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(54) **VISUAL INSUFFLATION PORT**

VISUELLER INSUFFLATIONSPORT

PORT D'INSUFFLATION VISUEL

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Description

Background

[0001] The present invention generally relates to surgical access devices for entering a patient's body, and in particular to visual insufflation obturators providing a visual and gaseous pathway.

[0002] Laparoscopic surgery of the abdominal area typically requires the introduction of an insufflation gas into the peritoneal cavity of the patient. The insufflation gas is usually pressurized to about 10 mm Hg above atmospheric pressure. This in turn lifts the abdominal wall away from the organs underlying it. Cannulas having seals are then placed at various locations through the abdominal wall to allow the use of a laparoscope and operating instruments. It is well known that establishing access to a non-inflated peritoneal cavity can be a very dangerous part of any laparoscopic procedure. The most common method to achieve insufflation is to pass a sharp needle through the abdominal wall and into the abdominal region, and then inject a gas through the needle and into the region thereby creating an enlarged or ballooned cavity to accommodate a laparoscopic procedure. Unfortunately, insertion of the needle has been required without any visual aid to facilitate location of the sharp needlepoint.

[0003] In order to reduce the probability of inadvertent penetration of delicate internal organs in this "blind" procedure, the sharp insufflation needle has been provided with a blunt or rounded member disposed within the lumen of the needle, and biased by a spring to an extended position beyond the needle tip. A drawback of this "blind" insertion is the surgeon may inadvertently contact the organs and tissues underlying the abdominal wall such as major blood vessels and the intestinal tract. Once access is gained, it can take several minutes for the gas to insufflate the abdomen and while this is happening the surgeon may be unaware of any complications caused by the insertion of the needle.

[0004] The Hasson technique can also be used to gain initial access to the peritoneal cavity. This technique involves making a mini-laparotomy and using the fingers to bluntly dissect the tissues of the abdominal wall and thereby creating an access similar to an open surgical procedure. Although generally considered less complicated, it can result in an access site that is not well suited for the subsequent introduction and use of a laparoscopic cannula. The cannula is typically held in place with an additional device that allows the cannula to be tied down with sutures to prevent it from slipping out of the abdominal wall. This may also leave a large defect and is difficult to perform in large abdominal walls.

[0005] Some surgeons have used trocar cannulas with an obturator for the initial entry into the peritoneal cavity. However, in order to allow the subsequent introduction of insufflation gas through the cannula, the trocar cannula must be inserted all the way through the wall of the abdomen and this in turn can be potentially dangerous as the tip of the trocar may have to advance as much as one inch beyond the distal surface of the abdominal wall and into the underlying anatomical structures. Additionally, the obturator must thereafter be removed in order to allow the introduction of the insufflation gas. US 2005/288622 A1 discloses a visual insufflation obturator of the general type to which the present invention relates which addresses some of these issues. However, there remains a need for an improved surgical instrument that provides enhanced visual entry and visual insufflation that minimizes the risks to organs, tissues and vessels underlying a body wall.

Summary

[0006] The present invention provides a visual insufflation obturator as defined by Claim 1 of the attached claims.

[0007] Many of the attendant features of the present invention will be more readily appreciated as the same becomes better understood by reference to the foregoing and following description and considered in connection with the accompanying drawings in which like reference symbols designate like parts throughout.

Brief Description of the Drawings

[0008]

FIG. 1 is a side view of a visual insufflation obturator having a visual insufflation port;
FIGs. 2-3 are side views of alternative obturators;
FIG. 4 is a cross-sectional view of an obturator;
FIG. 5 is a cross-sectional view of a tip of an obturator;
FIG. 6 is a cross-sectional view of a laparoscopic seal and a proximal end of an obturator;
FIGs. 7-14 are side views of various tips of an obturator;
FIGs. 15-19 are cross-sectional views of various tips of an obturator;
FIGs. 20-21 are cross-sectional views of various tips of a visual insufflation obturator in accordance with the present invention;
FIGs. 22-27 are cross-sectional views of various tips of an obturator;
FIG. 28 is a side view of a tip of an obturator;
FIGs. 29-33 are cross-sectional views of various tips of an obturator;
FIG. 34 is a cross-sectional view of an obturator; and
FIGs. 35-37 are cross-sectional views of various tips of an obturator.

Detailed Description

[0009] Obturators with visualization and insufflation properties are described below. A micro-seal within the

distal tip of the obturator enables the outflow (antegrade) of insufflating gasses such as carbon dioxide yet prevents the inflow (retrograde) of moisture and/or body fluids which could obstruct or impair the visualization properties through the distal tip of the obturator. The distal end of the obturator or portions thereof is formed of a material to enable visualization of tissue during the insertion of the obturator through a body wall. An obturator, such as that shown in Figure 1, enables the insertion of a laparoscope 40, which typically includes an imaging element and fiber optic light fibers.

[0010] During an operational exemplary use, the obturator is inserted into and through trocar seal housing 30 and cannula 20. A laparoscope 40 is inserted into the proximal end of the obturator and advanced to the distal tip of the obturator. An endoscopic video camera is attached to the proximal end of the laparoscope. As the surgeon advances the trocar through the body wall, the surgeon can visually observe the tissue through the obturator tip as the tissue is being separated without cutting via a video monitor, which is connected to the endoscopic video camera. The surgeon can also readily determine when the body wall has been traversed to enable the most distal portion of the obturator to enter the body cavity. The most distal portion of the obturator includes insufflation vent holes 12 or apertures through which an insufflation gas may flow from the obturator and into the peritoneal cavity. Insufflation of the abdominal cavity can then occur with minimal entry into the cavity by the obturator thereby reducing unintended contact with tissue or organs. The insufflated abdominal cavity enlarges the surgical area further reducing unintended contact and complications. The obturator can then be removed from the trocar cannula leaving behind a readily usable access port into the abdominal cavity.

[0011] A micro-seal is positioned just proximal to the insufflation apertures or vent holes on the obturator. The micro-seal is located inside the distal tip of the obturator and prevents the ingress of moisture and body fluids, which could impair or obstruct the visibility through the tip of the obturator. The micro-seal acting as a zero seal allows the flow of insufflation gas through the obturator and out through the insufflation vent holes.

[0012] The obturator may be bladeless (non-cutting) and provide visualization of body tissue fibers as they are being separated, a controlled traversal across a body wall, and a trocar, which enables insufflation of a body cavity through the distal tip of the obturator. The obturator accommodates a laparoscope without imposing special requirement on the laparoscope used with the obturator. The bladeless obturator tip also extends beyond the distal end of the trocar cannula and thereby advances ahead of the trocar cannula that can have tips that are angled or shaped with a point or sharp tip. Thus, advancement of the trocar cannula and obturator can be accomplished while avoiding unintended contact by the trocar cannula.

[0013] As shown in FIGs. 1-6, a visual insufflation obturator is shown having an elongate body 5 extending from an obturator handle 3 to a distal tip 7. A laparoscope seal 9 is attached to the obturator handle 3. The elongate body or shaft 5 is hollow having a body lumen extending from the proximal end of the body to a distal end and continuing into a cavity formed in the tip 7. The tip is bladeless with non-cutting edges or surfaces. The handle 3 is hollow having a handle lumen extending from its proximal end to its distal end in communication with the body lumen of the elongate body 7. As such, a viewing channel or pathway is provided from the proximal end of the obturator handle 3 through the elongate body 5 to the tip 7. Also, a gaseous channel or pathway is provided from the elongate body 5 to the tip 7.

[0014] The tip 7 has one or more apertures or holes disposed through the tip. The aperture provides a gaseous pathway from the lumen (interior) of the elongate body and out through the aperture in the tip 7 (exterior of the obturator). One or more apertures or holes through the elongate body provide a gaseous pathway for the flow of insufflation gas from a trocar cannula into the elongate body and out through the aperture in the tip 7, the tip extending beyond the distal end of the trocar cannula. The elongate body can have one or more insufflation channels embedded in or attached to the walls of the elongate body in gaseous communication with the aperture(s) in the tip. Pressurized insufflation gas is introduced through the stopcock 2 into the trocar cannula 20. Trocar seal housing 30 prevents the gas from escaping proximally out from the cannula 20. The gas from the trocar cannula 20 enters the one or more apertures or holes in the elongate body and flows out distally through the aperture in the tip.

[0015] The tip 7 has a micro-seal 11 positioned therein through which insufflation gasses may flow and then out through the hole or aperture 12 in the tip. However, the micro-seal acting as a zero seal is normally closed and therefore prevents moisture and body fluids from flowing into the tip of obturator. In the absence of the micro-seal, moisture and body fluids could flow into the tip 7 of the obturator and create condensation on the inner walls or lumen of the obturator (e.g., elongate body and/or tip) and on the lens of the laparoscope. The condensation can diminish the visibility through the obturator and in some cases, can entirely obstruct the view through the tip 7 of the obturator. The micro-seal 11 prevents the ingress of moisture and body fluids and therefore enhances the visibility through the tip of the obturator while also enabling the flow of insufflation gasses through the tip of the obturator. The micro-seal size is substantially diminished in size and thereby reduces obstruction of the view of a laparoscope inserted into the obturator. The micro-seal may be about 2 to 4 mm in diameter and about 2 to 3 mm tall. The micro-seal provides a one-way pathway allowing insufflation gas to flow out through the tip while preventing gas, fluid, etc. from entering back through the micro-seal.

[0016] The obturator handle 3 provides a place for a surgeon to hold or grasp the obturator. The obturator

handle 3 as shown has a generally domed shape that is connectable to a trocar seal housing 30. The handle may be pistol-like grip or generally flanged portion providing finger grips. The obturator handle can also be manipulated to apply torque to the obturator for insertion of the obturator into the body cavity.

[0017] A laparoscope seal 9 is positioned at the proximal end of the obturator handle 3. The laparoscope seal 9 has a zero seal 8 preventing the egress of insufflation gases when the obturator is used without an inserted laparoscope. The laparoscope seal 9 also includes a septum seal 10 forming a seal with a laparoscope to prevent the egress of insufflation gases when the obturator is used with an inserted laparoscope. The zero seal 8 is a double duckbill valve that minimizes the forces utilized to insert and remove the laparoscope. By minimizing the forces to insert and remove the laparoscope from the laparoscope seal 9, the application of lubricants such as silicone grease or silicone fluid on the laparoscope seal is obviated or minimized. Some form of lubrication such as silicone grease or silicone fluid can be used to reduce the insertion and removal forces of laparoscopic instrumentation. These lubricants however can be transferred to the lens of a laparoscope as the laparoscope is inserted through the trocar seal resulting in distorted and diminished visibility through the laparoscope. As such, the laparoscope seal 9 may enable the laparoscope to be inserted into the obturator and withdrawn from the obturator with minimal force while ensuring that optimal visibility through the laparoscope is maintained.

[0018] The laparoscope seal 9 also minimizes the torque required to rotate the obturator relative to the inserted laparoscope. The trocar cannula with the optical obturator is rotated in an alternating clockwise and counterclockwise fashion during traversal across a body wall. During this time, it is desirable to keep the laparoscope in a rotationally fixed position relative to the trocar and the optical obturator to ensure a stable image on the video monitor. The double duckbill valve incorporated into the laparoscope seal enables the obturator to be easily rotated relative to the inserted laparoscope.

[0019] The micro-seal 11 that prevents the ingress of moisture may be located entirely within the inner walls of the tip 7 of the obturator. With the micro-seal being an internal component, it is not possible to dislodge or separate the micro-seal from the obturator and thereby fall into the surgical site. The micro-seal 11 may be a double duckbill configuration, which enables the maximum flow rate through the valve while minimizing the overall size of the duckbill valve. The double duckbill valve also reduces the amount of pressure required to open the duckbill valve during initial flow of insufflation gasses. This can be desirable as some pressures used during the insufflation of a body cavity are low, e.g., about 15mm Hg.

