

Señora Jefe
DIVISIÓN DE NUEVAS CREACIONES
SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
Bogotá, D.C.

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 06-113491- -00004-0000

Fecha: 2008-06-20 12:06:00 Dep. 2020 NUECREACIONES
Tra. 11 PATENTE IYI Lve: 378 FASE NACIONAL I
Act. 444 RESPUESTA REQUE Folios: 6

Re.: Expediente No. 06 113.491
Fase Nacional Solicitud de Patente PCT
a nombre de
SYNTHESES GmbH
Código 011 - 378 - 608

En relación con la solicitud contenida en el Expediente de la referencia y, en particular, con la solicitud de examen de patentabilidad radicada el día 14 de Mayo de 2008, por medio del presente escrito me permito manifestarle:

1. Mi representada, la sociedad Synthes GmbH, me ha dado precisas instrucciones de modificar el Capítulo de Reivindicaciones de la presente solicitud.
2. En consecuencia, acompaño al presente escrito el texto de las nuevas reivindicaciones 1 - 22, que reemplaza las originalmente presentadas.
3. Igualmente, acompaño el comprobante de pago por concepto de la tasa correspondiente a esta modificación, Recibo No. 40,570

Le solicito se sirva agregar este escrito y sus anexos al expediente y continuar con el trámite de la solicitud.

De Usted Atentamente,

GERMAN CASTILLO GRAU
T.P. No. 2978 del C.S.J.

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REIVINDICACIONES

1. Un instrumento quirúrgico para hincar un elemento vertebral longitudinal dentro de un implante vertebral de carga superior, el cual instrumento comprende:

Un ensamblaje de mango que incluye un extremo proximal y un extremo distal, el cual extremo distal incluye un par de ranuras alargadas diametralmente opuestas que definen un par de digitaciones para enganchar el implante vertebral, y el extremo proximal del ensamblaje de mango incluye por lo menos una ranura;

Un ensamblaje de liberación que incluye un elemento tubular y un elemento empujador, el cual elemento tubular se dispone de forma deslizable dentro del ensamblaje de mango, y el elemento empujador rodea de forma deslizable por lo menos una porción del ensamblaje de mango, cada uno del elemento tubular y el elemento empujador incluye un extremo proximal y un extremo distal, el extremo proximal del elemento tubular incluye un primer par de ranuras, el extremo distal del elemento empujador incluye una muesca para entrar en contacto con el elemento vertebral longitudinal;

Un elemento accionador que incluye una primera punta y una segunda punta, la cual primera punta engancha la por lo menos una ranura formada en el extremo proximal del ensamblaje de mango y la segunda punta engancha el primer par de ranuras formadas en el extremo proximal del elemento tubular de manera que la acción del elemento accionador desplaza al ensamblaje de mango con respecto al elemento tubular e impulsa al elemento vertebral para que se enganche con el implante vertebral.

2. El instrumento quirúrgico de la reivindicación 1, en donde el extremo proximal del elemento tubular incluye un segundo par de ranuras, el cual segundo par de ranuras se alinea con la por lo menos una ranura formada en el ensamblaje de mango cuando el elemento tubular se inserta en el ensamblaje de mango.
3. El instrumento quirúrgico de las reivindicaciones 1 o 2, en donde el elemento accionador además incluye un primer elemento de agarre, un segundo elemento de agarre, un primer elemento de mordaza, y un segundo elemento de mordaza, el cual primer elemento de mordaza se acopla en forma de pivote al segundo elemento de agarre, primer elemento de agarre se acopla en forma de pivote al segundo elemento de mordaza, el segundo elemento de agarre se acopla en forma de pivote al segundo elemento de mordaza, y el primero y el segundo elementos de mordaza incluyen la primera y la segunda puntas, respectivamente, para enganchar las ranuras correspondientes formadas en el ensamblaje de mango y el elemento tubular, respectivamente.
4. El instrumento quirúrgico de la reivindicación 3, en donde el primer elemento de agarre además incluye un pin que se mueve deslizándose en una ranura formada en el segundo elemento de mordaza y el segundo elemento de agarre incluye un pin que se mueve deslizándose en una ranura formada en el primer elemento de mordaza para que los

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elementos de mordaza se mantengan en alineación paralela cuando el instrumento es accionado.

5. El instrumento quirúrgico de las reivindicaciones 2, 3 o 4, en donde la primera y la segunda puntas entran a presión en las ranuras correspondientes formadas en el ensamblaje de mango y en el elemento tubular.
6. El instrumento quirúrgico de la reivindicación 5, en donde el elemento accionador entra a presión en el ensamblaje de mango y el elemento tubular, estando el elemento accionador orientado sustancialmente perpendicular al eje longitudinal del ensamblaje de mango.
7. El instrumento quirúrgico de cualquiera de las reivindicaciones precedentes, en donde el elemento empujador rodea de forma deslizable por lo menos una porción de las digitaciones.
8. El instrumento quirúrgico de cualquiera de las reivindicaciones precedentes, en donde las digitaciones tienen una primera posición en la cual el implante vertebral es recibido libremente entre ellas, y una segunda posición en la cual las digitaciones enganchan al implante vertebral, en donde las digitaciones se pueden desplazar de forma ajustable de la primera posición a la segunda posición.
9. El instrumento quirúrgico de las reivindicaciones 1-7, en donde el elemento accionador se puede desplazar desde una posición de reposo y una posición accionada, en donde las digitaciones se inclinan apartándose de la posición de reposo y entran en contacto con la parte inferior de un borde del implante vertebral en la posición accionada.
10. El instrumento quirúrgico de las reivindicaciones 1-7, en donde el elemento empujador tiene una superficie inferior y las digitaciones tienen una superficie exterior para enganchar la superficie inferior del elemento empujador de manera que el desplazamiento del ensamblaje de mango con respecto al elemento tubular hace que las digitaciones se desplacen de una primera posición en la cual las digitaciones están separadas por una primera distancia de separación a una segunda posición en la cual las digitaciones se encuentran separadas por una segunda distancia de separación, la cual segunda distancia de separación es menor que la primera distancia de separación.
11. El instrumento quirúrgico de las reivindicaciones 1-7, en donde cada digitación incluye un reborde que apunta hacia dentro que se proyecta radialmente desde un extremo de la digitación respectiva, el cual reborde se pone en contacto con la parte inferior de un borde del implante vertebral cuando el implante vertebral es recibido dentro del instrumento quirúrgico.
12. El instrumento quirúrgico de cualquiera de las reivindicaciones precedentes, en donde el extremo distal del ensamblaje de mango además incluye una muesca en forma de U que se corresponde con la muesca formada en el elemento empujador de manera que el elemento vertebral se puede extender completamente a través del ensamblaje de mango y el elemento empujador.

- 13.El instrumento quirúrgico de cualquiera de las reivindicaciones precedentes, en donde el elemento empujador incluye una abertura en su extremo distal para recibir coaxialmente allí al ensamblaje de mango.
- 14.El instrumento quirúrgico de cualquiera de las reivindicaciones precedentes, en donde el extremo distal del elemento tubular incluye por lo menos un orificio y el elemento empujador incluye por lo menos una abertura, el cual por lo menos un orificio y la cual por lo menos una abertura reciben por lo menos un pin para asegurar el elemento empujador al elemento tubular, el cual pin se puede desplazar dentro del par de ranuras diametralmente opuestas formadas en el ensamblaje de mango.
- 15.El instrumento quirúrgico de cualquiera de las reivindicaciones precedentes, en donde el elemento tubular además incluye una canulación para recibir un elemento de sujeción.
- 16.El instrumento quirúrgico de cualquiera de las reivindicaciones precedentes, en donde el extremo proximal del elemento tubular incluye una ranura que se empareja con un pin de alineación en el extremo proximal del ensamblaje de mango para facilitar la alineación adecuada del elemento tubular dentro del ensamblaje de mango.
- 17.El instrumento quirúrgico de cualquiera de las reivindicaciones precedentes, que además comprende un elemento vertebral longitudinal, en donde el elemento vertebral longitudinal es una varilla vertebral longitudinal y el implante vertebral comprende:

Un cuerpo que tiene un canal para recibir la varilla vertebral;
Un elemento de anclaje asociado con el cuerpo; y
Un elemento de sujeción para asegurar la varilla vertebral al cuerpo y para fijar la posición angular del elemento de anclaje con respecto al cuerpo.
- 18.El instrumento quirúrgico de la reivindicación 17, en donde el cuerpo es un elemento generalmente cilíndrico que tiene una porción superior que incorpora el canal, y una porción inferior que define una muesca, y el elemento de anclaje además incluye una cabeza curva que tiene forma y dimensiones apropiadas para caber dentro de la muesca para facilitar el movimiento poliaxial del cuerpo con respecto al elemento de anclaje.
- 19.El instrumento quirúrgico de la reivindicación 18, en donde la porción inferior del cuerpo que rodea la muesca es por lo menos parcialmente compresible para permitir que el cuerpo entre a presión sobre la cabeza curva.
- 20.El instrumento quirúrgico de las reivindicaciones 18 o 19, en donde el implante vertebral además incluye un collar dispuesto de forma deslizante alrededor de la porción inferior del cuerpo, el cual collar tiene una superficie interna que interactúa con una superficie externa de la porción inferior del cuerpo para comprimir la muesca alrededor de la cabeza curva cuando el collar se presiona hacia abajo con respecto al cuerpo.

21. El instrumento quirúrgico de la reivindicación 20, en donde el elemento de sujeción es un tornillo empotrado que tiene roscas externas para enganchar las roscas internas formadas en la superficie interna de la porción superior del elemento de cuerpo de manera que al apretar el elemento de sujeción sobre el cuerpo se desplaza el elemento de sujeción contra la varilla vertebral cuando la varilla está situada dentro del canal e impulsa la varilla vertebral contra el collar haciendo que el collar se desplace hacia abajo a lo largo de la superficie externa de la porción inferior del cuerpo, con lo cual se contrae la muesca alrededor de la cabeza curva del elemento de anclaje, entabando la posición angular del elemento de anclaje con respecto al cuerpo.
22. El instrumento quirúrgico de las reivindicaciones 20 o 21, en donde el par de digitaciones aplican una fuerza axial ascendente que se va a aplicar al collar de entabe.

