



(51) International Patent Classification:
A61B 17/04 (2006.01)

(21) International Application Number:
PCT/TR2010/000156

(22) International Filing Date:
27 July 2010 (27.07.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2009/05821 28 July 2009 (28.07.2009) TR

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(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,

DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP,
KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD,
ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI,
NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD,
SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG,
ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

Published:

— without international search report and to be republished
upon receipt of that report (Rule 48.2(g))

(54) Title: A FORWARD CAPTURING NON-ATRAUMATIC NEEDLE HOLDER

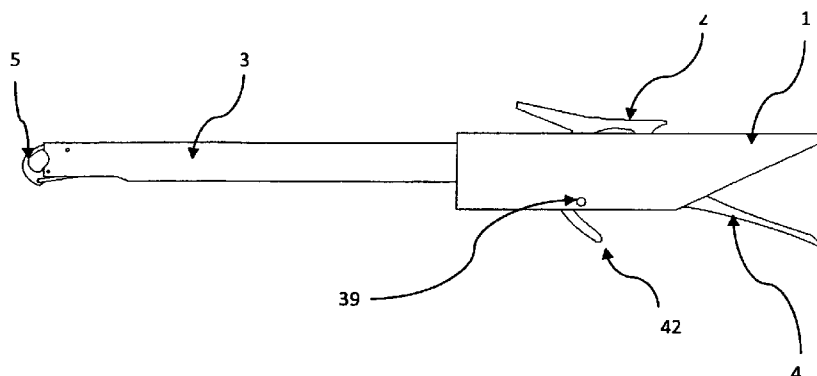


Figure 1

(57) Abstract: The invention relates to a forward capturing non-traumatic needle holder which is a tool used in such situations where the suture is intended to be made forward. The distance from the handle (1) of the forward capturing non-traumatic needle holder to the suture area is to be extended as much as desired. Upon putting the thread (48) into the hole at the tip, the tool is being approached to the tissue to be sutured when the thread carrier is open (5). When the handle (1) is compressed, the thread carrier (5) passes through the tissue. Optionally, the thread (48) is caught either automatically or in a controlled way. The suturing process is completed and the handle (1) is pulled back.



DESCRIPTION

A Forward Capturing Non-Atraumatic Needle Holder

TECHNICAL FIELD AND BACKGROUND OF THE INVENTION:

The invention relates to a forward capturing non-atraumatic needle holder to be used in such operations where sutures need not to be atraumatic. In the current systems which allow forward motion especially the thread carrier does not let forward motion therefore, not every intended area is being able to be sutured. Moreover, the practicality issues on installation and resetting of the tools are not quite resolved.

In the system specified in the Utility Model No. TR 2003 01604 Y, the tip of the needle to be passed through the flesh stands behind the muzzle tip. In such a case, it is impossible to suture on a straight flesh surface because the tip of the muzzle sticks to the flesh and prevent the contact of the needle with the flesh. Since the thread carrier tip is ahead of the connection pipe tip in the system of invention subject, a straight flesh surface is initially touched by the tip of the thread carrier and penetration to the flesh becomes possible.

Besides in the former system, the tool is not able to pass through small holes due to its large size. With the needle holder of the invention subject, it is possible to suture through much narrow holes to long distance, i.e. laparoscopic operations.

In the system of the invention subject, the triggering process is performed automatically with the press of the trigger hammer on button push surface. Therefore, the ease of use is being provided.

AIM OF THE INVENTION: The invention of forward capturing non-atraumatic needle holder eases the suturing process on any suture area by means of the forward motion of the thread holder from the tip of the device. The thread holder, after passing through the flesh (organ, tissue), catches the thread by itself automatically without pressing any button. Moreover, since the diameter of the tip section can be scaled down much and extended as required, it can be produced to be used in delicate and much deeper suture processes. The thread holder (needle) can be produced in variety of types and the thread catching system is arranged as it is.

EXPLANATION OF THE FIGURES:

- Figure 1- Side view (handle mechanism closed);
- Figure 2- Closed system oblique;
- Figure 3 - Handle inside view oblique;
- Figure 4- Motion arm;
- Figure 5- Connection pipe front bottom oblique;
- Figure 6- Button side;
- Figure 7- Button oblique;
- Figure 8 - Catching part oblique;
- Figure 9- Catching part drive rod;
- Figure 10-Thread carrier drive rod;
- Figure 11- The part providing the connection of thread carrier drive rod and thread carrier;
- Figure 12- Spring stand part, spring, handle front side, thread carrier drive rod relations;
- Figure 13- Side interior view (button pressed, lock set, thread ready to be caught) ;
- Figure 14- Side interior view (thread catching motion completed, motion are opened back);
- Figure 15- Tip detail;
- Figure 16- Setting of button lock by pushing the trigger inverse ;
- Figure 17- Thread carrier and thread relation;
- Figure 18- Catching part going under the thread and catches;
- Figure 19- Pulling back the thread holder after suturing the flesh;
- Figure 20- Thread carrier of the mechanism without catching part, back oblique;
- Figure 21- Side view of the mechanism without catching part and thread carrier closed;
- Figure 22- Side view of the mechanism without catching part and thread carrier open;
- Figure 23- Flesh opening in both tip structures;
- Figure 24- Thread catcher in the system having the thread hole front and back position, side, slight oblique view;
- Figure 25- Thread catcher in the system having the thread hole front and back position, thread, thread carrier relations, cross-section, upper view;
- Figure 26- Thread catcher in the system having the thread hole front and back position, thread, thread carrier relations, back, oblique;
- Figure 27- Thread catcher in the system having the thread hole front and back position, thread, thread carrier relations, slight oblique view;

Figure 28- Thread catcher in the system having the thread hole front and back position, thread, thread carrier relations, upper view;

Figure 29- Thread catcher in the system having the thread hole front and back position, drive rod tip structure;

Figure 30- In all mechanism types, the relation of thread carrier jagged edge and thread carrier inclined faces and jagged edge in between;

Figure 31- In all mechanism types, thread carrier jagged edge moves forward by leveling one of the inclines faces and goes between thread and inclined face;

Figure 32- In all mechanism types, thread carrier jagged edge moves forward by leveling one of the inclines faces and goes between thread and other inclined face.

PART NUMBERS:

1. handle
2. button for setting the spring feature
3. connection pipe
4. Motion arm
5. thread carrier
6. thread carrier drive rod
7. the part providing the connection of thread carrier drive rod and thread carrier
8. thread carrier drive rod spring stand ledge
9. thread carrier pivot point
10. thread carrier drive hole
11. thread carrier inclined faces
12. sharp edge between thread carrier inclined faces
13. thread carrier drive rod duct
14. thread carrier drive rod duct bottom point
15. thread carrier drive rod push shaft connected to motion arm
16. the hole of part providing the connection of thread carrier drive rod and thread carrier
17. thread catching part
18. catching part pivot point
19. catching part drive rod slot
20. catching part hook
21. jagged catching part hook tip
22. Catching part drive rod

23. catching part drive rod round tip
24. catching part drive rod spring drive edge
25. the shaft providing the connection of catching part drive rod and button
26. the hole of shaft providing the connection of catching part drive rod and button
27. spring
28. shaft carrying the button
29. button locking bar
30. button turning point hole
31. button locking edge
32. button push surface
33. button front part
34. handle side surface
35. handle front surface
36. connection pipe installation hole
37. spring stand part
38. spring stand part lower front edge
39. motion arm pad hole
40. motion arm turning pad
41. motion arm duct
42. setting lug
43. trigger hammer
44. thread hole at the thread carrier tip
45. button window
46. jagged catching part drive rod hook tip
47. flesh opening
48. thread
49. thread carrier drive hole shaft
50. flesh