[0020] The duckbill or double duckbill valve 11 may be a single-piece component, which is injection molded of a transparent material such as silicone or Kraton® to ensure that visibility through the duckbill valve is achieved and thereby ensuring a further reduction in potential obstruction of a laparoscope's view. The duckbill valve 11 can be molded from an opaque material such as polyisoprene to provide contrast between the duckbill valve and the obturator. The duckbill valve 11 can be tinted or colored to provide contrast and to visually indicate proper positioning of the distal tip of the obturator relative to a body wall.

[0021] The duckbill valve 11 is fixed in position via an interference slip fit within the obturator. The obturator may have a small cylinder or cylindrical spacing formed or carved within the tip of the obturator that is in fluid communication with the insufflation vent holes. The duckbill valve 11 is inserted into the cylinder, e.g., via a mandrel and remains in place via the interference slip fit and thereby avoids the use of adhesives or other attachments that may obstruct a laparoscope's view. A flange, lip or projection portion of the micro-seal may be wedged into the cylindrical space in which a ledge engaged with the flange secures the micro-seal in place.

[0022] The obturator in traversing the body wall or conduit can encounter fluids, such as gastric fluids that may damage a laparoscope, and tissue, e.g., fat that may obscure the laparoscope's view. The micro-seal prevents such fluids and tissue from contacting the laparoscope (often an expensive and delicate instrument). The introduction of insufflation gas via the insufflation gas pathway through the micro-seal and out of the tip aperture can also clear the view by expelling fluid or tissue that entered inside and/or positioned around the tip. The obturator also allows subsequent use of the obturator in the same surgical procedure, for example, use for a second, third or more insertion sites as used in some laparoscopic procedures. The micro-seal acting as a zero seal prevents the egress or escape of gas from the insufflated cavity or conduit. As such, the obturator could be used to form additional insertion sites into the insufflated cavity without losing pneumoperitoneum. The subsequent use of the obturator reduces surgical cost, time and other issues that arise from instrument exchanges or introducing additional instruments to the surgical procedure. The micro-seal can also obviate the use of other seals with the initial and/or subsequent use of the obturator.

[0023] The obturator shaft 5 is configured with integral sealing bands 15 at either distal or proximal ends or both to affect a seal between the obturator 10 and mating components of a trocar or other portions of the obturator to prevent the egress of insufflation gases. The obturator 10 has a small integral band of material 15 at its distal tip designed to create an interference fit between the obturator 10 and the trocar cannula 20 with the obturator inserted into the trocar cannula. The interference fit prevents the outflow of insufflation gas between the outer wall of the obturator and the inner bore of the cannula 20. The obturator has a small integral band of material 16 at its proximal end arranged to create an interference fit between the outer wall of the obturator 10 and the inner wall of the trocar handle/seal housing 30. The interfer-

ence fit prevents the outflow of insufflation gas between the inner bore of the trocar handle 30 and the outer wall of the obturator 10.

[0024] The laparoscope seal 9 prevents the egress of insufflation gas and is positioned on the proximal end of the obturator handle 3 via a snap fit with the handle. The laparoscope seal comprises a proximal septum seal 6 and a distal double duckbill valve 8. The laparoscope seal can be a single-piece component, which is injection molded of a transparent or opaque elastomeric material such as silicone, polyisoprene, or Kraton. The laparoscope seal 9 can be coated with a dry lubricant or treated with various materials to further reduce the forces used to insert and withdraw a laparoscope 40 and/or reduce the friction associated with insertion and withdrawal of the laparoscope. Examples of such coatings and treatments include Teflon® coatings, parylene coatings, plasma surface treatments, and chlorination treatments. The duckbill valve of the laparoscope seal 9 may be a single duckbill valve.

[0025] As shown in FIGs. 7-11, the tip 7 of the obturator can have varied configurations each providing a particular functionality and characteristics utilized in a particular surgical procedure and/or user. For example, the obturator has a sharp pointed tip 16 (FIG. 7), a pyramidal tip 17 (FIG. 8), a bladed tip 18 (FIG. 9), sharp edges 18a, or sharpened edges to facilitate traversal through body tissue. The obturator can have a conical blunt tip 19 configuration to facilitate traversal through body tissue (FIG. 10). The obturator has a radiused blunt tip 20 for traversal through an existing body orifice or through relatively soft or fatty tissue (FIG. 11). The tip is bladeless with no cutting or sharp edges or surfaces. The bladeless tip has a generally tapered configuration with an outer surface extending distally to a blunt point with a pair of side sections having a common shape and being separated by at least one intermediate section. The side sections extend from the blunt point radially outwardly with progressive positions proximally along the axis. The tapered configuration facilitates separation or spreading of different layers of the body tissue and provides proper alignment of the tip between the layers. The distal portion of the side sections are twisted radially with respect to the proximal portion of the side sections. The distal portion of the intermediate section is twisted in a first radial direction and the proximal portion of the intermediate section is twisted in a second radial direction opposite the first radial direction. Each tip has an insufflation vent hole or aperture 12 and a micro-seal placed within the tip adjacent to the vent hole 12. The tip 7 and/or shaft 5 or portions thereof can formed of a rigid material, flexible material or a combination thereof.

[0026] The tip may provide and allow viewing through the tip or portion thereof, for example, by using a laparoscope inserted into the obturator. The tip or portions thereof is transparent. One would recognize that transparent would include translucent and other means that provides/allows viewing through at least a portion of the tip with a laparoscope. Windows, viewing channels or magnifiers could be also added or embedded into the tip to enhance laparoscope vision. The tip may have one or more indicators, markings or deformations on the tip for example to identify the position of the tip. Such indicators may have to be positioned close to the aperture to prevent interference with the viewing path of the laparoscope. Likewise, the aperture and/or micro-seal are positioned close to the most distal portion of the tip to also prevent interference with the viewing path of the laparoscope. For example, the aperture may be a few millimeters from the distal portion of the tip and a micro-seal a few millimeters away from the aperture.

[0027] Referring now to FIGs. 12-13, the obturator has screens 21 across the insufflation apertures or vent holes 12 to prevent the ingress of body tissue such as fat into the insufflation vent holes and into tip 7 of the obturator. In place or in addition to the screens, the insufflation vent holes are configured with raised ribs 22 across the diameter of the holes to deflect body tissue away from the holes and thereby prevent the ingress of body tissue into the vent holes and into the tip of the obturator. As shown in FIG. 14, the obturator could also include integral tissue deflectors 23 just distal to the insufflation vent holes that would serve to move body tissue away from the holes and thereby prevent the ingress of body tissue into the holes and into the tip of the obturator. The tissue deflectors 23 may be attached to the tip 7 and be made of an elastomeric material, such as rubber.

[0028] The internal micro-seal 11 may be coated or treated with various materials to enable the duckbill valve to be slightly opened with less force and to increase the insufflation fluid flow characteristics of the duckbill valve. Examples of such coatings and treatments are Teflon® coatings, parylene coatings, plasma surface treatments, and chlorination treatments.

[0029] The internal micro-seal prevents the ingress of moisture and body fluids into the distal tip of the obturator. As previous described and also shown in FIGs. 15-16, the internal micro-seal of the obturator can have varied configurations each providing a particular functionality and characteristics utilized in a particular surgical procedure and/or user. For example, the internal micro-seal is a single or double duckbill valve, a flat disc type valve 25 with either a single slit or a plurality of slits, a double duckbill valve 26 with slits 27 running parallel to the distal end surface of the duckbill and to the longitudinal axis of the duckbill or a combination of valves thereof. The double duckbill valve with slits running parallel to the distal end surface of the duckbill and to the longitudinal axis of the duckbill are lengthened to run up the sides of the duckbill valve, thereby increasing the flow rate through the duckbill valve. The double duckbill valve may alternatively have a single slit, which runs parallel to the distal end surface of the duckbill and to the longitudinal axis of the duckbill.

[0030] As previously described, the obturator is configured with the internal micro-seal and an insufflation

vent hole at the most distal portion of the obturator tip next to the internal micro-seal. As shown in FIG. 17, the vent hole 12' in one aspect is generally coaxial with the longitudinal axis of the obturator. The micro-seal 11 would normally be closed to prevent the ingress of moisture and body fluids. Under pressure from the insufflation gas, the micro-seal 11 would open to enable the flow of the insufflation gas into the body cavity.

[0031] Various other exemplary micro-seals will now be described. In FIGs. 18 and 19, the obturator includes an external spring biased tip 35 at its distal end adjacent to the vent hole 12. The spring 33 biases the tip 35 to a distal position, as shown in FIG. 18. During traversal across a body wall, the body wall provides a compressive force on the tip 35 moving the tip 35 to a proximal or sealed position, as shown in FIG. 19. While in the proximal position (FIG. 19), the tip 35 prevents the ingress of moisture and body fluids into the obturator by sealing the insufflation vent hole 12. Once the tip of the obturator enters the body cavity, the tip 35 deploys into the distal unsealed position of FIG. 18. The insufflation gas is then transferred through perpendicular vent holes 12 and into the body cavity. The tip 35 may, through movement between the sealed and unsealed positions and vice versa, provide a visual indication to the surgeon that access into the body cavity had been achieved, which may be enhanced by colour coding the tip 35.

The tip 35 may also provide an audible indication, e.g., a snap, to the surgeon that access into the body cavity has been achieved.

[0032] Referring now to FIGs. 20-21, an obturator, in accordance with the present invention, has a non-biased moveable tip 36 at its distal end. The tip 36 is initially positioned in a distal unsealed position. During traversal across a body wall, the body wall provides a compressive force on the tip moving it to a proximal sealed position covering and sealing the vent hole 12. While in the proximal position, the tip 36 prevents the ingress of moisture and body fluids into the obturator. Once the tip of the obturator enters the body cavity, the movable tip would remain in the proximal sealed position. During pressurization of the obturator via insufflation gas, the moveable tip 36 would be forced to the distal unsealed position thus allowing the flow of insufflation gas through the vent hole 12 and into the body cavity. The movable tip in one aspect also comprises an o-ring or an elastomeric seal at its proximal end to assist in sealing the movable tip 36 with the internal walls of the obturator.

[0033] In FIGs. 22-23, an obturator has an internal check valve in the distal tip of the obturator near the vent hole 12. The check valve comprises a piston 37 in a cylinder with a spring 38 positioned below the piston such that the piston is biased in a proximal sealed positioned. In the proximal sealed position, the piston seals one or more perpendicular insufflation vent holes 12. During pressurization of the obturator via insufflation gas, the top of the piston is exposed to the pressure and thus is moved to a distal unsealed position allowing the insufflation gas to flow through the vent holes 12 and into the body cavity. The piston 37 can be injection molded of a transparent polycarbonate material.

[0034] In FIG. 24, the obturator has a membrane 41 positioned inside the distal tip 7 of the obturator which prevents the ingress of moisture and body fluids from the vent hole 12 yet allows insufflation gasses to flow through the membrane 41 and out the vent hole 12. The membrane 41 is porous and is formed from a hydrophobic material such as Gore-Tex® material. The membrane 41 is inserted into a small cylinder within the distal tip of the obturator adjacent to the insufflation vent hole 12. The membrane is also bonded or welded to the inside wall of the distal tip 7 of the obturator.

[0035] Referring now to FIG. 25, the obturator has a perforated membrane 43 positioned inside the distal tip 7 of the obturator, as an alternative to a duckbill valve, for example, which prevents the ingress of moisture and body fluids from the vent hole 12. The perforated membrane 43 tears open or bursts apart when exposed to the pressure of the insufflation gas allowing the insufflation gas to flow out through the insufflation vent holes 12 and into the body cavity. The membrane 43 is formed from paper, cellophane, polyethylene, or polyurethane. The membrane 43 provides a single use visual insufflation port. For example, once the membrane 43 tears open and the insufflation gas flow halts, the ingress of moisture and/or body fluids will not be stopped by the torn perforated membrane 43. Thus, the re-use of the obturator is prevented thereby if so arranged the obturator can be designated as a disposable or single-use instrument preventing unintended operation or improper sterilization of the used obturator.

