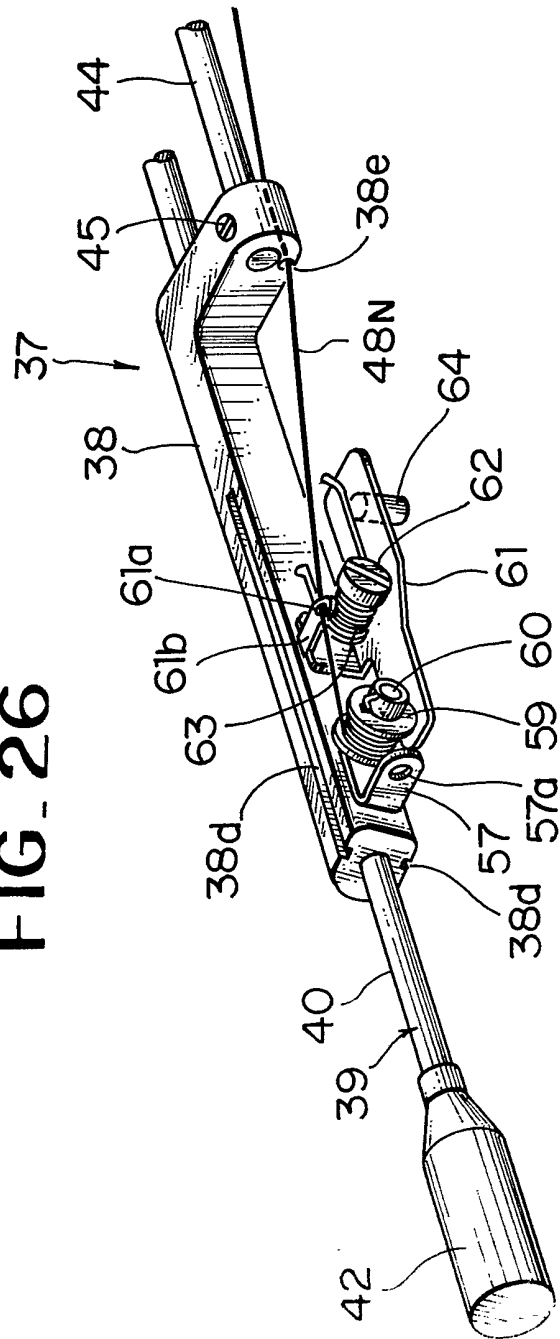
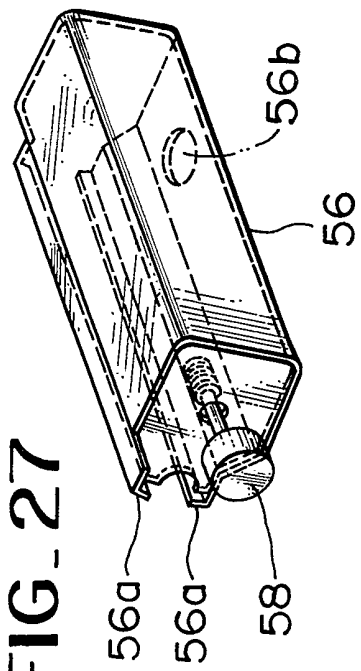