DETAILED DESCRIPTION OF THE INVENTION: The invention is composed of handle (1), button for setting the spring feature (2), connection pipe (3), motion arm (4), thread carrier (5), thread carrier drive rod (6), the part providing the connection of thread carrier drive rod and thread carrier (7), thread carrier drive rod spring stand ledge (8), thread carrier pivot point (9), thread carrier drive hole (10), thread carrier inclined faces (11), sharp edge between thread carrier inclined faces (12), thread carrier drive

rod duct (13), thread carrier drive rod duct bottom point (14), thread carrier drive rod push shaft connected to motion arm (15), the hole of part providing the connection of thread carrier drive rod and thread carrier (16), thread catching part (17), catching part pivot point (18), catching part drive rod slot (19), catching part hook (20), jagged catching part hook tip (21), catching part drive rod (22), catching part drive rod round tip (23), catching part drive rod spring drive edge (24), the shaft providing the connection of catching part drive rod and button (25), the hole of shaft providing the connection of catching part drive rod and button (26), spring (27), shaft carrying the button (28), button locking bar (29), button turning point hole (30), button locking edge (31), button push surface (32), button front part (33), handle side surface (34), handle front surface (35), connection pipe installation hole (36), spring stand part (37), spring stand part lower front edge (38), motion arm pad hole (39), motion arm turning pad (40), motion arm duct (41), setting lug (42), trigger hammer (43), thread hole at the thread carrier tip (44), button window (45), jagged catching part drive rod hook tip (46), flesh opening (47), thread (48).

WORKING PRINCIPLE: The forward capturing non-traumatic needle holder basically consists of two sub systems. One of them is the system controlling the thread carrier (5) which consists of the motion arm (4), thread carrier drive rod push shaft connected to motion arm (15), thread carrier drive rod (6) and the part providing the connection of thread carrier drive rod and thread carrier (7). The other system is the thread catching system which consists of the button (2), the shaft providing the connection of catching part drive rod and button (25), the catching part drive rod (22) and thread catching part (17). The both systems are given the spring power by the same spring (27). The control of both systems by the single spring (27) is provided by the suitable organization of the spring stand part (37).

When the handle (1) of the forward capturing non-traumatic needle holder is placed in the palm, the button (2) is in distant where the thumb can reach easily. Again in this situation the motion arm (4) is set to fit in the fingers and easily commanded. The thread catching system (46) is made ready by pressing the button (2). The button (2) runs in the button window (45) above the handle (1). The button (2) when not set is mounted to shaft carrying the button (28) mounted on the handle side surface (34) via button turning point hole (30) and freely rotates on this shaft. The button (2) is connected to the catching part drive rod (22) via the shaft providing the connection of catching part drive rod and button (25) penetrated into the hole of shaft providing the connection of

catching part drive rod and button (26). By means of this connection, the pressing and releasing of the button (2), i.e. in case pressing to the button front part (33), the catching part drive rod (22) is returned back to the user. The spring stand part (37) transmits the power taken from the spring (27) to the catching part drive rod (22) via catching part drive rod spring drive edge (24) and thread catching drive rod (22) is always as pushed forward (Figure 12). The motion arm (4) is easily rotatable within motion arm pad holes (39) at both sides of the handle side surfaces (34) via turning pads at both sides. When the motion arm (4) is pulled towards the handle (1), the spring force on the spring stand part (37) is increased since the thread carrier drive rod spring stand ledge (8) presses the spring (27) forward. This is a desired situation because the power is required to the thread (48) catching system at this time. That means, when the motion arm (4) comes to the end point and releases the button (2) from its place, the spring (27) force on the catching part drive rod (22) is highest. In such a way, the thread catching part (17) overcomes the struggle in the movements it made by creeping on the thread carrier inclined faces (11) (Figures 18, 25, 26, 31,32). Besides this moment, the thread catching system (17, 22) does not need the spring power, the single spring succeeds to control both thread catching and also the thread carrier. This spring (27) is a pushing string. The spring stand part (37) is a steel part. The lower front edge (38) sticks to the handle front surface (35) from inside and transmits the motion of the spring (27) pushing it forward with the power taken from the thread carrier drive rod spring stand ledge (8) by turning on this edge (38). Thus, the forward motion taken from the spring (27) is transmitted to the catching part drive rod (22) via catching part drive rod spring drive edge (24) mounted to it. This motion is transmitted to the catching part drive rod slot (19) over the thread catching part (17) by means of the catching part drive rod round tip (23). Thus, the thread catching part (17) turns on the pivot point (18) and pushes the hook (20) towards the thread carrier (5). When pressed on the button (2) with the spring feature, all these motions are reversed and the hook (20) gets away from the thread carrier. That means the downward press motion of the button (2) is met by the catching part drive rod (22) where the spring stand part (37) transmits the press taken from the spring by the catching part drive rod spring drive edge (24) and the button is always pushed upwards. When the button (2) is pushed to the end downwards, the button locking edge (31) on the button is fixed to the button locking bar (29). However, the button (2) having complete spring feature lets the edge (31) to reflex and lets it to pass below the locking bar (29). The button (2) with the spring feature applying pressure towards the locking bar (29), causes the edge (31) to stand on the locking bar (29).

Thus the position of the button is fixed, i.e. locked. In order to unlock the lock, it is required either to apply press from bottom to top on the push surface (32) or to press the button from part (33) downwards.

The spring (27) applying pres on the thread carrier drive rod spring stand ledge (8) by standing to the spring stand part (37) pushes the thread carrier drive rod (6) towards the user. This motion is transmitted to thread carrier drive hole (10) by means of the part providing the connection of thread carrier drive rod and thread carrier (7). Thus, it is provided that the thread carrier (5) is pulled back on the thread carrier pivot point (9) and the thread carrier (5) becomes ready for the suture. Since the thread carrier drive rod duct bottom point (14) pushes back thread carrier drive rod push shaft connected to motion arm (15) by push of the spring (27), the connected motion arm (4) turns over the motion arm pad holes (39) by its pads (40), gets away from the handle (1) and is in open state. The motion arm (4) has a little more turning share from the point pushed by the spring (27) (inverse opening and distant from handle). The purpose of this is to apply press on the setting lug (42) and provide button press and lock setting. Therefore, there are two separate setting and two separate triggering options as per user selection. When the motion arm (4) is turned back and apply press on the setting lug (42), the thread carrier drive rod push shaft connected to motion arm (15) gets away from the thread carrier drive rod duct bottom point (14) but remains within the thread carrier drive rod duct (13). The length of the duct (13) is adjusted in such a way that no matter how to force the motion arm (4) in inverse direction, the thread carrier drive rod push shaft connected to motion arm (15) does not go out from the duct (13). The forward-backward motion of the thread carrier drive rod (6) occurs within the motion arm duct (41).