[0036] As shown in FIG. 26, the obturator has an elastomeric external valve 45 such as an umbrella valve at the distal end of the obturator. The umbrella valve 45 is flush with the distal end of the obturator and covers longitudinal insufflation vent holes 12". The umbrella valve moves distally relative to the tip 7 of the obturator when exposed to the pressure of the insufflation gas. The insufflation gas flows though the vent holes into the body cavity. The umbrella valve 45 is attached to the distal tip of the obturator via an integral elastomeric stem 46, which runs through a central axial hole in the obturator. As the obturator is pressurized via the insufflation gas, the elastomeric stem 46 elongates to enable the external portion of the umbrella valve 45 to move distally thus unblocking the vent holes 12" and allowing insufflation gas to flow through the vent holes and into the body cavity. The umbrella valve 45 in its initial or normal condition also prevents the ingress of moisture and body fluids into the obturator during insertion into a body cavity by blocking the vent holes 12" and ensures that optimal visibility through the laparoscope and the obturator is maintained. The umbrella valve 45 is a single-piece component, which is injection molded of a transparent or opaque silicone, polyisoprene, or Kraton® material.

[0037] In FIG. 27, the obturator has an elastomeric in-

ternal umbrella valve 49 at the distal end of the obturator. The umbrella valve 49 is positioned just proximal to perpendicular or longitudinal vent hole 12' at the distal tip of the obturator. The umbrella valve 49 covers one or more intermediate flow channels 42 to prevent the ingress of moisture and body fluids into the obturator during insertion into a body cavity. During pressurization from the insufflation gas, the elastomeric stem 48 of the umbrella valve 49 elongates to enable distal movement of the umbrella valve thus allowing the insufflation gas to flow through the intermediate flow channel or channels 42, out through the insufflation vent hole 12', and into the body cavity. The internal umbrella valve 49 may be is a single-piece injection molded component formed from a transparent or opaque silicone, polyisoprene, or Kraton® material.

[0038] In FIG. 28, the obturator in one aspect comprises one or more over-molded elastomeric valves 51 at the tip 17 of the obturator. The elastomeric valves 51 can be flat disc type valves that are formed of materials such as polyisoprene, Kraton®, and silicone materials. The elastomeric valves 51 encases perpendicular insufflation vent holes 12 at the distal tip 7 of the obturator and with slits 52 in the valves, such that the slits are normally closed to prevent the ingress of body fluids and moisture. Under pressure from the insufflation gas, the slits 52 in the valves slightly open enabling the insufflation gas to flow into the body cavity. Once pressure from the insufflation gas is removed, the slits 52 in the valves close thereby preventing the ingress of body fluids and moisture through the vent holes 12.

[0039] As shown in FIG. 29, the obturator may have a single over-molded elastomeric valve 53 covering a portion or apex portion of the distal tip 7. The elastomeric valve 53 encases a single longitudinal insufflation vent hole 12' at the distal tip 7 of the obturator. The elastomeric valve 53 has a slit 54 at its distal end or apex generally aligned with the longitudinal vent hole 12' such that the slit 54 is normally closed to prevent the ingress of body fluids and moisture. Under pressure from the insufflation gas, the slit 54 in the valve slightly opens enabling the insufflation gas to flow into the body cavity. The elastomeric valve 53 also encase a pair of perpendicular insufflation vent holes. The elastomeric valve may encase a plurality of longitudinal insufflation vent holes 12' at the distal end of the tip 7 of the obturator.

[0040] Referring now to FIG. 30, the obturator has an internal elastomeric flapper valve 55 located proximal to the perpendicular insufflation vent holes 12. The flapper valve 55 may be a single-piece component with a hinged flapper door. The flapper door remains closed during traversal of the obturator across a body wall to prevent the ingress of moisture and body fluids into the distal tip of the obturator from the vent holes 12. Under pressure from the insufflation gas, the flapper door opens enabling the insufflation gas to flow into the body cavity.

[0041] As shown in FIGs. 31-32, the obturator has longitudinal and/or concentric inner and outer tubes 56,57 where the inner tube 56 rotates freely within the outer tube 57 about a central axis of the obturator. Both the inner tube 56 and the outer tube 57 have insufflation vent holes 58,59. During traversal across a body wall, the inner tube 56 is rotationally positioned such that the vent holes 58 in the inner tube 56 are not aligned with the vent holes 59 in the outer tube 57 thus creating a sealed condition to prevent the ingress of moisture and body fluids into the tip 7 of the obturator. Upon entry into the body cavity, the inner tube 56 is rotated such that the vent holes 58 on the inner tube are aligned with the vent holes 59 on the outer tube 57 allowing the flow of insufflation gas through the vent holes 58,59 and into the body cavity. The inner tube 56 and/or the outer tube 57 may be injection molded of transparent polycarbonate materials.

[0042] Referring now to FIG. 33, the obturator shaft 5 is formed of a flexible material with a rigid or semi-rigid tip 7, arranged to be used with a flexible scope, and without a cannula 20 to visually gain access to an area within a body including but not limited to a body conduit, a body cavity, a body organ, and a body wall. The obturator has a longitudinal vent hole 12' in the tip 7 with the micro-seal, e.g., duckbill valve, positioned proximal to the vent hole in the tip of the obturator. The micro-seal prevents the ingress of moisture, body tissue, and body fluids enabling precise visual placement of the tip 7 of the obturator into a targeted area. Once the obturator is properly positioned within the body, the area surrounding the obturator is insufflated with an insufflation gas to facilitate access to the targeted area. Another device can be inserted into a working channel of the obturator to conduct a surgical procedure such as brachytherapy or a breast biopsy. The surgical procedure, such as a breast biopsy, could be completed with or without visualization. The obturator could also include other types of internal micro-seals such as flapper valves or disc type valves. The internal micro-seal acting as a zero seal could also include a septum or instrument seal to seal around inserted instruments.

[0043] As the obturator traverses body tissue, pressurized insufflation gas are utilized to separate or dissect tissue away from the tip 7 of the obturator 5 thus lowering the force required to traverse the body tissue. The insufflation gas flows through the distal insufflation vent holes in the obturator 5 and into the body tissue forcing the body tissue away from the obturator tip 7. The insufflation gas is also used to separate relatively soft body tissue to enable access to a targeted body area within a relatively confined space. The obturator 5 can be formed of either a flexible material or a rigid material and used with or without a cannula 20.

[0044] In especially tortuous body conduits or surgical access pathways, the micro-seal preventing the ingress of fluid and/or tissue, e.g., fat, provides the ability to leave the laparoscope inserted into the obturator as it travels the pathway, thereby enhancing accuracy in movement of the obturator and access to the surgical site. As such, removal of the laparoscope to clean and/or de-fog the

scope is avoided. Also, it may not be feasible, to subsequently re-enter the laparoscope and obturator into the body conduit after removal of the laparoscope.

[0045] As shown in FIG. 34, the inside wall 71 of the tip 7 of the obturator is coated with an anti-fog solution to prevent excessive moisture from collecting on the inner wall of the obturator and to assist in maintaining optimal visibility through the tip of the obturator. The anti-fog solution is used with or without a valve in the tip of the obturator. A valve in the tip of the obturator may be replaced with two perpendicular vent holes 12 in the tip 7 of the obturator. The anti-fog solution is applied via a dipping or coating process and then allowed to dry. Upon exposure to moisture, the anti-fog agent activates thereby preventing condensation from collecting on the inside walls 71 of the obturator. The anti-fog solution can be formulated from a mixture of 1% by weight docusate sodium and 99% by weight distilled water.

[0046] The laparoscope seal 9 is coated with an anti-fog solution such that as the laparoscope passes through the laparoscope seal, the lens of the laparoscope is coated with the anti-fog solution. Once the laparoscope lens is coated with the anti-fog solution, condensation will not form on the laparoscope lens or is greatly minimized thereby maintaining optimal visibility during traversal of the obturator across a body wall. The laparoscope seal comprises an insert, pad or cap 73 saturated with an anti-fog solution. The insert 73 of the laparoscope seal 9 may be a form with a single slit, a plurality of slits, an aperture, or a combination thereof defining a passageway for the laparoscope through the foam. As the laparoscope is inserted into the obturator, the laparoscope passes through the saturated foam 73 thereby coating the lens of the laparoscope with the anti-fog solution. Once the lens of the laparoscope is coated with the anti-fog solution, condensation will not form on the laparoscope lens or is greatly minimized thereby maintaining optimal visibility during traversal of the obturator across a body wall. One or more applicators, e.g., foam or gel rollers or cylinders, saturated with anti-fog solution, may be positioned within the handle of the obturator, such that as the laparoscope passes through the applicator coats the lens of the laparoscope with anti-fog solution.

[0047] The insert, pad or cap 73 can be formed, entirely or partially, from various materials such as silicone foam, polyurethane foam, polyethylene foam, ethylene vinyl acetate foam, PVC foam, felt, and cotton. The saturated cap may be bonded to the proximal end of the obturator and/or the proximal end of the laparoscope seal. To prevent evaporation of the anti-fog solution, the obturator is packaged in a non-breathable package such as a mylar pouch or a foil pouch, both of which could be sterilized via gamma radiation sterilization or electron beam sterilization. The cap 73 can also be contained within a sealed section of the obturator to prevent migration of the anti-fog solution from the cap.

[0048] In FIG. 35, the obturator has a transparent lens 81 fitted adjacent to or into the tip 7 of the obturator that includes an internal elastomeric seal 83 configured to seal around the outside diameter of the laparoscope. The lens 81 encases the tip of the laparoscope to prevent fogging of the laparoscope. The lens 81 and/or the elastomeric seal 83 is arranged to have a relatively close fit with the outside diameter of the laparoscope 40 to minimize the flow of moisture into the space between the lens 81 and the distal tip of the laparoscope. The lens is also coated with an anti-fog solution to prevent condensation from collecting on the lens. The lens 81 is shaped to provide additional magnification of the image. The additional magnification of the image provided by the lens enhances the visibility of the surrounding tissue during traversal of the obturator 10 across a body wall. The thickness of the lens 81 may range from about .001" to about .250". The lens 81 may be formed from various transparent materials including glass, infrared absorbent glass, polycarbonate, acrylic, polyvinyl chloride, PET, PETE, PETG, cellophane, silicone, polyurethane, polyetherimide, polyamide, and polysulfone. The lens 81 is positioned such that the lens does not obstruct the insufflation pathway through the elongate body and out the aperture in the tip. An insufflation channel parallel with the longitudinal axis of the elongate body assists in providing a pathway around the lens extending across the tip cavity and out through the aperture in the tip.

[0049] Referring now to FIG. 36, the obturator 10 has a transparent disc lens 85 fitted into the tip 7 of the obturator 10. The distal end of the laparoscope 40 is juxtaposed to the disc lens 85. Heat generated by the light from the laparoscope serves to heat the polycarbonate disc lens 85, which in turn heats the lens of the laparoscope 40 to prevent condensation from forming on the lens of the laparoscope 40. The disc lens 85 is coated with an anti-fog solution to prevent condensation from forming on the lens 85. The thickness of the lens 85 ranges from about .001" to about .250". The lens 85 is formed from various transparent materials such as glass, infrared absorbent glass, polycarbonate, acrylic, polyvinyl chloride, PET, PETE, PETG, cellophane, silicone, polyurethane, polyetherimide, polyamide, and polysulfone.

[0050] In FIG. 37, the obturator has a transparent disc lens 85 as described above with an elastomeric perimeter seal 88 loosely positioned on the proximal side of the lens. The seal in one aspect is arranged as an o-ring or a planar type seal and serves to create a seal between the distal end of the laparoscope and the proximal face or side of the disc lens 85. The seal 88 prevents body moisture from contacting the lens of the laparoscope 40 and therefore prevents condensation from collecting on the laparoscope lens. The disc lens 85 in one aspect is coated with an anti-fog solution to prevent condensation from collecting on the surfaces of the disc lens 85. The elastomeric perimeter seal 88 is formed from various materials such as polyisoprene, silicone, urethane, ethylene propylene diene monomer, Kraton®, nitrile, neoprene, or various closed cell foam materials. The elastomeric perimeter seal 88 is adhered to the disc lens 85 through an

over-molding process. The elastomeric perimeter seal 88 is bonded to the disc lens 85 with an adhesive.

