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(54) **Bladeless Obturator**

Obturator ohne Klinge

Obturateur sans lame

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Description

[0001] This is a divisional application of European Application No 02706494.8.

Field of the Invention

[0002] This invention relates generally to trocar systems including obturators, and more specifically, bladeless obturators.

Background

[0003] Trocar systems have been of particular advantage in facilitating less invasive surgery across a body wall and within a body cavity. This is particularly true in the case of the abdominal surgery where trocars have provided working channels across the abdominal wall to facilitate the use of instruments within the abdominal cavity. Particularly in this form of surgery, it is advantageous to insufflate, inflate, or pressurize the abdominal cavity in order to provide an increased working volume. In the interest of maintaining this insufflation, trocars have been provided with valves which form at least two seals: across the working channel a zero seal in the absence of an instrument, and an instrument seal in the presence of an instrument.

[0004] The trocar systems of the past typically includes a cannula, which defines the working channel, and an obturator which is used to place the cannula across the abdominal wall. The obturator is inserted into the working channel of the cannula and then pushed through the abdominal wall with a penetration force of sufficient magnitude to result in penetration of the abdominal wall. Once the cannula is in place, the obturator can be removed.

[0005] In the past, obturators have been developed with an intent to provide a reduction in the force required for penetration. Sharp blades have typically been used to enable the obturator to cut its way through the abdominal wall. While the blades have facilitated a reduced penetration force, they have been of particular concern once the abdominal wall has been penetrated. Within the abdominal cavity, there are organs which need to be protected against any puncture by an obturator.

[0006] In some cases, shields have been provided with the obturators in order to sense penetration of the abdominal wall and immediately shield the sharp blades. These shielding systems have been very complex, have required a large amount of time to deploy, and have generally been ineffective in protecting the organs against the sharp blades.

[0007] Blunt-tip obturators have been contemplated with both symmetrical and asymmetrical designs. While the blunt tip tends to inhibit damage to interior organs, it also tends to increase the penetration force associated with the obturator.

[0008] Examples of known devices for piercing body tissue are disclosed in: US 5 735 867, which discloses the use of a closure pin with a screw thread to anchor the closure pin to a patient; US 6 030 406, which discloses a mechanical retractor for dissection of body tissue having an extendable element near the distal end; US 5 662 673, which discloses a screw threaded incising instrument; US 5 591 186, which discloses a self cutting trocar with an active cutting tool at a distal tip; WO 97/40758, which discloses a trocar spike for penetration of an abdominal wall; and EP 0 224 864, which discloses a surgical penetration instrument with a blade extending forwardly of a penetrating tip. GB 2 313 316 and US 5 147 376 disclose surgical penetrators whose tips are rounded and have a thread.

[0009] In some cases, blunt tip obturators have been adjusted to take advantage of the known anatomy associated with the abdominal wall. This anatomy includes three layers of muscle, each layer having parallel fibers which extend in a particular direction that is different for each of the layers. Notwithstanding this knowledge of the anatomy, prior attempts to develop blunt-tip obturators have not taken full advantage of this anatomical structure.

Summary

[0010] In accordance with the present invention there is provided a surgical obturator adapted to be inserted into a lumen of a cannula comprising: an elongate shaft extending along an axis between a proximal end and a distal end; and a bladeless tip disposed at the distal end of the shaft; the tip having an outer surface extending distally to a blunt end; the outer surface including a pair of generally opposed sections; the outer surface defining a geometric shape in progressive radial cross-sections of the tip from a distal cross-section to a proximal cross section wherein the geometric shape comprises a pair of opposed long sides and a pair of opposed short sides; the pair of generally opposed sections of the outer surface appearing as a pair of lines in each of the progressive radial cross sections representing one of the pair of opposed sides of the geometric shape; characterized by at least one of the pair of lines becoming increasing arcuate in the progressive radial cross sections.

[0011] This configuration facilitates insertion with a reduced penetration force as the user moves the tip back and forth radially while applying an axial penetration force. With the distal end of the tip having a length to width ratio greater than one, the tip can be inserted between the fibers and then rotated to provide increased fiber separation and thereby facilitate accommodation of the larger diameter associated with the cannula.

[0012] These and other features and advantageous of the invention will become more apparent with a discussion of preferred embodiments and reference to the associated drawings.

Description of the Drawings

[0013]

Figure 1 is a side elevation view of a trocar system including a cannula with associated valve housing, and an obturator with a blunt tip extending through the working channel of the cannula to facilitate placement across the abdominal wall;
Figure 2 is a perspective view of a preferred embodiment of the blunt tip illustrated in Figure 1;
Figure 3 is a side elevation view of the blunt tip taken along lines 3-3 of Figure 2;
Figure 4 is a side elevation view taken along lines 4-4 of Figure 3;
Figure 5 is an end view taken along lines 5-5 of Figure 4;
Figure 6 is a radial cross-section view taken along line 6-6 of Figure 4;
Figure 7 is a radial cross-section view taken along line 7-7 of Figure 4;
Figure 8 is a radial cross section view taken along lines 8-8- of Figure 4;
Figure 9 is a radial cross section view taken along lines 9-9 of Figure 4;
Figure 10 is a radial cross section view taken along lines 10-10 of Figure 4; and
Figure 11 is a schematic view illustrating each of the Figures of 5-10 super-imposed to facilitate an understanding of the twisted configuration of the blunt tip.

Description of Preferred Embodiments

[0014] A trocar system is illustrated in Figure 1 and designated by the reference numeral 10. This system includes a cannula 12, defining a working channel 14, and a valve housing 16. The system 10 also includes an obturator 18 having a shaft 21 extending along an axis 23. A handle 25 is disposed at a proximal end of the shaft at 21 while a blunt tip 27 is disposed at a distal end of the shaft 21. The shaft 21 of the obturator 18 is sized and configured for disposition within the working channel 14 of the cannula 12. With this disposition, illustrated in Figure 1, the obturator functions to penetrate a body wall such as the abdominal wall 30 to provide the cannula with access across the wall 30 and into a body cavity, such as the peritoneal or abdominal cavity 32. The blunt tip 27, which initially facilitates penetration of the abdominal wall 30 can be removed with the obturator 18 once the cannula 12 is operatively disposed with the working channel 14 extending into the abdominal cavity 32.

[0015] In order to facilitate penetration of the abdominal wall 30 by the trocar system 10, a penetration force, represented by an arrow 34, is typically applied along the axis 23. It can be appreciated that the force required to move the system through the abdominal wall 30 drops significantly once the wall 30 is penetrated. Further application of the force 34, even for an instant of time, can result in injury to organs within the cavity 32. Where the obturators of the past have included blades facilitating penetration of the abdominal wall, these blades have been particularly threatening and detrimental to the interior organs following penetration.

[0016] Consequently, in accordance with the present invention, the tip 27 of the obturator 18 is provided with a blunt configuration. As noted, blunt tips have been used in the past to significantly reduce any potential for damage to interior organs. Unfortunately, these blunt tips have increased significantly the amount of force 34 required for penetration of the abdominal wall 30.