FIG. 27



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FIG. 28

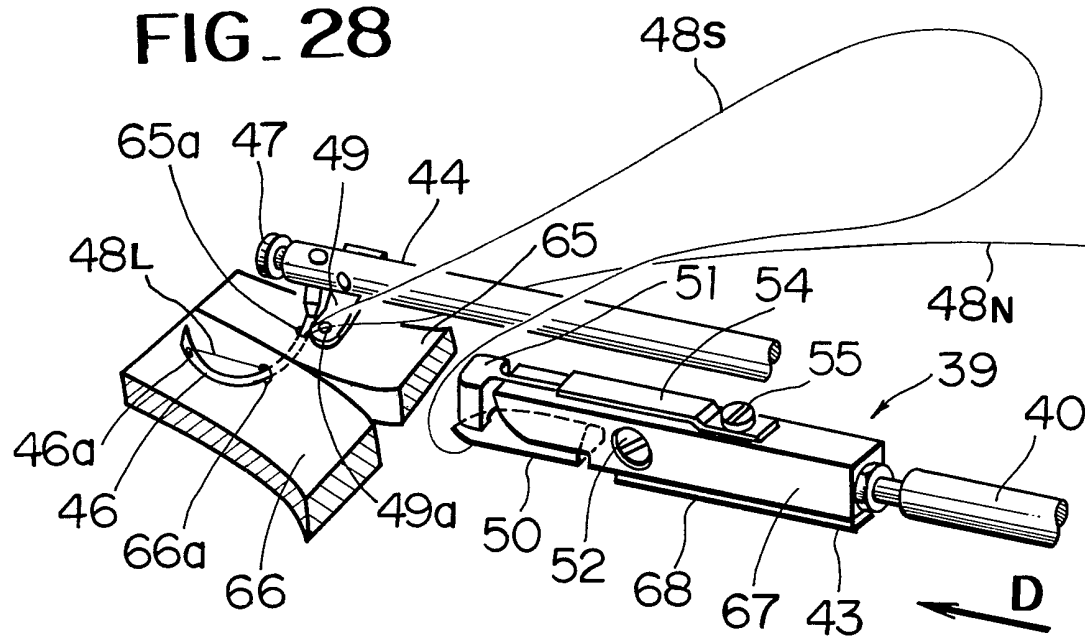


FIG. 29

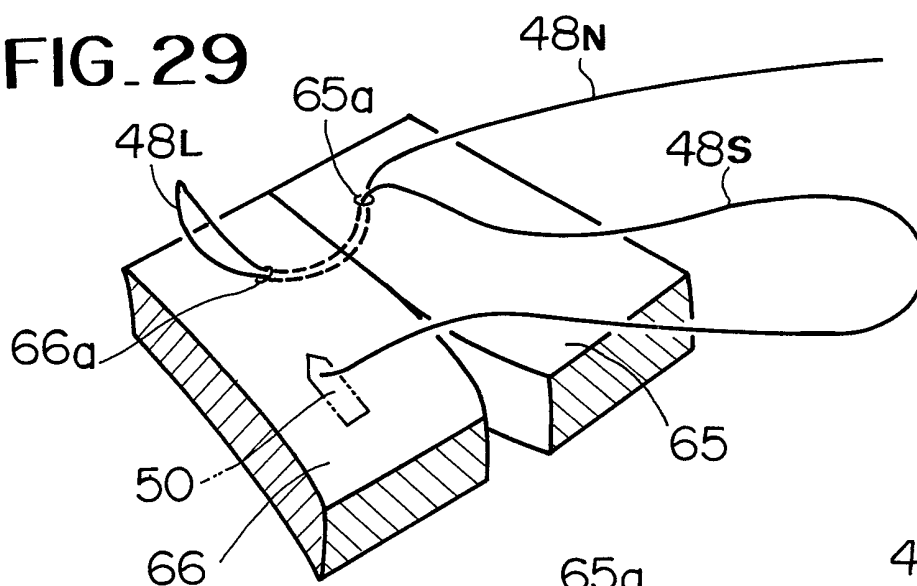


FIG. 30

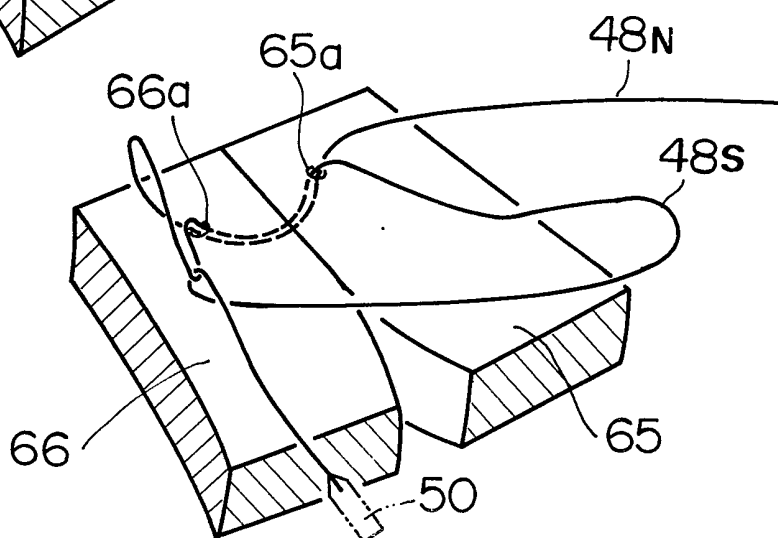


FIG. 31