[0051] Although this invention has been described in certain specific embodiments, many additional modifications and variations will be apparent to those skilled in the art. It is therefore to be understood that this invention may be practiced otherwise than specifically described, including various changes in the size, shape and materials, without departing from the scope of the present invention as defined by the claims.

Claims

1. A visual insufflation obturator for traversing a body wall comprising:

   an elongate shaft (5) having a proximal end, a distal end and a shaft lumen extending from the proximal end of the elongate shaft to the distal end of the elongate shaft;
   a handle (3) connected to the proximal end of the elongate shaft (5) and having a handle lumen extending from a proximal end of the handle (3) to the proximal end of the elongate shaft (5) and being connected to the shaft lumen;
   a transparent tip (7) connected to the distal end of the elongate shaft (5) and having a tip cavity, the transparent tip (7) having an outer surface and a distal end with a vent hole (12) extending through the outer surface into the tip cavity and defining an insufflation gas pathway from the elongate shaft out through the vent hole (12) for delivering insufflation gas under pressure; the tip cavity having a progressively decreasing diameter less than the diameter of the shaft lumen;
   a movable tip (36) connected to the transparent tip (7) and located adjacent to the vent hole (12);
   characterized by the movable tip (36) being adapted to move from a proximal to a distal position thereby respectively sealing and unsealing the vent hole (12) under, respectively, the compressive force during traversing the body wall and the pressurization of the insufflation gas.

2. The obturator of claim 1, wherein the body lumen has a diameter less than a diameter of the handle lumen.

3. The obturator of claim 1 or claim 2, further comprising a cannula (20) having a proximal end and a distal end, the elongate shaft (5) and tip movable into the cannula (20) and removable from the cannula (20) with the handle (3) extending away from the proximal end of the cannula (20) and the tip (7) extending through and beyond the distal end of the cannula (20).

4. The obturator of claim 3, further comprising a laparoscope (40) movable into and out of the handle and body lumen of the elongate shaft (5).

5. The obturator of any of claims 1 to 4, wherein the transparent tip (7) is partially obscured.

6. The obturator of any of claims 1 to 5, further comprising a laparoscope seal (9) attached to the proximal end of the elongate shaft (5) and positioned in a direct pathway of the shaft lumen, the laparoscope seal (9) having a zero seal (8) and an instrument seal (6, 10) axially aligned to and proximal to the zero seal (8).

7. The obturator of any of claims 1 to 6, further comprising a lens (81, 85) located within the tip cavity before the vent hole (12) and a distal enclosed end of the transparent tip (7), the lens (81) being coated with an anti-fog solution.

8. The obturator of claim 7, further comprising an elastomeric perimeter seal (83, 88) located within the tip cavity adhered to the lens (81).

9. The obturator of claim 7 or claim 8, wherein the lens (81, 85) has a thickness of 0.025 mm (0.001 inches) to 6.4 mm (0.250 inches).

10. The obturator of any of claims 7 to 9, further comprising an insufflation channel parallel with a longitudinal axis of the elongate shaft (5).

11. The obturator of claim 1 further including an o-ring or an elastomeric seal at the proximal end of the moveable tip (36) to assist in sealing the moveable tip (36).

12. The obturator of claim 1 wherein the movable tip (36) is non-biased.

13. The obturator of claim 1 wherein the movable tip (36) is arranged to prevent the ingress of moisture and body fluids into the obturator while in the proximal position.

Patentansprüche

1. Visueller Insufflationsobturator zum Durchqueren einer Körperwand, der Folgendes umfasst:

   einen länglichen Schaft (5), der Folgendes aufweist: ein proximales Ende, ein distales Ende und ein Schaftlumen, das sich von dem proximalen Ende des länglichen Schafts zu dem distalen Ende des länglichen Schafts erstreckt;
   einen Griff (3), der mit dem proximalen Ende

des länglichen Schafts (5) verbunden ist und ein Grifflumen aufweist, das sich von einem proximalen Ende des Griffs (3) zu dem proximalen Ende des länglichen Schafts (5) erstreckt und mit dem Schaftlumen verbunden ist;
eine transparente Spitze (7), die mit dem distalen Ende des länglichen Schafts (5) verbunden ist und einen Spitzenhohlraum aufweist, wobei die transparente Spitze (7) Folgendes aufweist: eine äußere Oberfläche und ein distales Ende mit einem Entlüftungsloch (12), das sich durch die äußere Oberfläche in den Spitzenhohlraum erstreckt und einen Insufflationsgasweg aus dem länglichen Schaft heraus durch das Entlüftungsloch (12) für die Abgabe von Insufflationsgas unter Druck definiert; der Spitzenhohlraum einen zunehmend abnehmenden Durchmesser aufweist, der kleiner als der Durchmesser des Schaftlumens ist;
eine bewegliche Spitze (36), die mit der transparenten Spitze (7) verbunden ist und sich benachbart zu dem Entlüftungsloch (12) befindet;
dadurch gekennzeichnet, dass die bewegliche Spitze (36) zur Bewegung von einer proximalen zu einer distalen Position geeignet ist, wodurch das Entlüftungsloch (12) unter der Druckkraft während des Durchquerens der Körperwand bzw. der Druckausübung des Insufflationsgas verschlossen bzw. geöffnet wird.

2. Obturator nach Anspruch 1, wobei das Körperlumen einen Durchmesser aufweist, der kleiner als ein Durchmesser des Grifflumens ist.

3. Obturator nach Anspruch 1 oder Anspruch 2, der weiter eine Kanüle (20) umfasst, die ein proximales Ende und ein distales Ende aufweist, wobei der längliche Schaft (5) und die Spitze in die Kanüle (20) bewegt und aus der Kanüle (20) entfernt werden können, wobei sich der Griff (3) weg von dem proximalen Ende der Kanüle (20) erstreckt und sich die Spitze (7) durch und über das distale Ende der Kanüle (20) hinaus erstreckt.

4. Obturator nach Anspruch 3, der weiter ein Laparoskop (40) umfasst, das in und aus dem Griff und Körperlumen des länglichen Schafts (5) beweglich ist.

5. Obturator nach einem der Ansprüche 1 bis 4, wobei die transparente Spitze (7) teilweise undurchsichtig ist.

6. Obturator nach einem der Ansprüche 1 bis 5, der weiter eine Laparoskopdichtung (9) umfasst, die an dem proximalen Ende des länglichen Schafts (5) angebracht ist und in einem direkten Weg des Schaftlumens positioniert ist, wobei die Laparoskopdichtung (9) eine Nulldichtung (8) und eine Instrumentendichtung (6, 10), die axial zu und proximal zu der Nulldichtung (8) ausgerichtet ist, aufweist.

7. Obturator nach einem der Ansprüche 1 bis 6, der weiter eine Linse (81, 85) umfasst, die sich innerhalb des Spitzenhohlraums vor dem Entlüftungsloch (12) und einem distalen eingeschlossenen Ende der transparenten Spitze (7) befindet, wobei die Linse (81) mit einer Antibeschlaglösung beschichtet ist.

8. Obturator nach Anspruch 7, der weiter eine elastomere umlaufende Dichtung (83, 88) umfasst, die sich innerhalb des Spitzenhohlraums befindet, die an der Linse (81) haftet.

9. Obturator nach Anspruch 7 oder Anspruch 8, wobei die Linse (81, 85) eine Dicke von 0,025 mm (0,001 Zoll) bis 6,4 mm (0,250 Zoll) aufweist.

10. Obturator nach einem der Ansprüche 7 bis 9, der weiter einen Insufflationskanal parallel zu einer Längsachse des länglichen Schafts (5) umfasst.

11. Obturator nach Anspruch 1, der weiter einen O-Ring oder eine elastomere Dichtung an dem proximalen Ende der beweglichen Spitze (36) einschließt, um die Abdichtung der beweglichen Spitze (36) zu unterstützen.

12. Obturator nach Anspruch 1, wobei die bewegliche Spitze (36) nicht vorgespannt ist.

13. Obturator nach Anspruch 1, wobei die bewegliche Spitze (36) angeordnet ist, um das Eindringen von Feuchtigkeit und Körperflüssigkeiten in den Obturator, während er in der proximalen Position vorliegt, zu verhindern.

Revendications

1. Un obturateur d'insufflation visuel pour traverser une paroi de corps comprenant :

Une tige allongée (5) ayant une extrémité proximale, une extrémité distale et une lumière de tige s'étendant de l'extrémité proximale de la tige allongée à l'extrémité distale de la tige allongée ;
Une poignée (3) connectée à l'extrémité proximale de la tige allongée (5) et dotée d'une lumière de poignée s'étendant de l'extrémité proximale de la poignée (3) à l'extrémité proximale de la tige allongée (5) et reliée à la lumière de la tige ;
Une pointe transparente (7) connectée à l'extrémité distale de la tige allongée (5) et dotée d'une cavité de pointe, cette pointe transparente (7)

ayant une surface extérieure et une extrémité distale dotée d'une ouverture (12) s'étendant à travers la surface extérieure vers la cavité de pointe, et définissant un conduit d'insufflation de gaz de la tige allongée à travers l'ouverture (12) pour envoyer du gaz d'insufflation sous pression, la cavité de pointe étant dotée d'un diamètre se réduisant graduellement inférieur au diamètre de la lumière de la tige ;

Une pointe mobile (36) connectée à la pointe transparente (7) et située à proximité de l'ouverture (12) ;

Caractérisée en ce que la pointe amovible (36) est adaptée pour passer d'une position distale à une position proximale en bouchant et de débouchant respectivement l'ouverture (12) en fonction, respectivement, de la force de compression lorsque la la paroi du corps est traversée et de la pression d'insufflation du gaz.

2. L'obturateur de la revendication 1, dans lequel le corps a un diamètre de lumière inférieur à celui de la lumière de la poignée.

3. L'obturateur de la revendication 1 ou de la revendication 2, comprenant en outre une canule (20) ayant une extrémité proximale et une extrémité distale, la tige allongée (5) et la pointe mobile dans la canule (20) et détachable de la canule (20) avec la poignée (3) s'étendant à l'écart de l'extrémité proximale de la canule (20) et la pointe (7) s'étendant à travers et au-delà de l'extrémité distale de la canule (20).

4. L'obturateur de la revendication 3, comprenant en outre un laparoscope (40) déplaçable dans et hors de la poignée et de la lumière du corps de la tige allongée (5).

5. L'obturateur de l'une quelconque des revendications 1 à 4, dans lequel la pointe transparente (7) est partiellement invisible.

6. L'obturateur de l'une quelconque des revendications 1 à 5, comprenant en outre un joint de laparoscope (9) fixé à l'extrémité proximale de la tige allongée (5) et placé dans le passage direct de la lumière de la tige, ce joint de laparoscope (9) étant doté d'un joint zéro (8) et d'un joint d'instrument (6, 10) aligné axialement à et proximal au joint zéro (8).

7. L'obturateur de l'une quelconque des revendications 1 à 6, comprenant en outre une lentille (81, 85) située à l'intérieur de la cavité de la tige avant l'ouverture (12) et une extrémité distale fermée de la pointe transparente (7), cette lentille (81) étant revêtue d'une solution anti-buée.

8. L'obturateur de la revendication 7, comprenant en outre un joint de périmètre en élastomère (83, 88) situé à l'intérieur de la cavité de la pointe adhérant à la lentille (81).

9. L'obturateur de la revendication 7 ou de la revendication 8, dans lequel la lentille (81, 85) a une épaisseur de 0,025 mm (0,001 pouces) à 6,4 mm (0,250 pouces).

10. L'obturateur de l'une quelconque des revendications 7 à 9, comprenant en outre un conduit d'insufflation parallèle à un axe longitudinal de la tige allongée (5).