[0017] The blunt tip 27 of the present invention takes into account an anatomical configuration of the abdominal wall 30 with an improved structural design and method of insertion.

[0018] In order to fully appreciate the aspects of this invention, it is helpful to initially discuss the anatomy associated with the abdominal wall 30. This wall 30 typically includes the skin or fascia 35 and a series of muscles in the form of muscle layers 36, 38 and 41. These layers are each defined by muscle fibers which extend generally parallel to each other in a direction which is different for each of the layers. For example, the layer 38 is composed of fibers 43 which extend generally parallel in a particular direction. Fibers 45 associated with the layer 36 extend generally parallel at an angle such as 45 degrees to the particular direction of the fibers 43. Fibers 47 associated with the layer 41 also extend in a parallel direction but at an angle of about 45 degrees to the fibers 43 and an angle of about 90 degrees to the fibers 45.

[0019] Having noted the directional nature of the fibers, such as the fibers 45, it can be appreciated that such a structure is most easily penetrated by a tip 27 having a narrow width which is capable of being moved generally parallel to and between the fibers associated with a particular muscle layer. This narrow width might be provided with a point configuration or in the case of a preferred embodiment, a line or rectangular configuration having the narrow width and a longer length. With the length oriented parallel to the fibers of a particular laser a reduced penetration force 34 is required to push the obturator 18 through the particular layer.

[0020] Unfortunately, with the fibers 45, 43 and 47 oriented at 45 degrees to each other, proper alignment of the tip 27 for penetration of one layer, such as the layer 36, will not necessarily result in proper alignment for penetration of the next layer, such as the layer 38. For this reason, the rectangular configuration for the tip 27 is twisted slightly so that penetration of the first layer 36 begins to rotate the distal end of the tip 27 into proper orientation for penetration of the next layer 38.

[0021] The twisted configuration of the tip 27 also causes the tip 27 to function with the mechanical advantage of a screw thread. With this configuration, a preferred method of placement requires that the user grip the handle 25 of the obturator 18, and twist it about the axis 27. This twisting motion in combination with the screw con-

figuration of the tip 27 converts radial movement into forward movement along the axis 23. Thus, the user applies both a forwardly directed force as well as a radial force to move the trocar system 10 in a forward direction. Since all of the force supplied by the user is not directed axially along the arrow 34, this concept avoids the tendency of prior trocar systems to jump forward upon penetration of the wall 30.

[0022] The twisted and rectangular configuration of the tip 27 is most apparent in the schematic view of Figure 2 and the side views of Figures 3 and 4. In this embodiment, the tip is composed generally of four surfaces: two opposing major surfaces 50 and 52, separated by two side surfaces 54 and 56 which extend between an end surface 58 and a proximal base 61. A plane drawn through the axis 23 would show the tip 27 in this case,_ to be composed of two symmetrical halves.

[0023] The major surfaces 50 and 52 and the side surfaces 54 and 56 generally define the cross section of the tip 27 to be rectangular from the end surface 58 to the proximal base 61. This configuration can best be appreciated with reference to the cross section views of Figures 5-10. In Figure 5, the distal end of the tip 27 is shown as a rectangle having its greatest length-to-width ratio. This rectangle, designated by the reference numeral 63, also has a twisted, S-shaped configuration at the distal-most end of the tip 27.

[0024] As views are taken along progressive proximal cross sections, it can be seen that the rectangle 63 becomes less twisted, and the width increases relative to the length of the rectangle 63. The spiral nature of the tip 27 is also apparent as the rectangle moves counterclockwise around the axis 23 in the embodiment of Figure 2. This is perhaps best appreciated in a comparison of the rectangle 63 in Figure 7 relative to that in Figure 6. With progressive proximal positions, the rectangle 63 begins to fatten with a reduction in the ratio of length to width. The long sides of the rectangle 63 also tend to become more arcuate as they approach a circular configuration most apparent in Figures 9 and 10. In these figures, it will also be apparent that the rotation of the rectangle 63 reaches a most counterclockwise position and then begins to move clockwise. This is best illustrated in Figures 8, 9 and 10. This rotation back and forth results from the configuration of the side surfaces 54 and 56, which in general, have a U-shape best illustrated in Figures 2 and 3.

[0025] The ratio of the length-to-width of the rectangle 63 is dependent on the configuration of the side surfaces 54 and 56, which defined the short sides of the rectangle 63, as well as the configuration of the major surfaces 50 and 52 which define the long sides of the rectangle 63. Again with reference to Figure 3, it can be seen that the side surfaces 50 and 52 are most narrow at the distal end of the tip 27. As these surfaces extend proximally, they reach a maximum width near the point of the most counterclockwise rotation, shown generally in Figure 8, and then reduce in width as they approach the proximal base 61. Along this same distal to proximal path, the major surfaces 50 and 52 transition from a generally flat configuration at the distal end to a generally conical configuration at the proximal end 61.

[0026] In the progressive views of Figures 6-10, the rectangle 63 is further designated with a lower case letter a, b, c, d, or e, respectively. In Figure 11, the rectangles 63 and 63a-63c are superimposed on the axis 23 to show their relative sizes, shapes, and angular orientations.

[0027] A preferred method of operating the trocar system 10 benefits significantly from this preferred shape of the blunt tip 27. With a rectangular configuration at the distal surface 58, the end of the tip 27 appears much like a flathead screwdriver. The length of the surface 58 is aligned parallel with the fibers 45 of the layer 36. With this shape, the simple back and forth twisting motion tends to separate the fibers 45 along natural lines of separation, opening the muscle layer 36 to accept the larger diameter of the cannula 12. By the time the first layer 36 is substantially penetrated, the twisted configuration of the blunt tip 27 turns the rectangle at the distal surface 58 more into a parallel alignment with fibers 43 in the next layer 48. Again, a twisting or dithering motion facilitates an easy separation of these fibers requiring a significantly reduced penetration force along the arrow 34.

[0028] When the muscle layer 38 is sufficiently penetrated, the twisted configuration of the tip 27 automatically rotates the rectangular end surface 58 into generally parallel alignment with the fibers 47 of the next layer 41. Again, the natural separation of these fibers 47 together with the unique configuration of the tip 27, accommodates the further penetration of the layer 41 until the cannula 12 is operatively disposed across the wall 30. It will be noted in particular that the fibers 45, 43, and 47 are naturally separated, not cut. This has two advantageous effects: 1) the abdominal wall 30 easily closes upon removal of the trocar system 10; and 2) without cutting, very little bleeding is encountered and very little healing is required to seal the wound permanently.

[0029] Certainly, one of the primary purposes of the invention is to maintain control and facilitate entry into the body cavity 32 while inhibiting any tearing or cutting of tissue. The tip 27 is bladeless, blunt, and atraumatic to organs and bowel within the peritoneal or abdominal cavity 32. The tip 27 also minimizes tenting of the peritoneum and allows for a safe entry. The device is used in conjunction with the cannula 12 to create an initial entry way into the peritoneal cavity 32. The obturator is first inserted through the valve housing 16 and into the cannula 12. The entire trocar system 10 is then inserted through the abdominal wall 30 and into the peritoneal cavity 32. Once the cannula 12 is properly placed, the obturator 18 can be removed.

