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(54) **Bladeless obturator**

Klingenloser Obturator

Obturateur sans lame

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(56) References cited:
US-A- 5 817 061

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Description

Field of the Invention

[0001] This invention relates generally to trocar systems including obturators, and more specifically, bladeless obturators.

Background

[0002] 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.

[0003] 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.

[0004] 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.

[0005] 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.

[0006] 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. An example of an obturator with a blunt tip is disclosed in US Patent Number 5,817,061. This obturator has the features of appended claim 1 except that it does not have a second cylindrical surface located distally of the conical surface, and therefore also the ridges do not extend radially outwardly from such a second cylindrical surface as well as from the conical surface. 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

[0007] In accordance with the present invention there is provided a surgical obturator having a bladeless tip as recited in attached Claim 1 with characteristics which take further advantage of the abdominal anatomy. In several embodiments, the obturator has a blunt tip with a configuration particularly adapted for alignment parallel to the fibers of the muscle layers. This tip transitions to a circular cross section from a distal end to a proximal end of the tip. 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 tip having a length to width ratio greater than one, the blade 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.

[0008] Features and advantageous of the invention will become more apparent with a discussion of the attached drawings of which:.

Figure 1 is a side elevation view of a trocar system including a cannula with associated valve housing, and an obturator (having a blunt tip as illustrated in Figure 2 and thus not in accordance with the present invention) extending through the working channel of the cannula to facilitate placement across the abdominal wall;

Figure 2 is a perspective view of a the blunt tip of the cannulla 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;

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; and

Figure 12 shows a perspective view of an embodiment of the blunt tip of the present invention.

Description of Preferred Embodiments

[0009] 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.

[0010] 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.

[0011] Consequently, 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.

[0012] The blunt tip 27 of Figure 2 takes into account an anatomical configuration of the abdominal wall 30 with an improved structural design and method of insertion.

[0013] In order to fully appreciate the above, 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.

[0014] 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.

[0015] 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.

[0016] 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 configuration 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.

[0017] 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.

[0018] 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.

[0019] 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.

[0020] 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.

[0021] 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.

[0022] 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.

[0023] 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.

[0024] Certainly, one of the primary purposes of the obturator described above 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.

[0025] 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 easy until the device enters the peritoneal cavity 32 and moves to its operative position.

[0026] 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.

[0027] 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.

[0028] 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.

[0029] 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.

[0030] 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.

[0031] 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.

[0032] 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.

[0033] 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.

[0034] An alternative configuration of a tip, for an obturator in accordance with the present invention, is disclosed in Figure 12. In the embodiment of Figure 12, the tip 27j includes a conical surface 75j which transitions proximally into the cylindrical surface 95j. Distally of the conical surface 75j a second cylindrical surface 99j is provided which extends to the distal end 85j. Ridges 93j extend radially outwardly from the second surface 99 and the conical surface 75j.

[0035] It will be understood that modifications can be made to disclosed embodiment in accordance with the invention without departing from scope of the claims.

Claims

1. A surgical obturator (18) adapted to penetrate a body wall, comprising:

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

   a bladeless tip (27) at the distal end of the shaft (21), the tip (27) having a rounded distal end and further includes a conical surface (75j), a first cylindrical surface (95j) and a second cylindrical surface (99j); the conical surface (75j) is located between the first cylindrical surface (95j) and the second cylindrical surface (99j); the second cylindrical surface (99j) being located distally of the conical surface (75j), and the conical surface (75j) transitions distally into the second cylindrical surface (99j); the second cylindrical surface (99j) extends to the rounded distal end of the tip (27), the first cylindrical surface (95j) is located proximally of the conical surface (75j); the conical surface (75j) transitions proximally into the first cylindrical surface (95j) and wherein the tip (27) further includes ridges (93j), each extending radially outwardly from the second cylindrical surface (99j) and the conical surface (75j).

2. The surgical obturator of Claim 1 wherein the ridges (93j) extend along the tip (27) such that a major component of each of the ridges (93j) isaligned with the axis (27).

3. The surgical obturator of any of the preceding claims wherein the obturator (18) comprises a lumen open at a proximal end of obturator (18) and wherein the obturator (18) is translucent and the lumen is configured to receive a laparoscope therein.

4. The surgical obturator of Claim 1 and a cannula (12) having a working channel (14) extending between an on open proximal end and an open distal end, wherein the cannula (12) is configured to receive the elongate shaft (21) inside the working channel (14) of the cannula (12).

5. The surgical obturator of Claim 1 wherein the tip (27) is adapted to closely fit with the elongate shaft to facilitate a fixed or removable relationship between the elongate shaft (21) and the tip (27).

6. The surgical obturator of Claim 1 wherein the tip (27j) is of a generally conical configuration and further includes recesses and wherein the ridges (93j) are disposed between the recesses and extend toward the first cylindrical surface (95j).

7. The surgical obturator of any of Claim 6 wherein the

recesses do not extend into the first cylindrical surface (95j).