11. L'obturateur de la revendication 1 comprenant en outre un joint torique ou joint en élastomère à l'extrémité proximale de la pointe mobile (36) pour aider au bouchage de cette pointe mobile (36).

12. L'obturateur de la revendication 1 dans lequel la pointe mobile (36) est non-biaisée.

13. L'obturateur de la revendication 1 dans lequel la pointe mobile (36) est configurée pour empêcher la pénétration d'humidité et de liquides organiques dans l'obturateur pendant qu'il se trouve dans la position proximale.

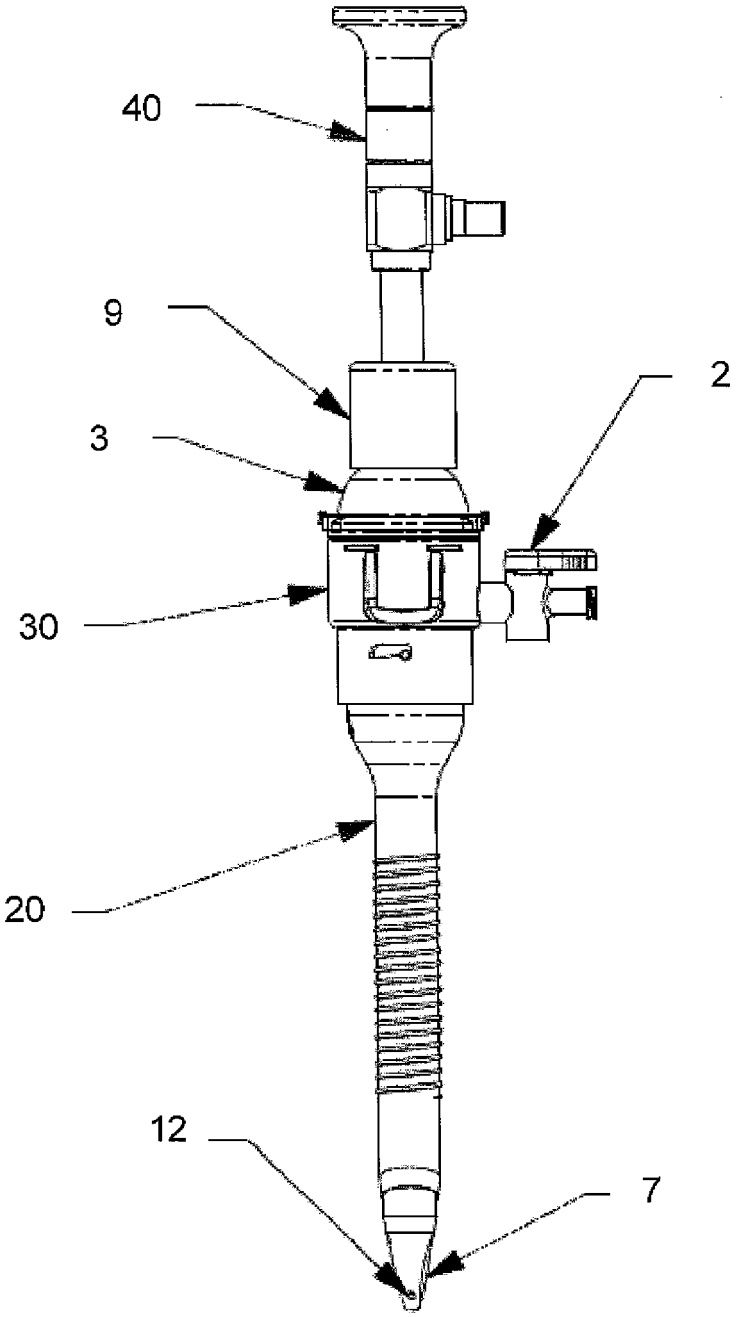


FIG. 1

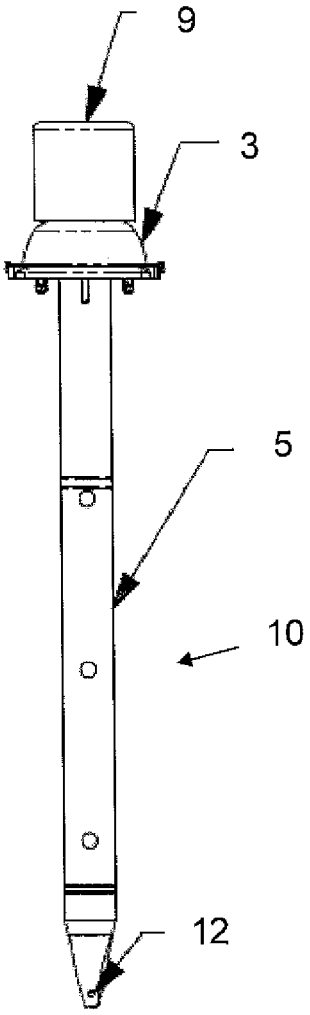


FIG. 2

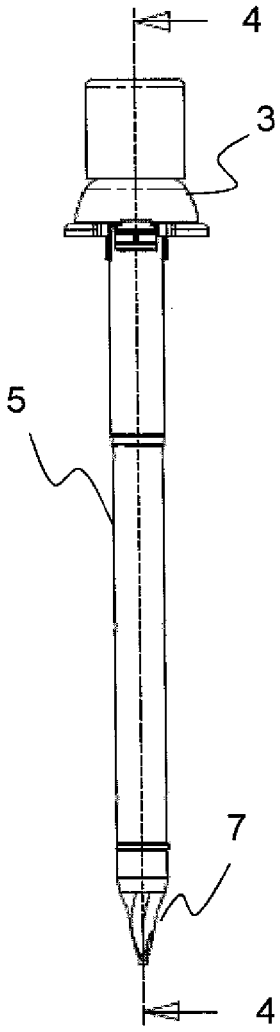


FIG. 3

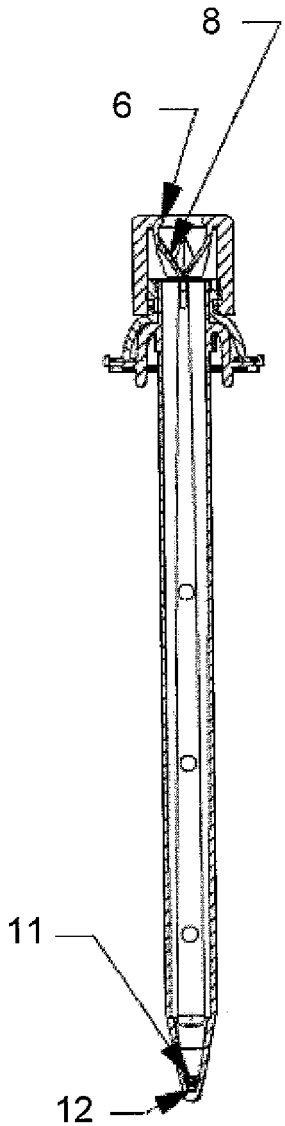


FIG. 4

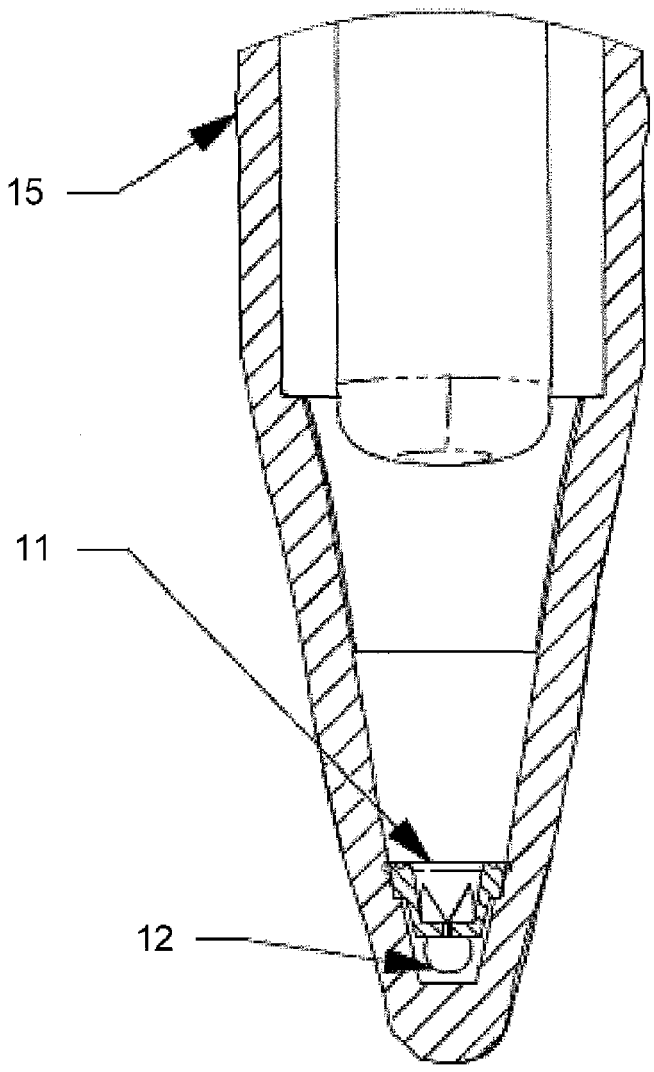


FIG. 5

