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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : A61M 13/00, 5/178	A1	(11) International Publication Number: WO 96/01132
		(43) International Publication Date: 18 January 1996 (18.01.96)

(21) International Application Number: PCT/US95/07713

(22) International Filing Date: 15 June 1995 (15.06.95)

(30) Priority Data:
08/269,937 1 July 1994 (01.07.94) US

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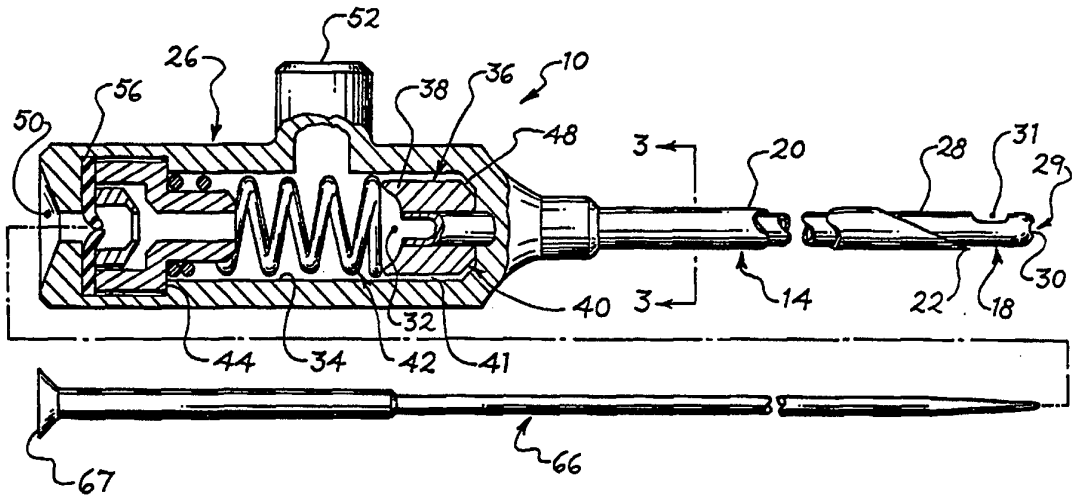
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(81) Designated States: CA, JP, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: HIGH FLOW INSUFFLATION INSTRUMENT FOR LAPAROSCOPIC SURGERY



(57) Abstract

A high flow insufflation instrument and method for laparoscopic surgery. The insufflation instrument (10) comprises a sharp-tipped hollow cannula (14) with an open distal end and a hollow obturator (18) located in the hollow cannula. The hollow obturator has a blunt distal tip. The obturator is shiftable relative to the cannula between an advanced position in which the blunt distal tip of the obturator is located distally of the sharp distal tip of the cannula and a retracted position in which the blunt distal tip of the obturator is not located distally of the sharp distal tip of the cannula. A first insufflation flow pasage (62) is defined within the obturator and extends from a proximal portion of the obturator to at least one aperture located in a distal portion. A second insufflation flow passage (60) is defined between the obturator and the inside of the hollow cannula and extends from the proximal end of the hollow cannula to the open distal end thereof. According to an alternative embodiment, the high flow insufflation instrument provides for accommodation of an optical viewing scope.

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HIGH FLOW INSUFFLATION INSTRUMENT FOR LAPAROSCOPIC SURGERY

BACKGROUND OF THE INVENTION

The present invention relates to a laparoscopic surgical instrument for providing gas insufflation of a body cavity, and in particular, the present invention relates to a laparoscopic surgical instrument for providing more efficient gas insufflation and which also may accommodate an optical viewing instrument.

Laparoscopic surgery involves the use of small incisions to insert surgical instruments of 3-10 millimeter diameter into the abdominal cavity. An initial step in laparoscopic surgery is to insert a needle or cannula of about 2 mm diameter through the abdominal wall such that the tip of the needle accesses in the abdominal cavity. About 2-4 liters of a sterilized gas, such as carbon dioxide, is insufflated through the needle and into the cavity. This procedure separates the abdominal wall from the organs and also may separate the organs from one another.

A conventional instrument for providing an insufflating gas to an internal body cavity is a Verres needle. A Verres needle includes a hollow cannula in which is located a hollow obturator. The cannula has a sharp distal tip for piercing the abdominal wall. The obturator has a closed, blunt distal tip and a lateral side port through the shaft of the obturator close to the distal tip. The obturator is slidable in the cannula and is biased by a spring mechanism so that the blunt distal

tip of the obturator extends distally of the sharp distal tip of the cannula. As the physician pushes the Verres needle against the patient's abdominal wall, the obturator retracts back into the cannula against the bias of the spring mechanism. After the sharp tip of the cannula penetrates the abdominal wall, the distal end of the obturator springs back out past the sharp distal tip of the cannula into the abdominal cavity. During the insufflation procedure, it is an advantage that the blunt distal tip of the obturator is biased distally past the sharp distal tip of the cannula in order to reduce the chances that the sharp tip of the outer cannula might accidently contact an internal organ. An insufflating gas can be delivered to the abdominal cavity from a gas supply which is connected to a proximal portion of the obturator. The insufflating gas is conveyed through the hollow obturator and passes out the lateral port at the distal end.

In performing laparoscopic procedures, it is advantageous that the instruments used, such as a Verres-needle, be made with relatively small outer diameters to minimize the size of the incision necessary to access the desired surgical site. It is also preferable to make an insufflation instrument, such as a Verres needle, as efficient as possible so that an internal body cavity can be insufflated as quickly and with control. It would also be advantageous to be able to observe the distal end of a Verres needle when it is inserted into a patient's body cavity to determine whether it is in the proper location. Accordingly, it is an object of the present invention to provide an insufflation device that is more efficient and which may be able to accommodate a separate optical viewing device.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention, there is provided a high flow insufflation

instrument and method for laparoscopic surgery. The insufflation instrument comprises a sharp-tipped hollow cannula with an open distal end and a hollow obturator located in the hollow cannula. The hollow obturator has a blunt distal tip. The obturator is shiftable relative to the cannula between an advanced position in which the blunt distal tip of the obturator is located distally of the sharp distal tip of the cannula and a retracted position in which the blunt distal tip of the obturator is not located distally of the sharp distal tip of the cannula. A first insufflation flow passage is defined within the obturator and extends from a proximal portion of the obturator to at least one aperture located in a distal portion. A second insufflation flow passage is defined between the obturator and the inside of the hollow cannula and extends from the proximal end of the hollow cannula to the open distal end thereof.

According to another aspect of the present invention, there is provided a high flow insufflation instrument and method for laparoscopic surgery that provides for accommodation of an optical viewing scope. The instrument comprises a hollow cannula having an open distal end with a sharp distal tip. An obturator is located in the hollow cannula and has a blunt distal tip. A first insufflation flow passage is defined within the obturator and extends to a sealed aperture located in a distal portion. An optical viewing scope having an elongate shaft portion for transmission of optical image can be located in the first insufflation fluid flow passage for viewing through the sealed aperture.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional side view of a laparoscopic instrument for providing insufflating gas to a body cavity according to a first embodiment of the present invention.

FIG. 2 is a perspective view of a hub portion of the obturator depicted in FIG. 1.

FIG. 3 is a cross sectional view of the laparoscopic instrument of FIG. 1 taken along line A-A'.

FIGS. 4A-4D represents diagrammatical views illustrating progressive steps in the procedure for using the embodiment of FIG. 1.

FIG. 5 is a sectional side view of another embodiment of the present invention.