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Act. 444 RESPUESTAREQUE Folios: 6

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

NIT : 800176089-2

RECIBO OFICIAL DE CAJA : 08 - 49,570
FECHA : JUNIO 20 DE 2008

***** CONSIGNACION *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PGO	Vr. PAGO
CASTILLO GRAU Y ASOCIADOS	CONSIGNACION	BANCO DE BOGOTA	062754387	2546296	20/06/2008	523,000.00

***** CONCEPTO *****

CANT.	RENTISTICO	CONCEPTO	TOTAL CONCEPTO
1	50005-01-03	CAMBIO DE MODALIDAD Y MODIFICA	
		12 MARCAS Y LEMAS COMERCIALES	103,000.00
		TOTAL :	\$ 103,000.00

SON: CIENTO TRES MIL PESOS



RESPONSABLE : _____

RECIBO DE CAJA APLICADO AL EXPEDIENTE No. _____

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80

DIVISIÓN DE NUEVAS CREACIONES

RADICACIÓN EXPEDIENTE No. 06-113491

EL EXTRACTO DE LA PRESENTE SOLICITUD DE **PATENTE DE INVENCION**

FUE PUBLICADO EN LA GACETA DE PROPIEDAD INDUSTRIAL No **583** DE

FECHA **18 DE DICIEMBRE DE 2007** EL TÉRMINO HÁBIL SEÑALADO POR LA

LEY EXPIRA EL **14 DE MARZO DE 2008**

NOTA: Dentro del plazo de los seis (6) meses siguientes a partir de la fecha de publicación en la gaceta de Propiedad Industrial, deberá solicitar y cancelar el examen de patentabilidad so pena de que la solicitud caiga en abandono, de acuerdo con lo establecido en el Artículo 44 de la Decisión 486/2000.

SE PRESENTARON OPOSICIONES POR PARTE DE TERCEROS.

SI _____

NO X



US006660006B2

(12) **United States Patent**
Markworth et al.

(10) **Patent No.:** US 6,660,006 B2
(45) **Date of Patent:** Dec. 9, 2003

(54) **ROD PERSUADER**

(75) Inventors: **Aaron Markworth**, Pompton Lakes, NJ (US); **Yves Crozet**, Ramsey, NJ (US)

(73) Assignee: **Stryker Spine (FR)**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

6,066,143	A	*	5/2000	Lane	606/72
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6,440,133	B1	*	8/2002	Beale et al.	606/99
6,440,142	B1	*	8/2002	Ralph et al.	606/99

* cited by examiner

(21) Appl. No.: **10/124,170**

(22) Filed: **Apr. 17, 2002**

(65) **Prior Publication Data**

US 2003/0199872 A1 Oct. 23, 2003

(51) **Int. Cl.⁷** **A61B 17/56**

(52)	U.S. Cl.	606/61
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(58) **Field of Search** 606/61, 73, 99,
606/104

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,020,519	A	6/1991	Hayes et al.	
5,364,397	A	11/1994	Hayes et al.	
5,449,361	A *	9/1995	Preissman	606/61
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5,720,751	A *	2/1998	Jackson	606/99
5,782,830	A	7/1998	Farris	
5,910,141	A	6/1999	Morrison et al.	
6,036,692	A	3/2000	Burel et al.	

Primary Examiner—David O. Reip

(74) *Attorney, Agent, or Firm*—Lerner, David, Littenberg, Krumholz & Mentlik, LLP

(57) **ABSTRACT**

An apparatus for persuading an orthopedic rod into position in an orthopedic device such as an implant or coupling element is disclosed. The apparatus includes a body, a pusher member and a trigger slidably coupling the pusher member to the body. The pusher member includes a slide and sleeve attached to the slide. The sleeve includes at least one pusher bar. A ratchet controls the translation of the pusher member along the body to urge the rod into position in the orthopedic device. The pusher member and body define a cannula so that a fastener may be inserted once the rod is in position. The apparatus is operable via a single hand. In addition, a method of urging an orthopedic rod into a recess of an orthopedic device using the rod persuader is provided.