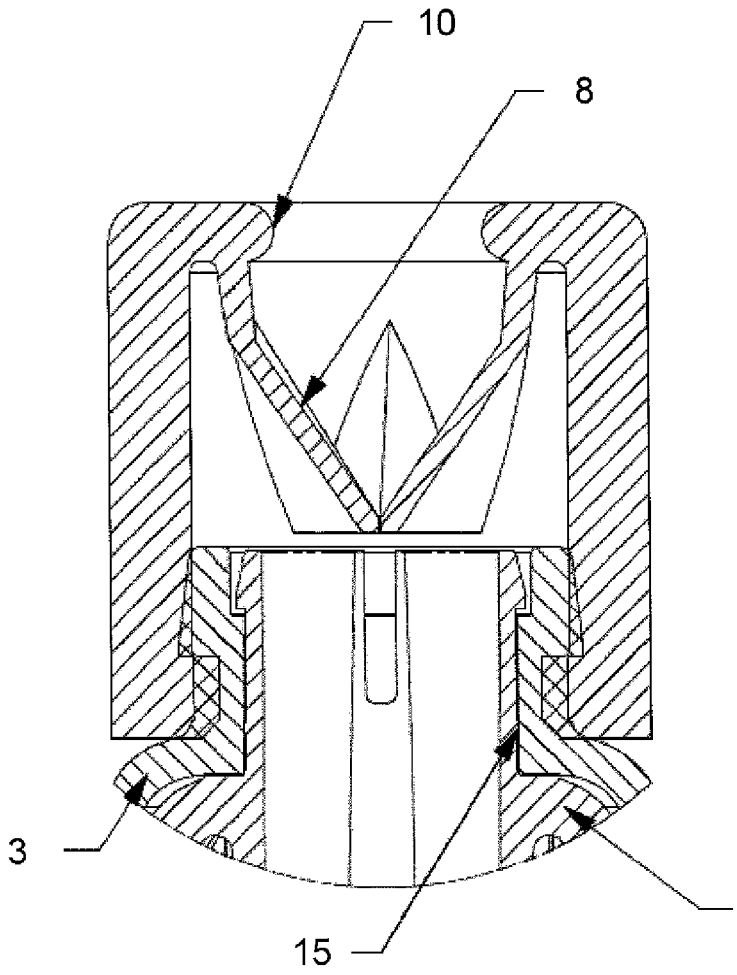


FIG. 6

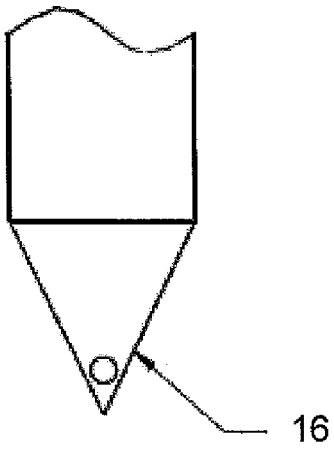


FIG. 7

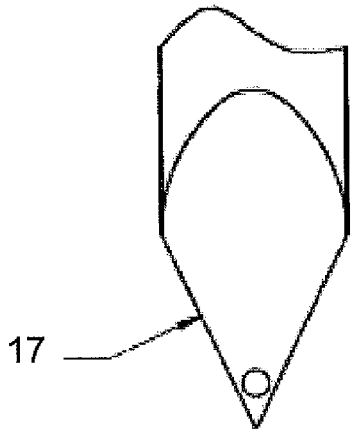


FIG. 8

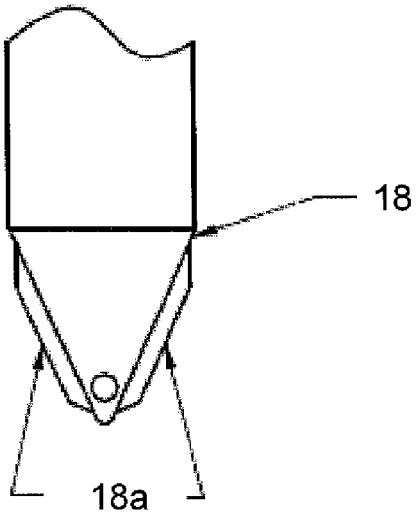


FIG. 9

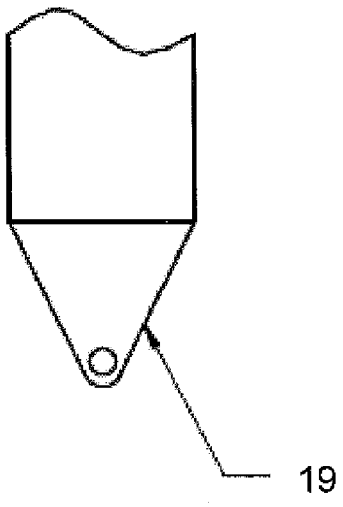


FIG. 10

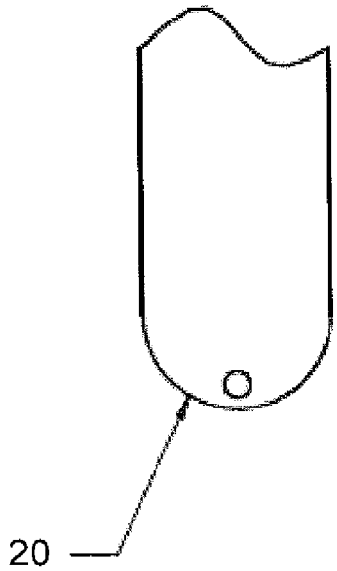


FIG. 11

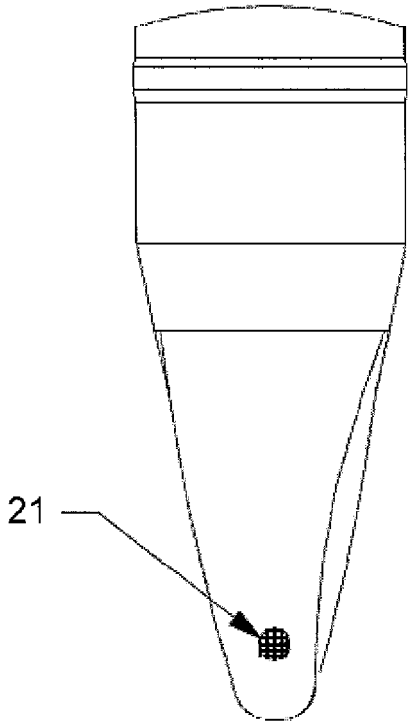


FIG. 12

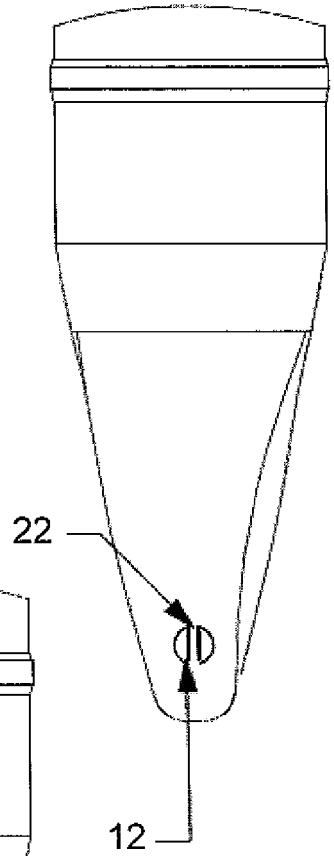


FIG. 13

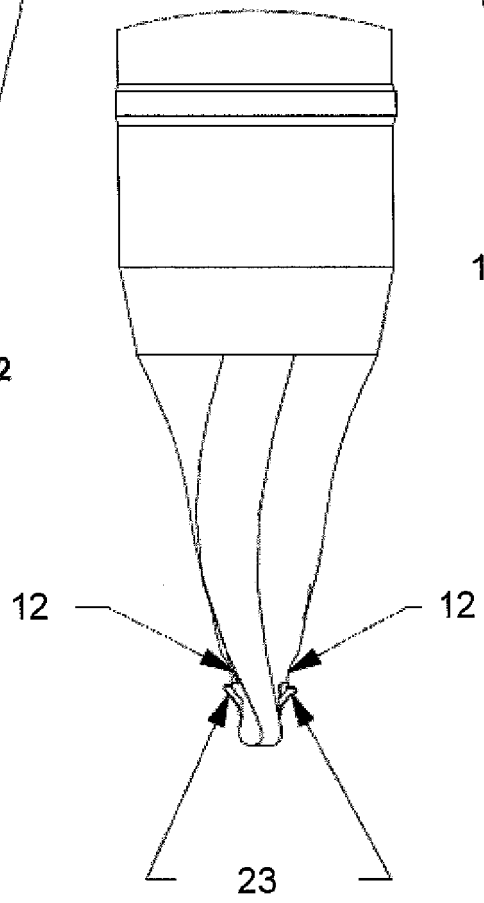


FIG. 14

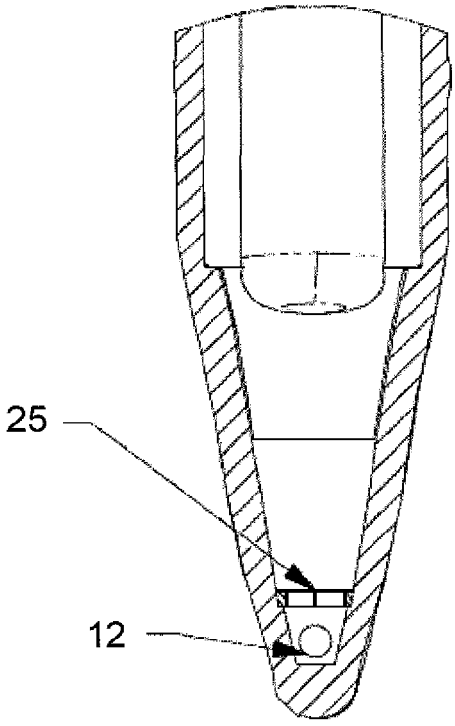
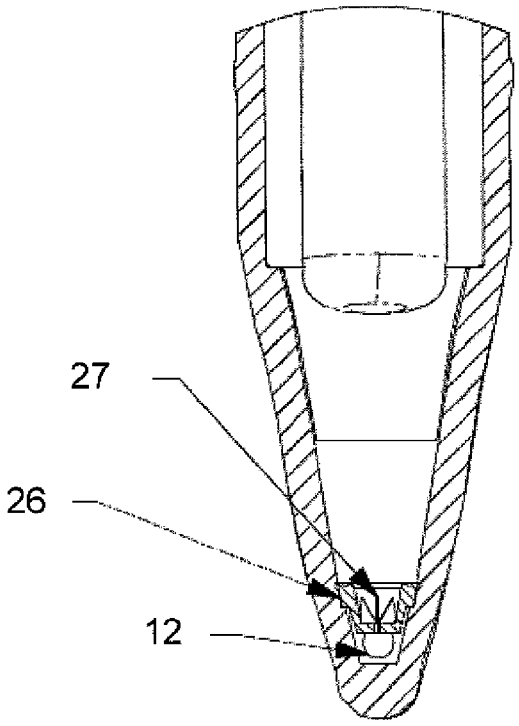


FIG. 15



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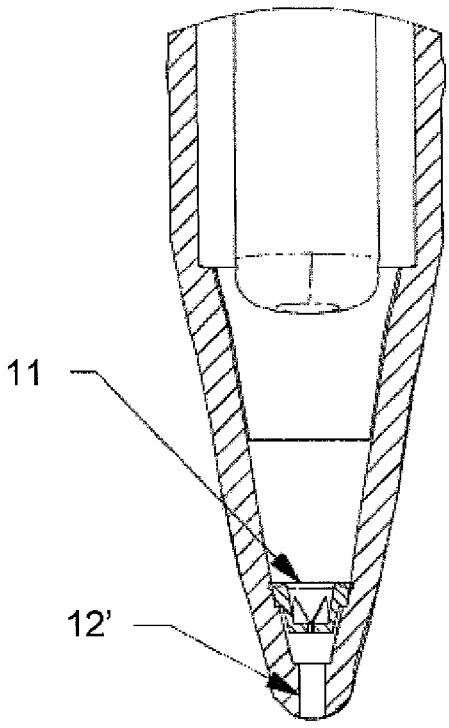

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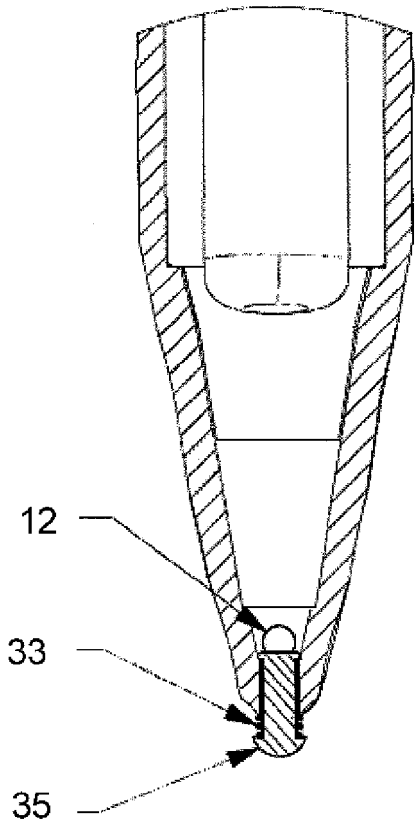
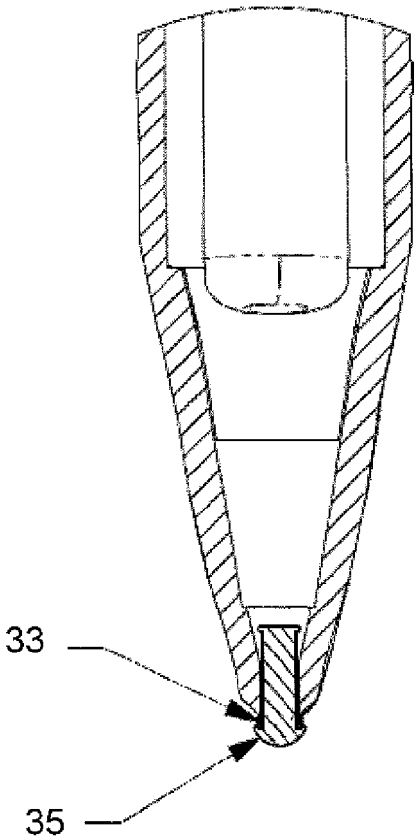