8. The surgical obturator of any of the preceding claims wherein the ridges (93) have a constant width or width that increases proximally.

9. The surgical obturator of any of the preceding claims wherein the ridges (93) lie in planes passing through the axis (23).

Patentansprüche

1. Ein chirurgischer Obturator (18), angepasst zum Durchdringen einer Körperwand, der Folgendes umfasst:

einen länglichen Schaft (21), der sich entlang einer Achse (23) zwischen einem proximalen Ende und einem distalen Ende erstreckt; und
eine klingenlose Spitze (27) an dem distalen Ende des Schafts (21), wobei die Spitze (27) ein abgerundetes distales Ende aufweist und ferner eine konisch zulaufende Oberfläche (75j), eine erste zylindrische Oberfläche (95j) und eine zweite zylindrische Oberfläche (99j) einschließt; wobei die konisch zulaufende Oberfläche (75j) sich zwischen der ersten zylindrischen Oberfläche (95j) und der zweiten zylindrischen Oberfläche (99j) befindet; wobei die zweite zylindrische Oberfläche (99j) sich distal zu der konischen Oberfläche (75j) befindet und die konische Oberfläche (75j) distal in die zweite zylindrische Oberfläche (99j) übergeht; die zweite zylindrische Oberfläche (99j) sich zu dem abgerundeten distalen Ende der Spitze (27) erstreckt, die erste zylindrische Oberfläche (95j) sich proximal zu der konisch zulaufenden Oberfläche (75j) befindet; die konisch zulaufende Oberfläche (75j) proximal in die erste zylindrische Oberfläche (95j) übergeht und wobei die Spitze (27) ferner Rippen (93j) einschließt, die sich von der zweiten zylindrischen Oberfläche (99j) und der konisch zulaufenden Oberfläche (75j) jeweils radial nach außen erstrecken.

2. Der chirurgische Obturator gemäß Anspruch 1, wobei die Rippen (93j) sich entlang der Spitze (27) erstrecken, so dass eine große Komponente von jeder der Rippen (93j) mit der Achse (27) ausgerichtet ist.

3. Der chirurgische Obturator gemäß einem der vorhergehenden Ansprüche, wobei der Obturator (18) ein Lumen beinhaltet, das an einem proximalen Ende des Obturators (18) offen ist und wobei der Obturator (18) durchscheinend ist und das Lumen zum Aufnehmen eines Laparoskops darin konfiguriert ist.

4. Der chirurgische Obturator gemäß Anspruch 1 und eine Kanüle (12) mit einem Arbeitskanal (14), der sich zwischen einem offenen proximalen Ende und eine offenen distalen Ende erstreckt, wobei die Kanüle (12) zum Aufnehmen des länglichen Schafts (21) im Innern des Arbeitskanals (14) der Kanüle (12) konfiguriert ist.

5. Der chirurgische Obturator gemäß Anspruch 1, wobei die Spitze (27) dazu angepasst ist, eng mit dem länglichen Schaft zusammenzupassen, um eine befestigte oder entfernbare Beziehung zwischen dem länglichen Schaft (21) und der Spitze (27) zu ermöglichen.

6. Der chirurgische Obturator gemäß Anspruch 1, wobei die Spitze (27j) eine allgemein konisch zulaufende Konfiguration aufweist und ferner Aussparungen einschließt, und wobei die Rippen (93j) zwischen den Aussparungen angeordnet sind und sich zu der ersten zylindrischen Oberfläche (95j) hin erstrecken.

7. Der chirurgische Obturator gemäß Anspruch 6, wobei die Aussparungen sich nicht in die erste zylindrische Oberfläche (95j) hinein erstrecken.

8. Der chirurgische Obturator gemäß einem der vorhergehenden Ansprüche, wobei die Rippen (93) eine konstante Breite oder eine proximal zunehmende Breite aufweisen.

9. Der chirurgische Obturator gemäß einem der vorhergehenden Ansprüche, wobei die Rippen (93) in Ebenen liegen, die durch die Achse (23) verlaufen.

Revendications

1. Obturateur chirurgical (18) conçu pour pénétrer une paroi corporelle, comprenant :

une tige allongée (21) se prolongeant le long d'un axe (23) entre une extrémité proximale et une extrémité distale ; et
une pointe sans lame (27) à l'extrémité distale de la tige (21), la pointe (27) ayant une extrémité distale arrondie et incluant également une surface conique (75j), une première surface cylindrique (95j) et une deuxième surface cylindrique (99j) ; où la surface conique (75j) est située entre la première surface cylindrique (95j) et la deuxième surface cylindrique (99j), la deuxième surface cylindrique (99j) étant située de façon distale par rapport à la surface conique (75j) et les transitions de la surface conique (75j) se prolongeant en direction distale dans la deuxième surface cylindrique (99j) ; où la deuxième surface cylindrique (99j) se prolonge jusqu'à l'extrémité

distale arrondie de la pointe (27) et la première surface cylindrique (95j) est située de façon proximale par rapport à la surface conique (75j) ; où les transitions de la surface conique (75j) se prolongent en direction proximale dans la première surface cylindrique (95j) et où la pointe (27) inclut en outre des arêtes (93j) qui se prolongent chacune radialement vers l'extérieur depuis la deuxième surface cylindrique (99j) et la surface conique (75j).