69 Claims, 10 Drawing Sheets

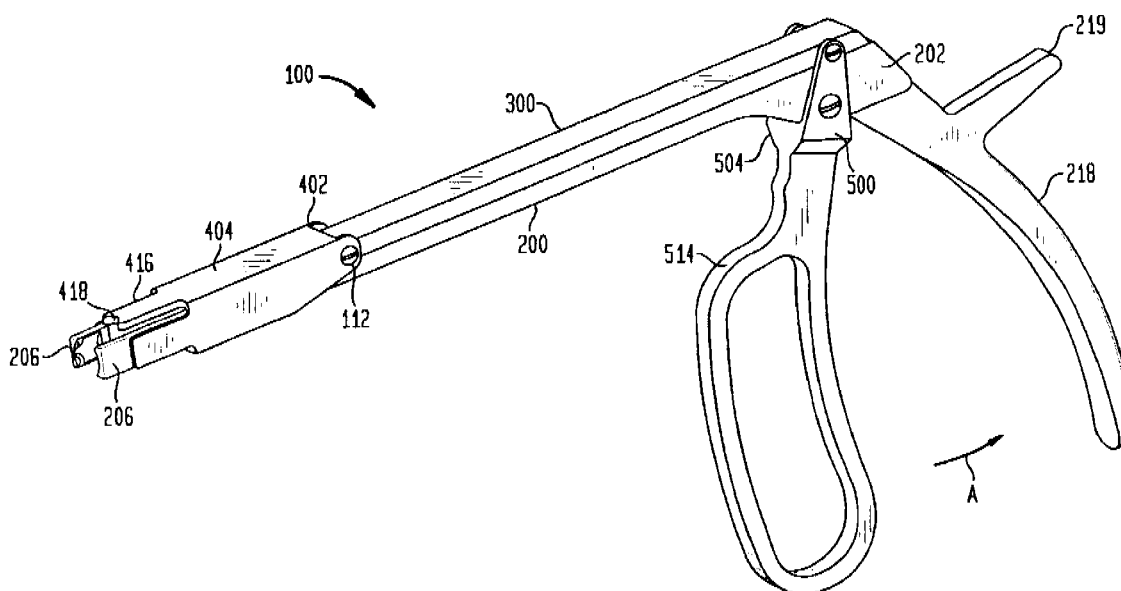


FIG. 1B

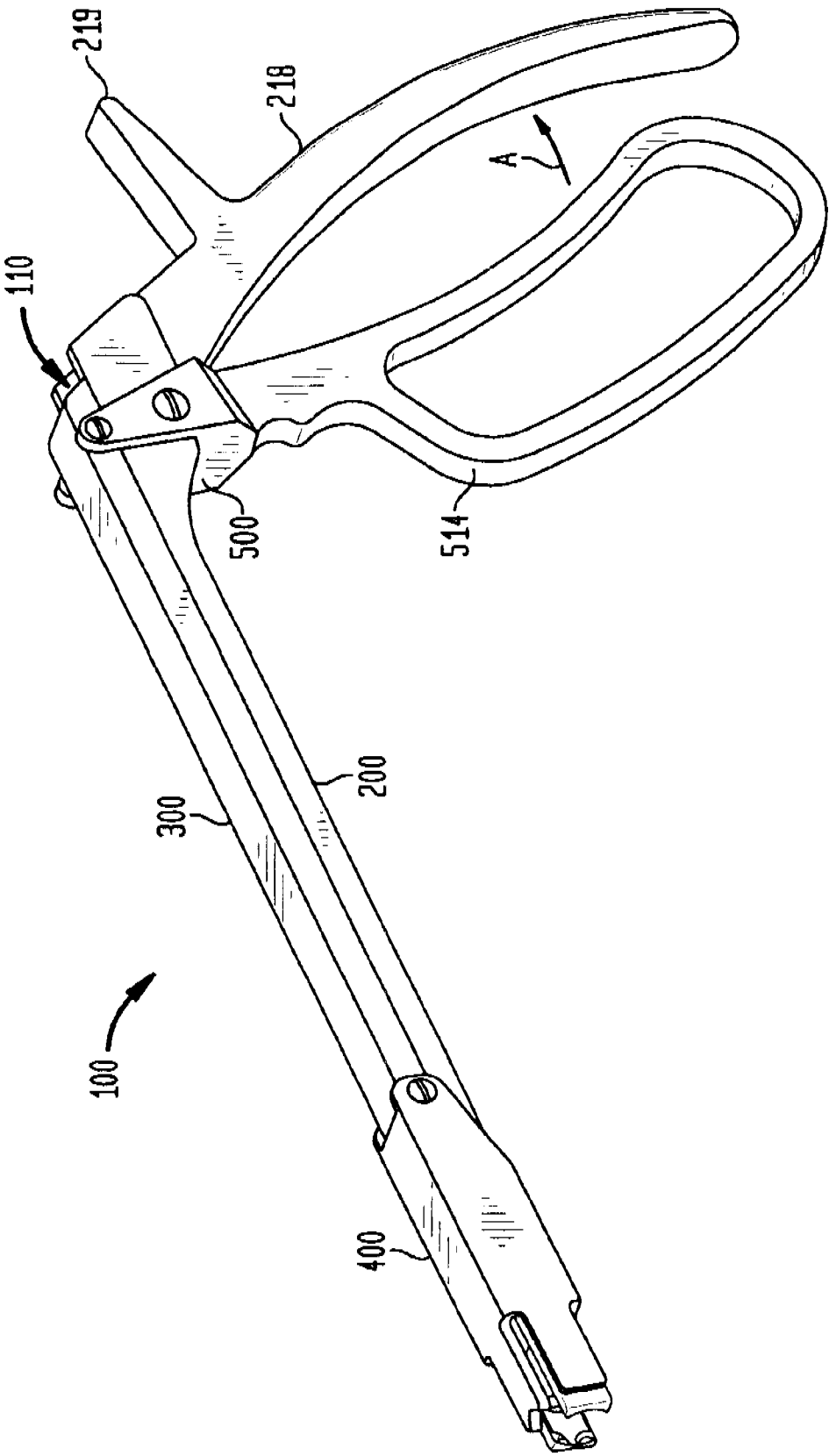


FIG. 1C

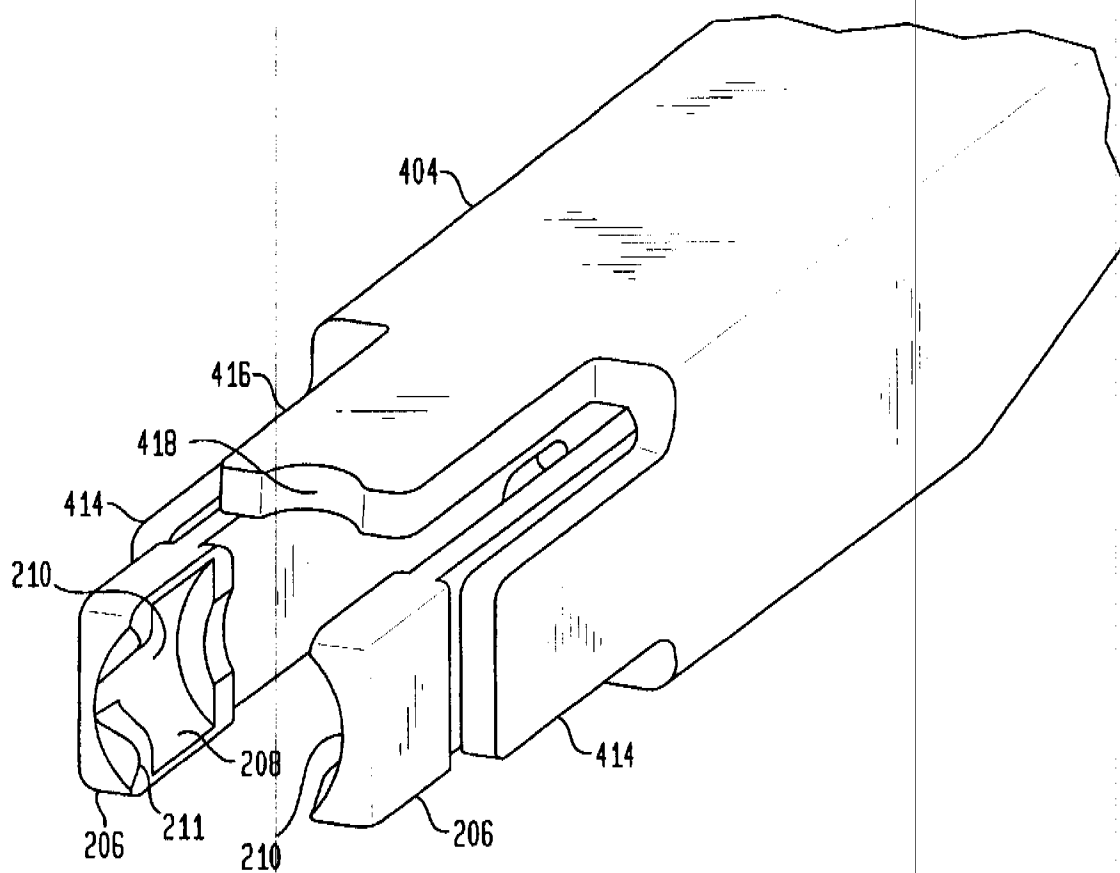


FIG. 1D

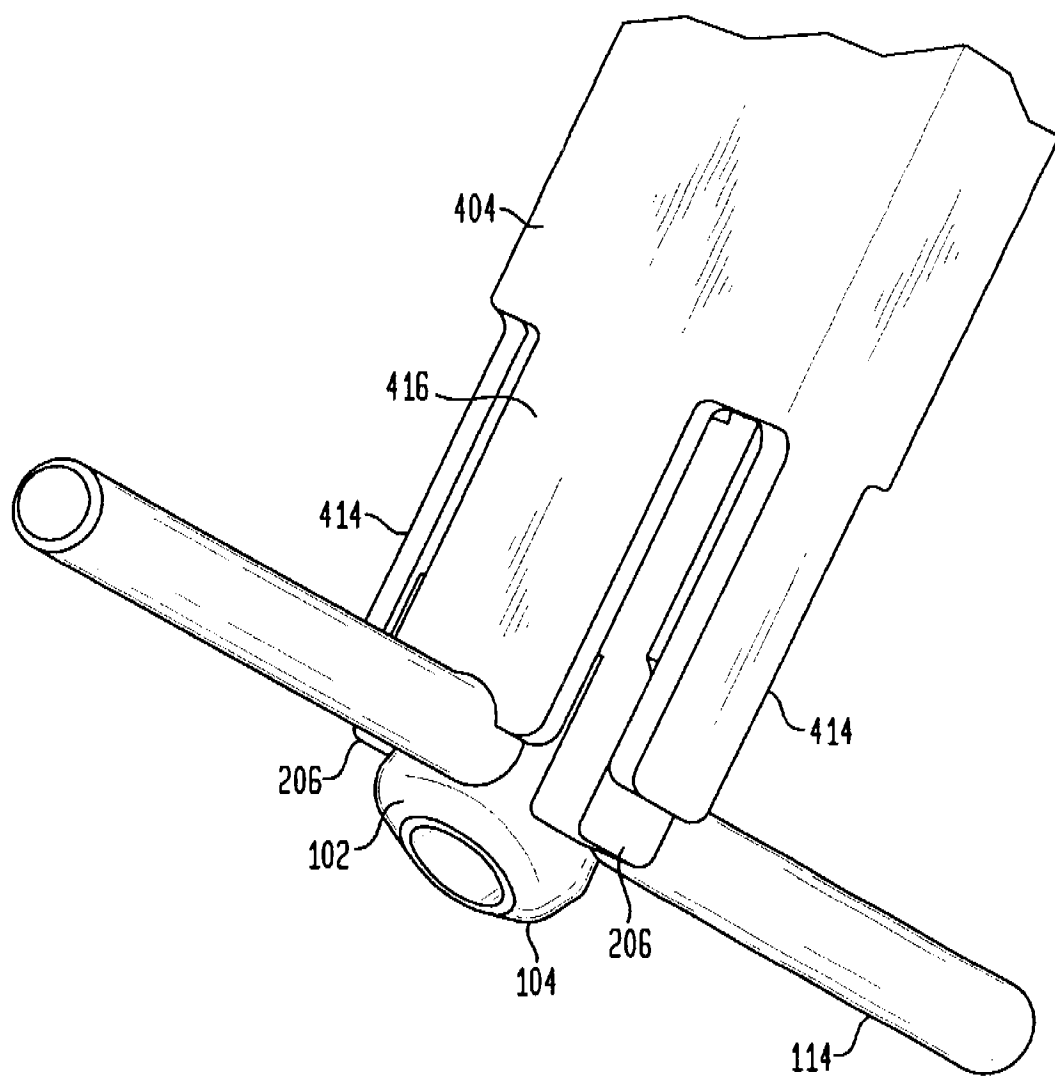
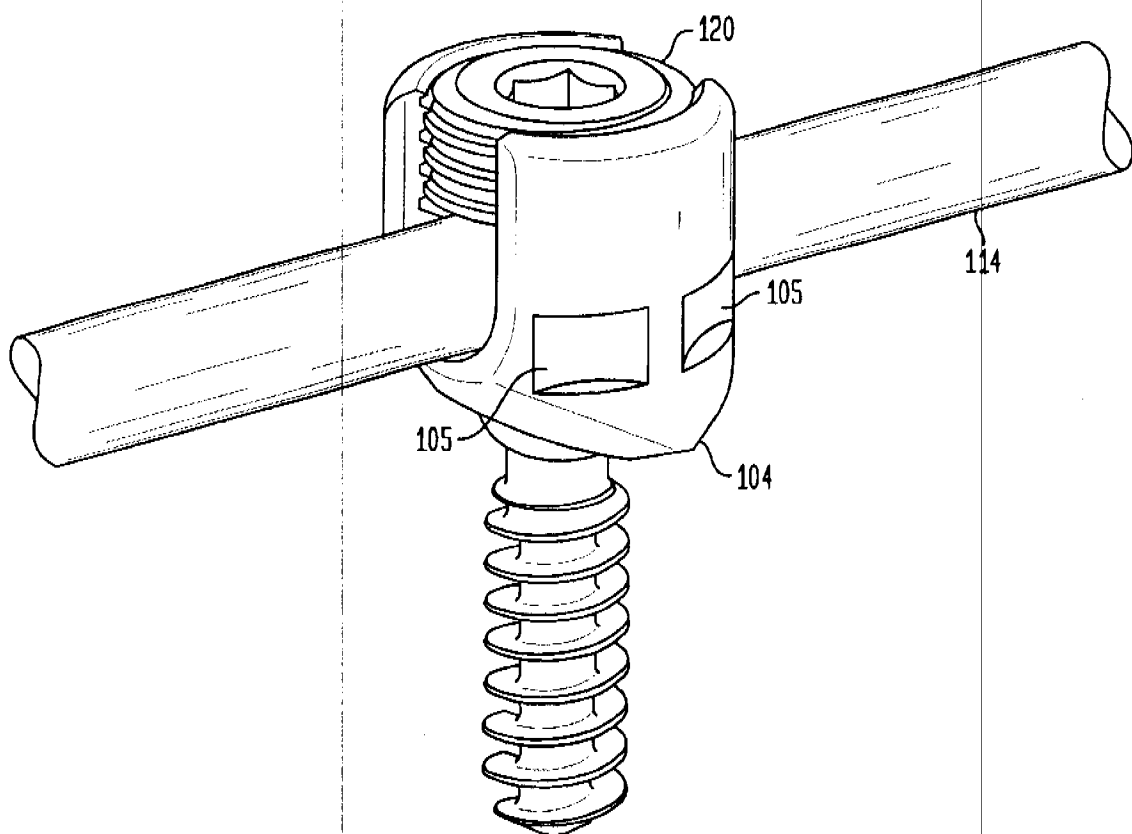