FIG. 18



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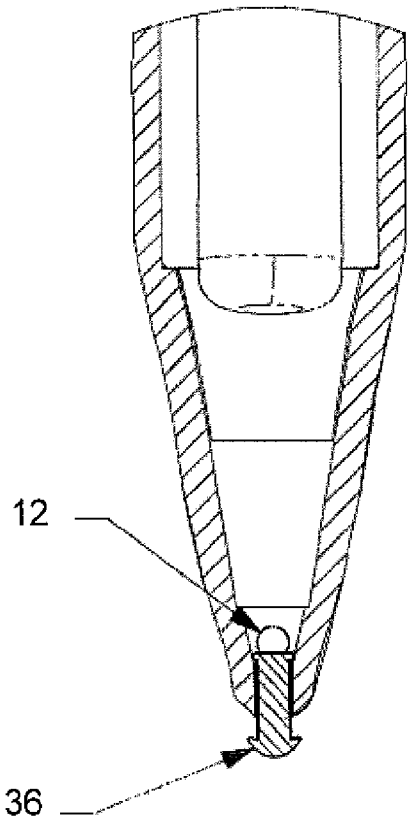

FIG. 20

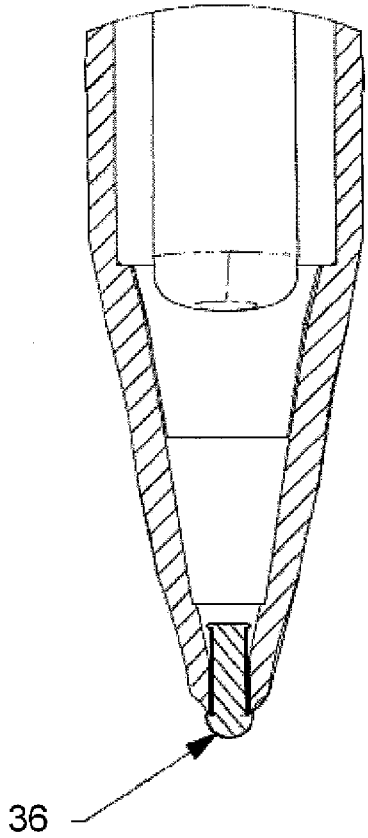

FIG. 21

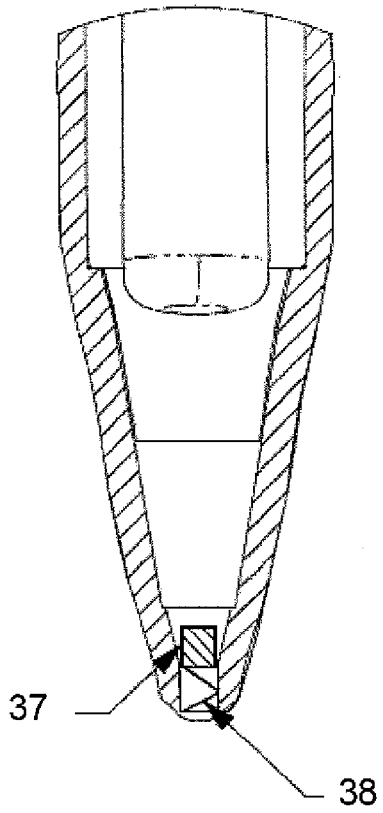

FIG. 22

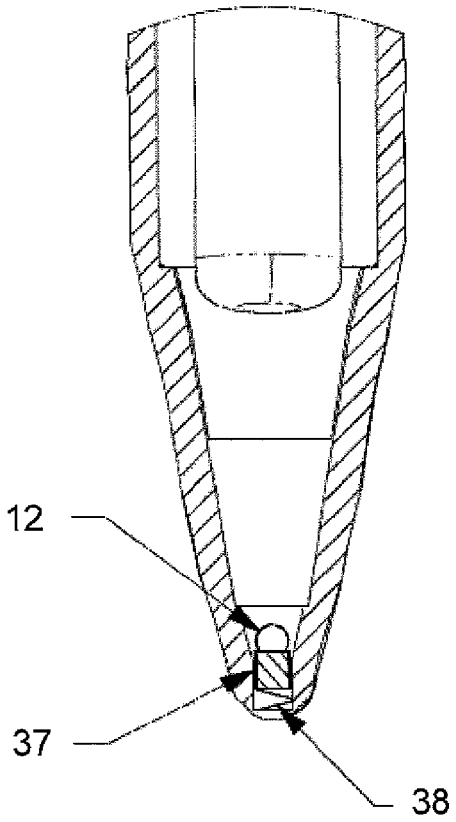

FIG. 23

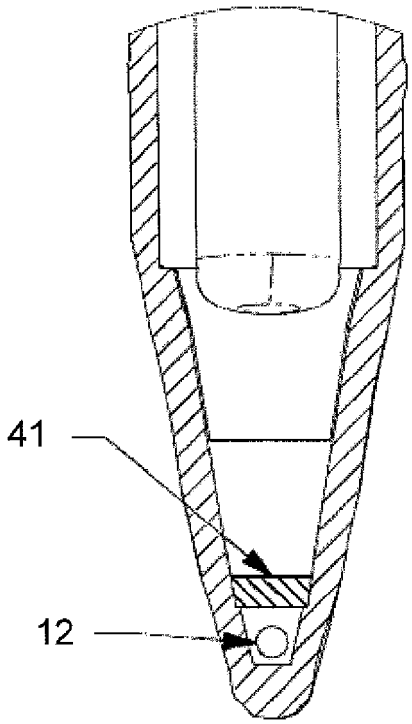

FIG. 24

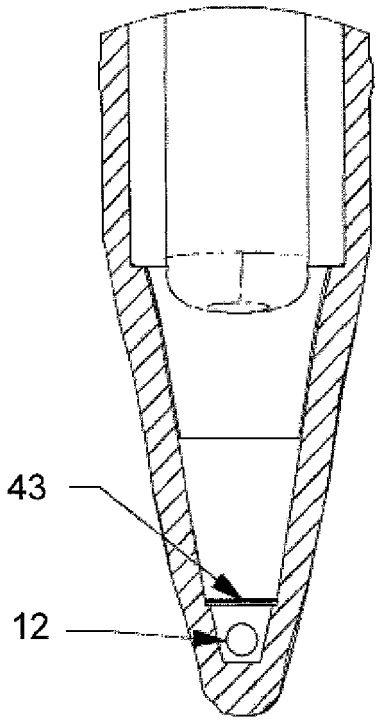

FIG. 25

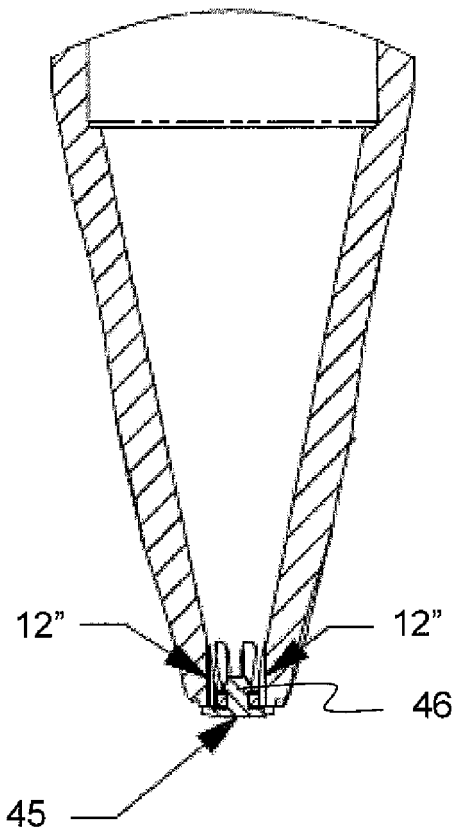

FIG. 26

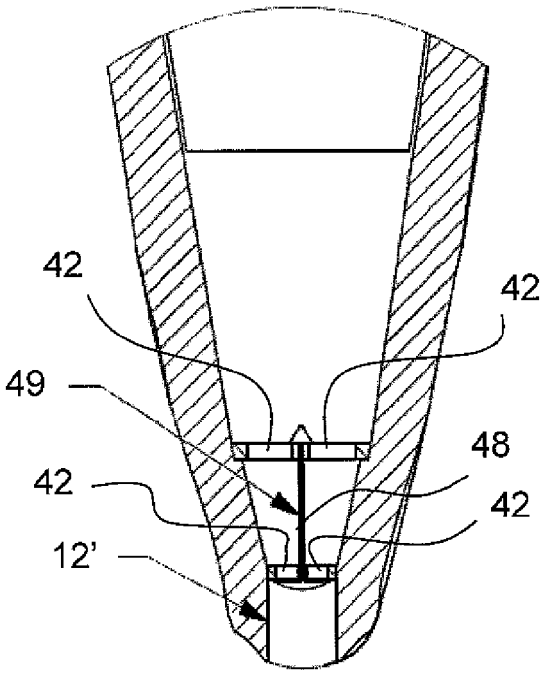

FIG. 27

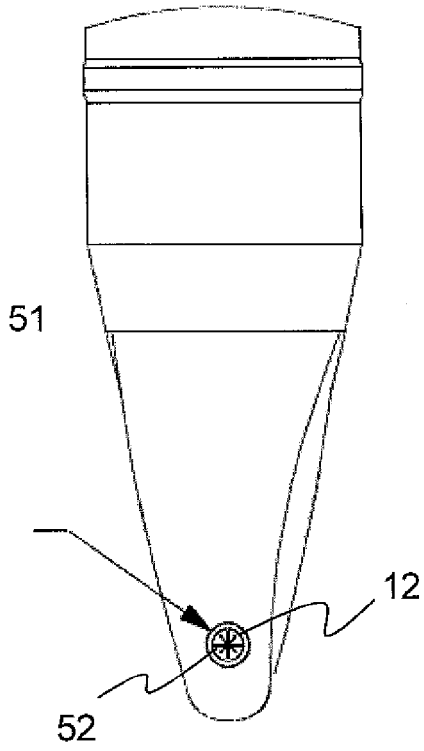

FIG. 28

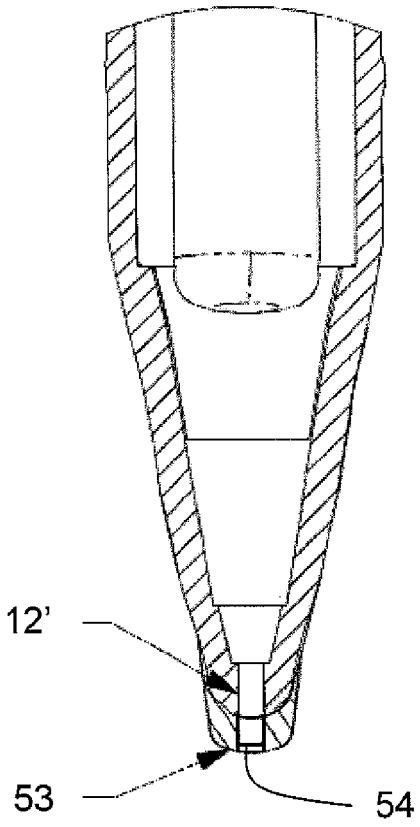

FIG. 29

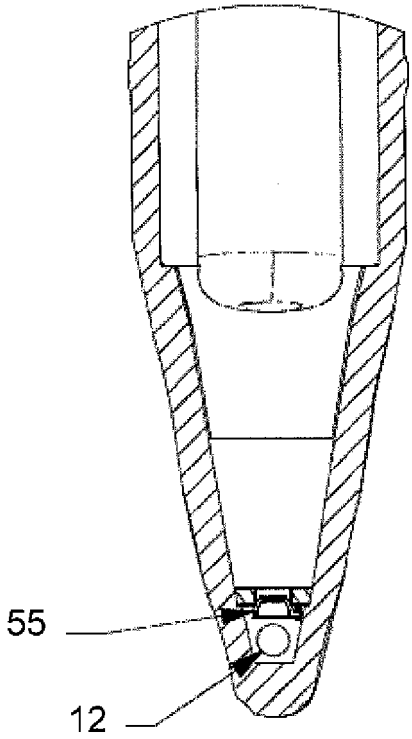

FIG. 30

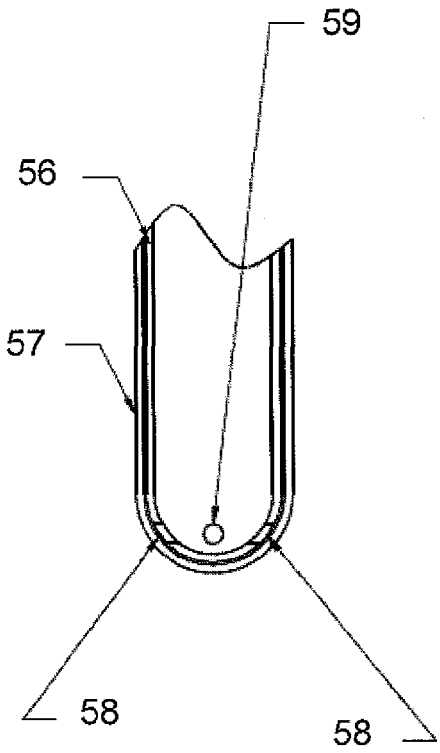

FIG. 31

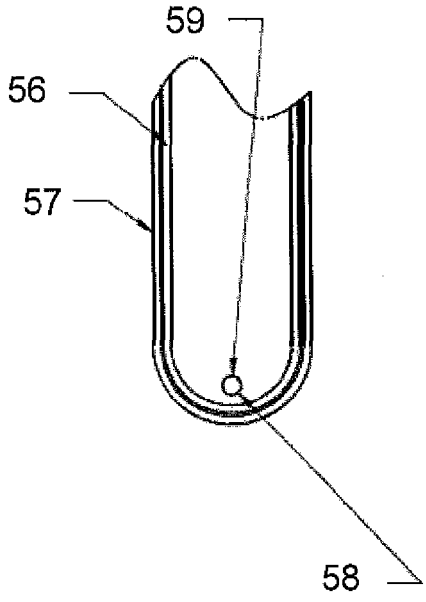

FIG. 32

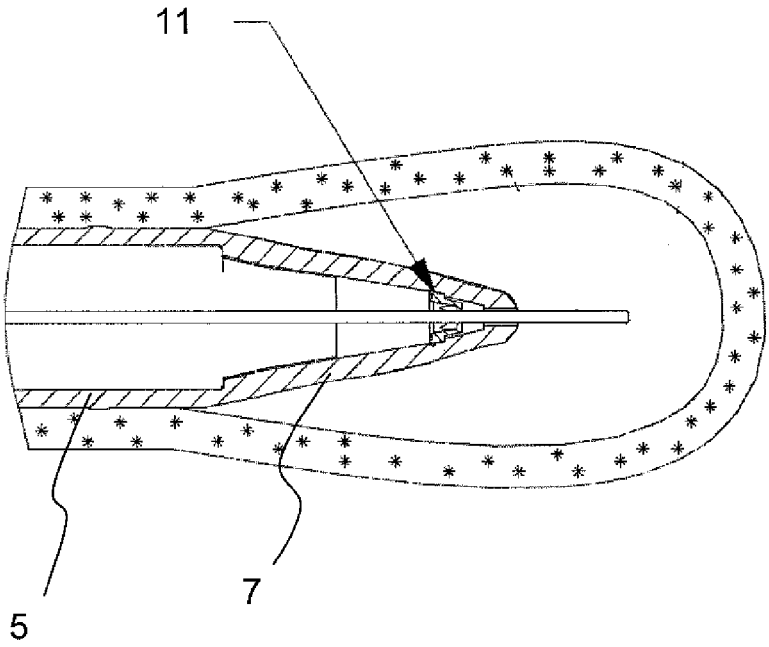

FIG. 33

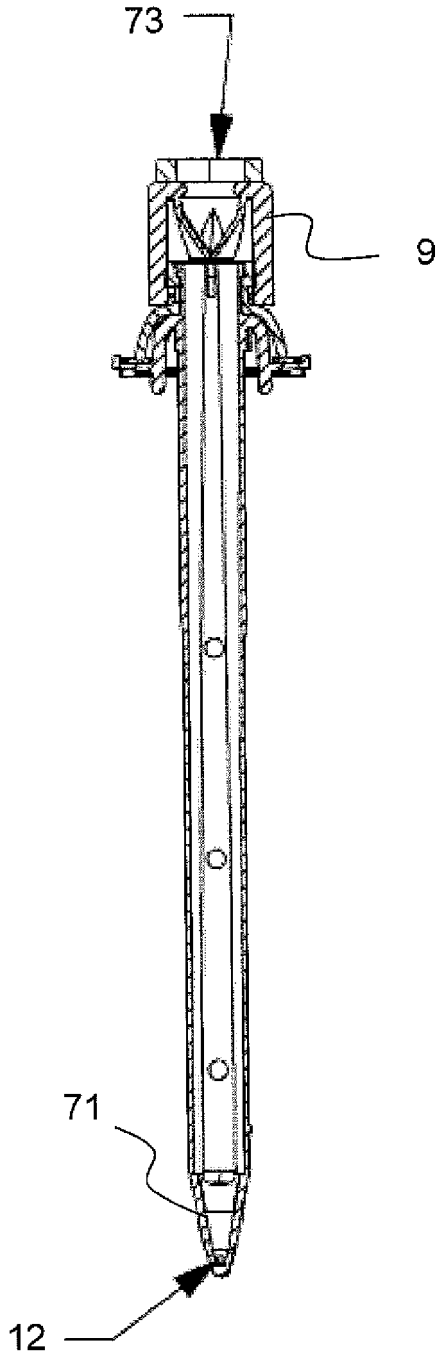

FIG. 34

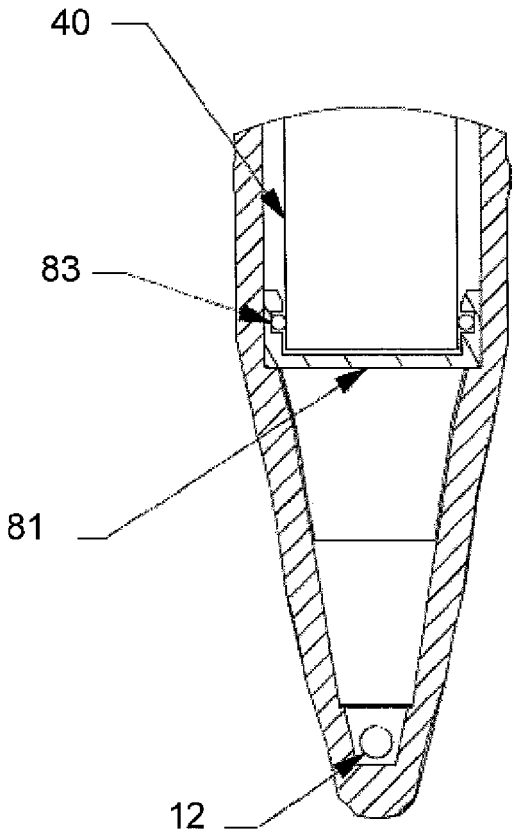

FIG. 35

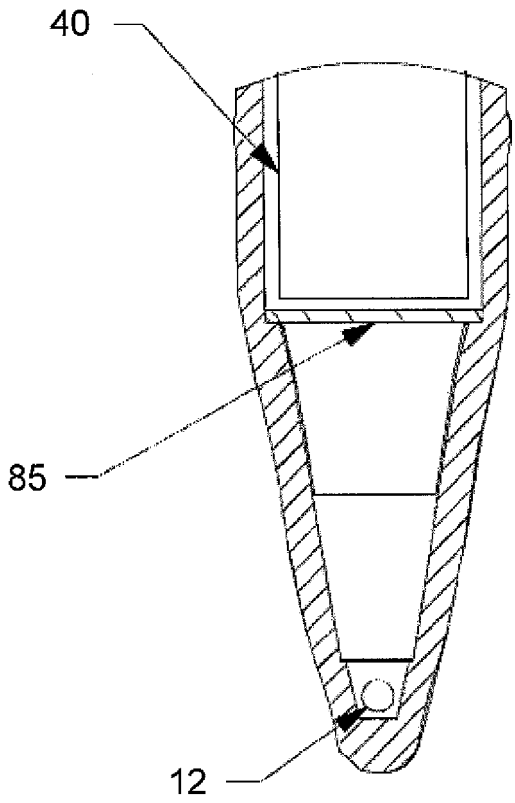