2. Obturateur chirurgical de la revendication 1, où les arêtes (93j) se prolongent le long de la pointe (27) d'une manière telle qu'un composant majeur de chacune des arêtes (93j) est aligné avec l'axe (27).

3. Obturateur chirurgical de l'une quelconque des revendications précédentes, où l'obturateur (18) comprend une lumière ouverte à une extrémité proximale de l'obturateur (18) et où l'obturateur (18) est translucide et la lumière conçue pour recevoir un laparoscope.

4. Obturateur chirurgical de la revendication 1 et canule (12) ayant un canal de travail (14) qui se prolonge entre une extrémité proximale ouverte et une extrémité distale ouverte, où la canule (12) est conçue pour recevoir la tige allongée (21) à l'intérieur du canal de travail (14) de la canule (12).

5. Obturateur chirurgical de la revendication 1, où la pointe (27) est adaptée pour être étroitement ajustée avec la tige allongée de manière à faciliter une association fixe ou démontable entre la tige allongée (21) et la pointe (27).

6. Obturateur chirurgical de la revendication 1, où le pointe (27j) a une configuration généralement conique et inclut en outre des cavités et où les arêtes (93j) sont disposées entre les cavités et se prolongent en direction de la première surface cylindrique (95j).

7. Obturateur chirurgical de la revendication 6, où les cavités ne se prolongent pas dans la première surface cylindrique (95j).

8. Obturateur chirurgical de l'une quelconque des revendications précédentes, où les arêtes (93) ont une largeur constante ou une largeur qui augmente en direction proximale.

9. Obturateur chirurgical de l'une quelconque des revendications précédentes, où les arêtes (93) se situent dans des plans qui passent au travers de l'axe (23).