FIG. 1E



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FIG. 2

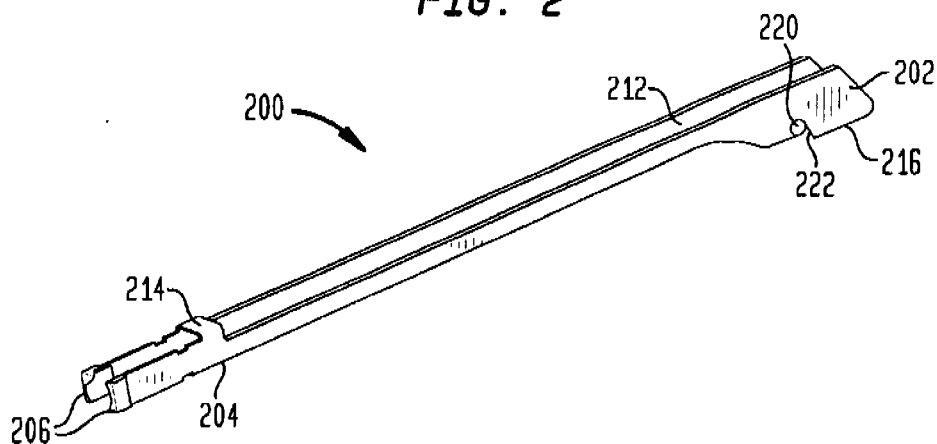


FIG. 3

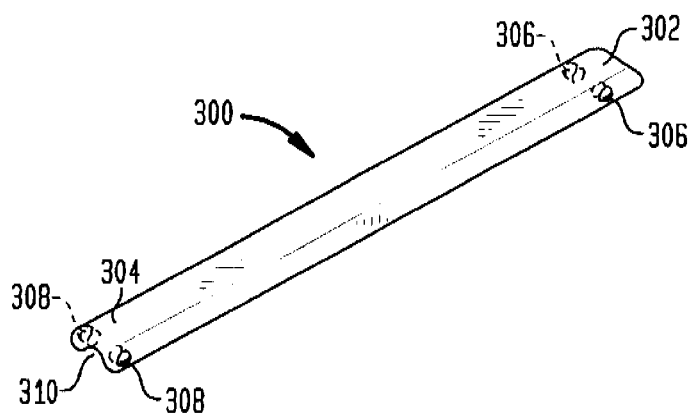


FIG. 4

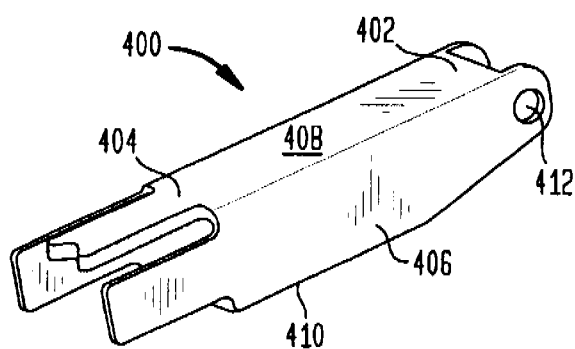


FIG. 5

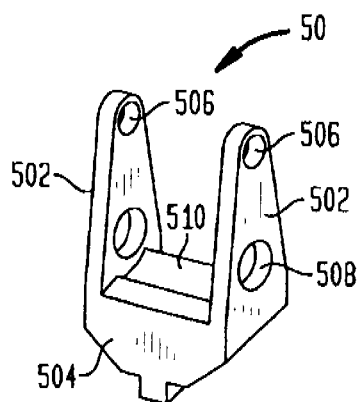


FIG. 6B

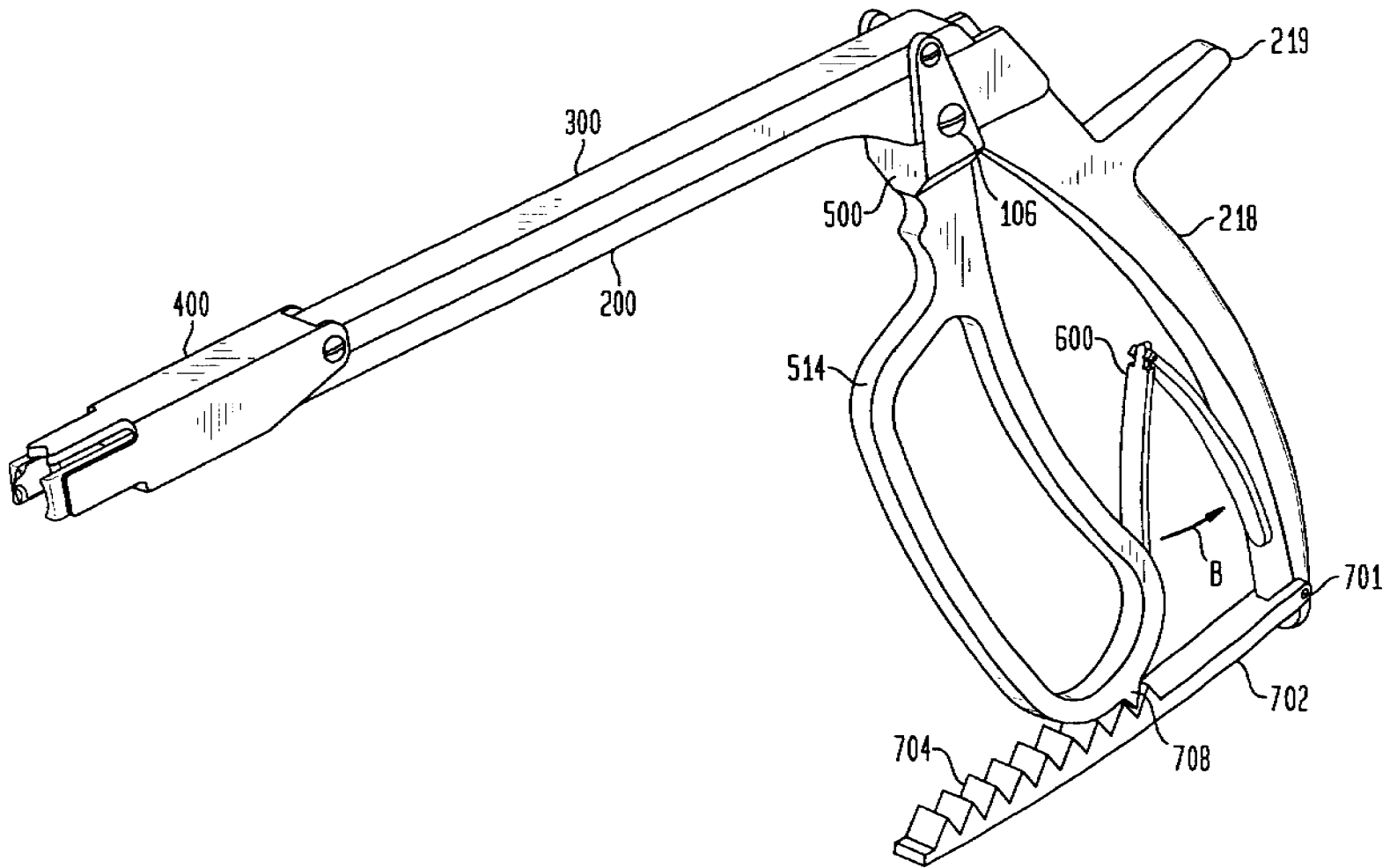
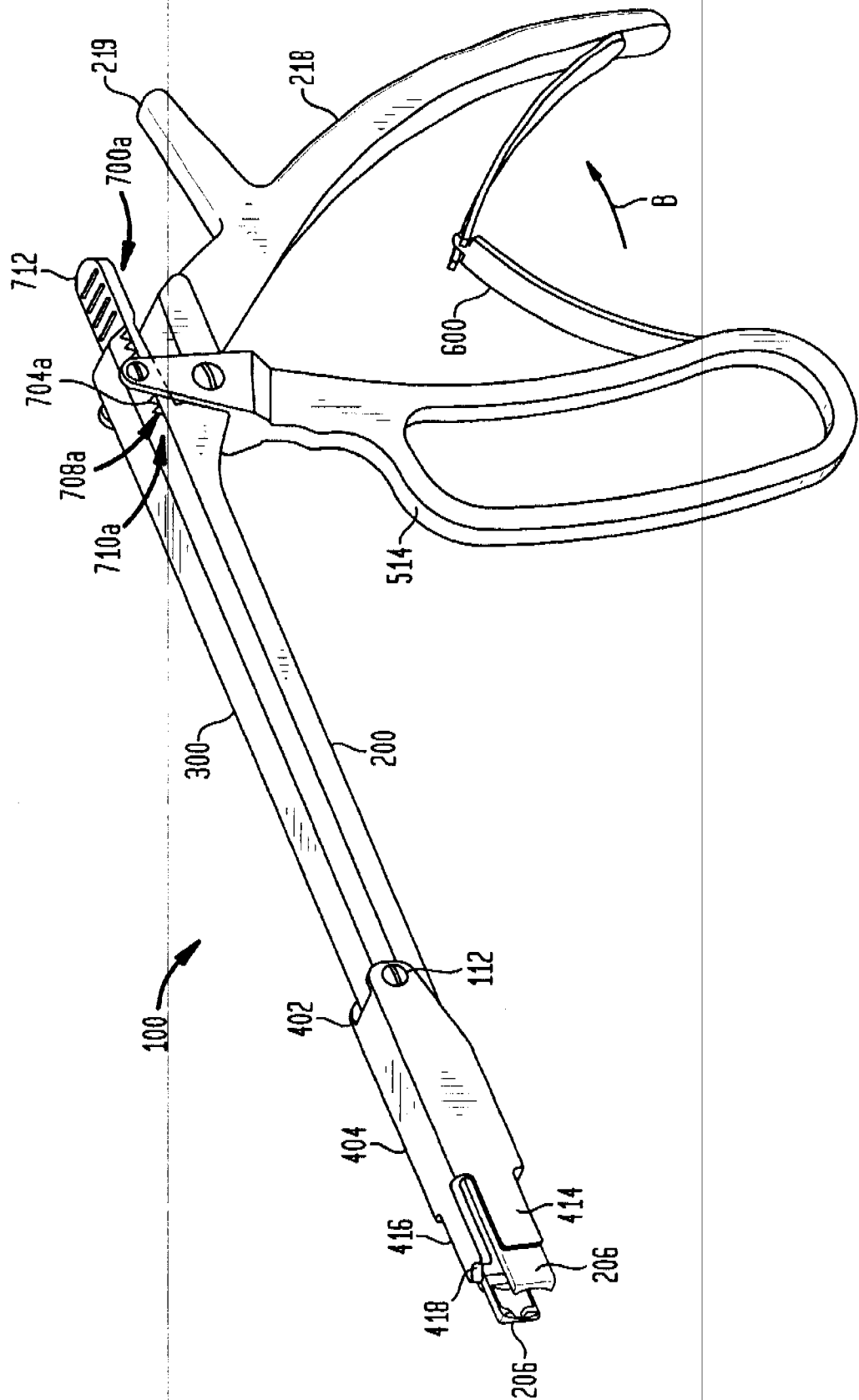
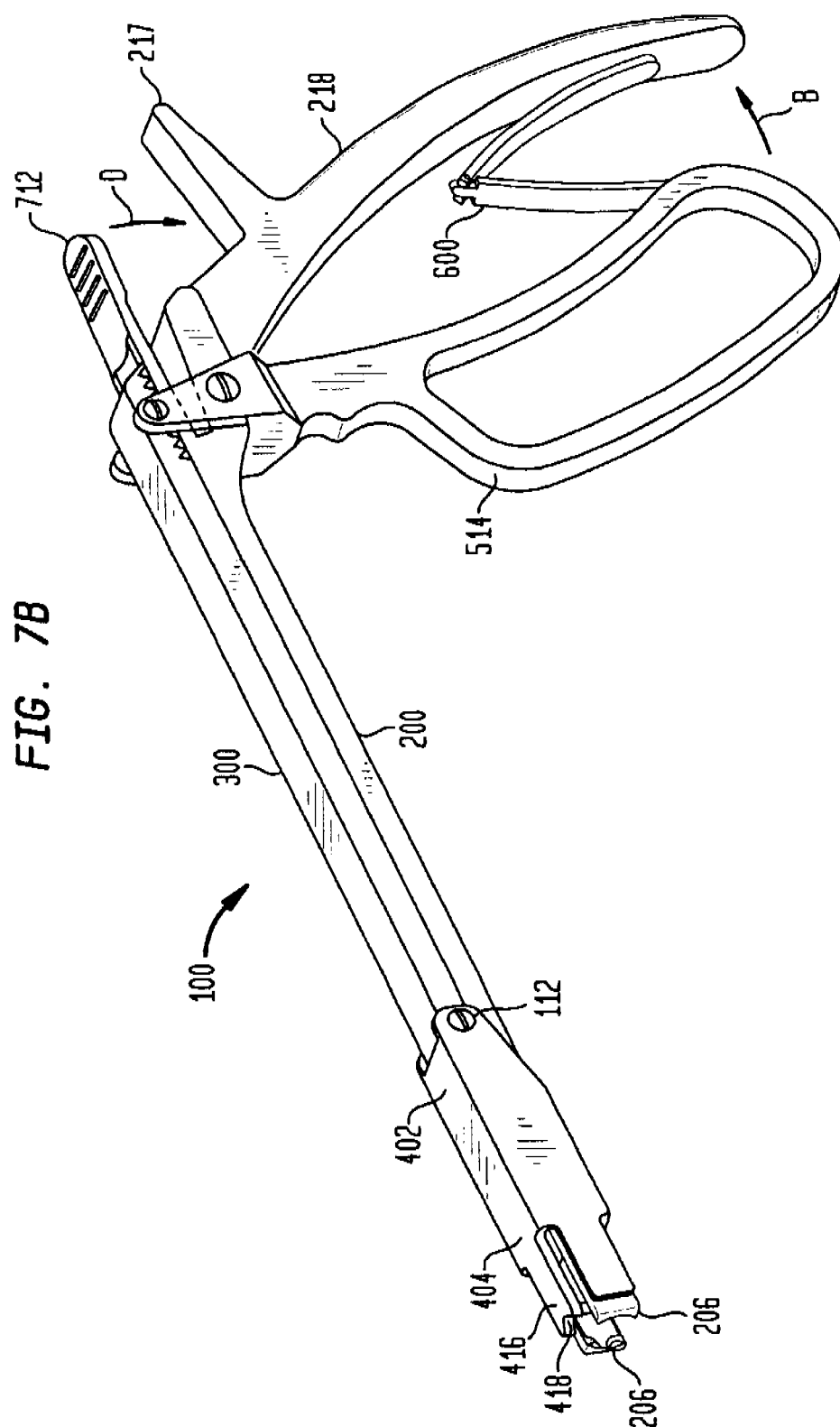