FIG. 6 is side view of a tip portion of an alternative embodiment of the laparoscopic instrument of FIG. 1.

FIG. 7 is side view of a tip portion of another alternative embodiment of the laparoscopic instrument of FIG. 1.

FIG. 8 is side view of a tip portion of still another alternative embodiment of the laparoscopic instrument of FIG. 1.

FIG. 9 is side view of a tip portion of yet still another alternative embodiment of the laparoscopic instrument of FIG. 1.

FIG. 10 is side view of the tip portion of the embodiment of FIG. 9 showing a fiber optic viewing scope inserted through the instrument.

FIG. 11 is sectional side view of a tip portion of still yet another alternative embodiment of the laparoscopic instrument of FIG. 1.

FIG. 12 is sectional side view of a tip portion of a further alternative embodiment of the laparoscopic instrument of FIG. 1.

FIG. 13 is side view of a tip portion of still a further alternative embodiment of the laparoscopic instrument of FIG. 1.

FIG. 14 is sectional side view of the tip portion of the embodiment of FIG. 13 showing a fiber optic viewing scope inserted through the instrument.

FIG. 15 is an end view of the embodiment of the laparoscopic instrument of FIG. 13.

FIG. 16 is an end view of an alternative embodiment of the laparoscopic instrument of FIG. 13.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1 there is shown a first preferred embodiment of the present invention. This embodiment is an insufflation device 10 used for laparoscopic procedures. This type of device is sometimes referred to as a "Verres needle" or a safety needle. This device is used to provide access through a wall of a person's body to a cavity internal of the body and then to provide for insufflation of the body cavity so that a medical procedure, such as a laparoscopic surgery, can be performed.

As shown in FIG. 1, the insufflation device 10 includes a cannula 14 and an obturator 18. The cannula 14 is formed of an elongate, relatively rigid, hollow shaft 20 with a sharp distal tip 22. A proximal end of the cannula shaft 20 connects to a handle-manifold 26.

The obturator 18 is located inside the hollow cannula shaft 20 and is slidable relative to the cannula shaft 20. The obturator 18 is formed of an elongate, relatively rigid, hollow shaft 28 with a relatively blunt distal tip 29. The obturator 18 has a range of movement relative to the cannula 14 such that when the obturator 18 is in a fully extended position, the blunt distal tip 29 extends distally of the sharp distal tip 22 of the cannula 14, and when the obturator 18 is in a fully retracted position, the blunt distal tip 29 is proximal of the sharp distal tip 22 of the cannula 14. Located at the blunt distal tip 29 of the obturator 18 is at least one opening. In a preferred embodiment, a first opening 30 is located at the end of the blunt distal tip 29 and is oriented in an axial direction relative to the obturator 18. Also, in a preferred embodiment, the

obturator 18 has a second opening 31. The second opening 31 is located slightly proximally of the end of the blunt tip 29 and is oriented in a radial (side) direction relative to the axis of the obturator 18. The obturator 18 also has a proximal opening 32 located at the proximal end of the obturator shaft 28.

A proximal portion of the obturator shaft 28 extends into a bore 34 of the handle 26. Connected around a proximal portion of the obturator shaft 28 is a hub 64. The hub 36 has a cylindrically-shaped body 38 and a conically profiled distal face 40. The hub 36 has a size and/or diameter such that a substantial gap 41 is formed between the outside surface of the hub 36 and the inside surface of the bore 34. A spring 42, or other biasing means, is also located in the bore 34 of the handle 26. The spring 42 is located between a proximal side of the hub 36 and a rear shoulder 44 located in the bore 34 of the handle 26. When mounted in the handle 26, the spring 42 is under compression thereby biasing the hub 36 (and therefore the obturator shaft 28) in a distal direction, as shown in FIG. 1. In the absence of a proximally-directed force, the spring 42 biases the distal tapered face 40 of the hub 36 against a tapered forward shoulder 48 located in the bore 34 of the handle 26. The distal face 40 of the hub 36 and the forward shoulder 48 of the handle 26 have irregular facing surfaces so that substantial spaces or gaps extend across the interface between the distal face 40 of the hub 36 and the forward shoulder 48 when the hub 36 is biased against the shoulder 48 by the spring 42. One way to provide for these gaps or spaces is to have the distal face 40 of the hub 36 formed with grooves or ridges 49, as shown in FIG. 2. These grooves or ridges 49 provide a fluid path across the surface of the distal face 40 even when the hub 36 bears against the shoulder 48. Alternatively, the grooves may be formed on the surface

of the shoulder 48 instead of the distal face of the hub 36.

The handle-manifold 26 also includes at least one port, and in a preferred embodiment the handle 26 includes a first port 50 and a second port 52. Both the ports 50 and 52 communicate with the bore 34. The first port 50 is aligned with an axis of the handle 26 and the second port 52 is oriented at an angle, e.g. 90 degrees, to the axis of the handle 26. Both ports have suitable fittings associated with them, such as luer lock-type fittings, so that a source of insufflation fluid, or other devices such as syringes, can be connected to the insufflation device. In addition, the port 50 may have a valve apparatus associated with it, such as a duck-bill type valve 56. This enables the introduction of instruments into the insufflation device 10 through the port 50 while maintaining a fluid pressure inside the insufflation device 10.

In a present embodiment, the cannula shaft 20 and the obturator shaft 28 are made of suitably durable materials, such as stainless steel. The handle-manifold 26 is composed of a suitably hard plastic material such as polycarbonate or lexan. The handle-manifold 26 is preferably transparent, at least in the portion surrounding the hub 36. The hub 36 is also made of a suitably hard plastic, such as polycarbonate or lexan, and is preferably a contrasting color to facilitate observation of the hub 36 through the transparent handle-manifold 26. The cannula shaft 20 is approximately 6 inches in length, although other lengths may be used. The end hole 30 has a diameter of .065 inches and the side hole 31 has a length of approximately .125 inches. The cannula shaft 20 has an O.D. of approximately .109 inches and an I.D. of approximately .095 inches. The obturator shaft 28 has an O.D. of approximately .083 inches and an I.D. of approximately .072 inches.

The relative sizes of the shaft of the cannula and the shaft of the obturator are such that a substantial portion of the cross sectional area of the insufflation device consists of the annular area 60 between the outside surface of the obturator shaft 28 and the inside surface of the cannula shaft, as depicted in FIG. 3. For example, in the embodiment of the insufflation device of FIGS. 1-3, the annular area 60 is approximately .0095 square inches and the area 62 inside the hollow obturator shaft 28 is .0041 square inches. Preferably, the annular area 60 substantially exceeds the area 62 and in the embodiment of FIG. 3, the annular area 60 is more than twice the area 62 inside the obturator 18.

Methods of Use

The insufflation device 10 may be used similarly to conventional "Verres" type needles. For example, when a physician desires to insufflate a body cavity in order to perform a laparoscopic surgery, the distal end of the insufflation device 10 is pressed against the body 63 of the patient causing the blunt tip 29 of the obturator 18 to retract rearward against the biasing of the spring 42. This allows the sharp tip 22 of the cannula 14 to pierce the outer body tissue of the patient, as shown in FIGS. 4A and 4B. The sharp tip 22 of the outer cannula 14 continues to pierce through the patient's skin 63 until the tip 22 reaches a cavity 64 inside the body, as shown in FIG. 4C. When the cavity 64 is reached, the force pushing against the blunt tip 29 of the obturator 18 is removed and the obturator 18 is biased distally of the sharp tip 22 of the cannula 14 by the spring 42. The physician can determine when the blunt tip 29 of the obturator 18 is extending distally of the sharp tip 22 of the cannula 14 by observing the relative positions of the distal end of the obturator hub 38 and the forward shoulder 48 of the handle 26. This

observation is facilitated because the handle-manifold 26 is made, at least in part, of a transparent plastic. Specifically, the physician observes the position of the hub 36 (which is directly attached to the obturator 18) relative to the shoulder 48 (which is connected to the cannula shaft 20). When the hub 38 shifts forward towards the shoulder 48, it is an indication that the blunt tip 29 of the obturator 18 is distal of the sharp tip 22 of the cannula 14, and therefore in the desired abdominal cavity 64. With the tip of the insufflation device in the desired body cavity, gas can be insufflated through the device 10 to enlarge the cavity. At this point, the physician has several alternative options.

