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McAfee

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[54] **METHOD OF AND APPARATUS FOR LAPAROSCOPIC OR ENDOSCOPIC SPINAL SURGERY USING AN UNSEALED ANTERIORLY INSERTED TRANSPARENT TROCHAR**

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[21] Appl. No.: **380,393**

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[51] **Int. Cl.**[6] **A61B 17/34**

[52] **U.S. Cl.** **606/185**; 606/179; 604/164

[58] **Field of Search** 606/185, 179; 604/164, 178, 174

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[57] **ABSTRACT**

A method of and apparatus for performing endoscopic or laparoscopic surgery on a patient's spine is provided. The apparatus includes a trochar which is specifically design for spinal applications. The trochar includes of a first transparent tubular member of a predetermined diameter and a second transparent tubular member of a slightly larger diameter than the first transparent tubular member. The first transparent tubular member fits slidingly within the second transparent tubular member in a telescoping manner. The first transparent tubular member has two ends: an end for remaining in side-to-side contact with said second tubular member and a free end which has an attached metal fitting with serrated teeth for anchoring in the patient's vertebrae when the trochar is inserted through a incision made in the patient's abdomen or chest. The trochar also includes a collar and set screw arrangement. The collar is made up of a short tubular portion having a flanged end. The flanged end is annularly shaped and protrudes approximately perpendicularly outwardly from the short tubular portion of the collar. The short tubular portion of the collar has a threaded aperture therethrough. The threaded aperture threadingly mates with a set screw which when turned far enough counterclockwise prevents the first tube from telescoping within the second tube. Additionally, the collar and set screw arrangement also functions to stabilize the trochar in an approximately upright position at an angle to the patient's body.

19 Claims, 3 Drawing Sheets

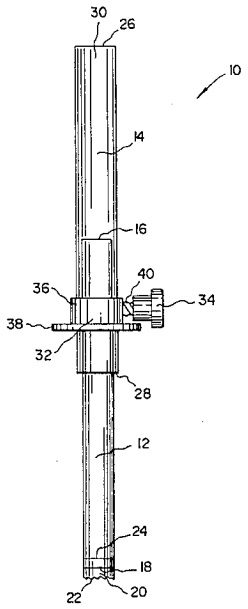
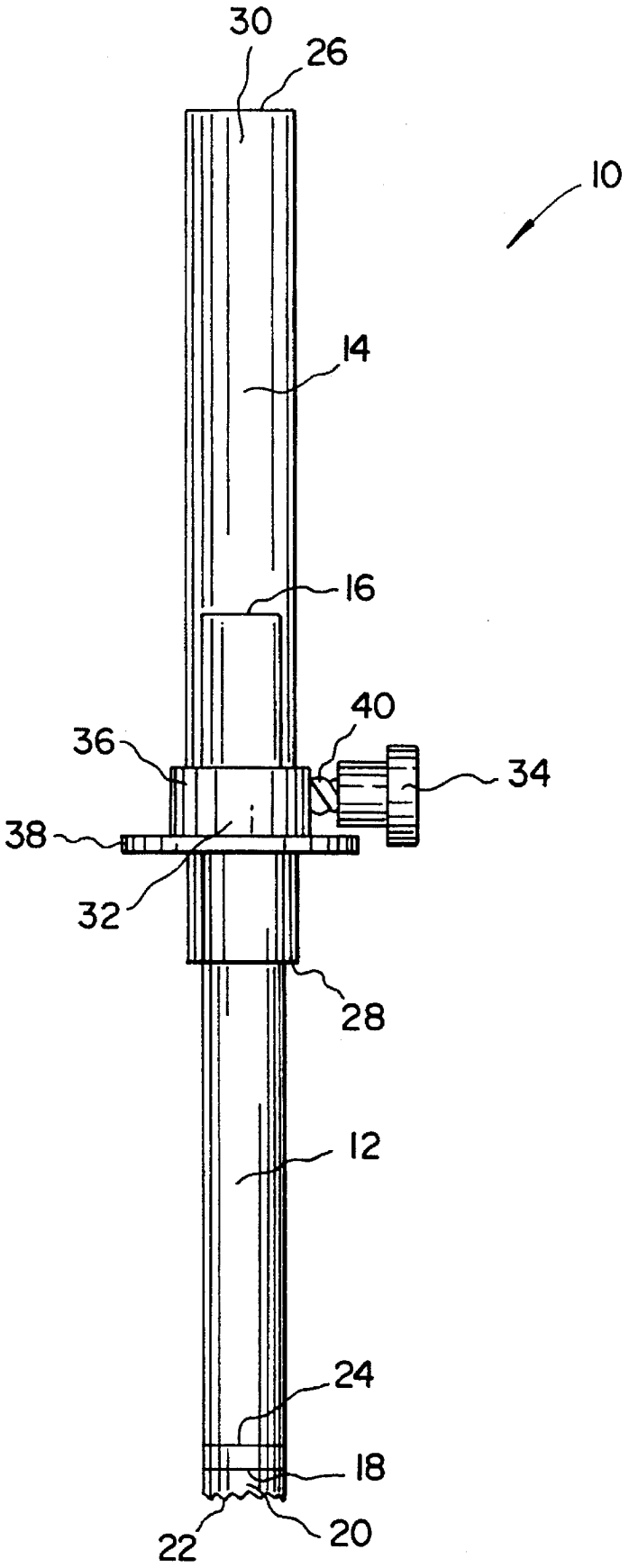