The trigger hammer (43) is above the motion arm (4) and planned to touch on the button push surface (32) at the end of its turning in the motion arm pad holes (39). When the button (2) is presses and the lock is active, the moment when the hammer (43) touches the push surface (32) is the moment when the thread carrier inclined faces (11) gets the levels of the jagged catching part hook tip (21) or of the jagged catching part drive rod hook tip (46). In case the motion arm (4) continues its movement of press towards the handle (1), the button locking edge (31) is released from the button locking bar (29) with the press on the push surface (32) and the catching part drive rod (22) is released from the tying effect of the button (2) and jumps forward quickly by also effect of the spring (27). This motion reaches to the thread catching part (17). The thread catching part pivot point (18) jagged catching part hook tip (21) or the jagged catching part drive rod hook tip (46) forward motion, the thread carries goes towards sharp edge

between thread carrier inclined faces (12). It selects one of the two sides on the sharp edge (12) and moves forward by touching the surface (11). The flexible structure of the thread catching part (17) and the thread carrier (5) and also the catching part drive rod (22) helps this motion. The tip of the hook (20) or catching part drive rod as in straight system is adjusted in such a way that it exactly coincides to thread carrier jagged edge (12). During the forward motion by touching the surface (11), the catcher (21) or the jagged catching part drive rod hook tip (46) goes between the thread (48) and thread carrier face (11) and clutches the thread (48) below. Due to the press transmitted by the spring (27), the position of the catching part (17) or the drive rod (22) is preserved in this form. The thread is hanging state. In this state when the motion arm (4) is released, the thread carrier (5) turns back by the push of the spring (27) and gets out of the flesh (50). In this state, one end of the thread (48) is at the tip of the connecting pipe (3) trapped inner side of the hook (20) and the other end is still at the thread carrier hole (44).

At one of the other tip formations, thread hole at the thread carrier tip (44) is in front back position (Figure 24) and the catching part is positioned as this (Figures 25, 26, 27, 28). At this tip formation, the thread carrier inclined faces (11) is in a ninety degree bended position and at the side face of the thread carrier, not the back of it as per the other tip formation due to the position of the thread hole (Figure 24).

At the other tip formation (Figure 20), there is no need for the catching part (17) due to the form of the thread carrier (5). Instead of this, the tip of the catching part drive rod is jagged as the catching part drive rod hook tip (46) and makes the motion of the slide over the thread carrier inclined face (11) and going under the thread (48) by itself. Again in the same tip form, there is no need for the part providing the connection of thread carrier drive rod and thread carrier (7). Instead of this, the thread carrier drive rod (6) is connected to the thread carrier drive hole (10) via the thread carrier drive hole shaft (49) and transmits the motion directly (Figures 21, 22).

APPLICATION TYPE OF THE INVENTION:

The handle (1) of the forward capturing non-atraumatic needle holder is clutched by taking into the palm. At the starting point, the motion arm (4) by pushing of the spring (27) is away from the handle and the button (2) is open and away from the handle due to the push transmitted by the same spring (27) to the catching part drive rod (22) via the stand part (37) and since this push is transmitted itself by means of the shaft providing the connection of catching part drive rod and button (25) (Figure 14). Since

the thread carrier drive rod (6) is pushed towards the user, i.e. inverse side of the thread carrier (5) via the spring (27), it moves away the tip of the thread carrier connected to itself from the connecting pipe (3). That means the thread carrier (5) is in open position and ready to take flesh (50) in between and make the suturing (Figure 14).

The thread (48) is passed through the thread carrier hole (44). The approximately same length is provided at both sides of the thread carrier (Figure 17). The motion arm (4) protects its position away from the handle (1). The button is locked by pressing the button (2) to the end or pushing the motion arm (4) away from the handle (Figure 16). In this position, it gets closer to the place where the thread is passed. The flesh (50) where the thread is passed is taken into the flesh opening (47) (Figure 19). The motion arm (4) is pressed towards the handle (1) and the thread is passed through the flesh towards the end of the connection pipe (3) (Figure 13). Upon the further movement of the motion arm towards the handle or pressing by the user who wants a controlled catching on the button front part (33) the button gets out of the locking position and the thread catching system becomes active. Then the motion arm (4) is released. Thus the thread carrier (5) gets back from the flesh but one end of the thread is as caught at the end of the connection pipe (3) (Figures 18, 19). When the device is pulled back like this, the thread passes through the flesh.

CLAIMS

1. A forward capturing non-traumatic needle holder comprising; a handle (1), button for setting the spring feature (2), connection pipe (3), motion arm (4), thread carrier (5), thread carrier drive rod (6), the part providing the connection of thread carrier drive rod and thread carrier (7), thread carrier drive rod spring stand ledge (8), thread carrier pivot point (9), thread carrier drive hole (10), thread carrier inclined faces (11), sharp edge between thread carrier inclined faces (12), thread carrier drive rod duct (13), thread carrier drive rod duct bottom point (14), thread carrier drive rod push shaft connected to motion arm (15), the hole of part providing the connection of thread carrier drive rod and thread carrier (16), thread catching part (17), catching part pivot point (18), catching part drive rod slot (19), catching part hook (20), jagged catching part hook tip (21), catching part drive rod (22), catching part drive rod round tip (23), catching part drive rod spring drive edge (24), the shaft providing the connection of catching part drive rod and button (25), the hole of shaft providing the connection of catching part drive rod and button (26), spring (27), shaft carrying the button (28), button locking bar (29), button turning point hole (30), button locking edge (31), button push surface (32), button front part (33), handle side surface (34), handle front surface (35), connection pipe installation hole (36), spring stand part (37), spring stand part lower front edge (38), motion arm pad hole (39), motion arm turning pad (40), motion arm duct (41), setting lug (42), trigger hammer (43), thread hole at the thread carrier tip (44), button window (45), jagged catching part drive rod hook tip (46), flesh opening (47).
2. A forward capturing non-traumatic needle holder according to claim 1, wherein the pushing force keeping the thread carrier (5) away from the handle (1) and therefore keeping the thread carrier (5) in open position and running the thread catching system is provided by using a single spring (27) and the spring (27) tension gradually increases during the movement of the motion arm towards the handle (1).
3. A forward capturing non-traumatic needle holder according to claim 1, wherein the motion arm (4) controlling the thread carrier (5) stops in a position away from the

handle by the press of the spring (4) on the drive lug (8) and turning on the pads by transition of this press to itself.

4. A forward capturing non-atraumatic needle holder according to claim 1, wherein the movement of pulling the motion arm (4) towards the handle (1) causes the tip of the thread carrier gets closer towards the connection pipe.
5. A forward capturing non-atraumatic needle holder according to claim 1, wherein the thread holder (5) in open position has enough opening (47) for the amount of the flesh requires the thread passing.
6. A forward capturing non-atraumatic needle holder according to claim 1, wherein the push force given on the motion arm (4) backwards is provided by the press on a shaft (15) in a duct (13); this shaft moves freely within the duct and as a result of this, during the inverse motion of the motion arm (4) in order to set the button (2), this inverse motion does not affect the thread carrier system.
7. A forward capturing non-atraumatic needle holder according to claim 1, wherein the button (2) locking motion to provide a push force sufficient for a thread catching process is provided optionally by pressing the button (2) or has a setting lug (42) after the button (2) in order to provide that also with the inverse movement of the motion arm (4).
8. A forward capturing non-atraumatic needle holder according to claim 1, whereby having the springing feature of the button (2) when the button lock mechanism on it touches the button locking bar (29) mounted to the handle (1) and is being forced for downward movement, it bends across and lets the button (2) to complete its motion.
9. A forward capturing non-atraumatic needle holder according to claim 1, whereby at the moment the thread catching system needs the highest pushing force with the advantage provided by a single spring (27), that means when the motion arm (4) gets closer to the end of its motion and the jagged edge between the thread carrier inclined faces comes across the thread carrier jagged edge or the drive bar jagged edge, the tip of the thread carrier passes through the flesh and goes into the connection pipe and thread becomes ready to be caught.