A. Alternative Method # 1

According to one method, the physician can insufflate the body cavity without using an optical viewing device. This can be accomplished by attaching a source of insufflating gas to the manifold-handle 26. A source of insufflating gas can be attached to either port 50 or 52 of the handle-manifold 26. The insufflating gas passes into the bore 34 of the handle 26 and is conveyed to the distal end of the insufflation device 10 by means of two flow paths. The first flow path is defined by the annular area 60 between the obturator 18 and the cannula 14 and the second flow path is defined by the area 62 inside the hollow obturator 18. By utilizing both flow paths, the body cavity can be insufflated much more quickly and efficiently. Both these fluid flow paths are available because both fluid flow paths communicate with the bore 34. The second flow path communicates directly with the area of the bore 34 through an opening in the proximal end of the obturator shaft 28. The first flow path communicates with the bore 34 around the hub 36. Passage of insufflating gas across the hub 36 is facilitated by the grooves 49 and the gap 41 provided around the hub 36. After the body cavity is insufflated,

the physician can proceed with the laparoscopic procedure.

B. Alternative Method # 2

After the physician has penetrated the body wall 63, it may be desirable to view the location of the distal end of the insufflation device before fully insufflating the cavity 64. As mentioned before, it may be a concern whether the distal tip of the insufflation device 10 is properly located in the abdominal cavity. It sometimes occurs that the insufflation device reaches a portion of the abdominal wall of the patient that has a gap or void in it or is relatively soft. Also, it is possible that the tip has been inserted too far and has pierced into an internal organ. When this occurs, the obturator 18 may shift forward giving the physician a false indication that the tip is in the proper body cavity. If a substantial amount of gas were to be supplied through the insufflation device when the tip is still in a portion of the patient's abdominal wall or in an organ, complications to the patient might ensue. This difficulty can be avoided through use of the present embodiment.

The embodiment of the insufflation device of FIGS. 1-3 provides the physician with the capability to view the location of the distal end at various stages of use. After the hub 36 has shifted forward indicating that the blunt end 29 of the obturator 18 has shifted forward of the sharp tip 22 of the cannula 14 and before a significant amount of gas has been insufflated into the body cavity, the physician may insert an optical viewing scope 66 through the obturator 18 so that the location of the distal end of the insufflation device can be determined. Specifically, the viewing member 66 is inserted through the port 50 of the handle-manifold 26 and into the shaft 28 of the obturator 18. The optical viewing scope 66 should have a sufficient length relative

to the obturator 18 so that a distal end of the optical viewing member 66 extends through the opening 30 at the distal end of the obturator and distally past the distal end 29, as shown in FIG. 4D. Since the blunt tip 29 of the obturator 18 is distal of the sharp tip 22 of the cannula 14 during insertion of the viewing member 66, the risk of injuring an internal organ of the body is reduced. The optical scope 66 should have a sufficiently small O.D. so that it passes freely through the inside of the obturator and out the distal opening 30. A suitable optical scope is commercially available from Optimed and has an O.D. of 1.48 mm.

With the optical scope 66 inserted in the insufflation device 10, the physician may observe the location of the distal end of the insufflation device through an eyepiece 67 of the viewing scope to determine whether the distal end is properly located in the peritoneum, as shown in FIG. 4D. It may be helpful at this stage to insufflate a small amount of gas through the cannula to clear the area immediately around the distal end of the insufflation device 10 to provide for at least a minimal separation of tissue from the face of the optical scope lens. The small amount of gas that would be insufflated at this stage would be less than the amount normally used to insufflate the peritoneum to perform the surgery in case the distal end of the insufflation device were not properly located. Gas may be insulated through the insufflation device 10 by connecting a supply of gas to the port 52 on the handle 26. Although the viewing device 66 occupies a portion of the insufflating channel inside the obturator 18, because the insufflating gas supplied to the port 52 can also pass both through the obturator 18 and through the annular area 60 between the obturator 18 and the cannula 14, insufflation may still proceed efficiently.

If the physician determines by observation through the viewing scope 66 that the distal end of the

insufflation device 10 is in the proper position in the peritoneum, the physician can operate the gas supply to insufflate additional gas through the port 52 and the surgery can proceed in a usual manner. If during observation through the viewing member 66, the physician determines that the distal end of the insufflation device 10 is still in the skin of the patient, the physician can partially withdraw the scope and advance the insufflation device further into the patient until the cavity 64 has been properly reached. This may be done with the viewing member 66 inside the obturator 18 or fully or partially withdrawn from the obturator. If the tip is spread apart by the scope (as in FIG. 13), the scope should be retracted first. The needle can then be advanced to the new position where the scope may then reinserted and advanced out the obturator.

If at any time during the observation through the optical scope 66, the physician observes that the distal tip of the insufflation device 10 has pierced an organ, he can immediately withdraw the device 10 and thereby avoid further injury by not supplying additional insufflation gas.

It is an advantage of the present embodiment that the position of the sharp tip 22 of the cannula 14 can be ascertained after the physician has observed the conventional "Verres needle"-type signal, i.e. the obturator 18 clicking forward, that indicates that the tip of the insufflation device is in the peritoneal cavity.

Alternative Embodiments

Referring to FIG. 5, there is shown an alternative embodiment of the present invention. This embodiment shows a Verres-type needle 70 used for accessing an internal body cavity of a patient and insufflating a fluid into the cavity. The needle 70 includes an cannula 72 with a sharp tip 74 and a hollow

obturator 76 slidably located inside the cannula 72. The obturator 76 has a blunt tip 78. Located at the end of the blunt tip 78 is an end hole 79. A side hole 80 is located slightly proximally of the end hole 79. The obturator 76 is connected to the cannula 72 so that the blunt tip 78 is biased distally of the sharp tip 74 by a compression spring 81 located in a handle 82 which is connected to the proximal end of the cannula 72. The spring 81 is located in a bore 84 of the handle 82 and is compressed between a rear wall 86 of the handle 82 and a hub 88 connected to a shaft portion 90 of the obturator 76.

The embodiment of FIG. 5 differs from the embodiment of FIGS. 1-3 in that the obturator shaft 90 extends proximally from a proximal end of the handle 82. In one embodiment, the proximal end of the obturator shaft 90 extends approximately 1 inch from the handle 82. Located at a proximal end of the obturator shaft 90 is a manifold 92. The manifold 92 has at least one port and in a preferred embodiment has a first port 94 and a second port 96. The manifold 92 also has a cock 98 associated with it to open either the first port 94 or the second port 96 or to close both ports. Similar to the first embodiment, the embodiment of FIG. 5 provides for high flow through the Verres needle by utilizing both the area inside the obturator 76 as well as the annular area between the obturator 76 and the cannula 72. In the embodiment of FIG. 5, fluid communication between the inside and the outside of the obturator 76 is provided by one or more openings or apertures 100 located through the obturator shaft 90 along a portion located adjacent a proximal portion 102 of the cannula 72. Each of these openings 100 may be approximately 1/8 inches in length. In a present embodiment, there are 2 openings. These openings 100 permit the fluid insufflated into the Verres needle 70 through either the ports 94 or 96 to be conveyed to the distal end of the device through both the

area inside the obturator shaft 90 as well as between the obturator shaft 90 and the cannula 72.