FIG. 1



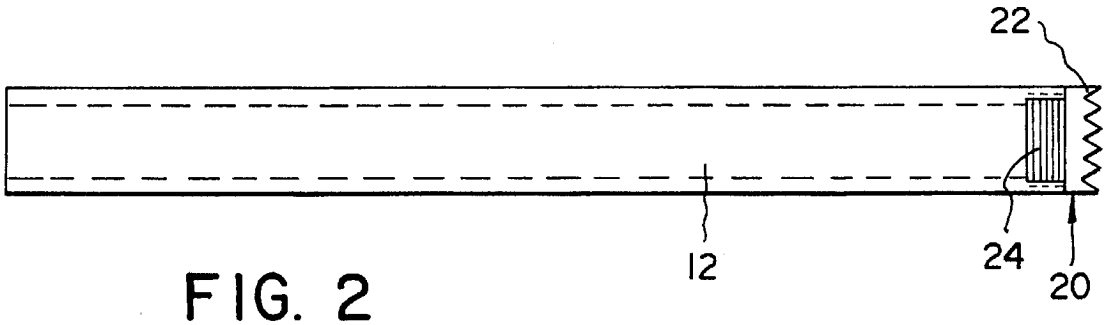


FIG. 2

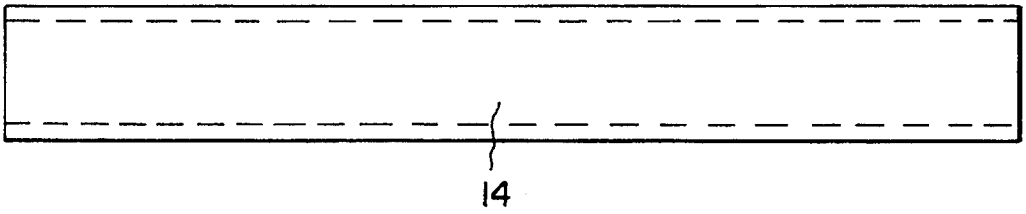


FIG. 3

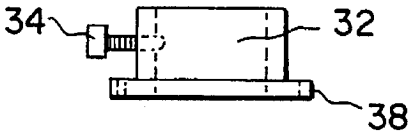


FIG. 4

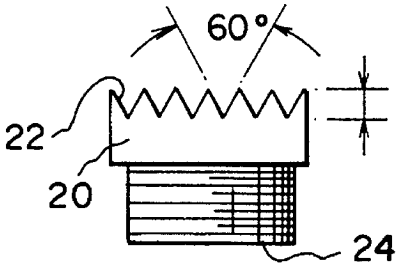


FIG. 5

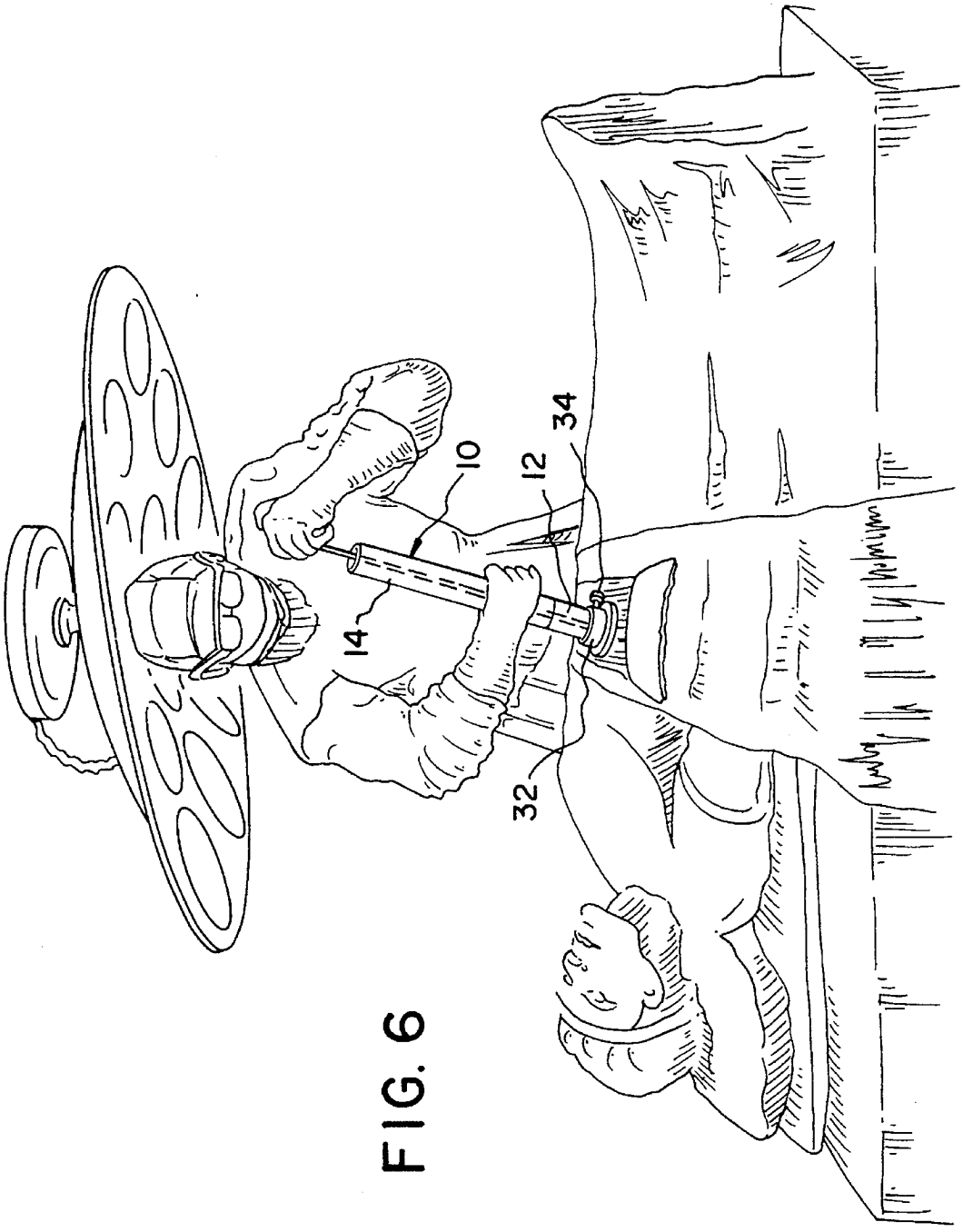


FIG. 6

METHOD OF AND APPARATUS FOR LAPAROSCOPIC OR ENDOSCOPIC SPINAL SURGERY USING AN UNSEALED ANTERIORLY INSERTED TRANSPARENT TROCHAR

FIELD OF THE INVENTION

The present invention relates generally to instruments and procedures for performing spinal surgeries and, more particularly, to a method of and apparatus for performing laparoscopic or endoscopic surgical procedures on a patient's spine using a trochar specifically designed for spinal applications which includes a dually functioning flanged collar and set screw arrangement slidably mounted on the outer of two transparent telescoping inner and outer tubular members forming an unsealed, open-air passageway for insertion of surgical instruments therethrough after the trochar is inserted through an incision made in the patient's abdomen or chest so that the free end of the inner tubular member having a metal fitting with serrated teeth is anchored into a vertebrae of the patient's spine for end organ docking.

BACKGROUND OF THE INVENTION

Currently, instruments called trochars are well known within the medical sciences. Indeed, surgeons today often use trochars to perform a variety of medical and surgical procedures. A medical dictionary defines a trochar as a sharp pointed surgical instrument for use with a cannula in order to puncture a body cavity for fluid aspiration. However, trochars may also be used for paracentesis, i.e., as the means providing a passageway into a body cavity.