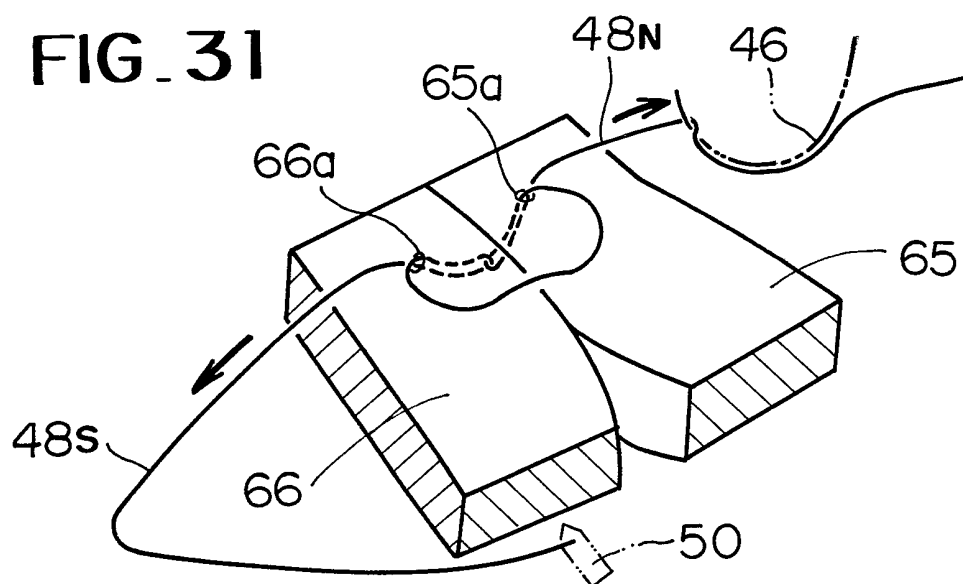


FIG. 32

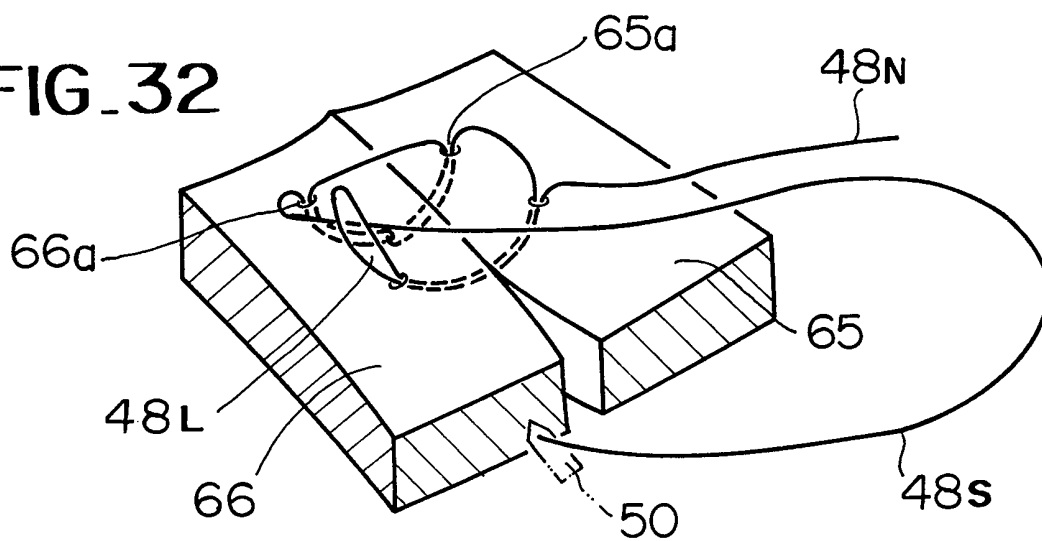


FIG. 33

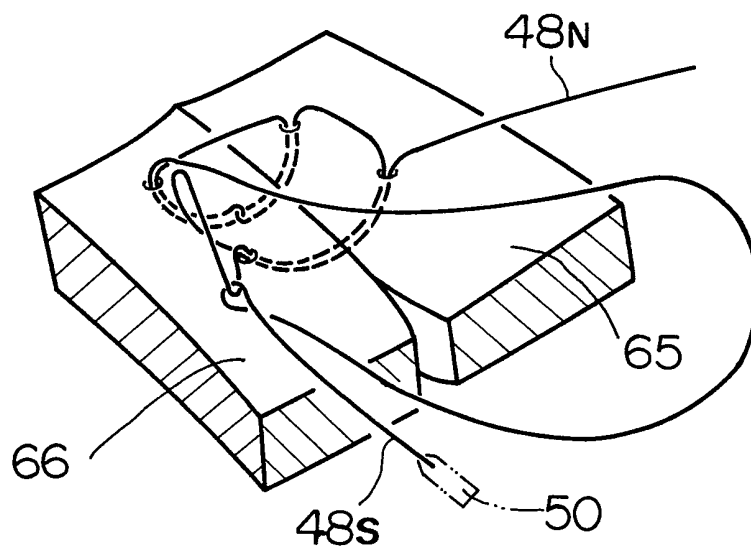


FIG. 34

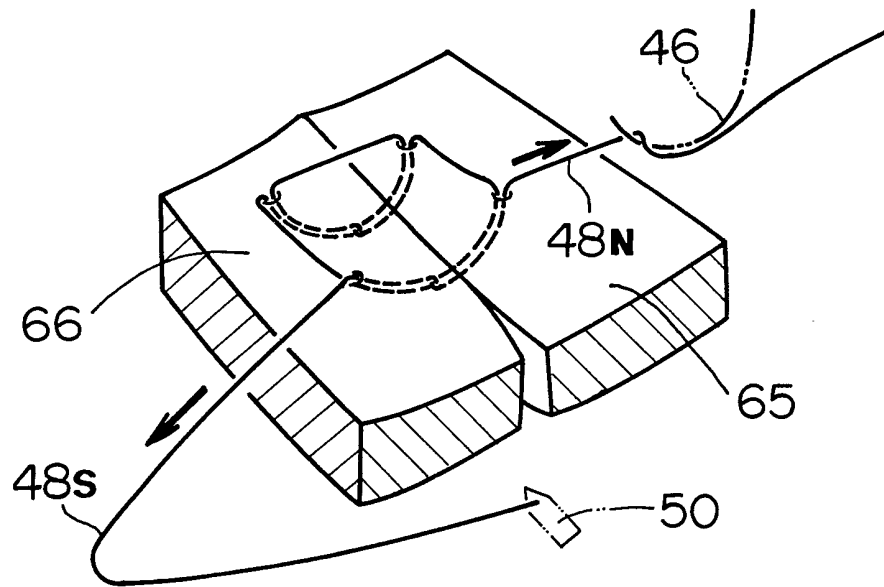
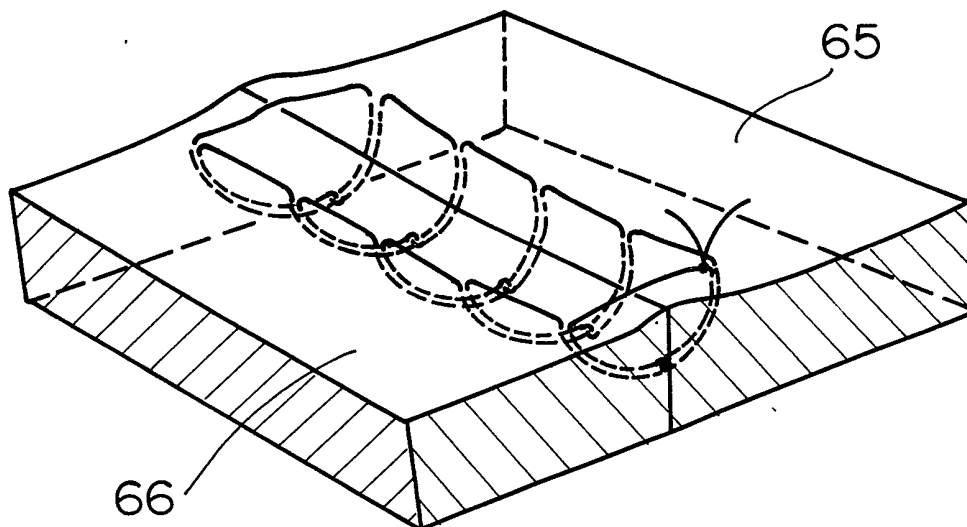