The insufflation device of FIG. 5 may also have another proximal insufflation port 101 located in the handle portion 82. If an insufflation port is located on the handle 82, fluid communication from the bore 84 may be provided across the hub 88 by means of grooves or a gap as described in the previous embodiment, or through additional apertures through the obturator shaft located in the area of the bore 84.

The embodiment of the Verres needle of FIG. 5 may have similar dimensions as the embodiment of FIGS. 1-3. Also, the embodiment of the Verres needle 70 in FIG. 5 may be used in a manner similar to that of FIGS. 1-3 for accessing an internal body cavity and may be used with a separate optical viewing scope in a similar manner.

FIGS. 6-16 show alternative embodiments for the tip portion of an insufflation device. The proximal portions of each of the embodiments in FIGS. 6-16 may be similar to either the embodiment of FIGS. 1-3 or the embodiment of FIG. 5.

In FIG. 6, a blunt tipped obturator 110 extends distally of a sharp tipped cannula 112. In this embodiment, the blunt tipped obturator 110 does not have an end hole. Instead, the blunt end of the obturator 110 is closed. The obturator 110 of this embodiment is provided with a side hole 114. This embodiment may provide for high flow insufflation but may not be suitable for accommodating a separate optical viewing device since there is no opening through which the viewing device can exit.

FIG. 7 shows another embodiment of a high flow Verres-needle. In this embodiment, a blunt tipped

obturator 116 extends past a sharp tipped cannula 118. This embodiment, like the embodiment of FIG. 6, does not include an end hole and therefore is not especially suitable for use with an optical viewing member. The embodiment of FIG. 7 differs from the embodiment of FIG. 6 with the provision of multiple insufflation openings 120 and 122 located through the obturator 116 near the tip. These multiple openings provide for fluid efficiency for insufflation through the device. In a present embodiment, the openings 120 and 122 are located on opposite sides of the obturator shaft. If more than two openings are provided, the openings may be staggered around the circumference of the obturator shaft.

FIG. 8 shows another embodiment of a high flow Verres-needle. In this embodiment, a blunt tipped obturator 124 extends past a sharp tipped cannula 126. A side hole 128 is located through the wall of the obturator 124 near the distal tip. This embodiment has an end hole 130 to accommodate an optical viewing device, however the end hole is covered with a transparent lens 132. The transparent lens 132 shields the viewing device when it is placed in the obturator 124 and helps prevent it from becoming occluded with tissue or blood.

FIGS. 9 and 10 show another embodiment of the high flow insufflation device. In this embodiment, a blunt tipped obturator 134 having a side hole 135 extends past a sharp tipped cannula 136. An end hole 138 located through the tip of the obturator 134 accommodates a viewing device 140 which may be similar to the viewing device 66, noted above. In this embodiment, a closure valve 142 is located in the end hole 138. The closure valve 142 includes resilient flaps 144 that part to accommodate the viewing device 140 and reseal again when the viewing device 140 is removed.

FIG. 11 shows still another embodiment of the high flow insufflation device with a sealed end hole to accommodate an optical fiber scope. In this embodiment, a hollow obturator 146 is located inside a hollow cannula 147. The hollow obturator 146 has an end hole 148. The end hole 148 is occupied by an inner obturator 150. The inner obturator 150 is in place in the hollow obturator 146 but can be removed and replaced with an optical scope if viewing through the insufflation device is required. If viewing is not required, the inner obturator 150 can remain in place and serves to seal the end hole 148. The inner obturator 150 may be made of a suitable metal or plastic material.

FIG. 12 shows another embodiment of the insufflation device with a sealed end hole. In this embodiment, an obturator 154 located inside a cannula 156 has an end hole 158. The end hole 158 is covered by a membrane 160 located across it. The high flow insufflation device in this embodiment can be used without a viewing scope, however, if the physician determines that viewing would be helpful, a scope can be inserted through the obturator 154. The scope punctures the membrane 160 thereby allowing the scope to extend distally of the tip of the obturator 154 to permit viewing of the distal end of the insufflation device.

FIGS 13-16 show another embodiment of the high flow Verres needle. In this embodiment, an obturator 162 is located inside a cannula 164. The blunt tip of the obturator 162 has at least one slit 166 located across it. The obturator 162 is formed of a resilient material. The slit 166 allows the distal end of the obturator to open when an optical scope 167 is inserted through it, as shown in FIG. 14. The resilient obturator 162 recovers its initial closed configuration when the optical scope is removed, as shown in FIG. 13. The blunt end of the

obturator 162 can have one slit 166 as shown in FIG. 15 or can have multiple slits as shown in FIG. 16.

As noted above, the above-described embodiments of the present invention are particularly advantageous for laparoscopy. However, embodiments of the present invention could also be used for other types of medical procedures, such as arthroscopy, with appropriate dimensional modifications. It is intended that the foregoing detailed description be regarded as illustrative rather than limiting and that it is understood that the following claims including all equivalents are intended to define the scope of the invention.

WE CLAIM:

1. A high flow insufflation instrument for laparoscopic surgery comprising:

a hollow cannula having an open distal end and a sharp distal tip at said open distal end;

an obturator having a proximal portion and a distal portion with a blunt distal tip, said obturator located in said hollow cannula and shiftable relative thereto between an advanced position in which said blunt distal tip of said obturator is located distally of said sharp distal tip of said cannula and a retracted position in which said blunt distal tip of said obturator is not located distally of said sharp distal tip of said cannula;

a first insufflation flow passage defined within said obturator and extending from said proximal portion of said obturator to an aperture located in said obturator in said distal portion; and

a second insufflation flow passage defined between an interior wall of said cannula and said obturator and extending from said proximal end of said hollow cannula to said open distal end;

a valve at second insufflation passage for sealing or locking around a scope.

2. The insufflation instrument of claim 1 in which said first insufflation flow passage communicates with a first insufflation port associated with said obturator and said second insufflation flow passage communicates with a second insufflation port associated with said cannula.

3. The insufflation instrument of claim 1 in which said first insufflation flow passage and said second insufflation flow passage communicate with a common insufflation port.

4. The insufflation instrument of claim 1 in which said obturator includes an aperture located in the proximal portion thereof, said aperture providing a fluid communication path between the proximal portion of said obturator and a proximal portion of said cannula.

5. The insufflation instrument of claim 1 in which said first insufflation flow passage has a first cross sectional area and said second insufflation flow passage has a second cross sectional area, and further wherein said second cross sectional area exceeds said first cross sectional area.

6. The insufflation instrument of claim 1 in which said first insufflation flow passage has a first cross sectional area and said second insufflation flow passage has a second cross sectional area, and further wherein said second cross sectional area is approximately twice that of said first cross sectional area.

7. The insufflation instrument of claim 6 in which said first cross sectional area is approximately .004 square inches and said second cross sectional area is approximately .009 square inches.

8. The insufflation instrument of claim 1 further comprising:

a valve in said first insufflation flow passage sized and adapted for receiving an optical scope therethrough and sealing around said scope.