10. A forward capturing non-traumatic needle holder according to claim 1, wherein for providing an ease of use when the thread passes through the flesh and becomes ready to be caught, the thread catching process is commissioned automatically by the press of the trigger hammer of the motion arm (4) on the push surface of the button (2).
11. A forward capturing non-traumatic needle holder according to claim 1, wherein the thread catching process is made automatically by the motion arm and also in a controlled and slow way by pressing front extension of the button.
12. A forward capturing non-traumatic needle holder according to claim 1, whereby comprising a thread carrier (5) with that the jagged tip edge as per the area of use or making the thread catching process by the jagged edge of the thread carrier drive rod (6) which transmits the thread catching motion from the handle (1).
13. A forward capturing non-traumatic needle holder according to claim 1, whereby comprising the inclined faces on the thread carrier (5) and when the thread catcher system is active the thread catcher jagged edge or the drive rod jagged tip selects one of the inclined faces and moves forward by touching this face.
14. A forward capturing non-traumatic needle holder according to claim 1, t whereby the trigger hammer on the motion arm (4) first contacts the button push surface (32) below the locked button (2), the thread catcher (17) or the thread catching drive rod (22) jagged tip edge (46) is aligned with the section of the sharp edge between thread carrier inclined faces (12) closer to the thread hole (44).