[0030] This facilitates a unique method of separating tissue and could apply to any object with a slim profile and flat sides. When inserted into the peritoneum the slim profile of the device requires very little area to move safely between tissue and muscle fibers. The device can then

be rotated in alternating clockwise and counterclockwise directions while the downward penetration force is applied. When rotated in alternating directions, the tissue is moved apart and a larger opening is created for a profile of greater cross sectional area to follow. This process continues with safety and ease until the device enters the peritoneal cavity 32 and moves to its operative position.

[0031] When the cannula 12 is ultimately removed, the size of the opening left in the tissue is minimal. Importantly, this opening is left sealed due to a dilating effect caused by the mere separation of fibers. Note that there are no blades or sharp edges to cut muscle fiber, and thereby prolong the healing process.

[0032] In other embodiments, the tip 27 of the obturator can be fabricated of a translucent or clear material, and the handle provided with a passageway along the inside of the tip. With this configuration, a laparoscope can be inserted through the handle of the obturator and through the shaft to the tip. Insertion can then be monitored through the laparoscope, and the clear tip of the obturator, in order to further ensure safe entry.

[0033] The obturator 18 can be constructed as a single component or divided into two components such as the shaft 21 and the tip 27. If the obturator 18 is constructed as a single component, it may be constructed of either disposable or reusable materials. If the obturator 18 is constructed as two or more components, each component can be made either disposable or useable as desired for a particular configuration. In certain preferred embodiments, the obturator shaft 21 and handle are made of a reusable material, such as a metal or an autoclavable polymer in order to facilitate re-sterilization and reuse of these components. In this embodiment, the tip 27 is made of a material that is not autoclavable and therefore is adapted to be disposable.

[0034] The blunt tip 27 can be coated or otherwise constructed from a soft elastomeric material. In such a case, the material could be a solid elastomer or composite elastomer/polymer.

[0035] The obturator could also contain a spring-biased shield to cover the tip. On entry the shield could be retracted exposing the tip and then immediately and automatically moved distally back over the tip upon full entry into the peritoneal cavity 32. The action of the shield could also serve as an indicator to the surgeon that safe entry had been achieved. The obturator could be constructed in a manner wherein the tip 27 itself is spring biased and keyed to the shaft. The tip 27 would retract during insertion but would then deploy upon entry into the peritoneal cavity 32. This deployment action could also further serve as an indicator of safe entry.

[0036] The shaft 21 of the obturator 18 could be partially or fully flexible. With this configuration, the obturator 18 could be inserted through a passageway containing one or more curves of virtually any shape. A partially or fully flexed obturator 18 could then be used with a flexible cannula 12 allowing greater access to an associated body cavity 32.

[0037] The obturator 18 could also be used as an insufflation needle and provided with a passageway and valve to administer carbon dioxide or other insufflation gas to the peritoneal cavity 32. The obturator 18 could also be used with an insufflation needle cannula, in which cases removal of the obturator 18 upon entry would allow for rapid insufflation of the peritoneal cavity 32.

[0038] The obturator 18 could also be constructed to permit free spinning of the tip about the axis 23. This would allow the tip 27 to find its own way through the abdominal wall 30 rather than relying on the user for clockwise and counterclockwise rotation.

[0039] It will be understood that many modifications can be made to the various disclosed embodiments without departing from the scope of the invention as claimed. For example, various sizes of the surgical device are contemplated as well as various types of constructions and materials. It will also be apparent that many modifications can be made to the configuration of parts as well as their interaction. For these reasons, the above description should not be construed as limiting the invention, but should be interpreted as merely exemplary of preferred embodiments. Those skilled in the art will envision other modifications within the scope of the present invention as defined by the following claims.

Claims

1. A surgical obturator (18) adapted to be inserted into a lumen of a cannula comprising:

   an elongate shaft (21) extending along an axis (23) between a proximal end and a distal end; and

   a bladeless tip (27) disposed at the distal end of the shaft (21); the tip (27) having an outer surface extending distally to a blunt end (62);

   the outer surface including a pair of generally opposed sections; **characterized by** the outer surface defining a rectangular geometric shape (63) in progressive radial cross-sections of the tip (27) from a distal cross-section to a proximal cross section wherein the geometric shape (63) comprises a pair of opposed long sides and a pair of opposed short sides represented by first and second pairs of opposed lines in each of the progressive radial cross sections with the pair of generally opposed sections of the outer surface appearing as the first pair of opposed lines, at least one of the first pair of opposed lines becoming increasingly arcuate in the progressive radial cross sections wherein in successive proximal cross-sections, the geometric shape (63) rotates in a first direction.

2. The surgical obturator of claim 1 wherein in succes-

sive proximal cross-sections, the geometric shape (63) then rotates in a second direction.

3. The surgical obturator of claim 1 wherein in successive proximal cross-sections of the tip (27), a radial line from the axis (23) to a midpoint of one of the short sides rotates about the axis (23) in a first direction.

4. The surgical obturator of claim 3 wherein the radial line then rotates about the axis (23) in a second direction opposite to the first direction.

5. The surgical obturator of claim 1 wherein the long sides of the rectangular geometric shape become more arcuate in successive proximal cross-sections of the tip (27).

6. The surgical obturator of claim 1 the short sides of the rectangular geometric shape become more arcuate in successive proximal cross-sections of the tip (27).

7. The surgical obturator of claim 1 wherein the geometric shape has a pair of opposed long sides having a first length and a pair of opposed short sides having a second length wherein the ratio of the first length divided by the second length decreases along the progressive radial cross sections of the tip (27).

8. The surgical obturator of claim 1 wherein the geometric shape is twisted along the tip (27).

9. The surgical obturator of claim 1 wherein the outer surface further includes a conical surface (60) extending distally to the blunt end (62).

10. The surgical obturator of claim 1 wherein the tip (27) is transparent and the shaft (21) is adapted to receive a laparoscope.

11. The surgical obturator of claim 1 further including a passageway for delivering insufflation gas from the proximal end to the distal end.

12. The surgical obturator of claim 1 wherein the long sides of the rectangular geometric shape are curved lines in a plane perpendicular to the axis.

13. The surgical obturator of claim 1 wherein the geometric shape has a narrow width relative to its length in a plane perpendicular to the axis (23).

14. The surgical obturator of claim 12 wherein the short sides of the rectangular geometric shape are straight.

15. The surgical obturator of claim 1 wherein one of the pairs of lines becomes increasingly arcuate and the other pair of lines is straight.