FIG. 35



SPECIFICATION

Suturing machine for use in medical treatment

5 The invention relates to a suturing machine, and more particularly relates to a suturing machine for use in medical treatment to suture up the incised parts of a patient continuously by lock stitches using a needle thread and a shuttle thread.

10 It is known to carry out the suturing operation at the incision in the patient by means of a curved needle formed with a needle eye at the shank thereof, which is mounted in a holder handled by an operator with a thread passed through the needle eye of the curved needle. Thus the curved needle is inserted
15 into the incision to be sewn up and then the needle is released to manually form up a knotted seam per stitch. As a result, the suturing operation takes a long time and is a physically heavy burden on the part of
20 the operator as well as the patient.

In order to shorten the suturing time, there has been proposed another machine such as a stapler employing staples made of a metal such as silver. In this case, however, the metal staples remain in the
25 human body, and have an adverse influence on any X-rays which may be taken later to inspect the condition of the operated part or other inner organs. Such metal staples will also act as obstacles should the operation need to be repeated, or may be alien substances which psychologically affect the convalescence of the patient.

The present invention seeks to reduce the defects and disadvantages of the prior art by providing a suturing machine for medical treatment which is
35 simple in structure and easy in operation to continuously suture up the incised parts of a patient by means of lock stitches using a needle thread and a shuttle thread.

According to the invention there is provided a
40 suturing machine for medical treatment for producing stitches with a needle thread and a shuttle thread, said machine comprising means for holding a curved needle carrying the needle thread, said
45 needle holding means being operated to insert the curved needle into a part to be sutured up to form a loop of the needle thread, means for holding a shuttle carrying a shuttle thread, said shuttle holding means being operated to insert the shuttle into the
50 needle thread loop to interlock the thread loop with the shuttle thread to produce a lock stitch, said shuttle holding means being normally mounted on said needle holding means and operated relative to the latter while the latter is stationary.

In one embodiment of the invention the needle
55 holding means comprises a pair of grips providing jaws at one end thereof to releasably hold the curved needle, one of the grips being formed with a guide groove, and the shuttle holding means comprises an elongate support having an operating structure
60 formed at one end thereof and a shuttle holding structure formed at the other end thereof, said operating part being in engagement with the guide

65 groove of the grip and displaceable lengthwise of the grip to move the shuttle holding structure with respect to the needle thread loop formed at the curved needle.

In another embodiment of the invention the needle holding means is an elongate frame formed with a grip and supporting a needle bar having the curved
70 needle secured to one end thereof, and shuttle holding means comprising a support rod formed with an operating part at one end thereof and a shuttle holding structure at the other end thereof, said support rod being mounted on the elongate frame and being
75 displaceable lengthwise of the latter to move the shuttle holding structure with respect to the needle thread loop formed at the curved needle.

In order that the invention may be better understood, two embodiments thereof will now be described by way of example only and with reference to the accompanying drawings in which:—

Figure 1 is a perspective view of a needle holder for use in a first embodiment of a suturing machine according to the invention;

85 Figure 2 is a perspective view of a holding part of the needle holder and a curved needle;

Figure 3 is the above mentioned perspective view seen from a direction opposite to that of Figure 2;

Figure 4 is a perspective view of a shuttle holder, for use in the suturing machine;

90 Figure 5 is a cross sectional view taken along the lines A-A of Figure 4;

Figure 6 is an exploded perspective view of the shuttle holder and a shuttle;

95 Figure 7 is a perspective view of the shuttle seen from the direction of the arrow B in Figure 6;

Figures 8 to 19 are views of suturing processes by the suturing machine;

Figure 8 is a view of the start of the suturing operation;