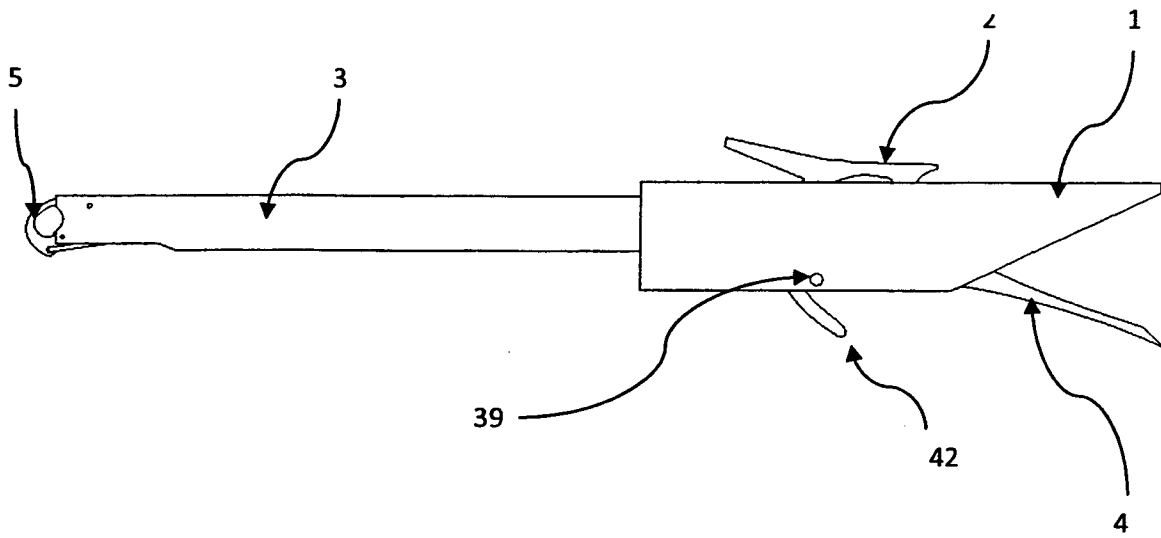


Figure 1

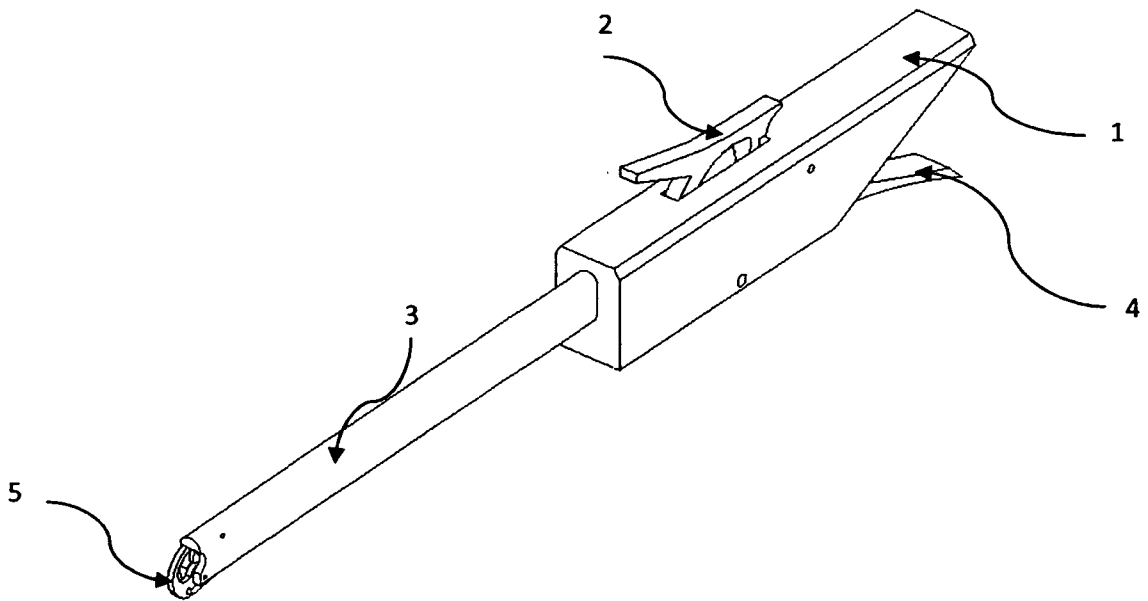


Figure 2

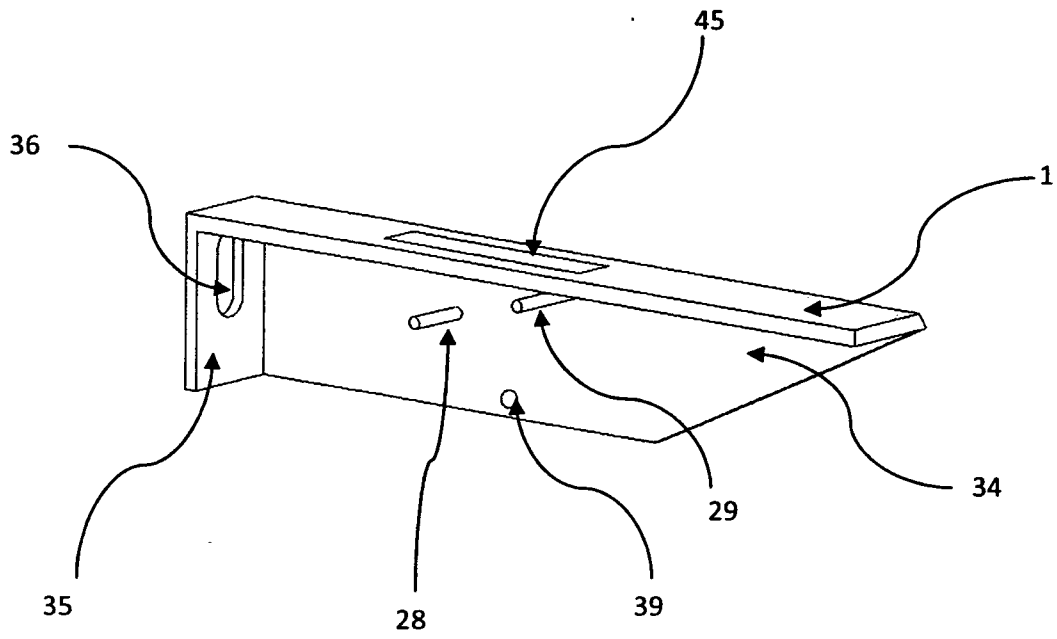


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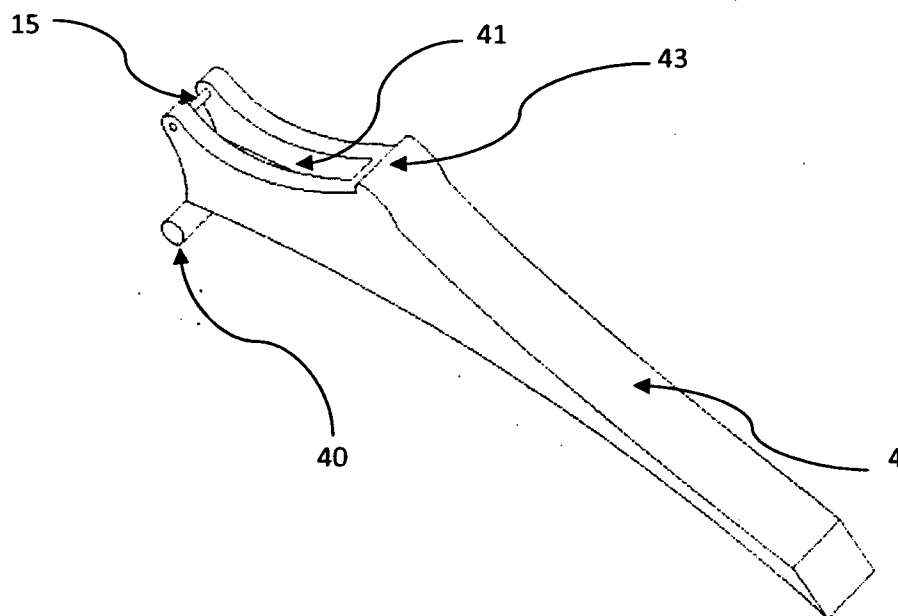