9. A laparoscopic instrument comprising:

a hollow cannula having an open distal end, and a sharp distal tip at said open distal end;

an obturator having a proximal portion and a distal portion with a blunt distal tip, said obturator located in said hollow cannula and shiftable relative

thereto between an advanced position in which said blunt distal tip of said obturator is located distally of said sharp distal tip of said cannula and a retracted position in which said blunt distal tip of said obturator is not located distally of said sharp distal tip of said cannula; and

a first insufflation flow passage defined within said obturator and extending from said proximal portion of said obturator to a sealed aperture located in said obturator in said distal portion.

10. The laparoscopic instrument of claim 9 in which said sealed aperture is defined by at least one flap extending across an opening located in said distal portion.

11. The laparoscopic instrument of claim 9 in which said sealed aperture is defined by a puncturable membrane extending across an opening located in said distal portion.

12. The laparoscopic instrument of claim 9 in which said sealed aperture is defined by a transparent or translucent lens extending across an opening located in said distal portion.

13. The laparoscopic instrument of claim 9 in which said sealed aperture is defined by at least one slot formed in said distal portion of said obturator.

14. The laparoscopic instrument of claim 9 in which said sealed aperture is defined by a plurality of slots formed in said distal portion of said obturator.

15. The laparoscopic instrument of claim 9 further comprising a second distal aperture located in

said distal portion of said obturator, said second distal aperture not being sealed.

16. The laparoscopic instrument of claim 15 in which said second distal aperture is located proximal of said blunt distal tip.

17. The laparoscopic instrument of claim 9 further comprising:

a second insufflation fluid flow passage defined between an interior wall of said cannula and said obturator and extending from a proximal portion of said cannula to said open distal end.

18. The laparoscopic instrument of claim 9 further comprising:

an optical viewing scope having an elongate shaft portion for transmission of optical image from a distal end of said shaft to a proximal end, said elongate shaft of said optical viewing scope located in said first insufflation fluid flow passage.

19. The laparoscopic instrument of claim 18 in which said optical viewing scope is removable from said first insufflation fluid flow passage.

20. The laparoscopic instrument of claim 18 in which said distal end of said shaft of said optical viewing scope extends to said sealed aperture.

21. The laparoscopic instrument of claim 18 in which said distal end of said shaft of said optical viewing scope extends through said sealed aperture.

22. A high flow insufflation instrument for laparoscopic surgery comprising:

a hollow cannula having a proximal end and a sharp distal tip; and

an obturator having a proximal portion and a distal portion with a blunt distal tip, said obturator located in said hollow cannula and shiftable relative thereto between an advanced position in which said blunt distal tip of said obturator is located distally of said sharp distal tip of said cannula and a retracted position in which said blunt distal tip of said obturator is not located distally of said sharp distal tip of said cannula, said obturator defining a flow passage therethrough from said proximal portion of said obturator to both first and second distal apertures located in said distal portion of said obturator.

23. The insufflation instrument of claim 22 in which said first distal aperture is located in said blunt distal tip and said second distal aperture is located proximal of said blunt distal tip.

24. The insufflation instrument of claim 22 in which said first distal aperture and said second distal aperture are located proximally of said blunt distal tip.

25. The insufflation instrument of claim 22 in which said first distal aperture and said second distal aperture are located on opposite sides of said obturator.

26. A method of performing a laparoscopic procedure comprising the steps of:

advancing a sharp-tipped insufflation safety needle through a patient's abdominal wall, said insufflation safety needle having a hollow cannula portion and a distally-biased retractable, hollow obturator portion;

insufflating a fluid through the safety needle via a first flow passage defined within said obturator

portion and extending from a proximal portion of said obturator portion to an aperture located in a distal portion of said obturator portion, and a second flow passage defined between an interior wall of said cannula portion and said obturator portion and extending from a proximal end of said hollow cannula portion to an open distal end.

27. A method of performing a laparoscopic procedure comprising the steps of:

advancing a sharp-tipped insufflation safety needle through a patient's abdominal wall, said insufflation safety needle having a hollow cannula portion and a distally-biased retractable, hollow obturator portion, said hollow obturator portion defining a first passage therewithin extending from said proximal portion of said obturator to a sealed aperture located in said obturator in said distal portion; and

observing an interior of said patient with an optical viewing device located in said first passage.

28. The method of claim 27 further comprising the step of:

puncturing the sealed aperture.

29. The method of claim 27 further comprising the step of:

advancing the optical viewing device through the sealed aperture.