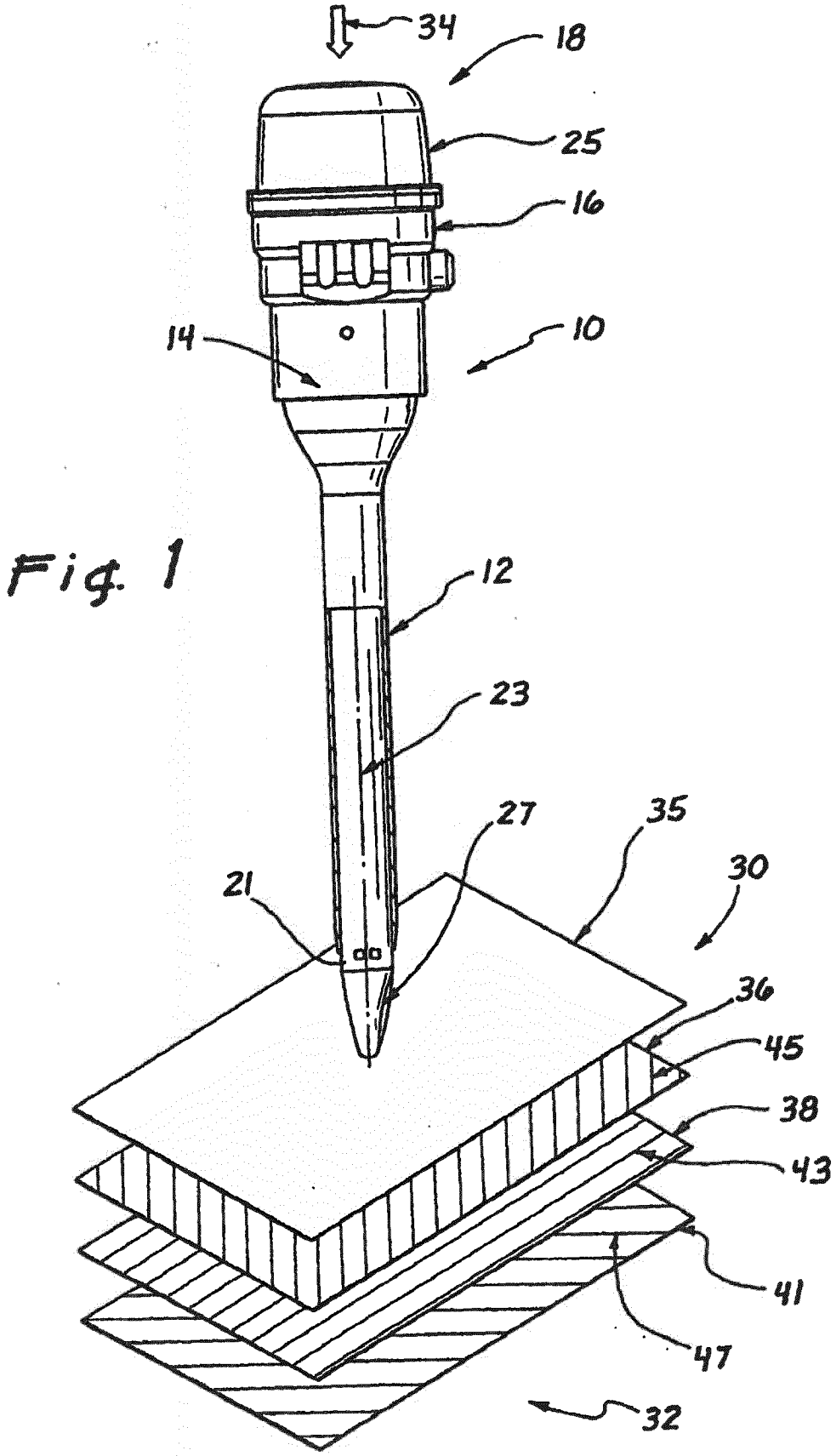


Fig. 1

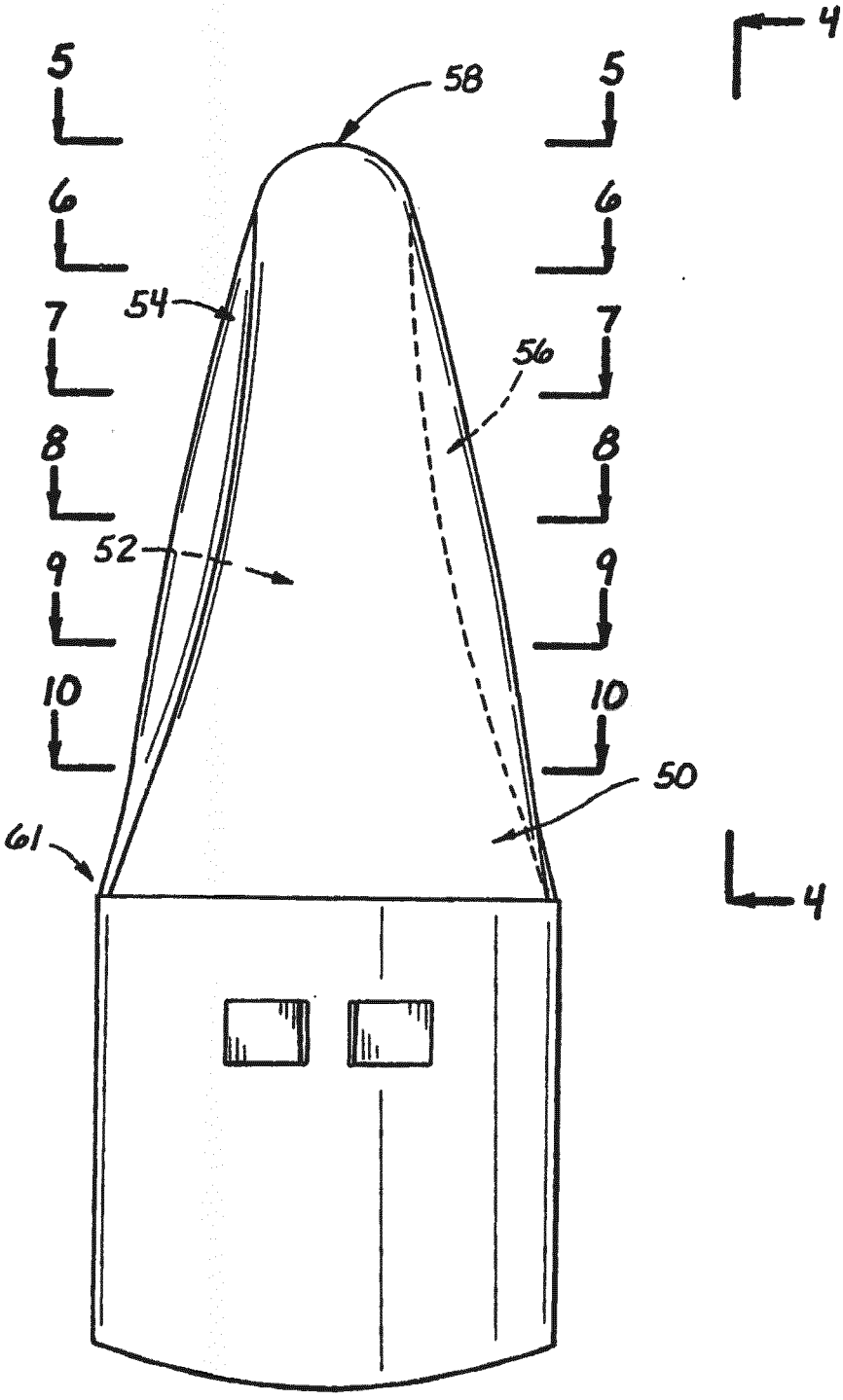


Fig. 3