Patentansprüche

1. Ein chirurgischer Obturator (18), der zum Einführen in ein Lumen einer Kanüle angepasst ist und umfasst:

einen länglichen Schaft (21), der sich an einer Achse (23) entlang zwischen einem proximalen Ende und einem distalen Ende erstreckt; und
eine klingenlose Spitze (27), die an dem distalen Ende des Schafts (21) angeordnet ist; wobei die Spitze (27) eine Außenfläche aufweist, die sich distal zu einem stumpfen Ende (62) hin erstreckt;
wobei die Außenfläche ein Paar von im Allgemeinen gegenüberliegenden Abschnitten einschließt; **dadurch gekennzeichnet, dass** die Außenfläche eine rechteckige geometrische Form (63) in progessiven radialen Querschnitten der Spitze (27) von einem distalen Querschnitt zu einem proximalen Querschnitt definiert, wobei die geometrische Form (63) ein Paar gegenüberliegender langer Seiten und ein Paar gegenüberliegender kurzer Seiten umfasst, die durch das erste und zweite Paar gegenüberliegender Linien in jeder der progressiven radialen Querschnitte mit dem Paar im Allgemeinen gegenüberliegender Abschnitte der Außenfläche dargestellt sind, das als das erste Paar der gegenüberliegenden Linien erscheint, wobei mindestens eines des ersten Paars gegenüberliegender Linien in den progressiven radialen Querschnitten zunehmend bogenförmig wird, wobei in aufeinanderfolgenden proximalen Querschnitten die geometrische Form (63) in einer ersten Richtung rotiert.

2. Der chirurgische Obturator nach Anspruch 1, wobei in aufeinanderfolgenden proximalen Querschnitten die geometrische Form (63) dann in einer zweiten Richtung rotiert.

3. Der chirurgische Obturator nach Anspruch 1, wobei in aufeinanderfolgenden proximalen Querschnitten der Spitze (27) eine radiale Linie von der Achse (23) zu einem Mittelpunkt einer der kurzen Seiten in einer ersten Richtung um die Achse (23) rotiert.

4. Der chirurgische Obturator nach Anspruch 3, wobei die radiale Linie dann in einer zweiten Richtung, die der ersten Richtung entgegengesetzt ist, um die Achse (23) rotiert.

5. Der chirurgische Obturator nach Anspruch 1, wobei

die langen Seiten der rechteckigen geometrischen Form in aufeinanderfolgenden proximalen Querschnitten der Spitze (27) bogenförmiger werden.

6. Der chirurgische Obturator nach Anspruch 1, wobei die kurzen Seiten der rechteckigen geometrischen Form in aufeinanderfolgenden proximalen Querschnitten der Spitze (27) bogenförmiger werden.

7. Der chirurgische Obturator nach Anspruch 1, wobei die geometrische Form ein Paar gegenüberliegender langer Seiten mit einer ersten Länge und ein Paar gegenüberliegender kurzer Seiten mit einer zweiten Länge aufweist, wobei das Verhältnis der ersten Länge, geteilt durch die zweite Länge, entlang der progressiven radialen Querschnitte der Spitze (27) abnimmt.

8. Der chirurgische Obturator nach Anspruch 1, wobei die geometrische Form entlang der Spitze (27) verdreht ist.

9. Der chirurgische Obturator nach Anspruch 1, wobei die Außenfläche weiterhin eine konische Fläche (60) einschließt, die sich distal zu dem stumpfen Ende (62) hin erstreckt.

10. Der chirurgische Obturator nach Anspruch 1, wobei die Spitze (27) transparent ist und der Schaft (21) dazu angepasst ist, ein Laparoskop aufzunehmen.

11. Der chirurgische Obturator nach Anspruch 1, der weiterhin einen Durchgang zum Zuführen von Insufflationsgas von dem proximalen Ende zu dem distalen Ende einschließt.

12. Der chirurgische Obturator nach Anspruch 1, wobei die langen Seiten der rechteckigen geometrischen Form gebogene Linien in einer senkrecht zu der Achse stehenden Ebene sind.

13. Der chirurgische Obturator nach Anspruch 1, wobei die geometrische Form eine schmale Breite relativ zu ihrer Länge in einer senkrecht zu der Achse (23) stehenden Ebene aufweist.

14. Der chirurgische Obturator nach Anspruch 12, wobei die kurzen Seiten der rechteckigen geometrischen Form gerade sind.

15. Der chirurgische Obturator nach Anspruch 1, wobei eines der Paare von Linien zunehmend bogenförmiger wird und das andere Paar von Linien gerade ist.

Revendications

1. Obturateur chirurgical (18) adapté pour être inséré dans une lumière d'une canule comprenant :

un arbre allongé (21) s'étendant le long d'un axe (23) entre une extrémité proximale et une extrémité distale; et
une pointe sans lame (27) disposée à l'extrémité distale de l'arbre (21); la pointe (27) ayant une surface extérieure s'étendant dans le sens distal jusqu'à une extrémité contondante (62);
la surface extérieure comprenant une paire de sections généralement opposées;

caractérisé par :

la surface extérieure définissant une forme géométrique rectangulaire (63) dans des sections transversales radiales progressives de la pointe (27), depuis une section transversale distale jusqu'à une section transversale proximale, où la forme géométrique (63) comprend une paire de côtés longs opposés et une paire de côtés courts opposés représentés par une première et une deuxième paires de lignes opposées dans chacune des sections transversales radiales progressives avec la paire de sections généralement opposées de la surface extérieure apparaissant comme la première paire de lignes opposées,
au moins l'une de la première paire de lignes opposées devenant de plus en plus arquée dans les sections transversales radiales progressives, où dans des sections transversales proximales successives la forme géométrique (63) tourne dans une première direction.

2. Obturateur chirurgical selon la revendication 1, dans lequel dans des sections transversales proximales successives, la forme géométrique (63) tourne alors dans une deuxième direction.

3. Obturateur chirurgical selon la revendication 1, dans lequel dans des sections transversales proximales successives de la pointe (27), une ligne radiale depuis l'axe (23) jusqu'à un point central de l'un des côtés courts, tourne autour de l'axe (23) dans une première direction.

4. Obturateur chirurgical selon la revendication 3, dans lequel la ligne radiale tourne alors autour de l'axe (23) dans une deuxième direction opposée à la première direction.

5. Obturateur chirurgical selon la revendication 1, dans lequel les côtés longs de la forme géométrique rectangulaire deviennent plus arqués dans des sections transversales proximales successives de la pointe (27).

6. Obturateur chirurgical selon la revendication 1, les côtés courts de la forme géométrique rectangulaire deviennent plus arqués dans des sections transversales proximales successives de la pointe (27).

7. Obturateur chirurgical selon la revendication 1, dans lequel la forme géométrique a une paire de côtés longs opposés ayant une première longueur et une paire de côtés courts opposés ayant une deuxième longueur, dans lequel le rapport de la première longueur divisée par la deuxième longueur, diminue le long des sections transversales radiales progressives de la pointe (27).

8. Obturateur chirurgical selon la revendication 1, dans lequel la forme géométrique est tordue le long de la pointe (27).