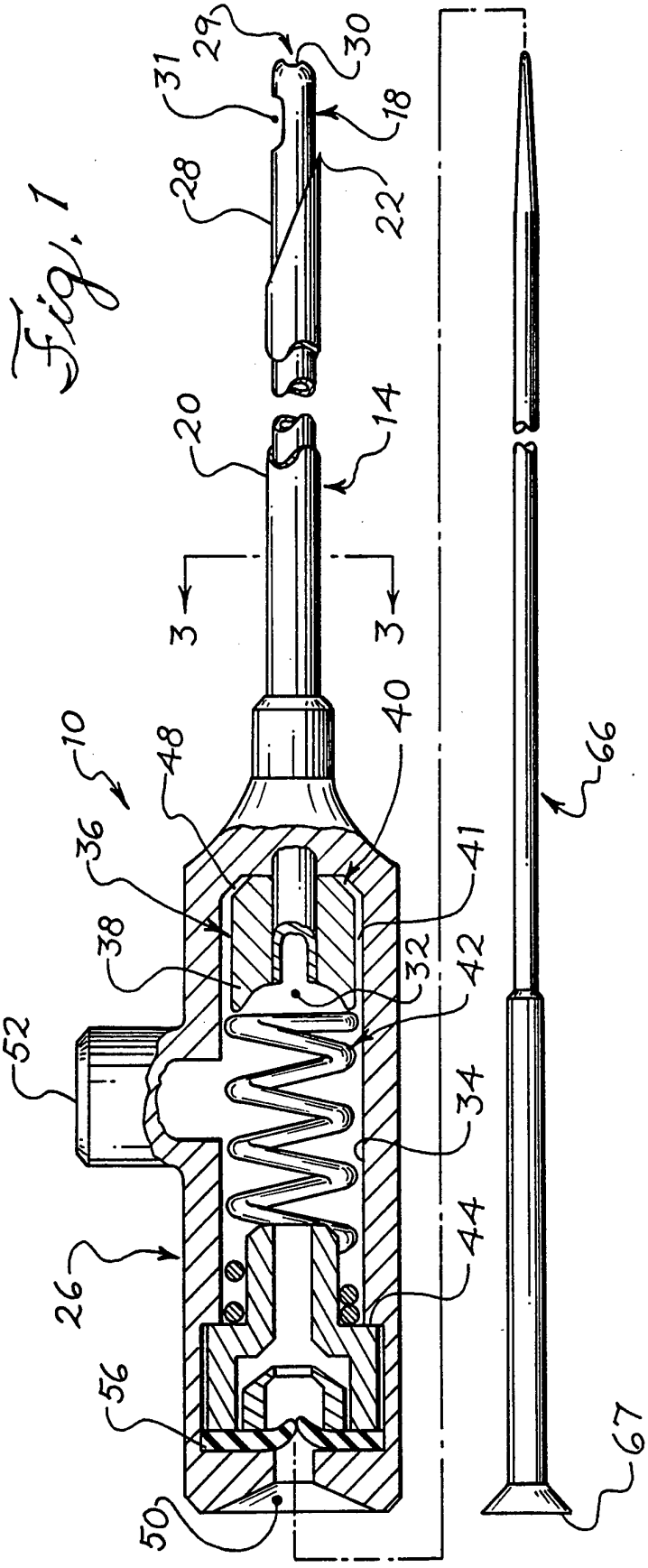

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Fig. 1

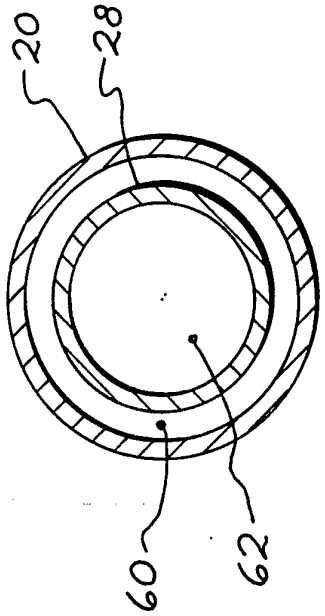

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Fig. 3

Fig. 2

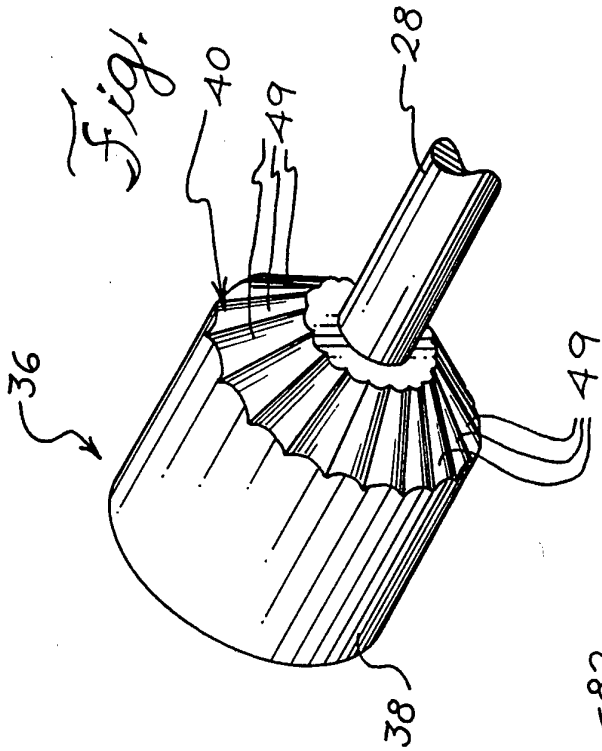
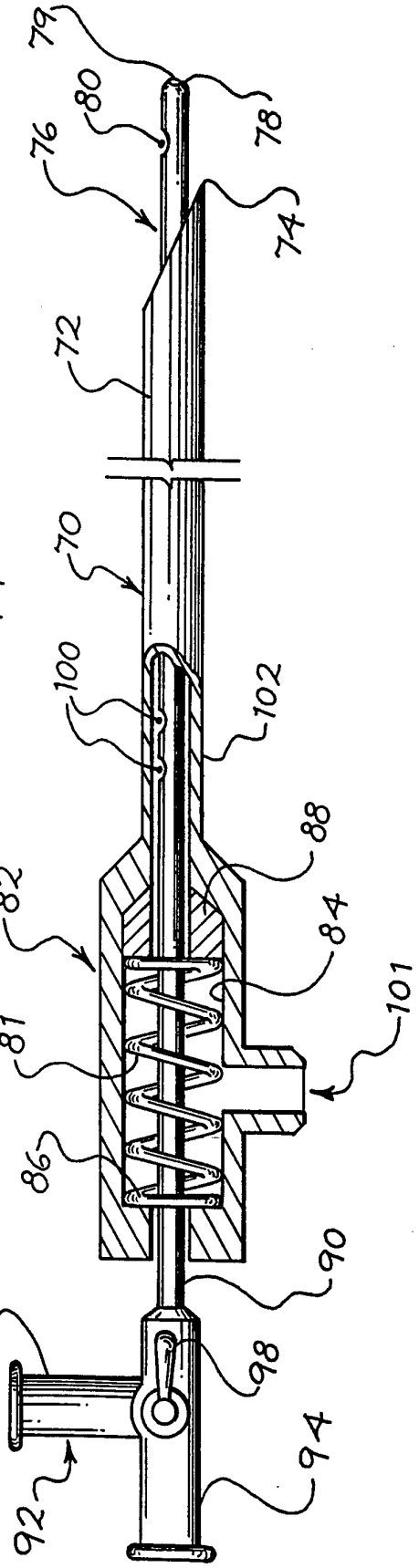

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Fig. 5


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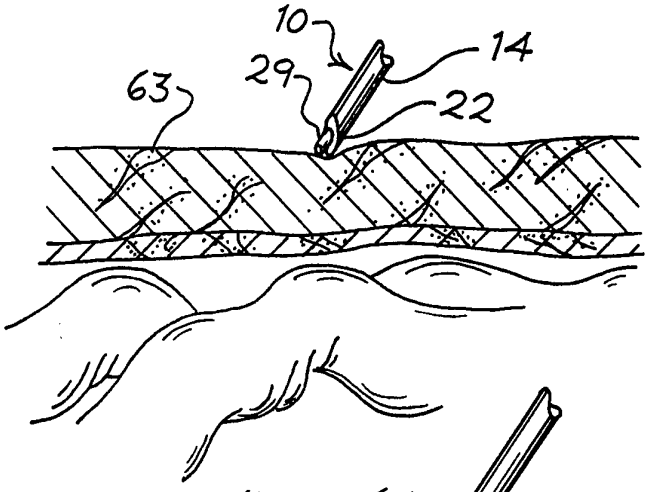