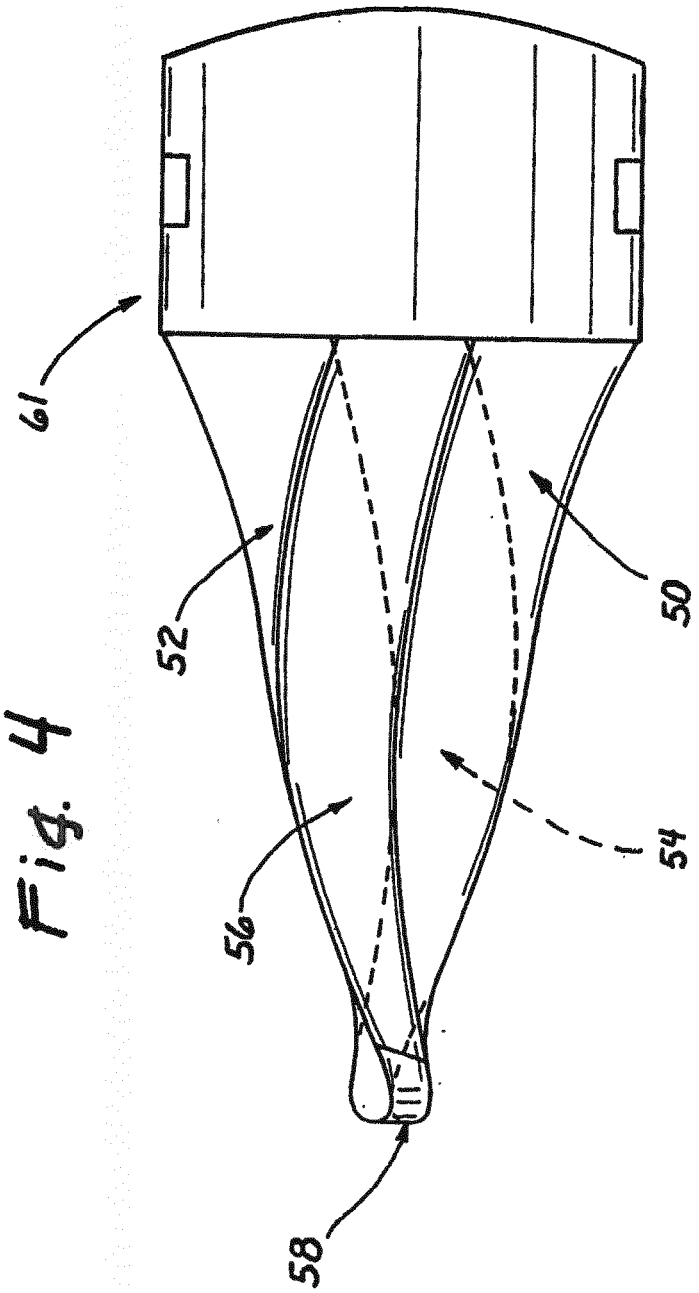


Fig. 4

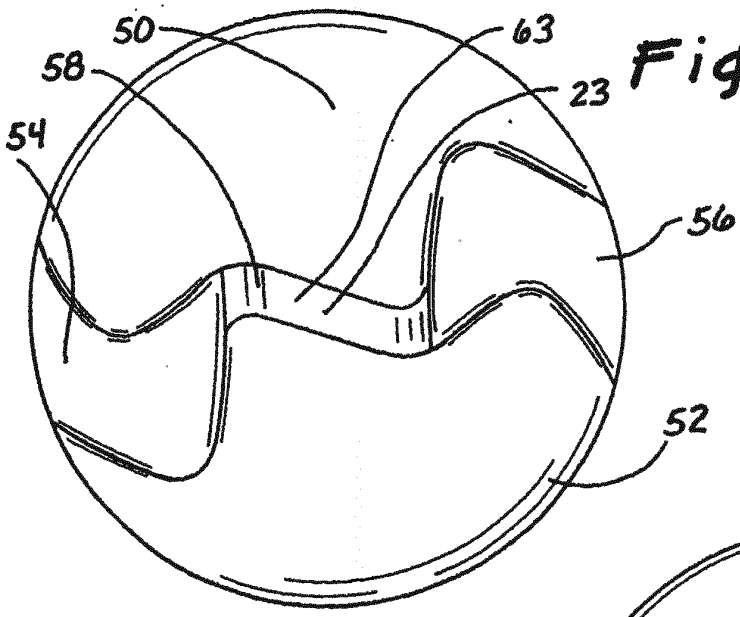
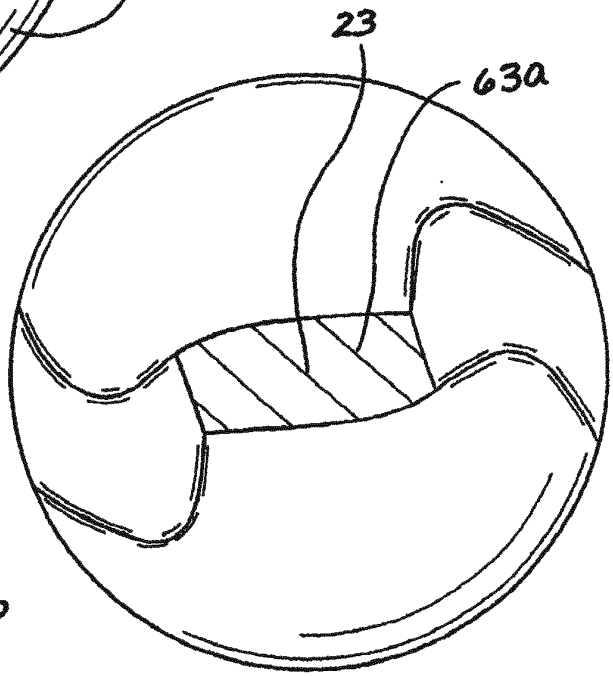