100 Figure 9 is a view showing the curved needle penetrated into the part to be sutured;

Figure 10 shows the thread condition in the Figure 9 position;

105 Figure 11 is a view showing the shuttle holder attached to the needle holder;

Figure 12 is a view showing the operation of the shuttle holder;

110 Figure 13 is a diagram showing the relation between the needle thread and the shuttle thread in the position shown in Figure 12;

Figure 14 shows the drawing out of the needle thread from the shuttle holder;

Figure 15 shows the arrangement when the needle
115 thread has been drawn out from the shuttle holder;

Figure 16 shows the drawing out of the curved needle from the penetrated hole of the sutured part;

Figure 17 shows a stitch made by the needle thread and the shuttle thread at the sutured part;

120 Figure 18 shows a plurality of stitches formed in succession;

Figure 19 shows the relation between the needle thread and the shuttle thread in the stitching illustrated in Figure 18;

Figures 20 to 35 show a second embodiment of the present invention;

Figure 20 is a perspective view of the suturing machine;

5 Figure 21 is an enlarged perspective view of the curved needle;

Figure 22 is a shuttle holder seen from the direction of arrow A in Figure 20;

10 Figure 23 is a shuttle holder seen from the direction of arrow B in Figure 22;

Figure 24 is a perspective view of a pawl member;

Figure 26 is a perspective view of the shuttle;

15 Figure 26 is a perspective view of the suturing machine seen from the direction of arrow C in Figure 20, and partly abbreviated;

Figure 27 is a perspective view of the grip cover of the suturing machine;

Figure 28 is a perspective view showing the curved needle penetrated into a part to be sutured up;

20 Figures 29 to 34 are views showing the suturing process;

Figure 29 shows the relation between the needle thread and the shuttle thread under the condition shown in Figure 28;

25 Figure 30 shows the shuttle thread crossed by the needle thread;

Figure 31 shows the tightening of the needle thread and the shuttle thread;

30 Figure 32 shows the relation between the needle thread and the shuttle thread at the second penetration of the curved needle;

Figure 33 shows the shuttle thread crossed by the shuttle thread;

35 Figure 34 shows the tightening of the needle thread and the shuttle thread; and

Figure 35 shows the completion of the suturing operation.

Referring to Figure 1, a needle holder 1 comprises a pair of grips 2, 3 each formed with jaws 2a, 3a at one end thereof and abutments 3a, 3b at the other end thereof respectively. The jaws 2a, 3a form a needle holding part 18 of the holder 1. The grips 2, 3 are pivoted with respect to each other so that the needle holding part 18 may be opened and closed by manipulation of the grips 2, 3. The grip 2 is provided with a vertical pin 4 on which a thread wound bobbin 5 is detachably and rotatably mounted. The bobbin 5 is provided with a spring 6 which is normally pressed against the pin 4 to prevent the bobbin 5 from slipping off the pin 4.

60 The grip 2 is provided with another vertical pin 8 on which is mounted a thread tension device 7. As shown, the thread tension device 7 consists of a pair of discs 9, 10 for receiving therebetween the thread 11 of the bobbin 5, a compression spring 12 placed on the discs, and a thumbscrew 13 which is in engagement with a threaded part of the pin 8 to adjust the pressure of the discs 9, 10 through the spring 12. A thread guide 14 is mounted on a base element 15 secured to the grip 2 by a fastening screw 16. The grip 3 has a guide groove 3d formed on the upper face thereof and a flat part 3c provided around the guide groove 3d. As shown in Figure 3, another thread guide 20 is provided on the rear side of the jaw 3a.

Referring to Figures 1, 2 and 3, the needle holding part 18 has a needle positioning notch 2c formed on the inner side of the jaw 2a and has a needle positioning pin 19 secured to an inner indented side 3f of the jaw 3a just opposite to the needle positioning notch 2c, for determining the vertical position of a needle 17. As shown, the needle 17 has an upper straight stem 17a and a curved shank with a needle eye 17d formed at a part adjacent to the pointed end. The curved needle 17 has a flat part 17b provided on one side of the stem 17a and a thread guide groove 17c formed on one side of the curved shank and extending therealong. In order to hold the needle 17 by means of the holder 1, the needle holding part 18 of the holder 1 is opened by manipulation of the grips 2, 3, and the upper end of the stem 17a of the needle 17 is pressed against the positioning pin 19 of the jaw 3a of the holder 1 and the flat face 17b of the stem 17a is pressed against the indented face 17f of the jaw 2a as shown in Figure 2. Then if the needle holding part 18 is closed, the positioning notch 2c of the jaw 2a engages the stem 17a of the needle 17 and presses the latter against the indented face 17f of the jaw 3a. Thus the needle 17 is vertically positioned by the pin 19 and laterally positioned by the notch 2c, and fixedly held by the holder 1.