Fig. 4A

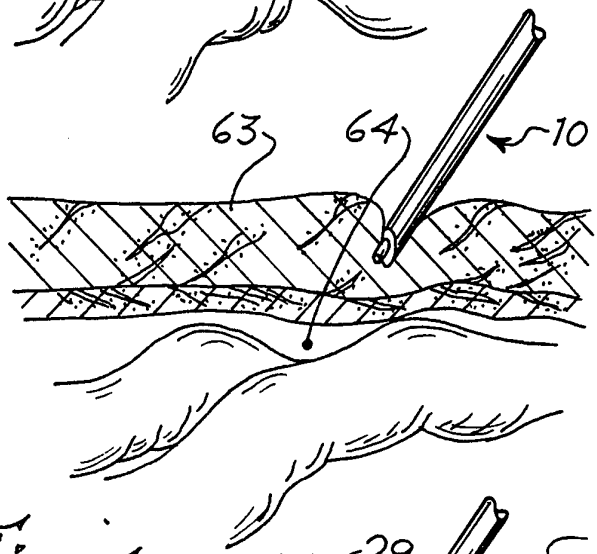


Fig. 4B

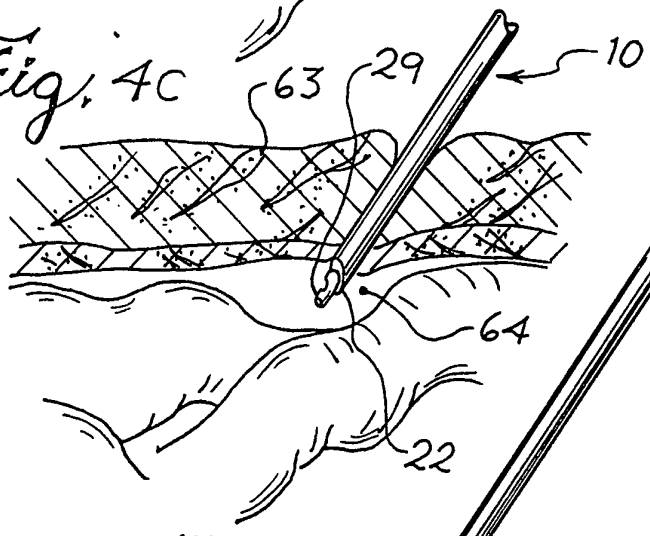


Fig. 4C

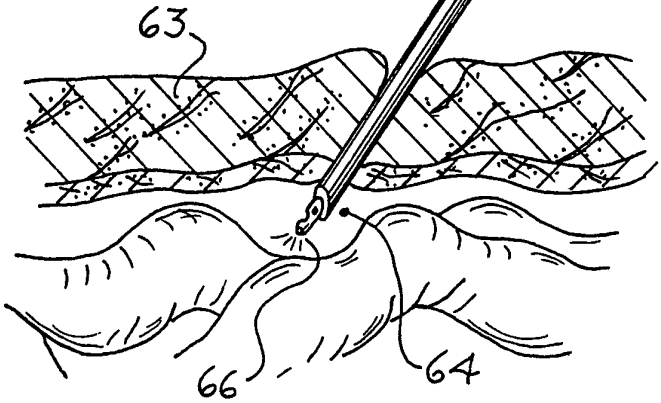
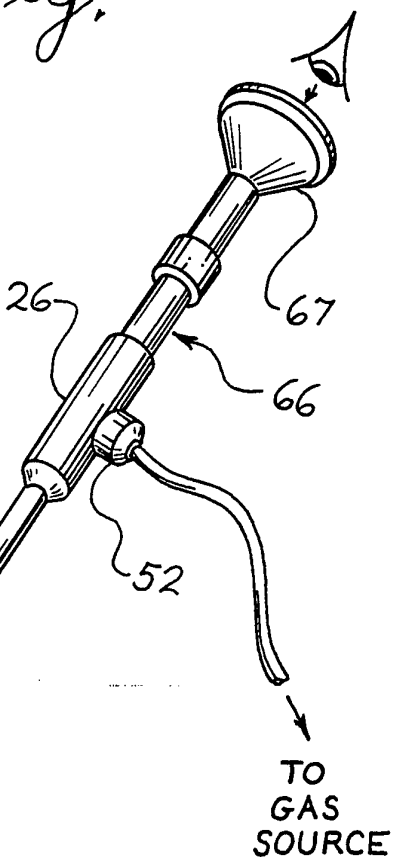