9. Obturateur chirurgical selon la revendication 1, dans lequel la surface extérieure comprend en outre une surface conique (60) s'étendant dans un sens distal jusqu'à l'extrémité contondante (62).

10. Obturateur chirurgical selon la revendication 1, dans lequel la pointe (27) est transparente et l'arbre (21) est adapté pour recevoir un laparoscope.

11. Obturateur chirurgical selon la revendication 1, comprenant en outre un passage pour fournir du gaz d'insufflation depuis l'extrémité proximale jusqu'à l'extrémité distale.

12. Obturateur chirurgical selon la revendication 1, dans lequel les côtés longs de la forme géométrique rectangulaire sont des lignes courbées dans un plan perpendiculaire à l'axe.

13. Obturateur chirurgical selon la revendication 1, dans lequel la forme géométrique a une largeur étroite par rapport à sa longueur dans un plan perpendiculaire à l'axe (23).

14. Obturateur chirurgical selon la revendication 12, dans lequel les côtés courts de la forme géométrique rectangulaire sont droits.

15. Obturateur chirurgical selon la revendication 1, dans lequel l'une des paires de lignes devient de plus en plus arquée et l'autre paire de lignes est droite.

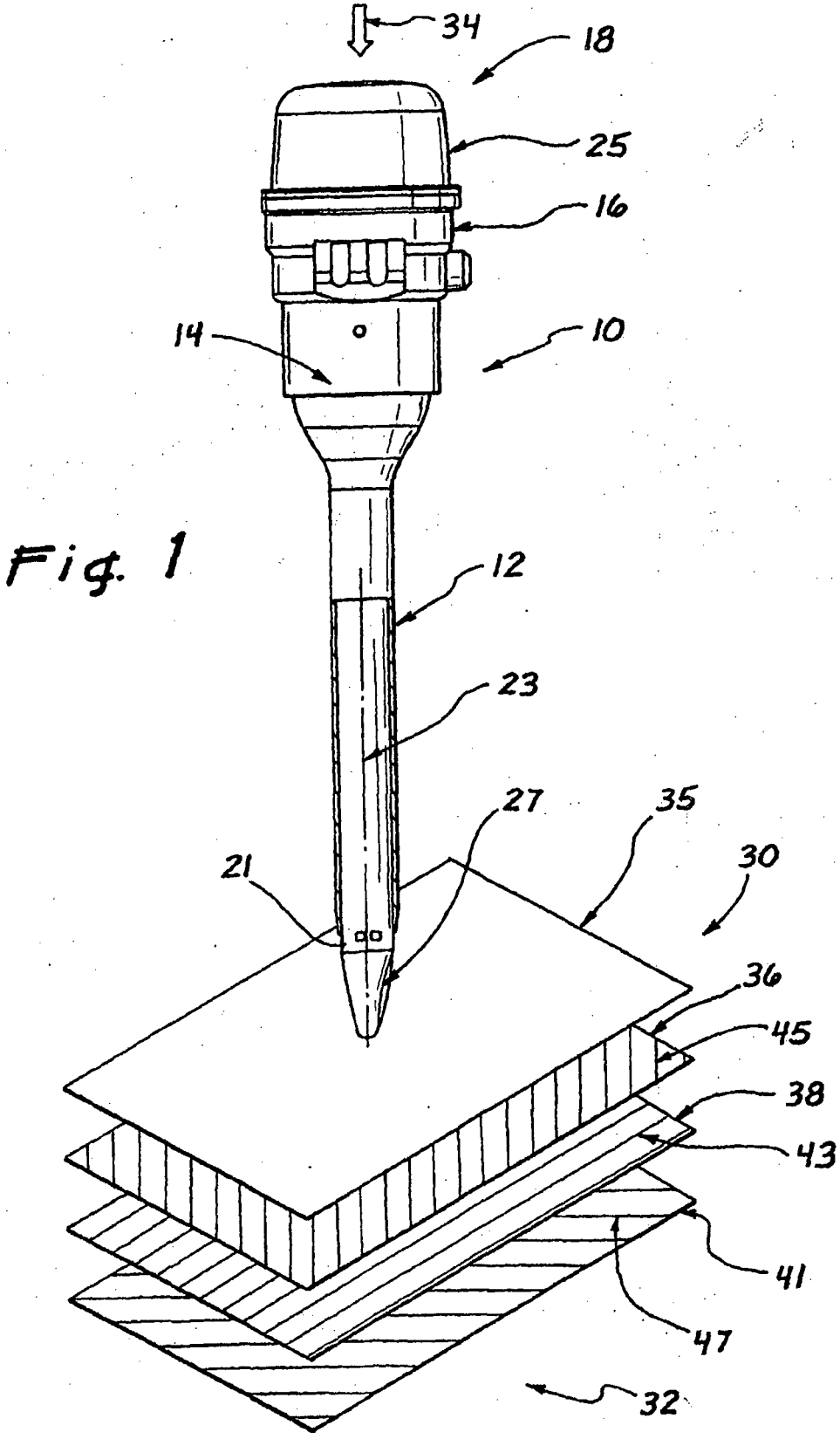
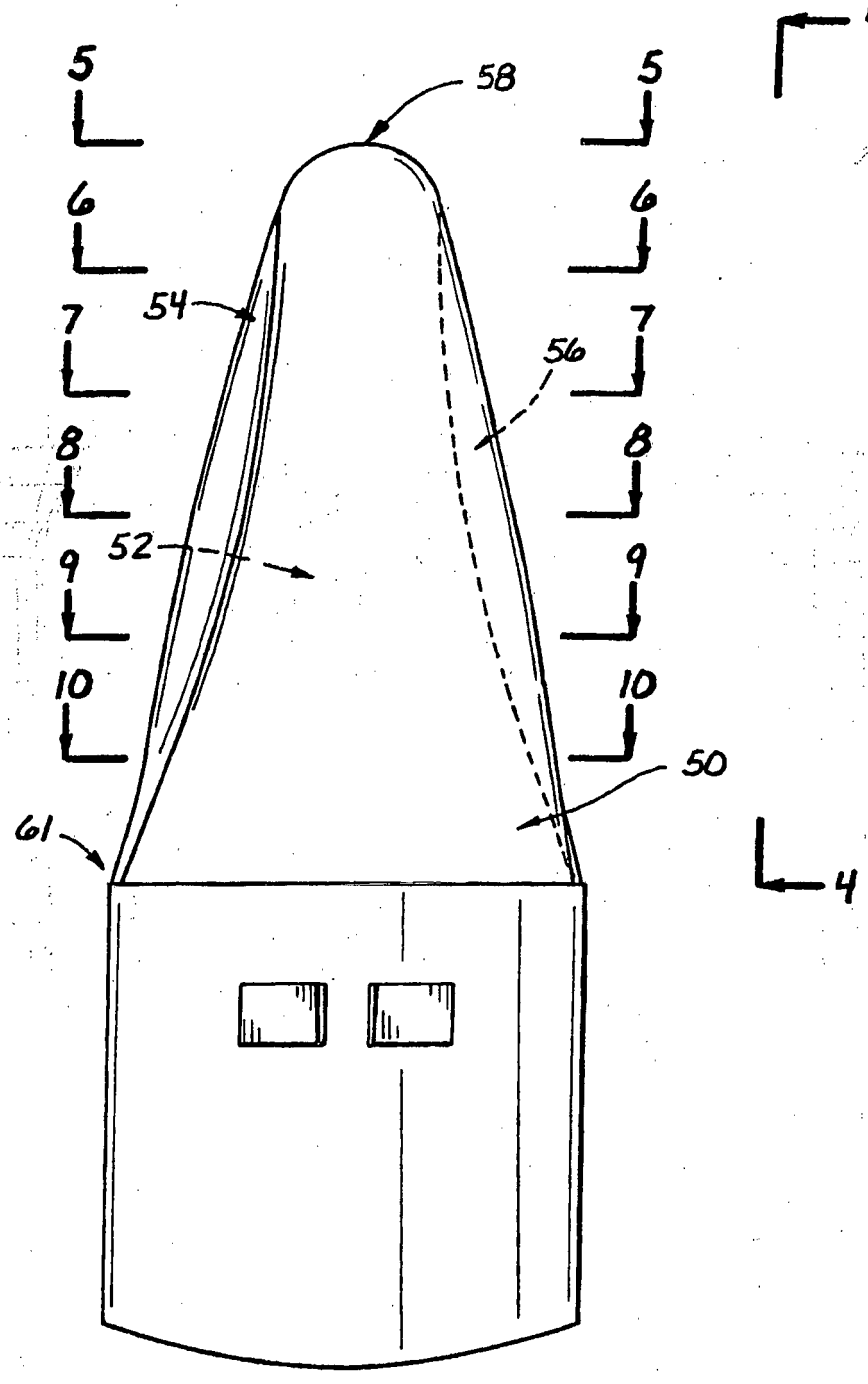