Fig. 5



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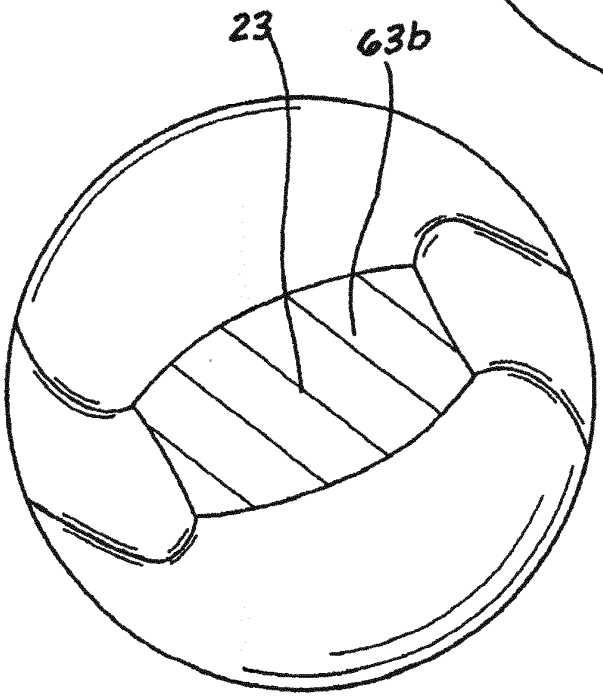
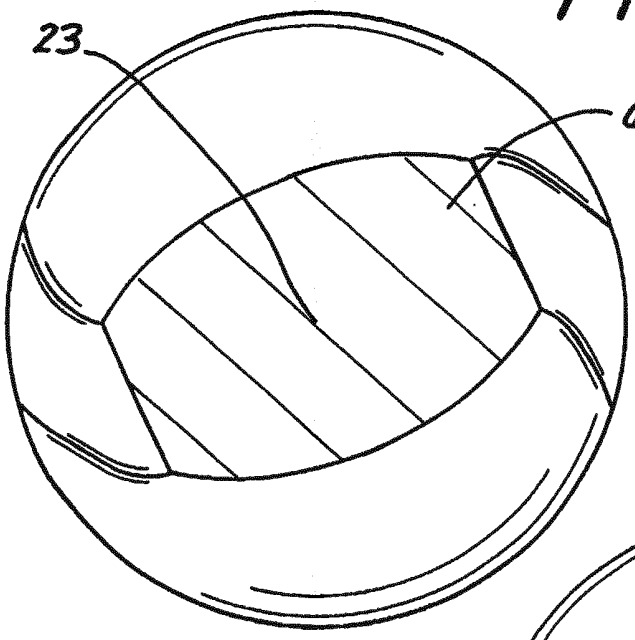


Fig. 7

Fig. 8



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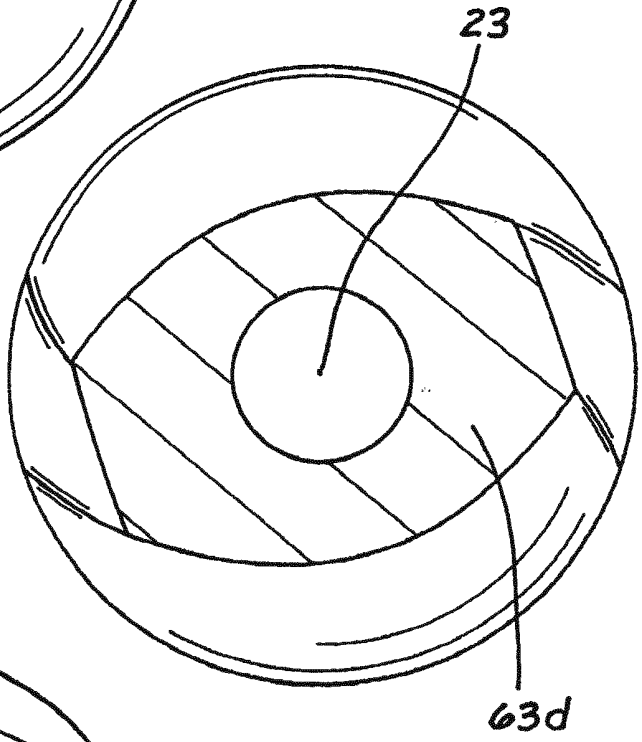