Fig. 4D



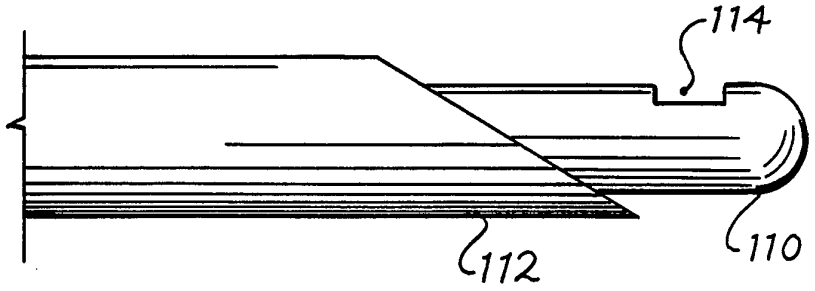


Fig. 6

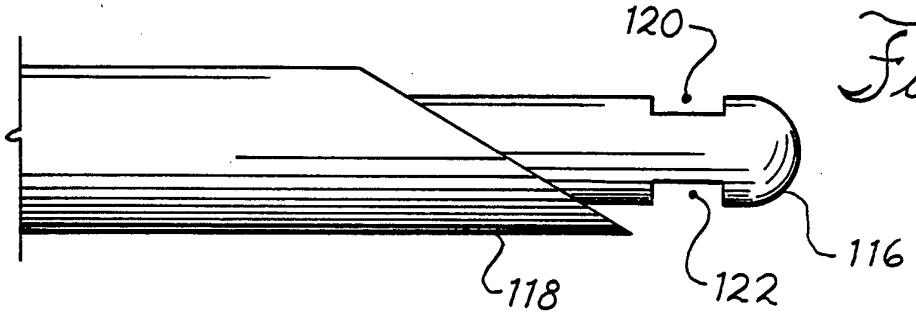


Fig. 7

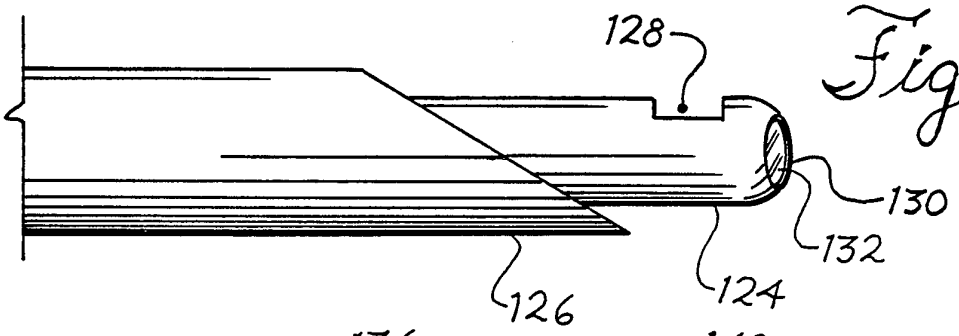


Fig. 8

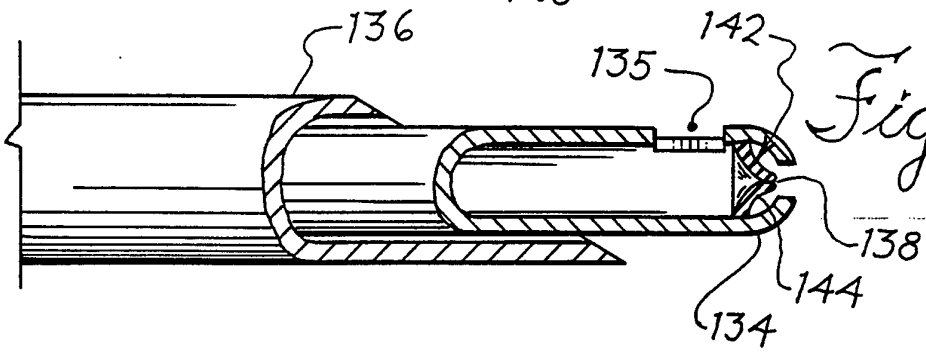


Fig. 9

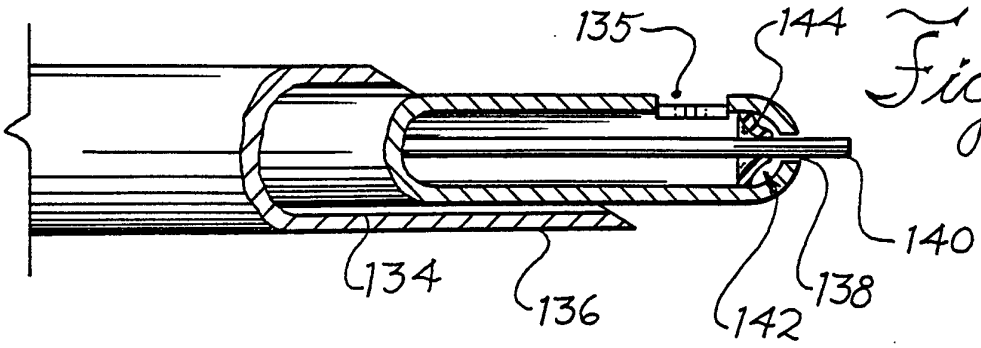


Fig. 10

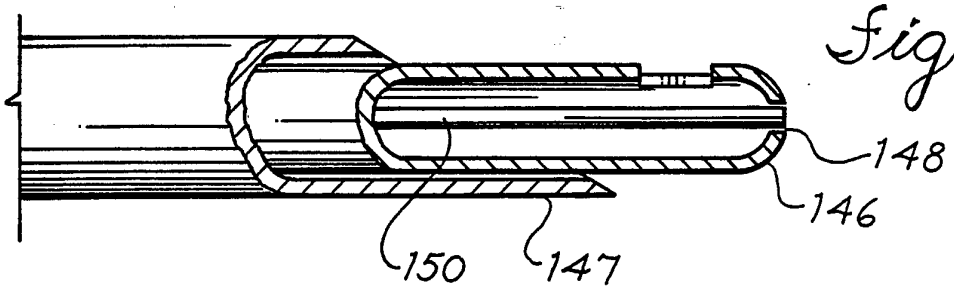


Fig. 11

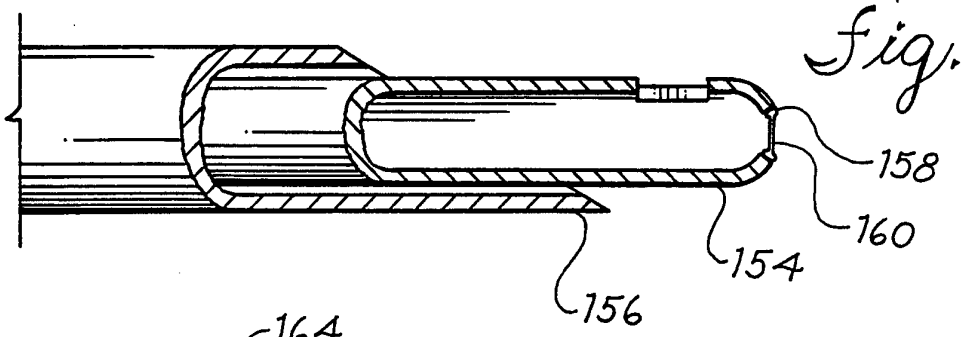


Fig. 12

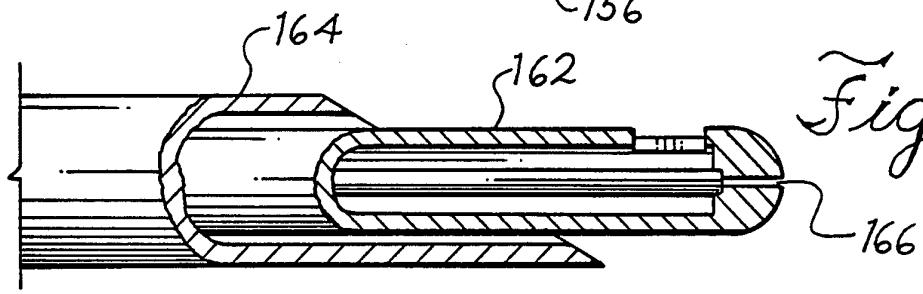


Fig. 13

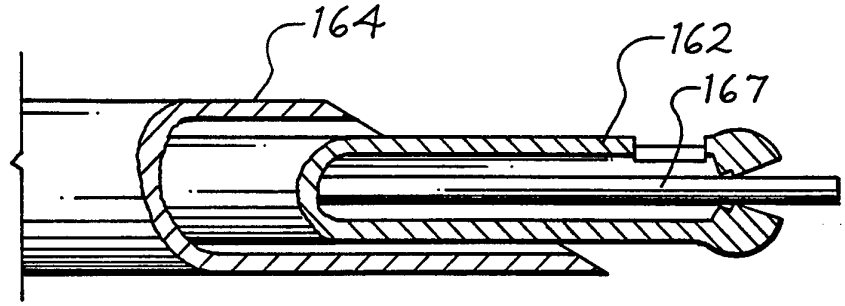


Fig. 14

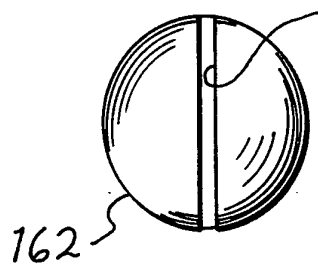


Fig. 15

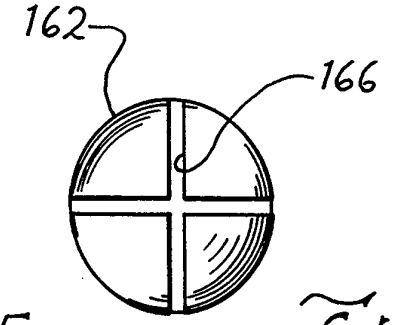


Fig. 16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/07713

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A61M 13/00, 5/178
US CL :604/26; 128/747; 600/123, 129, 154, 156
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 604/26, 58, 167; 128/747; 600/114, 123, 129, 154, 156

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS, DIALOG (MEDLINE, DERWENT, USPAT)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A, 5,137,509 (FREITAS) 11 AUGUST 1992, SEE COL. 5 LINE 10-COL. 6 LINE12.	22, 23
X	US,A, 1,527,291 (ZORRAQUIN) 24 FEBRUARY 1925, SEE ENTIRE DOCUMENT.	22, 24, 25
X --- P Y	US,A, 5,374,252 (BANKS) 20 DECEMBER 1994, SEE COL. 9, LINES 12-68, COL. 5 LINE 5-COL. 7 LINE 41.	26 --- 1, 4-7, 17
Y	US,A, 4,869,717 (ADAIR) 26 SEPTEMBER 1989, SEE COL. 2 LINE 44 - COL. 3 LINE68, COL. 4 LINE 30-COL. 5 LINE48.	1, 4-7
Y	US,A, 4,177,814 (KNEPSHIELD ET AL.) 11 DECEMBER 1979, SEE ABSTRACT.	8

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be part of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 01 OCTOBER 1995	Date of mailing of the international search report 13 OCT 1995
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer KELLY M. MCGLASHEN Telephone No. (703) 308-0858

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/07713

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US,A, 5,271,380 (RIEK ET AL.) 21 DECEMBER 1993, SEE COL. 4 LINE 38-COL. 6 LINE 35.	9, 10, 12, 13, 27
Y, P	US,A, 5,437,626 (COHEN ET AL.) 01 AUGUST 1995, SEE ABSTRACT, FIGURES 9A, 9B.	18-21
Y	US,A, 4,254,762 (YOON) 10 MARCH 1981, SEE COL. 3 LINE 42-COL. 5 LINE 46, COL. 6 LINES 26-62.	9, 10, 12, 17-20

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/07713

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Please See Extra Sheet.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/07713

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING
This ISA found multiple inventions as follows:

I. Claims 1-8 and 22-26 correspond to a first proximal portion invention (Figure 1) and its method of use.
II. Claims 9-25 and 27-29 correspond to a second proximal portion invention (Figure 5) and its method of use.

Group I and II lack unity since there exists no common special technical feature between the two proximal portions.

THE CLAIMS SET FORTH TWO DISTINCT PROXIMAL PORTIONS AND THEIR ASSOCIATED METHOD OF USE, WHICH ARE NOT SO LINKED AS TO FORM A SINGLE INVENTIVE CONCEPT.