Figure 4

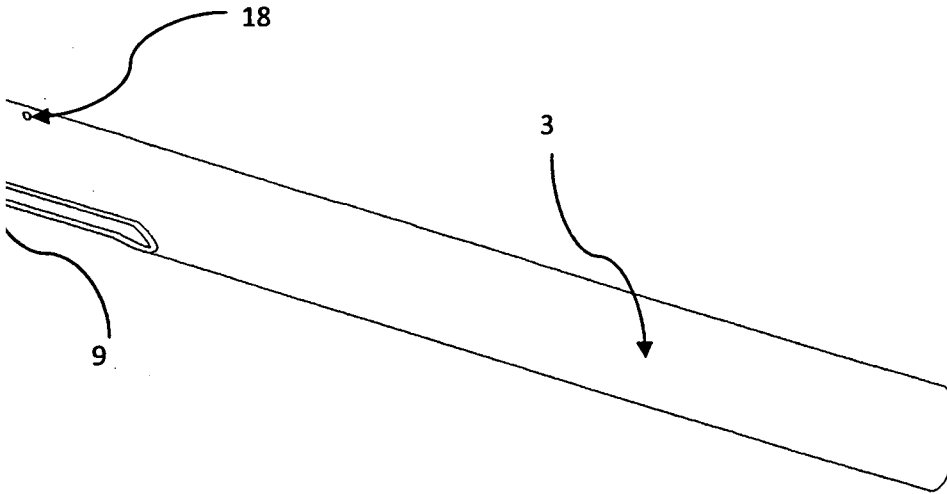


Figure 5

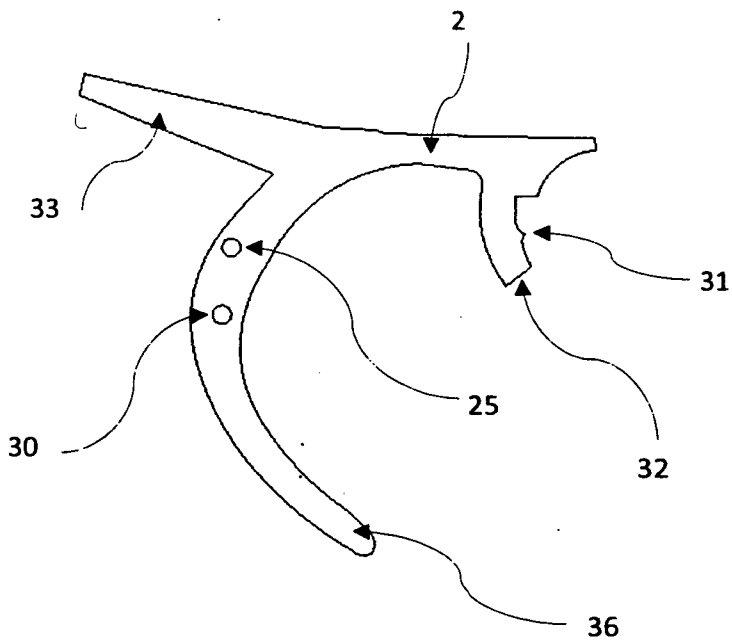


Figure 6

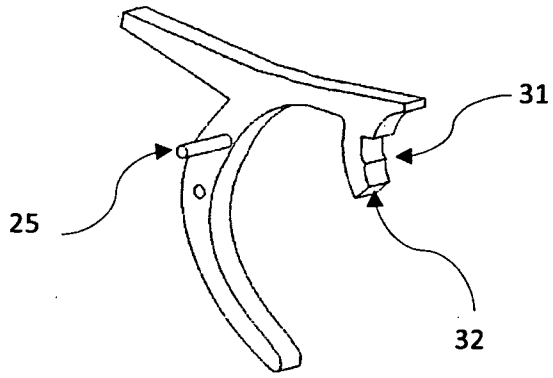


Figure 7

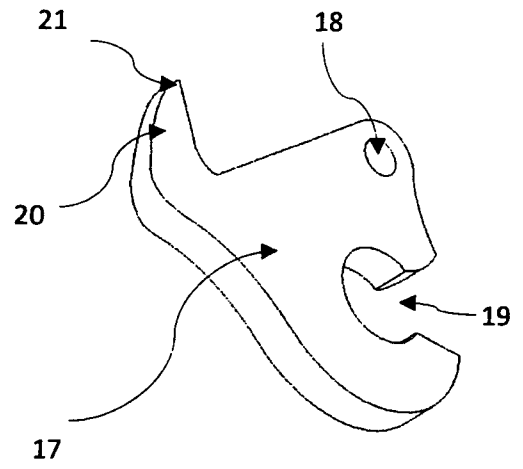


Figure 8

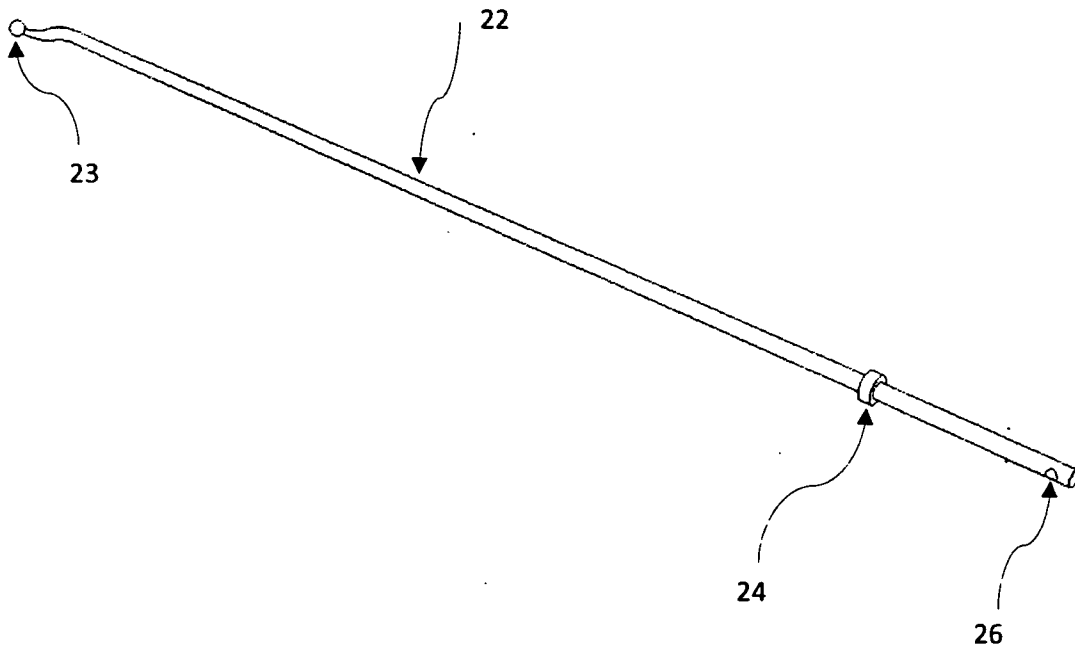


Figure 9

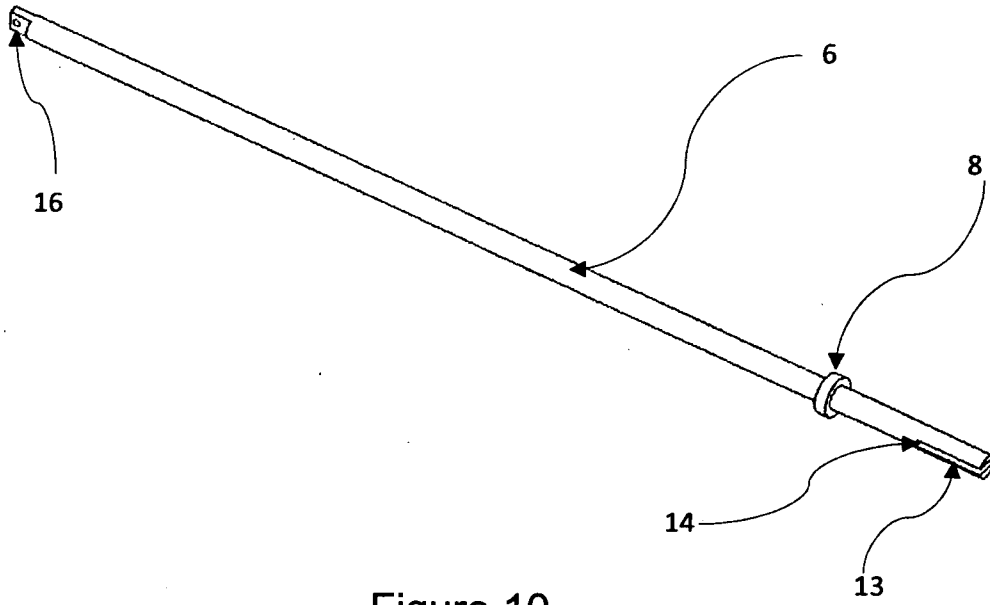


Figure 10

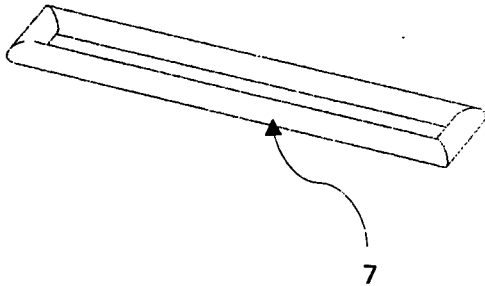


Figure 11

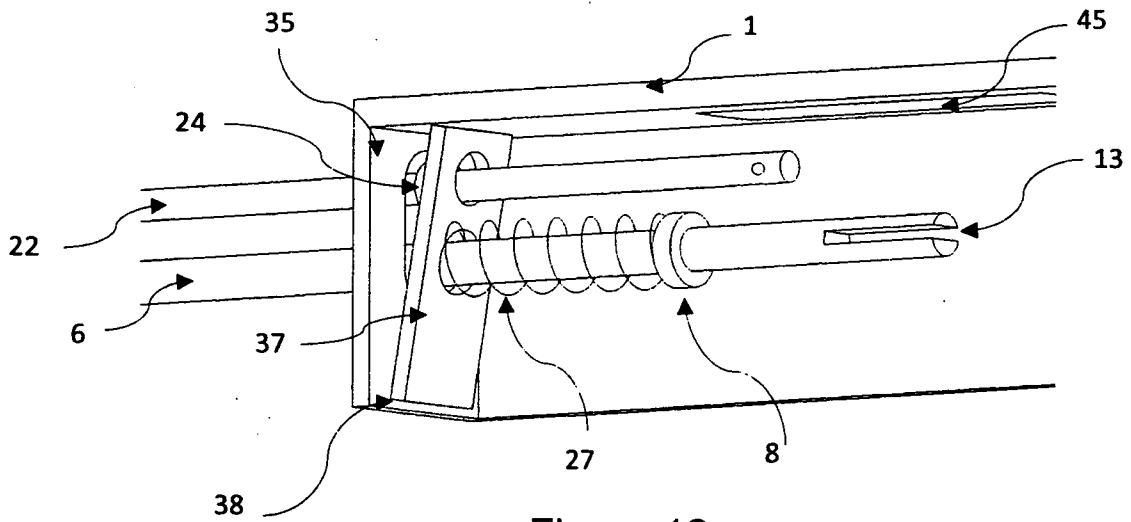


Figure 12

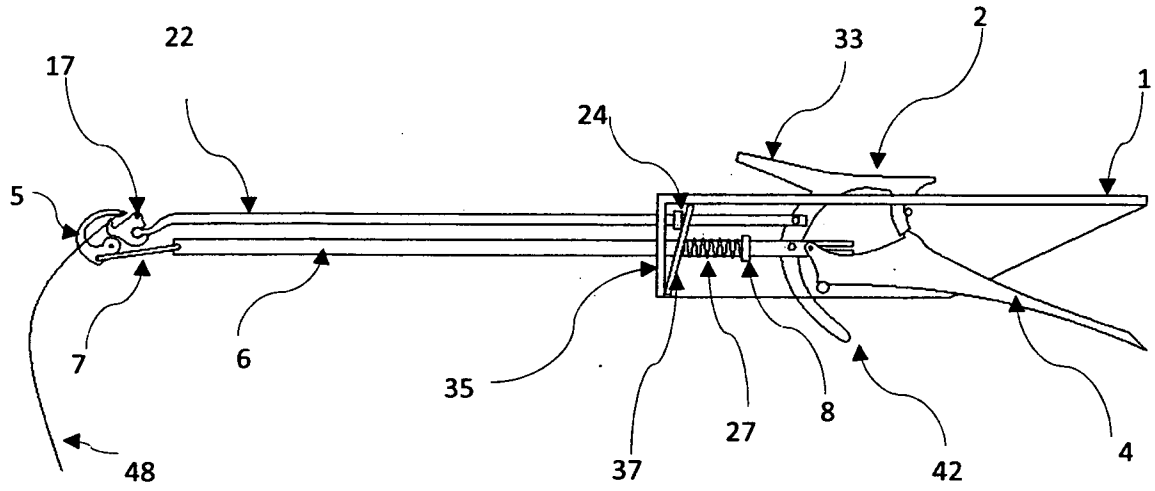


Figure 13