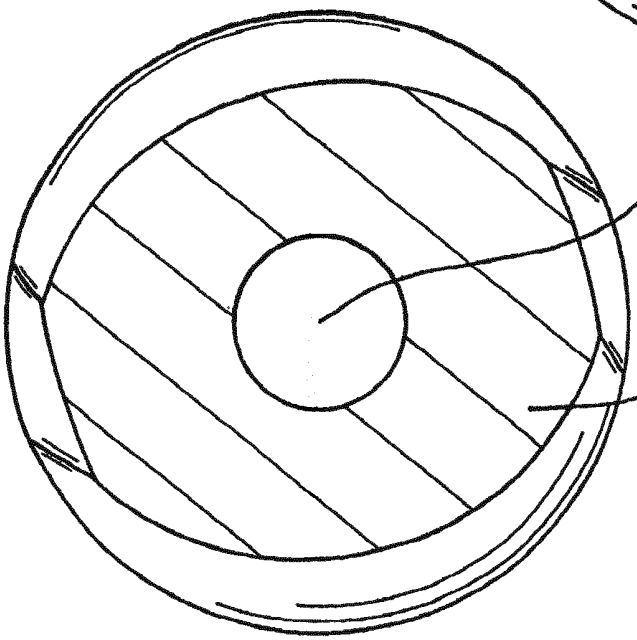
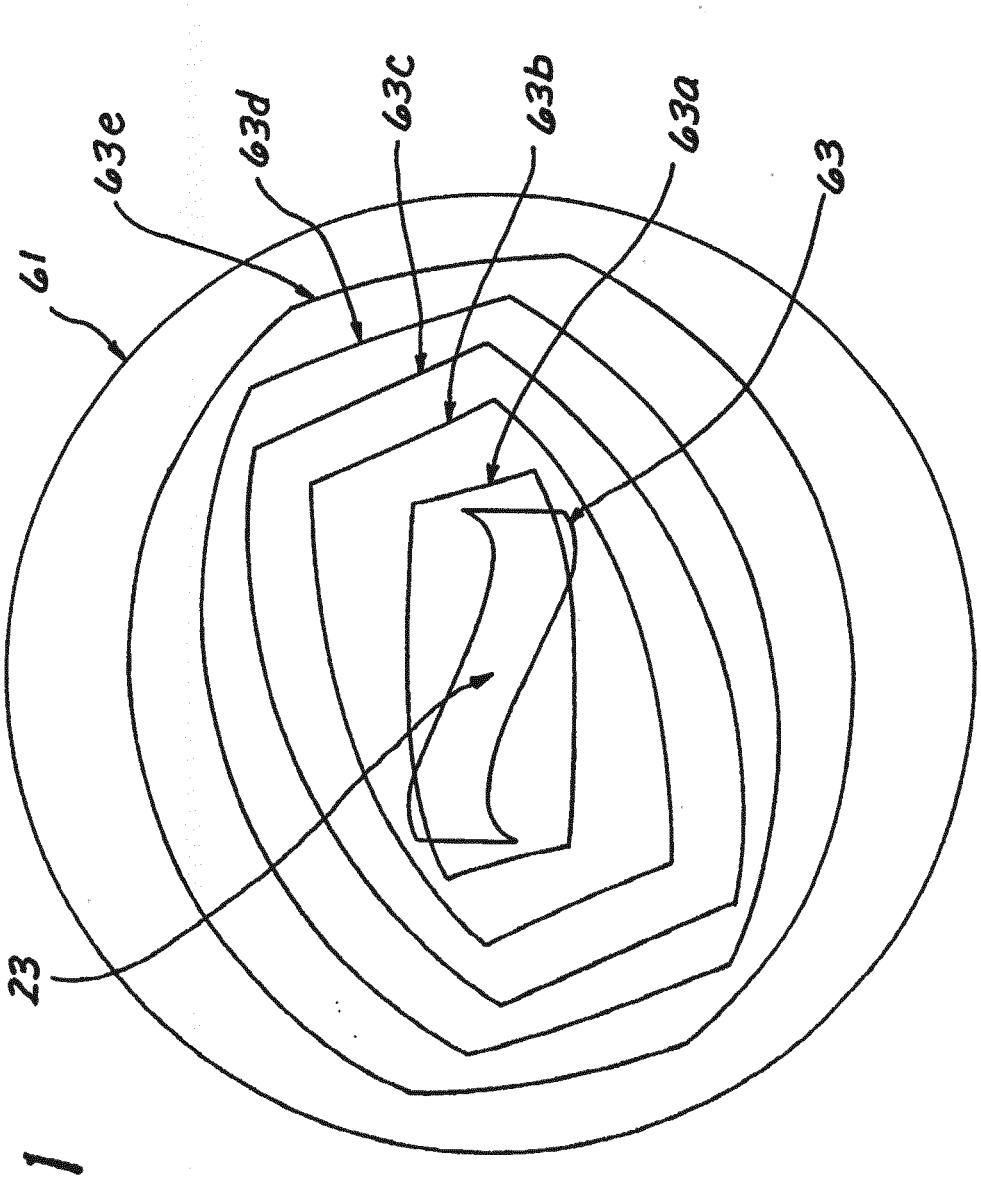