Fig. 1



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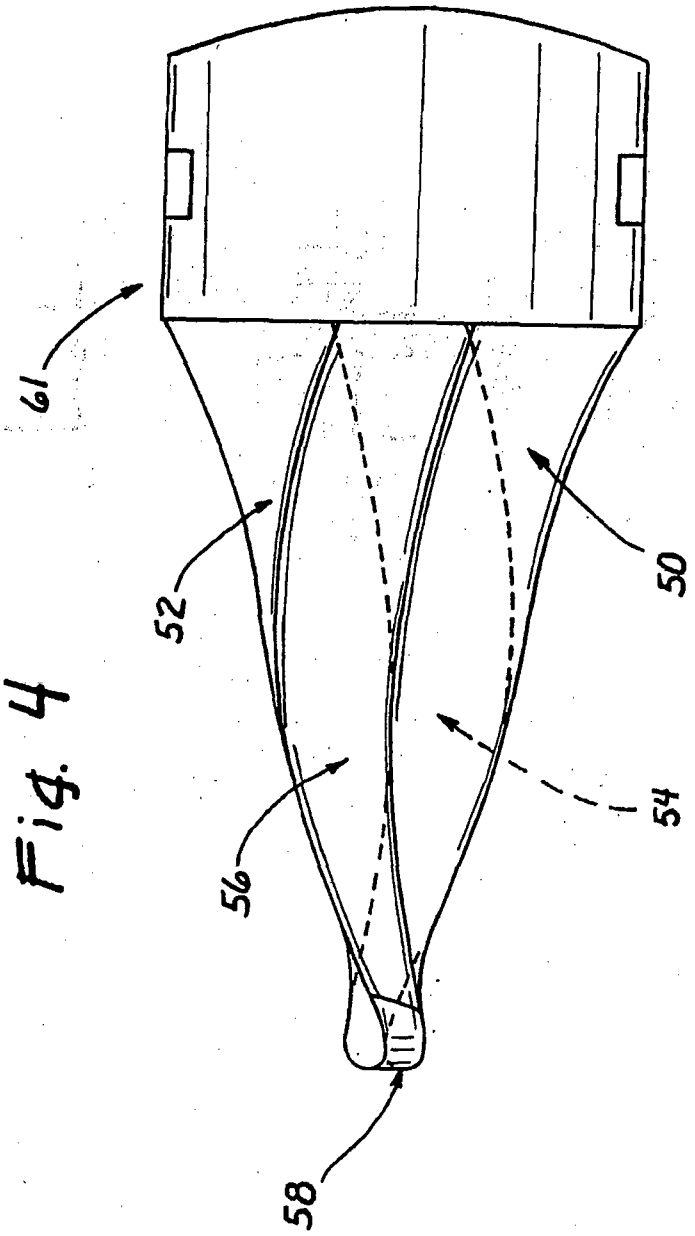

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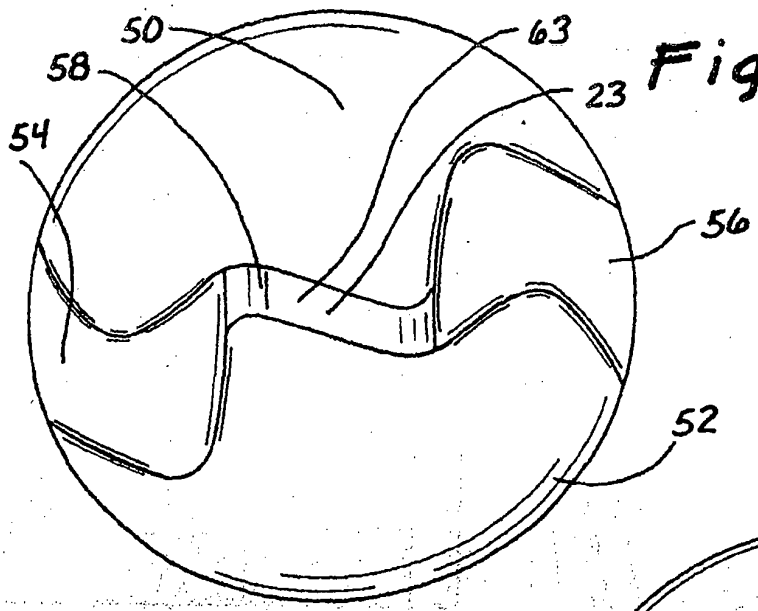

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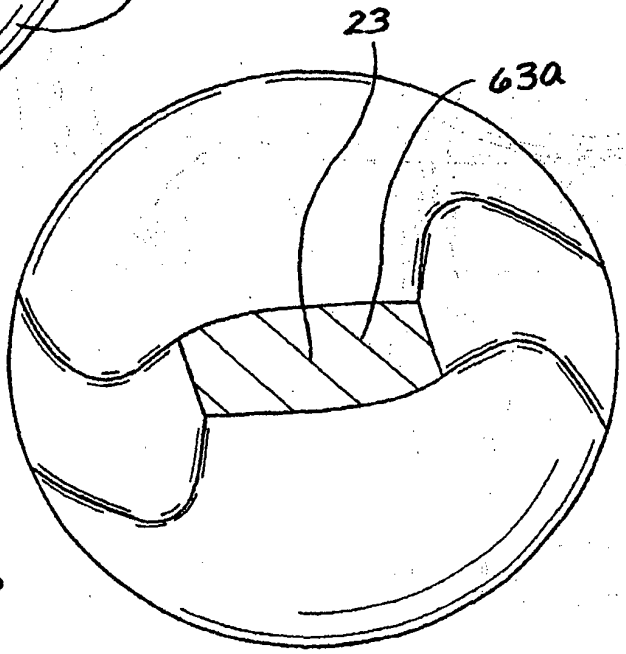