FIG. 7A





ROD PERSUADER

BACKGROUND OF THE INVENTION

The present invention relates to an instrument for urging an orthopedic rod into a recess in an orthopedic device and more particularly, to an instrument for securing a spinal rod to a coupling element.

The spinal column is a highly complex system of bones and connective tissues that provides support for the body and protects the delicate spinal cord and nerves. The spinal column includes a series of vertebral bodies stacked one atop the other, each vertebral body including an inner or central portion of relatively weak cancellous bone and an outer portion of relatively strong cortical bone. Situated between each vertebral body is an intervertebral disc that cushions and dampens compressive forces exerted upon the spinal column. A vertebral canal containing the spinal cord and nerves is located behind the vertebral bodies.

There are many types of spinal column disorders, including scoliosis (abnormal lateral curvature of the spine), kyphosis (abnormal forward curvature of the spine, usually in the thoracic spine), excess lordosis (abnormal backward curvature of the spine, usually in the lumbar spine), spondylolisthesis (forward displacement of one vertebra over another, usually in a lumbar or cervical spine) and other disorders caused by abnormalities, disease or trauma, such as ruptured or slipped discs, degenerative disc disease, fractured vertebra, and the like. Patients that suffer from such conditions usually experience extreme and debilitating pain, as well as diminished nerve function.

Surgical techniques commonly referred to as spinal fixation use surgical implants and/or mechanical immobilization to fuse two or more vertebral bodies of the spinal column. Spinal fixation may also be used to alter the alignment of adjacent vertebral bodies relative to one another so as to change the overall alignment of the spinal column. Such techniques have been used effectively to treat the above-described conditions and, in many cases, to relieve pain.

One spinal fixation technique involves immobilizing the spine using orthopedic stabilizing rods, commonly referred to as spine rods, which are positioned generally parallel to the spine. This may be accomplished by exposing the spine posteriorly and fastening bone screws to the pedicles of vertebral bodies. The pedicle screws are generally placed two per vertebra and serve as anchor points for the spine rods. Coupling elements or implants adapted for receiving a spine rod therethrough are then used to join the spine rods to the pedicle screws. A set screw or fastener then fastens the spine rod into a seat in a coupling element.

Instruments are utilized for inserting a spine rod into position within an orthopedic device such as a coupling element. Surgeons have encountered considerable difficulty when attempting to use these instruments to insert a spine rod into the seat of the coupling element and then inserting a fastener to secure the set up. For example, U.S. Pat. No. 5,910,141 to Morrison provides a rod introduction apparatus capable of laterally aligning a rod with an implant and vertically advancing the rod into position in the implant. The instrument, however, is difficult to use since it requires two hands, one hand to hold the instrument while it clamps the implant and one hand to operate the lateral alignment and vertical alignment means to properly position the rod in the implant.

In addition, U.S. Pat. No. 5,020,519 to Hayes et al. discloses an instrument for seating a spine rod into a hook.

The instrument grips the hook with teeth and clamps the hook between the jaws. The thumb wheel must be rotated to shift the pusher thereby urging the spine rod into the hook. Again, it is difficult to utilize this instrument with a single hand.

There remains a need for improved instruments for urging or persuading spinal rods into position in orthopedic devices such as coupling elements or implants. In particular, there remains a need for spinal rod persuaders that may be effectively utilized with one hand. Moreover, there is a need for a simple design that both holds the coupling element stationary while persuading the rod into position. There is a further need for a rod persuader that locks as the rod is advanced into position. It is advantageous for a rod persuader to be easily removed from gripping the coupling element after the rod is properly positioned. It is further advantageous to provide a cannula in the rod persuader in which a set screw or other fastener may be inserted and delivered to the coupling element while the rod persuader is gripping the coupling element and rod.

SUMMARY OF THE INVENTION

According to one aspect of the invention, a rod persuader or an apparatus for urging an orthopedic or spinal rod into a recess or seat on an orthopedic device such as an implant, coupling element, or pedicle screw system is provided. The apparatus includes a body that is releasably attachable to the orthopedic device, pusher member and a trigger slidably coupling the pusher member to the body.

The trigger may be actuated to translate the pusher member into contact with the rod and continue translating the pusher member until the rod is urged into recess of the orthopedic device. The pusher bar comprises a slide coupled to the body via the trigger and a sleeve attached to the slide so that the slide and sleeve translate together. Additionally, the sleeve includes at least one pusher bar integral with the sleeve and for accommodating the rod upon contact. Furthermore, the rod persuader may include a grip extending from the body and a handle extending from the trigger so that the rod persuader may be comfortably held in one hand. The handle is movable toward the grip to actuate the trigger.

According to another aspect of the invention, the rod persuader has a pair of fingers extending from an end of the body. The fingers are adaptable to releasably grip the orthopedic device. The fingers are elastic members that are separable to receive and grip the orthopedic device therebetween. The fingers may further include projections that cooperate with recess on the orthopedic device that allows the rod persuader to snap onto the orthopedic device. Additionally, the sleeve may include portions such as arms that prevent the fingers of the body from separating while gripping the orthopedic device as the sleeve is advanced.

According to another aspect of the invention, the rod persuader defines a cannula for receiving a fastener and a driver to secure the rod to the orthopedic device. The body and/or the pusher member may have channels which together form the cannula.

According to another aspect of the invention, a rod persuader or apparatus for urging and securing an orthopedic rod to an orthopedic device is provided. The apparatus includes a body releasably attachable to the orthopedic device, a pusher member coupled to the body via a trigger, and a ratchet. Actuation of the trigger translates the pusher member into contact with the rod and urges the rod into the recess of the orthopedic device, the ratchet controls the translation of the pusher member in steps so that after each

step, the ratchet locks into position to prevent the pusher member from reverting backwards.