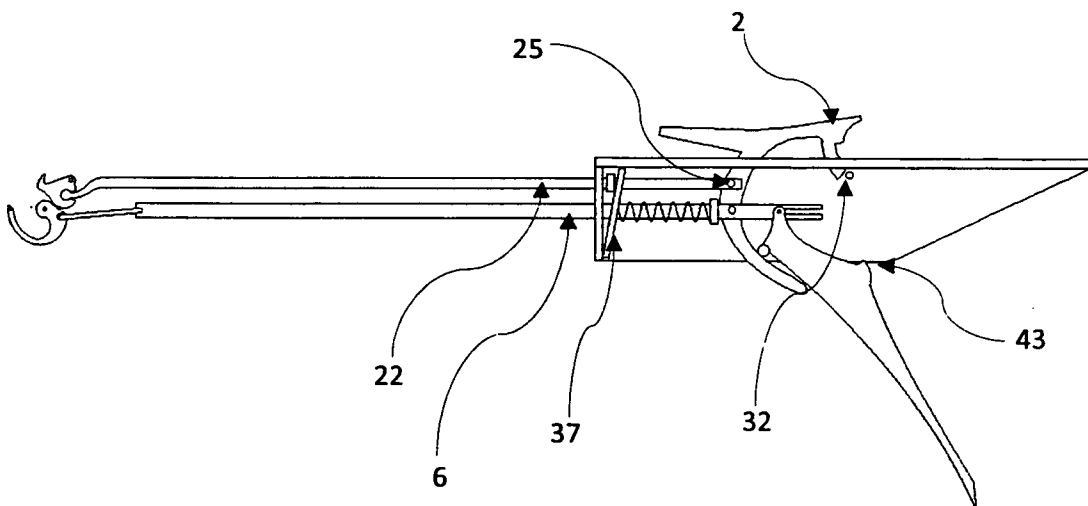


Figure 14

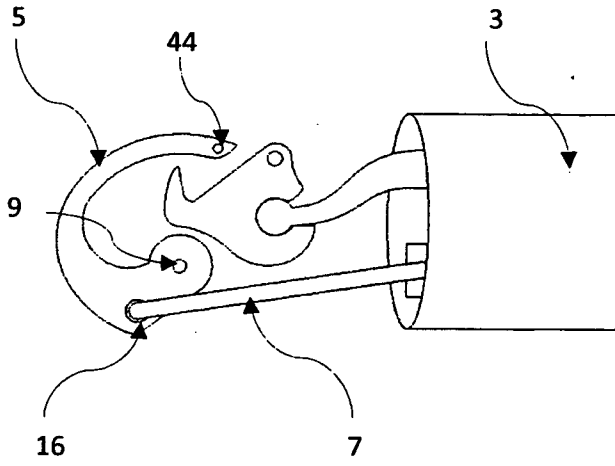


Figure 15

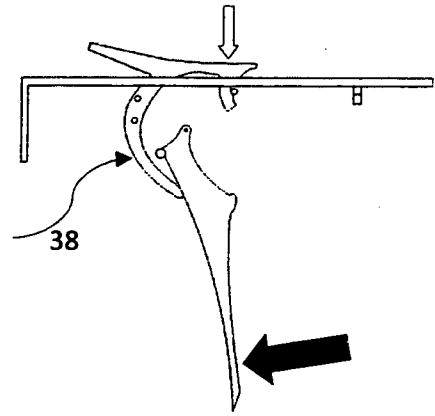


Figure 16

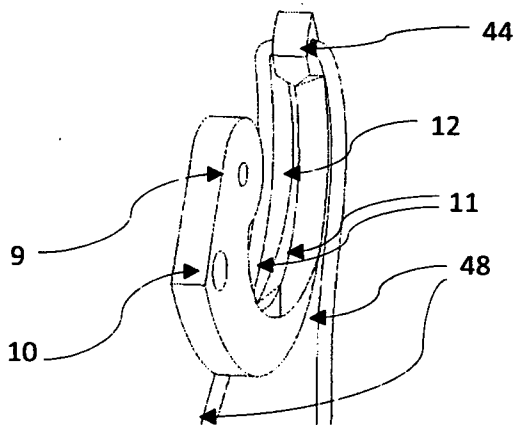


Figure 17

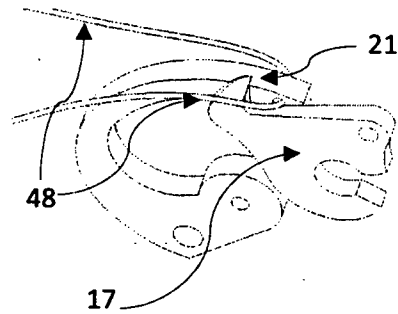


Figure 18

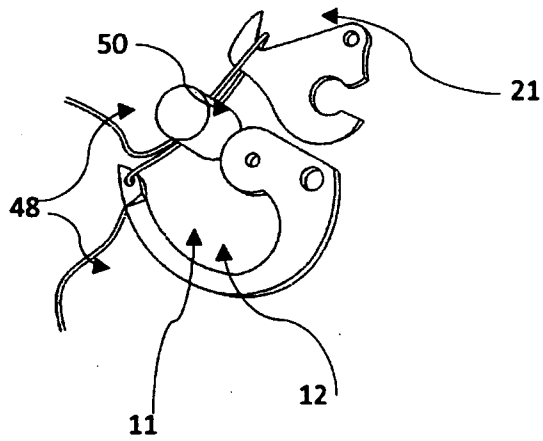


Figure 19

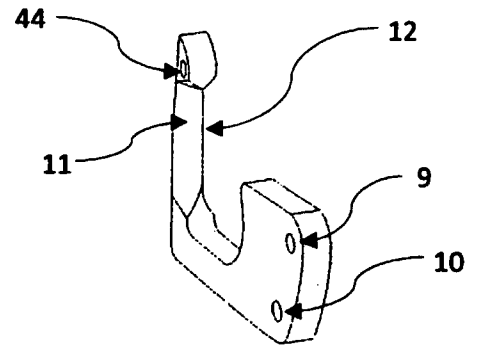


Figure 20

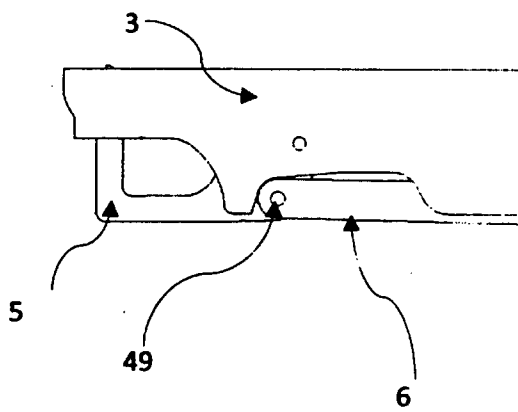


Figure 21

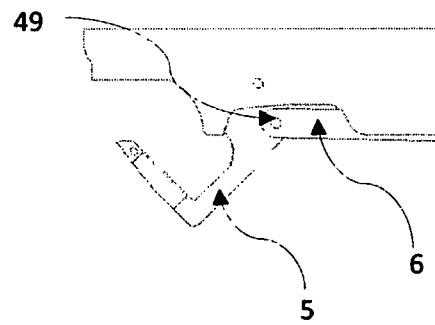


Figure 22

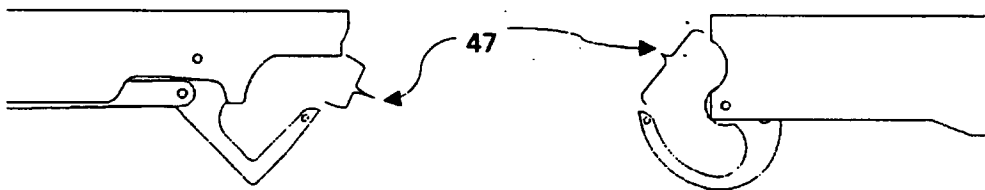