Referring to Figure 4, a shuttle holder 22 is substantially an elongate support having an operating part 22b provided at one end thereof and a base 22a provided on the lower end of the operating part 22b, which is to be received into the guide groove 3d of the needle holder 1. Thus shuttle holder 22 has a shuttle holding member 23 secured to the other end thereof. As shown in Figure 6, the shuttle holding member 23 is substantially composed of upper and lower holding tongues 34, 25 each laterally extending and vertically spaced from each other. The shuttle 24 is an elongate member having a semi-circular cross section with a flat bottom and a tapered end 24a. The shuttle 24 has also a recess 24b formed at the bottom thereof for receiving therein the lower holding part 25 of the shuttle holder 23. As shown in Figure 7, a leaf spring 27 is secured in the recessed bottom 24b by a disc screw 26, so that a shuttle thread 28 may be inserted between the leaf spring 27 and the recessed bottom 24b. For convenience in thread drawing, which will be mentioned later, the head of the disc screw 26 is positioned in the same plane as the outer face of the leaf spring 27 or is in a plane spaced inwardly from the outer face of the leaf spring 27, and the rear face of the shuttle 24 is inclined in the rightward direction defining an angle α of about 15° with respect to the vertical plane as shown in Figure 5.

As shown in Figures 4 and 5, the shuttle holder 22 is at the leftward end thereof formed with a vertical slot 22c which is open at the bottom thereof. An elongate holder element 29 with a depending forked part 29a is rotatably arranged in the slot 22c on a pivot pin 30. The clockwise turning movement of the holder element 29 is limited by a vertically threaded adjustable screw 33. Another adjustable screw 31 is employed to press the forked part 29a against the forward end part of the shuttle 24 by way of a compression spring 32 which is guided in a vertical

groove 22d formed in the inner faces of the walls defining the slot 22c. Thus the holder member 23 and holder element 29 constitute a structure 35 for holding the shuttle 24 in such a manner that the shuttle 24 is laterally adjustable with respect to the holder member 23. The shuttle holding structure provides a clearance between the shuttle 24 and the lower and upper tongues 25, 34 and between the shuttle 24 and the forked part 29a to allow the needle thread to pass through the clearance.

Operation is as follows:— Prior to the suturing operation, the shuttle thread 28 is inserted between the recessed bottom 24b of the shuttle 24 and the leaf spring 27 as shown in Figure 7, and then the shuttle 24 is mounted on the holding structure 35 of the shuttle holder 22. Then the bobbin carrying the needle thread 11 is mounted on the needle holder 1, and the thread 11 is inserted into the thread tension device 7 and passed through the thread guides 14, 20 and is placed in the guide groove 17c of the curved needle 17, and then passed through the needle eye 17d. A part to be sutured up is fixed by a pincette or other suitable instruments as shown in Figure 8. The needle holder 1 holding the curved needle 17 is inclined as shown in Figure 8 to penetrate the part 36 to be sutured up. When the curved needle 17 penetrates the part 36, the thread 11L is tensioned between the needle eye 17d and the point 36a of penetration of the needle, as shown in Figure 9, to thus form a crescent thread loop together with the thread guided in the guide groove 17c of the curved needle 17 (Figure 10). In this case, it is improper to form a thread loop by utilizing the friction between the thread and the sutured part which is produced when the needle returns as is seen in ordinary sewing machines, because the thread loop is deformed due to the adhesive blood and becomes difficult to catch by means of the shuttle 24.

Next, the shuttle holder 22 is mounted on the needle holder 1. To do this, as shown in Figure 11, the base 22a of the operating part 22b of the shuttle holder 22 is inserted into the guide groove 3d of the needle holder 1. Then if the shuttle holder 22 is moved in the rightward direction, the shuttle 24 enters the loop 11L, and the loop 11L in enlarged as shown in Figure 12. As a result, the loop 11L comes to the rear end of the shuttle through the clearance between the upper face of the shuttle 24 and the forked part 29a of the holder element 29 and between the upper face of the shuttle and the upper tongue 34 of the holder member 23. The relation between the loop 11L and the shuttle thread 28 is such as shown in Figure 13.

Next the shuttle holder 22 is removed from the needle holder 1, and is inclined in such a manner that the rearward end of the shuttle 24 is slightly lifted up, as shown in Figure 14. In this condition, if the shuttle holder 22 is moved back in the direction indicated by the arrow C, the loop 11L is drawn out from the shuttle 24 and shuttle holder structure 35 through the clearance between the leaf spring 27 of shuttle 24 and the lower tongue 25 of the holder member 23. The relation between the loop 11L and the shuttle thread 28 during this operation is shown in Figure 15. Thus the loop 11L and the shuttle thread

28 are interlocked to each other, if the curved needle 17 is withdrawn from the penetrated point 36a of the sutured part 36 as shown in Figure 16. In this condition, the shuttle thread 28 and the needle thread 11 are knotted on the free end side thereof, and then the shuttle holder 22 and the needle holder 1 are pulled in the opposite directions to tighten the threads 11, 28, thereby to form a lock stitch S_1 as shown in Figure 17. In this way, the same stitches $S_2, S_3, \dots, S_n$ are produced repeatedly as shown in Figures 18 and 19 and the threads 11, 28 are knotted again at the end of last stitch. Thus the suturing operation is completed.

It is proper to make the suturing operation with the shuttle thread 28 constantly kept about 40 cm. to 50 cm. long from the part to be sutured up. If the shuttle thread 28 is used up, the shuttle 24 is replaced by a new shuttle which is supplied with a new thread to continue the suturing operation.