The pusher member comprises a slide slidably coupled to the body, a sleeve attached to the slide, and at least one pusher bar integral with the slide. A grip may extend from the body and a handle may extend from the trigger. An elastic member is operatively associated with the grip and handle to hold the handle in a normally open position so that moving the handle toward the grip actuates the trigger to advance the ratchet. Thus, the elastic member locks the ratchet in position at each step. According to another aspect of the invention, the ratchet is attached to the handle or the grip. The ratchet comprises a rack having a plurality of female teeth. Each of the teeth on the rack corresponds to one step of the ratchet. The rack further includes a hinge connecting the rack to the grip or the handle and a male tooth extending opposite the female teeth from the handle or the grip and cooperating with the female teeth. Thus, as the handle is moved toward the grip, the male tooth is advanced to the first female tooth and locked into position. The male tooth advances along the rack of the female teeth each time the handle is moved and the male tooth locks in at each step. As this occurs, the pusher member translates in steps to urge the rod into position. The ratchet is unlocked by rotating the rack about the hinge.

According to yet another aspect of the invention, the ratchet comprises a plurality of female teeth defined in the pusher member or the body and a male tooth extending opposite the female teeth from the body or the pusher member. Moving the handle, thus actuates the trigger to translate the pusher member and advance the male tooth along the female teeth, step-by-step, locking in at each step. A tab extends from the body and is operable to unlock the ratchet. In one aspect of the invention, the pusher member includes a slide coupled to the body via the trigger, a sleeve attached to the slide, and at least one pusher bar for direct contact with the rod.

In accordance with another aspect of the invention, the body may further include a pair of fingers for releasably gripping the orthopedic device. The sleeve includes portions such as a pair of arms for preventing the fingers of the body from separating while holding the orthopedic device when the sleeve is translated. The rod persuader also includes a cannula formed by the channels of the slide and body. The pusher bar further defines a recess for accommodating the rod.

According to yet another aspect of the invention, an apparatus for securing a spinal rod to a pedicle screw is provided. The apparatus includes a generally longitudinally body defining a channel, a generally longitudinal pusher member defining a channel, a cannula formed by the channels, a ratchet, a grip extending from the body, a trigger slidably coupling the pusher member to the body, a handle extending from the trigger, and a handle extending from the body. The handle is movable toward the grip to actuate the trigger and thereby translate the pusher member toward the spinal rod and into contact therewith. The ratchet controls the translation of the pusher member and rod in steps, locking at each step. An elastic member is associated with the grip and handle to return the handle back to a normally open position after it has been moved.

The apparatus may further include a pair of elastic fingers extending from the body that are separable to receive and grip the pedicle screw. The pusher member may include a slide attached to the body via the trigger, a sleeve and at least one pusher bar. The sleeve may include a pair of arms extending therefrom for preventing the fingers from separating.

According to another aspect of the invention, the ratchet includes a plurality of female teeth and a male tooth. The female teeth may be defined on a rack attached to the handle or grip via a hinge, or the female teeth may be defined in the slide or the body. Accordingly, the male tooth extends opposite the female teeth at the grip or handle, or the male tooth is defined opposite the female teeth in the body or slide.

According to yet another aspect of the invention, a method for securing an orthopedic rod to an orthopedic device using a rod persuader including a body having a grip extending therefrom, a pusher member and a trigger coupling the pusher member to the body and having a handle extending therefrom is provided. The method includes the steps of holding the rod persuader in a single hand, engaging the orthopedic device via a pair of fingers extending from the body, displacing the handle toward the grip to actuate the trigger and thereby advance the pusher member, contacting the rod with the pusher member, displacing the handle further to advance the rod into the seat of the orthopedic device, securing the rod to the orthopedic device and releasing the rod persuader from the orthopedic device.

In accordance with another aspect of the invention, the engagement of the orthopedic device further includes contacting the fingers of the body with the orthopedic device and applying a force to the body to separate the fingers allowing for insertion of the orthopedic device between the fingers. The securing step further includes inserting a fastener into the cannula and using a driver to tighten the fastener to secure the rod to the orthopedic device.

According to another aspect, the method further includes removing the driver and removing the apparatus from the orthopedic device by applying a force to the body away from the orthopedic device.

In accordance with another aspect of the invention, a method for securing a rod to an orthopedic device is provided. The method utilizes a rod persuader including a body with a grip, a pusher member, a trigger with a handle, a ratchet, and an elastic member connecting the handle to the grip. The method includes holding the rod persuader in a single hand, engaging the orthopedic device via fingers on the body, displacing the handle to actuate the trigger and advance the ratchet one step, and thereby translate the pusher member, locking the ratchet in position at the step, and repeatedly displacing the handle to advance the rod into position step by step.

The engaging step may include contacting the fingers with the orthopedic device and applying a force to the body to separate the fingers to allow for insertion of the orthopedic device there between.

According to another aspect, the securing step includes inserting a fastener into the cannula and using a driver to tighten the fastener to secure the rod to an orthopedic device. Finally, the rod persuader is released from the orthopedic device by unlocking the ratchet and applying a force to the body away from the orthopedic device to separate the fingers thereby releasing the rod persuader.

The method may further include inserting a fastener into the cannula and using a driver to tighten the fastener to secure the rod to the orthopedic device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A is a front perspective view of an instrument for urging a spinal rod in the open position in accordance with the present invention.

FIG. 1B is a front perspective view of the instrument of FIG. 1A in the closed position.

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FIG. 1C is a front perspective close-up view of section C—C of FIG. 1A.

FIG. 1D is a top perspective close-up view of the sleeve, arms, rod and orthopedic device in accordance with the present invention.

FIG. 1E is a front perspective view of the rod fully secured to the orthopedic device.

FIG. 2 is a front perspective view of a body in accordance with the present invention.

FIG. 3 is a front perspective view of a slide in accordance with the present invention.

FIG. 4 is a front perspective view of a sleeve in accordance with the present invention.

FIG. 5 is a front perspective view of a trigger in accordance with the present invention.

FIG. 6A is a front perspective view of another embodiment of the invention, showing an instrument for urging a rod with a ratchet in the open position.

FIG. 6B is a front perspective view of the instrument of FIG. 6A in the closed position.

FIG. 7A is a front perspective view of another embodiment of the invention, showing an instrument for urging a rod with a ratchet in the open position.

FIG. 7B is a front perspective view of the instrument of FIG. 7A in the closed position.

DETAILED DESCRIPTION

FIGS. 1A through 1D show an instrument for persuading a rod into 114 a seat recess 102 of an orthopedic device or a coupling element 104. The instrument comprises a generally longitudinal body 200, a slide 300, a sleeve 400 and a trigger 500, each illustrated separately in FIGS. 2, 3, 4, and 5 respectively. The slide 300 and sleeve 400 together form a pusher member.

Referring now to FIGS. 1A–1E and 2, the body 200 defines a first end 202 and a second end 204. A pair of fingers 206 extend from the second end 204 of the body 200. The fingers 206 each have an interior wall 208 which define indentations 210 and notches 211 that correspond to the shape of the coupling element 104. As shown in FIG. 1E, the coupling element 104 defines grooves 105 for receiving notches 211. The fingers are rigid, but also elastic so that they act in a springing motion so that the application of a force will separate the fingers. Thus, a force may be applied to the body in order to insert the coupling element 104 between the fingers 206, as shown in FIG. 1D. Once in position, the fingers 206 securely grip the coupling element 104 via the grooves 105 by the spring motion.

The body 200 further defines a channel 212 extending longitudinally on its top side from the first end 202 through the middle area of the body. The channel 212 ends at an abutment 214 located at the second end 204. The abutment 214 projects vertically higher than the first end 202 of the body. The fingers 206 extend longitudinally from opposite sides of the abutment 214.

In a preferred embodiment a joint 216 is provided extending at an angle from the second end 204. A pistol grip 218 with thumb rest 219 may be attached to the second end 204 at the joint 216 via welding, bolting or any other method of attaching. In an alternate embodiment, the grip 218 and the body 200 may be integral and therefore the body 200 and grip 218 would be formed of a single piece. The body 200 further defines a pair of threaded holes 220 to receive screws 106. A notch 222 extends downwards from the area of the holes 220.

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Referring now to FIGS. 1A–D and 3, the slide 300 has a first end 302 and a second end 304. The first end defines a pair of threaded holes 306 and the second end defines a pair of threaded holes 308. The slide 300 further defines a channel 310 extending longitudinally on its bottom side along the entire length of the slide.

FIGS. 1A–1D and 4 show the sleeve 400. The sleeve 400 is generally shaped like a square column defining a first end 402 and a second end 404 and having a pair of opposite sides 406, a top side 408 and a bottom side 410. The first end 402 defines holes 412 on either side 406 of the sleeve 400. A pair of arms 414 extend longitudinally from opposite sides 406 at the second end 404 of the sleeve 400. A pusher bar 416 extends longitudinally from the top side 408 of the sleeve 400, between the arms 414. The pusher bar 416 defines a groove 418 for accommodating the spine rod.

FIGS. 1A–1D and 5 show the trigger 500 having a pair of branches 502 and a bottom piece 504 connecting the branches 502. Each branch defines an upper hole 506 and a lower hole 508. The inside surface of the bottom piece 504 has an indentation 510. The outside surface of the bottom piece 504 also defines a joint 512 extending therefrom. In a preferred embodiment, a handle 514 is attached to the trigger at the joint 512 via welding, bolting or any other method of attaching. In addition, the handle 514 and trigger 500 may be integral so that the handle 514 and trigger 500 together are formed of a single piece.

As illustrated in the FIGS., the instrument 100 comprises the body 200, the slide 300, the sleeve 400 and the trigger 500. The trigger 500 connects the slide 300 to the body 200, so that the slide and body are generally parallel. The notch 222 at the first end 202 of the body fits into the indentation 510 of the trigger 500. Lower holes 508 of the trigger are generally aligned with threaded holes 220 of the body. Screws 106 secure the trigger 500 to the body 200 via the holes 508, 220.

Upper holes 506 of the trigger are generally aligned with threaded holes 306 of the slide. Screws 108 secure the trigger 500 to the slide 300 via holes 506, 306. Thus, the slide 300 fits on top of the body 200 and extends the length from the first side 202 of the body 200 to a point just past the middle of the body 200. There is room for the slide to advance longitudinally forward on top of the body toward the abutment 214 of the body. The channel 212 of the body 200 and the channel 310 of the slide 300 together form a cannula 110.