Figure 23

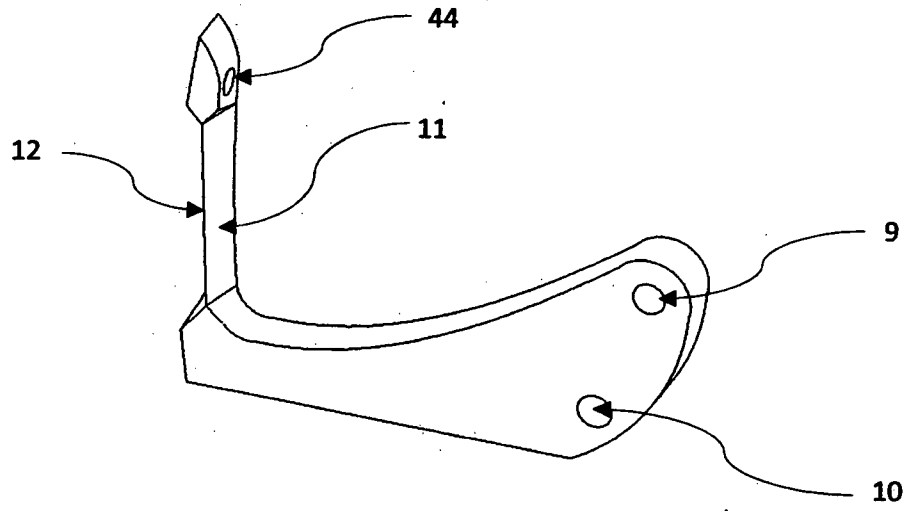


Figure 24

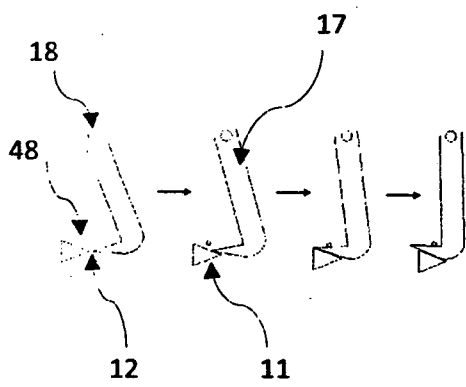


Figure 25

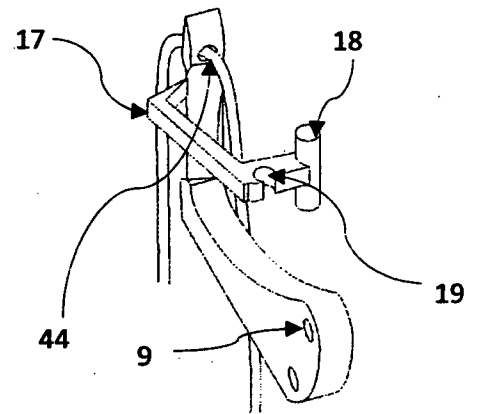


Figure 26

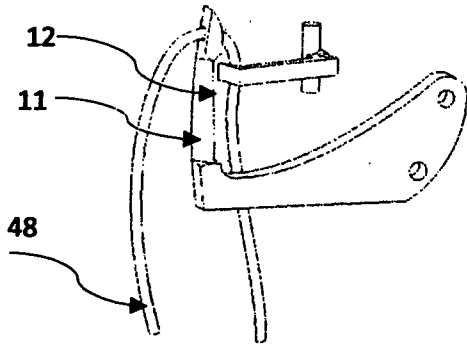


Figure 27

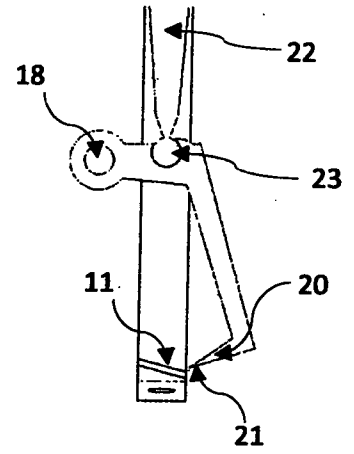


Figure 28

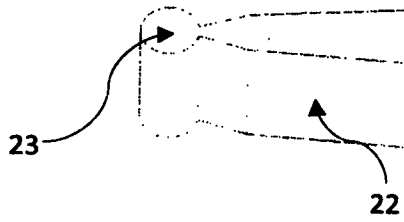


Figure 29

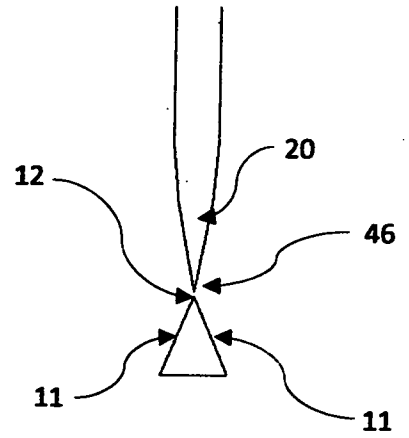


Figure 30

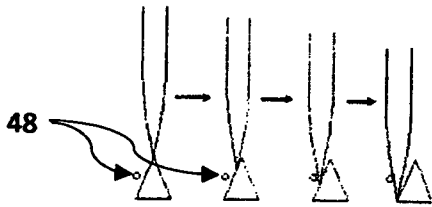


Figure 31

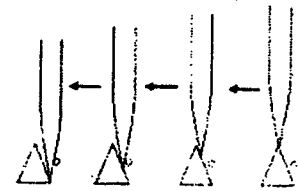


Figure 32