Now another embodiment of the invention will be described with reference to Figures 20 to 35. Referring to Figure 20, the suturing machine 37 comprises an L-shaped body 38 which is formed with a bore 38a lengthwise thereof. A rod 40 inserted into the bore 38a has an operating part 42 secured to one end thereof and a shuttle holder 43 secured to the other end thereof. A pin 41 is secured to an intermediate part of the rod 40. The pin 41 is in engagement with a guide groove 38b which is formed in the bore 38a lengthwise thereof. Thus the rod 40 can be reciprocated lengthwise thereof in the bore 38a but is prevented from turning movement. The shuttle holder 43 is housed in an enlarged bore 38c of the body 38, which is coaxial with the bore 38a, when the rod 40 is moved to the rightward direction to the maximum extent.

As shown, a needle bar 44 is at one end thereof secured to the L-shaped body 38 by a fastening screw 45 parallel to the rod 40. The needle bar 44 has a curved needle 46 secured to the free end thereof by a fastening screw 47. The curved needle 46 shown in Figure 21 is substantially same in structure as the needle of the first embodiment, and therefore detailed description is omitted.

Referring to Figures 22 and 23, the shuttle holder 43 is substantially a U-shaped frame 67 which is open at the bottom but is, however, covered with a shuttle support plate 68. The frame 67 forms a chamber 67a together with the bottom support plate 68 for housing a shuttle 50. As shown, the chamber 67a is provided with a pair of spaced abutments for limiting the rightward movement of the shuttle 50. The U-shaped frame 67 has a slot 67c formed in the upper wall lengthwise thereof. A stopper plate 54 is at one end thereof secured to the upper wall of the frame 67 by a fastening screw 55, and is extended over the slot 67c.

Figure 24 shows a shuttle holding member 51 which is formed with an elongate shank 51d, a mounting hole 51c provided at the intermediate part of the shank 51d and a pawl 51e provided at one end of the shank 51d. The pawl 51e is forked at the lower end thereof to form shuttle holding parts 51b, 51b. The front face 51a of the pawl 51e is smoothed and inclined toward the shuttle holding parts 51b, 51b as

shown. The shuttle holding member 51 is rotatably mounted in the frame 67 by a stepped screw 52 which is inserted into the side wall of the frame 67 and into the hole 51c of the shuttle holding member 51 and is threaded into a threaded hole 67a which is formed with the opposite side wall of the frame 67, as shown in Figure 22. The shuttle holding member 51 is normally biased in the counterclockwise direction by a spring 53 acting on one end of the holding member 51.

Figure 25 shows a shuttle 50 which is streamlined and pointed at the forward end thereof and is inclined at the rear end 50d with an angle about 10° with respect to the vertical plane. The shuttle 50 has a flat bottom 50b and a flat top 50c, and has a vertically projecting part 50e formed on the flat bottom 50b at the forward end thereof. The projecting part 50e is provided with an eye at which one end of a shuttle thread 48S is knotted. The shuttle is placed in the chamber 67a of the frame 67 as shown in Figure 22 and is held thereby by the holding member 51, the forked pawl 51e of which is pressed against the forward end part of the shuttle 50.

Referring to Figure 26 a thread wound bobbin 59 is mounted on a pin 60 which is secured to one side of the L-shaped frame 38. A brake plate 61 is turnably mounted on the side of the frame 38 by a pivot screw 62. The brake plate 61 is normally biased in the counterclockwise direction by a spring 63 mounted on the pivot screw 62, and is pressed against the side of the bobbin 59 to prevent the bobbin 59 from rotating freely. The brake plate 61 is provided with an operating projection 64 on the underside thereof. A pair of grooves 38d are provided opposite to each other on the upper and lower faces of the L-shaped frame 38.

Figure 27 shows a box like cover 56 which is open at one side thereof and has a pair of guide rails 56a provided on respective opposite edges of the open side thereof. The guide rails 56a are each engaged into the grooves 38d of the frame 38. Thus the cover box 56 is detachably attached to the L-shaped frame to cover the bobbin 59 and the brake plate 61, and is secured to the frame 38 by a fastening screw 58 which is threaded into a threaded hole 57a of a plate element 57 which is fixedly mounted on the frame 38. In this case, the operating projection 64 of the brake plate 61 is extended out of the cover box 56 through an opening provided in the lower side of the cover box 56. The cover box 56 is also used as a grip when the suturing device is operated.

As shown in Figure 26, a thread guide hole 61a is provided at a bent end 61b of the brake plate 61. another thread guide hole 38e is provided at the rightward end of the L-shaped frame 38, and still another thread guide 49 with a hole 49a is provided at the free end part of the needle bar 44 in the neighbourhood of the needle 46 as shown in Figure 20.

Operation is as follows:— Prior to the suturing operation, the cover box 56 is removed from the L-shaped frame 38, and the bobbin 59 carrying the thread 48N is mounted on the support pin 60. Then the thread 48N is drawn out from the bobbin 56 and is passed through the hole 61a of the thread guide 49 and through the hole 38e of the L-shaped frame 38, and then the cover box 56 is attached again to the

frame 38. The thread 48N is further passed through the hole 49a of the thread guide 49 and then is passed through the needle eye 46a of the curved needle 46 guided in the curved groove 46b thereof.