The holes 412 of the sleeve 400 are generally aligned with the threaded holes 308 at the second end 304 of the sleeve 300. Thus, the sleeve 400 is attached to the second end of the slide 300 via screws 112. Moreover, the sleeve 400 partially encases the second end 204 of the body 200 which assists coupling the sleeve 400 and slide 300 to the body 200. The arms 414 of the sleeve 400 partially extend adjacent to the exterior walls of the fingers 206.

In operation, a user (not shown) grasps the instrument in one hand at the pistol grip 218 and handle 514. The coupling element 104 having a spine rod resting within or nearby the seat 102 is engaged or gripped between the fingers 206 of the body 200 by applying a small force allowing the fingers 206 to separate slightly and then grasp the coupling element 104 via the groove 105 as shown in FIG. 1D. The handle 514 is then displaced, moved or squeezed toward the grip 218 in the direction of arrow A as shown in FIGS. 1A and 1B. The displacement of the handle 514 causes the sleeve 400 to advance toward the rod 114 and coupling element 104. Squeezing the handle 514 angularly displaces the trigger 500

moving the notch 222 of the body 200 out of the locked position from the indentation 510 of the trigger 500. Thus, with a single continuous squeeze of the handle, the pusher bar 416 contacts the rod 114 at groove 418. The rod 114 is then advanced into the recess or seat 102 of the coupling element 104 to the position shown in FIG. 1D, while the fingers 206 continue to grip the coupling element 104. As the slide 300 and sleeve 400 advance, the arms 414 of the sleeve also advance adjacent to the fingers 206. Thus, the arms 206 prevent the fingers 206 from separating. The user of the instrument may then continuously squeeze the handle to maintain the positioning of the rod 114 on the seat 102 of the coupling element. While the positioning is maintained, the user may use the free hand to perform other tasks. In addition, a fastener 120 (FIG. 1E) may be inserted through the cannula 110 to secure the rod 114 to the coupling element 104. A driver (not shown) may also be inserted through the cannula to tighten the fastener. Once the rod is secured, the user may release the handle allowing the pusher to withdraw from contact with the rod. Then, the instrument release its grip on the coupling element 104 by slightly rotating the instrument to displace the ratches 211 from the groove 105 of the coupling element and to slightly separate the fingers 206. A force may then be applied on the instrument in the direction opposite the coupling element. This force will free the instrument from its grip on the coupling element 104. Thus, the rod 114 is secured to the coupling element 104 as shown in FIG. 1E.

Referring now to FIGS. 6A and 6B, another embodiment of the invention is shown where like elements are similarly numbered. The instrument further comprises a ratchet mechanism 700 and a springing connector 600 connecting the handle 514 and grip 218. The ratchet mechanism includes a rack 702 having a plurality of female teeth 704. The rack 702 is connected to the bottom of the pistol grip at hinge 706. A male tooth 708 extends from the bottom of the handle 514.

The male tooth 708 of the handle cooperates with the female teeth 704 of the rack 702. FIG. 6A shows the instrument in the beginning or open position so that the male tooth is resting at a first end 710 of the rack 702. Each of the female teeth of the rack represents a single step.

In operation, the user grasps the instrument with one hand via the pistol grip 218 and the handle 514. After the instrument grips the coupling element via the notches 211 of the fingers, the user then squeezes the handle 214 toward the pistol grip in the direction of arrow B to displace the male tooth 708 one step into the first female tooth. The springing connector 600 causes the handle to lock in this first step, advancing the slide and the sleeve forward the distance of one step. The user repeatedly squeezes the handle to displace the male tooth a single step at a time into each of the female teeth. As this occurs, the slide 300 and sleeve 400 advance forward so that the pusher 416 contacts the rod 114 at groove 418 and urges the rod into position in the seat 102 of the coupling element 104 as illustrated in FIG. 1D at each step.

As the ratchet mechanism is operated, the springing connector 600 locks the male tooth. Thus, the user does not have to constantly apply pressure to the handle in order to maintain the position of the rod. Rather, the locking nature of the ratchet maintains the advancement of the slide and sleeve and in turn, the advancement of the rod. Additionally, the user may release his grasp on the instrument without threat of the rod 114 regressing back away from the coupling element 104, since the ratchet is locked in position.

Once again, after the rod 114 is positioned in the seat 102 of the coupling element 104, a fastener 120 may be inserted

through the cannula. A driver may be used through the cannula to tighten the fastener to secure the rod 114 to the coupling element 104. Once the rod is secured, the rack 702 of the ratchet mechanism may be rotated about the hinge 706 in the direction of arrow C, to unlock the ratchet mechanism. This results in the pusher 416 releasing its contact with the rod 114. The instrument may then be removed from its grip on the coupling element as discussed above.

FIGS. 7A and 7B show yet another embodiment of the invention where like elements are similarly numbered. In this embodiment, the instrument generally comprises a body 200, slide 300, sleeve 400, trigger 500, springing connector 600 and a ratchet mechanism 700a.

The ratchet mechanism 700a includes a plurality a female teeth 704a defined in the bottom of the slide 300. A male tooth 708a extends upwards from the body 200. In addition, a tab 712 extends from the body 200. The male tooth 708a of the body cooperates with the female teeth 704a of the slide.

FIG. 7A shows the instrument in the beginning or open position so that the male tooth is resting at a front end 710a of the plurality of female teeth 704a. Each of the female teeth 704a represents a single step.

In operation, the user grasps the instrument with one hand via the pistol grip 218 and the handle 514. After the instrument grips the coupling element via the notches 211 of the fingers, the user then squeezes the handle 214 toward the pistol grip in the direction of arrow B which displaces the male tooth 708 one step into the first female tooth 704. The springing connector 600 causes the male tooth to lock in this first step, advancing the slide 300 and the sleeve 400 forward the distance of one step. The user repeatedly squeezes the handle to displace the male tooth a single step at a time and lock into position at each of the female teeth. As this occurs, the slide 300 and sleeve 400 advance forward so that the pusher 416 contacts the rod 114 at groove 418 and urges the rod into position in the seat 102 of the coupling element 104 as illustrated in FIG. 1D.

As the ratchet mechanism is operated, the springing connector 600 locks the male tooth at each step. Thus, the user does not have to constantly apply pressure to the pressure in order to maintain the position of the rod. Rather, the locking nature of the ratchet maintains the advancement of the slide and sleeve and in turn, the advancement of the rod. Additionally, the user may release his grasp on the instrument without threat of the rod 114 regressing back away from the coupling element 104, since the ratchet is locked in position.

Once again, after the rod 114 is positioned in the seat 102 of the coupling element 104, a fastener 120 may be inserted through the cannula. A driver may be used through the cannula to tighten the fastener to secure the rod 114 to the coupling element 104. Once the rod is secured, the tab 712 of the ratchet mechanism may be rotated in the direction of arrow D, to unlock the ratchet mechanism. This results in the pusher 416 releasing its contact with the rod 114. The instrument may then be removed from its grip on the coupling element 104 as discussed above.

Although the invention herein has been described with reference to particular embodiments, it is to be understood that these embodiments are merely illustrative of the principles and applications of the present invention. It is therefore to be understood that numerous modifications may be made to the illustrative embodiments and that other arrangements may be devised without departing from the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. An apparatus for urging an orthopedic rod into a recess of an orthopedic device, comprising:

a body having a first end and a second end, said second end being releasably attachable to the orthopedic device;

a pusher member;

a trigger coupling said pusher member to said body, wherein actuation of said trigger translates said pusher member toward said second end into contact with the orthopedic rod and further urges the orthopedic rod into the recess of the orthopedic device.

2. An apparatus according to claim 1, wherein said pusher member comprises:

a slide slidably coupled to said body via said trigger;

a sleeve attached to said slide and partially surrounding said second end; and

at least one pusher bar integral with said sleeve and defining a recess for accommodating the orthopedic rod upon contact.

3. An apparatus according to claim 1, further comprising:

a grip extending angularly from said first end of said body; and

a handle extending from said trigger, said handle being movable toward said grip to actuate said trigger and thereby, translate said pusher member toward said second end.

4. An apparatus according to claim 1, further comprising a pair of fingers extending from said second end for releasably gripping the orthopedic device.

5. An apparatus according to claim 4, wherein said fingers are elastic members that are separable to receive and grip the orthopedic device therebetween.

6. An apparatus according to claim 5, wherein said fingers define projections cooperable with recesses on the orthopedic device.

7. An apparatus according to claim 4, wherein said sleeve includes portions in juxtaposition with said fingers and upon translation of said pusher member toward said second end, said portions translate adjacent to said fingers to prevent said fingers from separating.

8. An apparatus according to claim 7, wherein said portions comprise a pair of arms extending from opposite sides of said sleeve.

9. An apparatus according to claim 1, further comprising a cannula extending from said first end of said body to said second end of said body.

10. An apparatus according to claim 9, wherein said cannula is formed by channels in said body and said pusher member that are arranged one on top of the other.

11. An apparatus for urging an orthopedic rod into a recess of an orthopedic device, comprising:

a body having a first end and a second end, said second end being releasably attachable to the orthopedic device;

a pusher member slidably coupled to said body; and

a trigger coupling said pusher member to said body, wherein actuation of said trigger translates said pusher member toward said second end into contact with the orthopedic rod and further urges the orthopedic rod into the recess of the orthopedic device;

a ratchet for controlling the translation of said pusher member in steps, wherein said ratchet locks at each step to prevent the pusher member from translating away from the orthopedic rod.

12. An apparatus according to claim 11, wherein said pusher member comprises:

a slide slidably coupled to said body via said trigger;

a sleeve attached to said slide and partially surrounding said second end; and

at least one pusher bar integral with said sleeve and defining a recess for accommodating the orthopedic rod upon contact.

13. An apparatus according to claim 11, further comprising:

a grip extending angularly from said first end of said body;

a handle extending from said trigger, said handle being movable toward said grip to actuate said trigger and thereby, translate said pusher member toward said second end, wherein moving said handle advances said ratchet one step; and

an elastic member operatively associated with said handle and said grip to hold said handle in a normally open position, wherein said elastic member locks said ratchet at each step after said handle is moved.