Fig. 10



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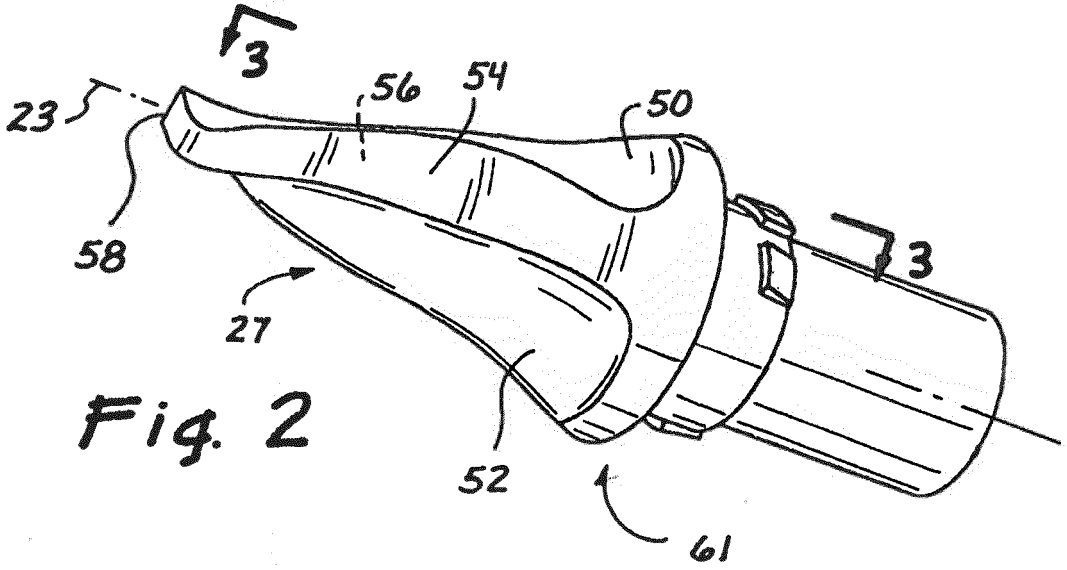
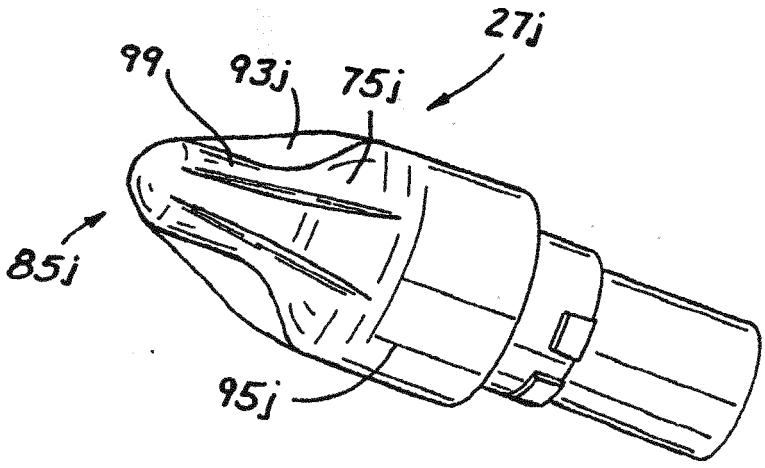


Fig. 2

Fig. 12



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 5817061 A **[0006]**

专利名称(译)	无叶闭孔器		
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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		
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优先权	60/324613 2001-09-24 US		
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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）。本发明包括无叶片填塞器（18），其具有尖端（63），该尖端具有具有至少一条线的几何形状的一般构造的横截面，其中所述至少一条线围绕渐进近端的闭塞器的轴线旋转。交叉区域。

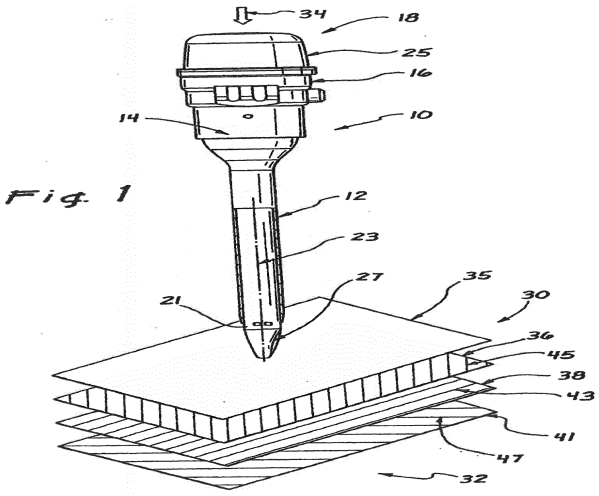

Fig. 1