FIG. 36

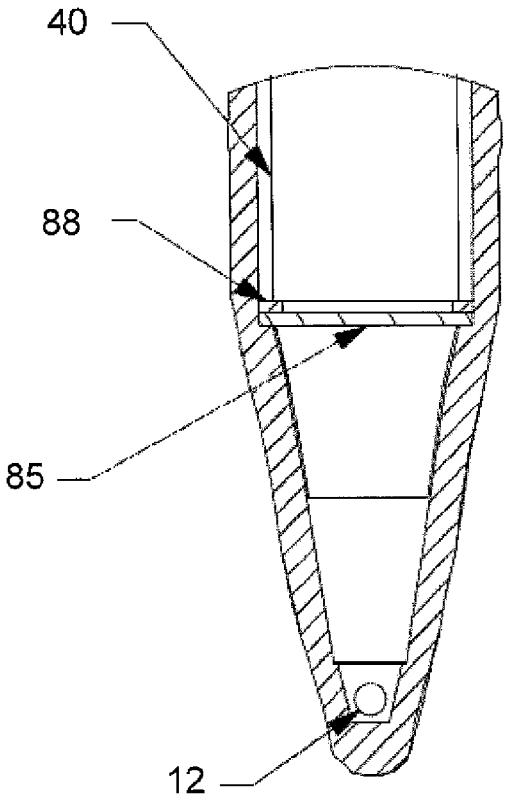

FIG. 37

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2005288622 A1 **[0005]**

专利名称(译)	视觉注气口		
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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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IPC分类号	A61B17/00 A61B17/34 A61B1/06 A61B1/015 A61B1/00 A61B1/12 A61B1/313 A61M13/00		
CPC分类号	A61B1/0008 A61B1/00154 A61B1/015 A61B1/127 A61B1/3132 A61B17/3474 A61B90/361 A61B2017/00907 A61B2017/3441 A61B2017/3454 A61B2017/3456 A61B2017/346 A61M13/003 A61B17/3498		
优先权	60/828529 2006-10-06 US PCT/US2007/080724 2007-10-08 WO		
其他公开文献	EP2984993A1		
外部链接	Espacenet		

摘要(译)

提供了视觉吹气闭孔器。闭塞器包括密封件，阀门，筛网和/或各种其他尖端特征，以消除可能破坏设置在闭塞器内的腹腔镜的视野的流体，物质和/或气体的进入。闭塞器提供额外的特征，例如镜片和防雾特征，以进一步增加镜片的可见度，有效地吹入患者并且一旦移除视觉吹气闭孔器，最终提供进入通气腹部的进入通道。

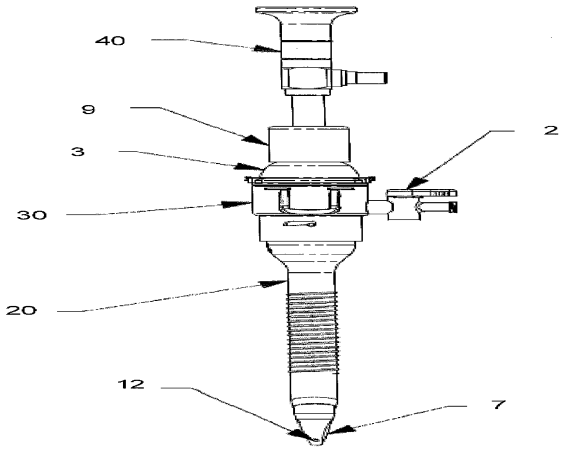

FIG. 1