Fig. 6

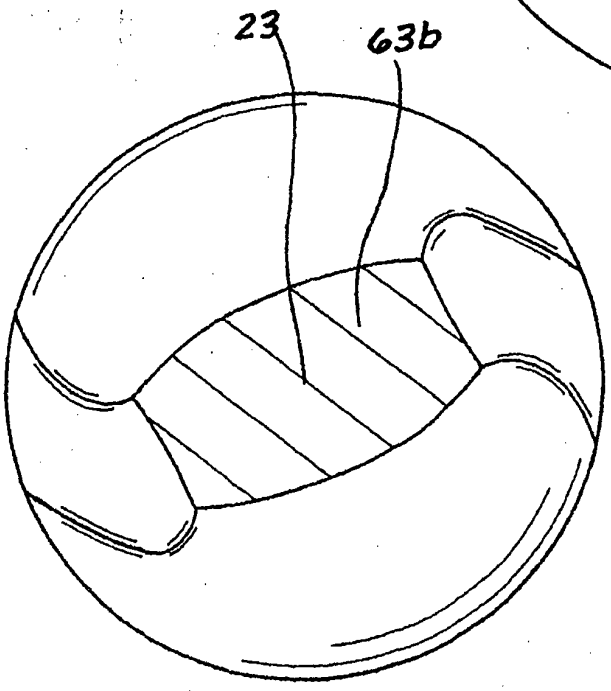


Fig. 7

Fig. 8

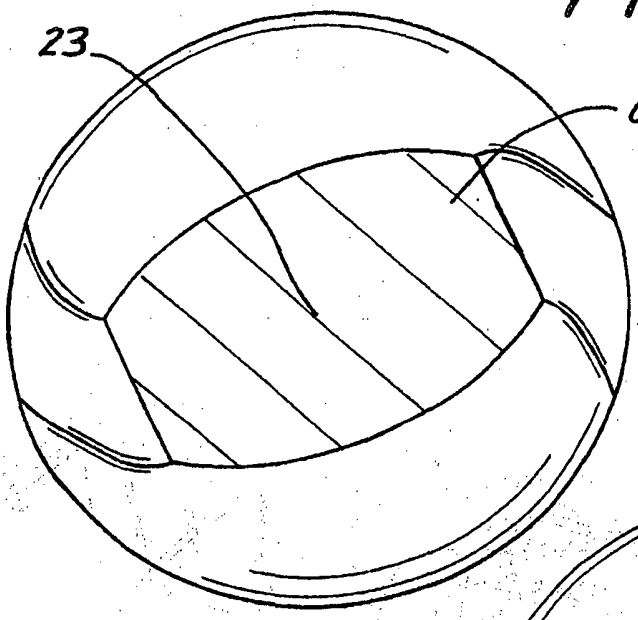
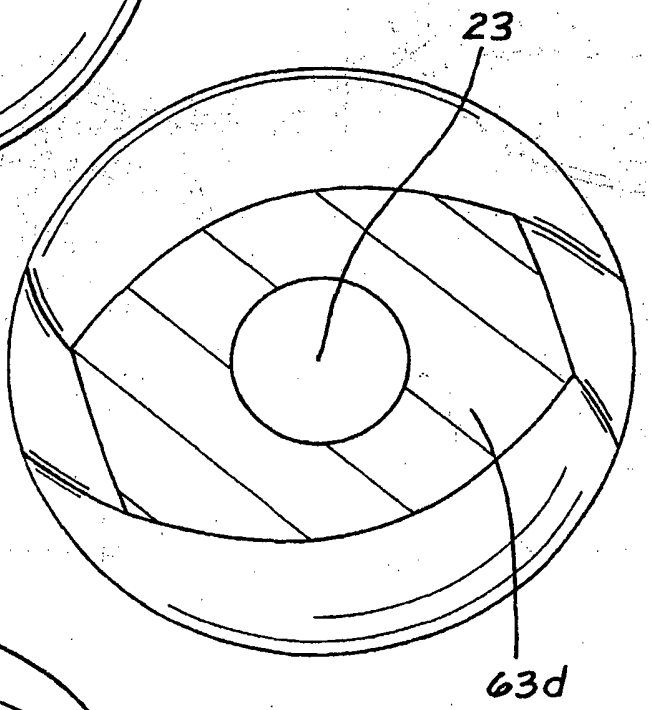