Next the screw 55 (Figure 22) is loosened to displace the stopper plate 54 from the slot 67c of the U-shaped frame 67, and the shuttle holding member 51 is turned in a clockwise direction, and then the shuttle 50 is placed in the chamber 67a, so that the shuttle may be held there by the holding member 51. Then the thread 48N, which is finally passed through the needle eye 46a is knotted to the thread eye 50a of the shuttle 50. This thread is to be called a shuttle thread 48S. If the needle thread 48N and the shuttle thread 48S are continuous, these threads do not need to be knotted at the initial stitch.

Prior to suturing, the shuttle holder 43 is displaced into the enlarged bore 38c of the L-shaped frame 38 by moving the rod 39 in the rightward direction, so that the shuttle holder 43 may not hinder the penetration of the curved needle 46 into the part to be sutured up. At the same time, the drawn out shuttle thread 48S is to be held in a direction spaced from the needle penetrating position by the operator or his assistant.

In this condition, the operator holds the suturing machine at the grip 56 and inserts the curved needle 46 into a sutured parts 65, 66 which are to be fixed by a pincette or other instrument as shown in Figure 28. Then the needle thread 48N is tensioned between the needle eye 46a and a point 66a of the sutured part 66, and a crescent loop 48L is formed together with the thread guided in the needle groove 46b (ing Figure 21) in the same manner as in the first embodiment. The operating part 42 is then operated to displace the shuttle holder 43 toward the loop 48L in the direction as indicated by the arrow D, so that the streamlined shuttle 50 may be inserted into the loop 48L. Then the loop 48L is guided on the upper face of the shuttle 50, passing between the shuttle and the forked pawl 51 and between the rear face 50d of the shuttle 50 and the abutments 67b, 67b of the chamber 67a, to the inclined rear face 50d of the shuttle 50 as will be understood from Figure 22.

The operating part 42 is then operated to return the shuttle holder 43 towards the L-shaped frame 38. The loop 48L is, therefore, guided between the bottom face 50b of the shuttle 50 and the support plate 68 of the chamber 67a and is drawn out from the shuttle 50. Thus the needle thread 48N and the shuttle thread 48S are interlocked to each other. Figure 29 shows the relation between the threads 48N, 48S before the shuttle 50 is inserted into the loop 48L, and Figure 30 shows the relation between the threads 48N, 48S after the shuttle has been inserted into the loop 48L and returned toward the L-shaped frame 38.

Next the curved needle 46 is withdrawn from the sutured parts 65, 66 and the needle thread 48N and the shuttle thread 48S are pulled in the opposite directions as shown in Figure 31. Thus these threads are tightened to form a stitch. In this manner, the same stitches are formed one after another as shown in Figure 35. Figures 32, 33 and 35 show the procedure for forming the next stitch by the suturing

machine.

There has been described a suturing machine which is effectively and positively operated to suture up a desired part of a patient without injuring the other parts of the patient. The machine employs silk or nylon threads in order not to affect X-rays which may be taken later to inspect the condition of the operated part.

CLAIMS

1. A suturing machine for medical treatment for producing stitches with a needle thread and a shuttle thread, said machine comprising means for holding a curved needle carrying the needle thread, said needle holding means being operated to insert the curved needle into a part to be sutured up to form a loop of the needle thread, means for holding a shuttle carrying a shuttle thread, said shuttle holding means being operated to insert the shuttle into the needle thread loop to interlock the thread loop with the shuttle thread to produce a lock stitch, said shuttle holding means being normally mounted on said needle holding means and operated relative to the latter while the latter is stationary.

2. A suturing machine as claimed in claim 1, wherein said needle holding means comprises a pair of grips providing jaws at one end thereof to releasably hold the curved needle, one of the grips being formed with a guide groove, and wherein said shuttle holding means comprises an elongate support having an operating structure formed at one end thereof and a shuttle holding structure formed at the other end thereof, said operating part being in engagement with the guide groove of the grip and displaceable lengthwise of the grip to move the shuttle holding structure with respect to the needle thread loop formed at the curved needle.

3. A suturing machine as claimed in claim 2, wherein said jaws are formed with a notch to prevent the curved needle from being displaced laterally of the jaws and formed with stop to prevent the curved needle from being displaced vertically of the jaws.

4. A suturing machine as claimed in claim 1, wherein said needle holding means is an elongate frame formed with a grip and supporting a needle bar having the curved needle secured to one end thereof, and wherein said shuttle holding means comprises a support rod formed with an operating part at one end thereof and a shuttle holding structure at the other end thereof, said support rod being mounted on the elongate frame and being displaceable lengthwise of the latter to move the shuttle holding structure with respect to the needle thread loop formed at the curved needle.

5. A suturing machine as claimed in claim 2, wherein said shuttle holding structure comprises a chamber having at least an upper wall and a bottom wall for supporting a shuttle therein, a holding element formed with a forked end for holding the shuttle in the chamber and a spring acting on the holding element to press the forked end against the shuttle, said shuttle holding structure providing a clearance for the needle thread loop to pass therethrough.

6. A suturing machine for medical treatment substantially as hereinbefore described with refer-

ence to Figures 1 to 19 of the accompanying drawings.

7. A suturing machine for medical treatment substantially as hereinbefore described with reference to Figures 20 to 35 of the accompanying drawings.

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