When used for paracentesis, a typical trochar usually includes two tubular members. A first tubular member has a slightly larger diameter than a second tubular member. This allows the second tubular member which is of a slightly smaller diameter to be placed to fit within the first tubular member of a slightly larger diameter.

The two tubular members when positioned one within the other may be moved relative to each other in a telescoping manner. When telescoped, each tubular member has one free end and one end remaining in side-to-side adjacent contact with the other tubular member.

For use in a surgical procedure, the free end of the inner tubular member of the trochar is then usually inserted into a body cavity through an incision made in the patient's body. The trochar is used as a passageway through which specially designed, long-necked surgical instruments can be inserted in order to perform a surgical procedure within the body cavity.

Although trochars have previously been used to perform surgical procedures on a patient's spine, spinal surgeries using trochars have not been the favored way of performing surgery on the spine. This is due to the following complications of spine surgeries using trochars.

A first complication stems from the fact that a typical spinal trochar to date has usually had two telescoping tubes made of metal. Metal seems to be the material of choice because it can withstand the high temperature necessary to sterilize the trochar. However, metal trochars are disadvantageous because they do not offer the surgeon any view of the area on which he or she is performing the surgery.

To date, surgeons using metal trochars have had to depend on x-rays in order to view what is going on inside of the trochar. Continued exposure to X-rays can be harmful to the patient. Therefore, the patient must be protected during surgery from the continual exposure to harmful x-rays by use of a heavy leaded gown. The leaded gown can add further difficulties to the surgery, particularly, if the patient's position must be moved during the surgical procedure in order to access different bodily organs, bones or other internal parts.

Additionally, the use of x-rays is a time-consuming and imprecise manner of performing surgery on a patient's spine, especially since the spine is such a delicate and sensitive area of the body. Indeed, the spine protects the spinal chord which runs along the outside of the vertebrae nearer the skin on the patient's back. The spinal chord houses various nerves which allow the patient to walk and perform other functions. Because the spinal chord runs along the patient's back on the outside of the spine it is safest to perform spinal surgeries anteriorly rather than posteriorly in order not to interfere with the spinal chord in any way.

Another complication with conventional spinal surgical procedures using trochars is that to date these surgeries have always been performed in such a manner so as to require insufflation. Insufflation is defined as the act of blowing a powder, vapor, gas, or air into a body cavity.

The body cavity through which a trochar must be passed contains carbon dioxide or CO_2 gas. To date, surgeons have always felt that the trochar used needs to be sealed against ambient air entering the CO_2 filled body cavity. Thus, in order to keep the ambient air in the operating room from entering the body cavity, trochars have been sealed and carbon dioxide gas has been blown into the passageway created by the trochar in order that ambient air not enter the body cavity. However, trying to pass a surgical instrument through a sealed trochar is difficult and time consuming and there is always some amount of leakage.

As noted above there are numerous drawbacks associated with conventional trochars now being used in spinal surgical procedures. Because the present invention is the first trochar specifically designed for spinal surgeries it tends to avoid many of the pitfalls which occur with conventional trochars.

More particularly, the trochar of the present invention was designed for end organ docking which means it goes from the patient's skin and inserts directly into an anchored position in the patient's spine without harming the spine.

To date, few, if any, trochars have been made of a transparent material as is the apparatus of the present invention, mainly because no plexiglass-like material could be found that could be pushed, pulled and twisted through the extrusion process and would not break. The present invention uses an acrylic tubing that can withstand the extrusion process and the high temperatures necessary to sterilize the trochar for surgery.

It would be desirable to have a trochar which allowed the surgeon a more direct view of the area of the patient's spine on which he or she was performing the medical procedure in order to perform the spinal surgery with more precision and accuracy. The apparatus of the present invention allows for better viewing of the area in which the surgeon is performing the surgery by means of a miniaturized video camera placed adjacent to the outer periphery of the trochar's transparent tubular members. The video camera lights the surgical area to be viewed during the course of the surgery and provides video images via a fiberoptic cable to allow the surgeon to view from a monitor the area on which he is operating.

Another disadvantage of conventional spinal surgical trochars used today is that the trochars are typically designed in such a manner that the cylindrical passageway which is

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