Fig. 9



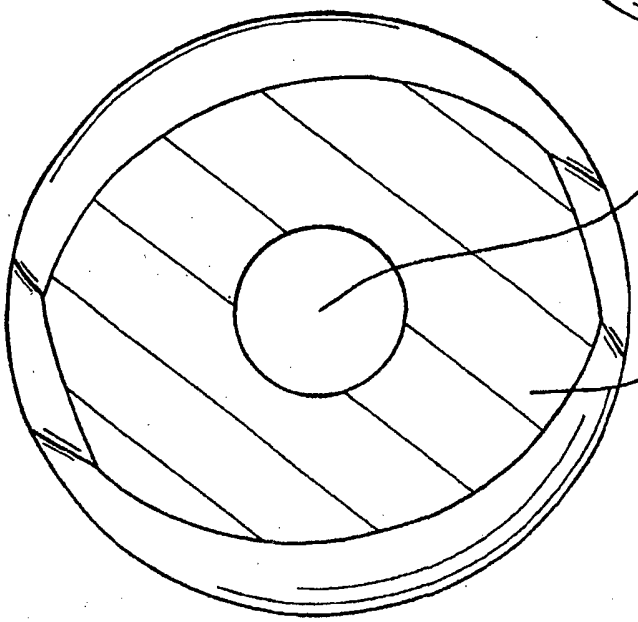


Fig. 10

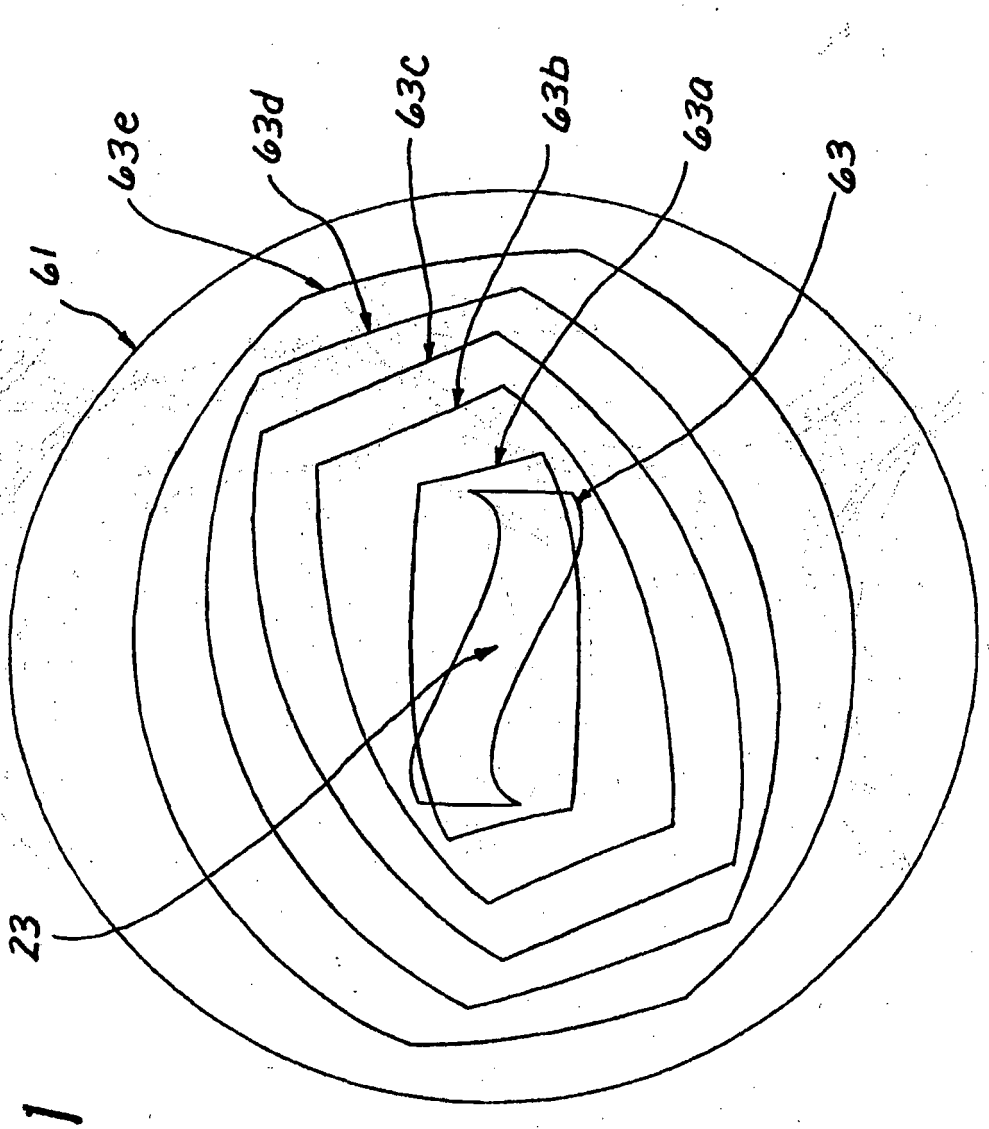


Fig. 11

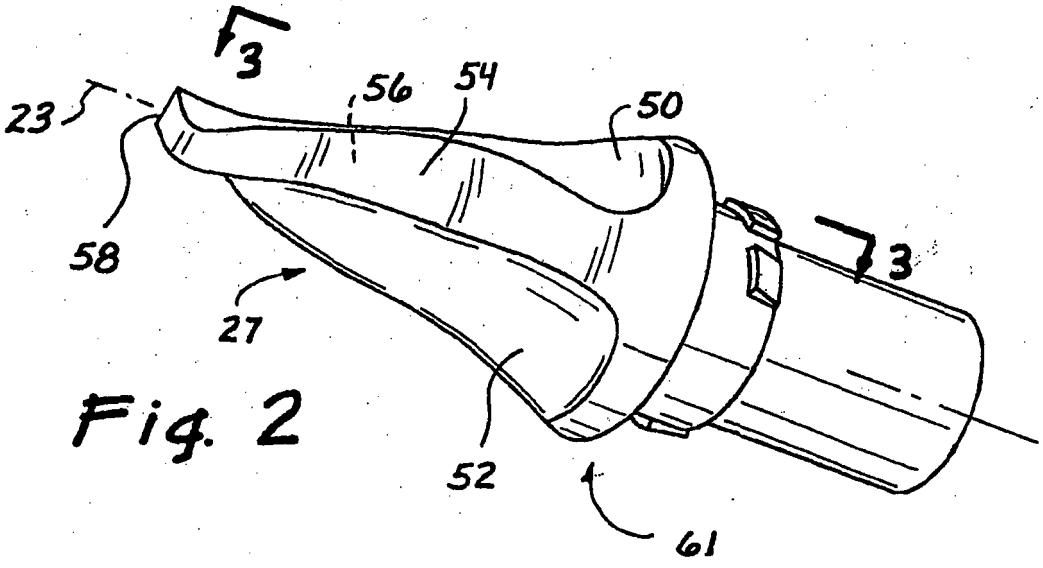


Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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申请(专利权)人(译)	应用医疗资源CORPORATION		
当前申请(专利权)人(译)	应用医疗资源CORPORATION		
[标]发明人	PINGLETON EDWARD D WIXEY MATTHEW A KAHLE HANK		
发明人	PINGLETON, EDWARD D WIXEY, MATTHEW A KAHLE, HANK		
IPC分类号	A61B17/34 A61B17/32		
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优先权	60/324613 2001-09-24 US		
其他公开文献	EP2428171A2 EP2428171A3		
外部链接	Espacenet		

摘要(译)

本发明涉及一种无刀片填塞器（18），用于楔入肌纤维层（41,43,45）以安全地切入腹腔（32），以便应用套管（12）。本发明包括无刀片填塞器（18），其具有尖端（27），其外表面包括由中间表面（50,52）分开的一对侧表面（54,56），其中中间表面限定几何形状，其在在填塞器沿着第一层纤维的取向方向穿透第一层肌肉组织之后，远端与第二层肌肉组织的纤维更加平行对齐。

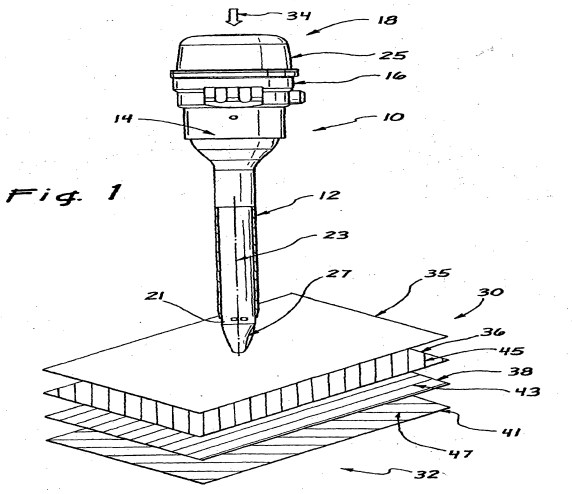

Fig. 1