14. An apparatus according to claim 13, wherein said ratchet is attached to said grip or said handle.

15. An apparatus according to claim 14, wherein said ratchet comprises:

a rack including a plurality of female teeth, each said female tooth being one step;

a hinge attaching said rack to said grip or said handle, wherein said rack may be rotated about said hinge to unlock said ratchet; and

a male tooth extending opposite said female teeth from said handle or said grip and cooperating with said female teeth, wherein moving said handle advances said male tooth into the next said female tooth and said elastic member locks said male tooth at the next step.

16. An apparatus according to claim 15, further comprising a pair of fingers extending from said second end for releasably gripping the orthopedic device.

17. An apparatus according to claim 16, wherein said fingers are elastic members that are separable to receive and grip the orthopedic device therebetween.

18. An apparatus according to claim 17, wherein said fingers define projections cooperable with recesses on the orthopedic device.

19. An apparatus according to claim 16, wherein said sleeve includes portions in juxtaposition with said fingers and upon translation of said pusher member toward said second end, said portions translate adjacent to said fingers to prevent said fingers from separating.

20. An apparatus according to claim 19, wherein said portions comprise a pair of arms.

21. An apparatus according to claim 14, further comprising a cannula extending from said first end of said body to said second end of said body.

22. An apparatus according to claim 21, wherein said cannula is formed by channels in said body and said pusher member that are arranged one on top of the other.

23. An apparatus according to claim 13, wherein said ratchet is formed at said first end of said body.

24. An apparatus according to claim 23 wherein said ratchet comprises:

a plurality of female teeth defined in a bottom of said pusher member or a top of said body, each said female tooth being one step;

a male tooth extending opposite said female teeth from said top of said body or said bottom of said pusher

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member and cooperating with said female teeth, wherein moving of said handle advances said male tooth into the next said female tooth and said elastic member locks said male tooth at the next step; and
a tab extending from said body, wherein said tab is operable to unlock said ratchet.

25. An apparatus according to claim 24, further comprising a pair of fingers extending from said second end for releasably gripping the orthopedic device.

26. An apparatus according to claim 16, wherein said fingers are elastic members that are separable to receive and grip the orthopedic device therebetween.

27. An apparatus according to claim 26, wherein said fingers define projections cooperable with recesses on the orthopedic device.

28. An apparatus according to claim 26, wherein said sleeve includes portions in juxtaposition with said fingers and upon translation of said pusher member toward said second end, said portions translate adjacent to said fingers to prevent said fingers from separating.

29. An apparatus according to claim 11, further comprising a cannula extending from said first end of said body to said second end of said body.

30. An apparatus according to claim 29, wherein said cannula is formed by channels in said body and said pusher member that are arranged one on top of the other.

31. An apparatus according to claim 23, further comprising a cannula extending from said first end of said body to said second end of said body.

32. An apparatus for securing a spinal rod to a pedicle screw, comprising:

a generally longitudinal body defining a channel on a top side, said body being capable to releasably grip the pedicle screw;

a generally longitudinal pusher member adjacent to said body and defining a channel on a bottom side, said channel of said body and said channel of said slide forming a cannula being capable of receiving a fastener for securing the spinal rod to the pedicle screw and a driver for tightening the fastener;

a trigger slidably coupling said pusher member to said body, wherein actuation of said trigger translates said slide toward and into contact with the spinal rod and further urges the spinal rod into a recess of the pedicle screw;

a ratchet for controlling the translation of said pusher member in steps;

a grip extending angularly from an end of said body;

a handle extending from said trigger, said handle being movable toward said grip to actuate said trigger and thereby, translate said pusher member toward the spinal rod; and

an elastic member operatively associated with said handle and said grip to hold said handle in a normally open position, wherein said elastic member locks said ratchet at each step.

33. An apparatus according to claim 32, further comprising:

a pair of elastic fingers extending from said body, said elastic fingers being separable to receive and grip the pedicle screw therebetween; and

wherein said pusher member comprises:

a slide slidably coupled to said body via said trigger;
a sleeve attached to said slide and including a pair of arms in juxtaposition with said finger, wherein upon

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translation of said pusher member, said arms translate adjacent to said fingers to prevent said fingers from separating; and

at least one pusher bar integral with said sleeve and defining a recess for accommodating the spinal rod upon contact.

34. An apparatus according to claim 33, wherein said ratchet comprises:

a rack including a plurality of female teeth, each said female tooth being one step;

a hinge attaching said rack to said grip or said handle, wherein said rack may be rotated about said hinge to unlock said ratchet; and

a male tooth extending from said handle or said grip and cooperating with said female teeth, wherein moving said handle advances said male tooth into the next said female tooth and said elastic member locks said male tooth at the next step.

35. An apparatus according to claim 33 wherein said ratchet comprises:

a plurality of female teeth defined in a bottom of said slide or a top of said body, each said female tooth being one step;

a male tooth extending opposite said female teeth from said top of said body or said bottom of said slide and cooperating with said female teeth, wherein moving said handle advances said male tooth into the next said female tooth and said elastic member locks said male tooth at the next step; and

a tab extending from said body, said tab being operable to unlock said ratchet.

36. A method for securing an orthopedic rod to an orthopedic device using a rod persuader including a body having a grip extending therefrom, a pusher member, and a trigger coupling said pusher member to said body and having a handle extending therefrom, said method comprising the steps of:

holding the rod persuader in a single hand at the grip and handle;

engaging the orthopedic device via a pair of fingers extending from the body;

displacing the handle toward the grip to actuate the trigger and thereby translating the pusher member toward the engaged orthopedic device;

contacting the rod with the pusher member while the handle is displaced;

displacing the handle further to advance the rod into the seat of the orthopedic device;

securing the rod to the orthopedic device; and

releasing the rod persuader from the orthopedic device.

37. A method according to claim 36, wherein said step of engaging further comprises the steps of:

contacting the fingers of the body with the orthopedic device; and

applying a force to the body to separate the fingers thereby allowing for insertion of the orthopedic device therebetween.

38. A method according to claim 37, wherein said step of securing further comprises the steps of:

inserting a fastener into a cannula formed between the pusher member and the body;

inserting a driver into the cannula; and

tightening the fastener via the driver to secure the rod to the orthopedic device.

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39. A method according to claim 38, wherein said step of releasing further comprises the steps of:

- removing the driver from the cannula;
- rotating the body to separate the fingers; and
- applying a force to the body away from the orthopedic device to release the rod persuader from the orthopedic device.

40. A method for securing an orthopedic rod to an orthopedic device using a rod persuader including a body having a grip extending therefrom, a pusher member, a trigger coupling the pusher member to the body and having a handle extending therefrom, a ratchet, and an elastic member attaching the handle to the grip, said method comprising:

- holding the rod persuader in a single hand at the grip and handle;
- engaging the orthopedic device via a pair of fingers extending from the body;
- displacing the handle to actuate the trigger and advance the ratchet one step, and thereby translate the pusher member toward the engaged orthopedic device; and
- locking the ratchet in position at the one step;
- repeating said displacing step and said locking step until the pusher member contacts the orthopedic rod and the orthopedic rod is translated into the seat of the orthopedic device; and

securing the orthopedic rod to the orthopedic device.

41. A method according to claim 40, wherein said step of engaging further comprises the steps of:

- contacting the fingers of the body with the orthopedic device; and
- applying a force to the body thereby allowing for insertion of the orthopedic device therebetween.

42. A method according to claim 41, wherein said securing step further comprises the steps of:

- inserting a fastener into a cannula formed between the pusher member and the body;
- inserting a driver into said cannula; and
- tightening the fastener via the driver to secure the rod to the orthopedic device.

43. A method according to claim 42, wherein said step of releasing further comprises the steps of:

- removing the driver from the cannula;
- unlocking the ratchet;
- rotating the body to separate the fingers; and
- applying a force to the body away from the orthopedic device to release the rod persuader from the orthopedic device.

44. An apparatus for urging an orthopedic rod toward an orthopedic device, comprising:

- a body having a first end and a second end, said second end being releasably attachable to said orthopedic device and adapted to receive a portion of said orthopedic rod;
 - a pusher member; and
 - a triggering mechanism coupled to said pusher member and said body,
- wherein said triggering mechanism is operable to urge said orthopedic rod toward said orthopedic device, and wherein displacement of said triggering mechanism occurs in a direction substantially parallel to a direction of advancement of said orthopedic rod toward said orthopedic device.

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45. The apparatus of claim 44, wherein said triggering mechanism comprises a pistol grip fixedly attached to said body at said first end, and a trigger coupled to said pusher member and said body.

46. The apparatus of claim 45, wherein said trigger is pivotally hinged to said pusher member and said body.

47. The apparatus of claim 46, wherein a portion of said trigger has a fixed distance between a first pivot point connecting said trigger to said body and a second pivot point connecting said trigger to said pusher member.

48. The apparatus of claim 44, wherein said pusher member comprises a slide and a sleeve, and

wherein said slide has a first end and a second end, is pivotally coupled to said triggering mechanism at said first end, and is pivotally coupled to said sleeve at said second end.

49. The apparatus of claim 48, wherein a portion of said sleeve defines a recess for accommodating said orthopedic rod.

50. The apparatus of claim 44, further comprising a set of fingers extending from said second end of said body for releasably gripping said orthopedic device.

51. The apparatus of claim 50, wherein said set of fingers are elastic, and separable to receive and grip said orthopedic device therebetween.

52. The apparatus of claim 44, further comprising a cannula extending from said first end of said body to said second end of said body.

53. The apparatus of claim 52, wherein said cannula is formed by channels in said body and said pusher member.

54. The apparatus of claim 44, further comprising a ratchet for controlling advancement of said pusher member.

55. The apparatus of claim 54, wherein said ratchet is located at said first end of said body.

56. The apparatus of claim 54, wherein said ratchet is located at said triggering mechanism.

57. An apparatus for urging an orthopedic rod toward an orthopedic device, comprising:

- a body having a first end and a second end, said second end being releasably attachable to said orthopedic device and adapted to receive a portion of said orthopedic rod;
- a pusher member;
- a pistol grip fixedly attached to said body at said first end, and
- a trigger coupled to said pusher member and said body, wherein said trigger is operable to urge said orthopedic rod toward said orthopedic device when said trigger is displaced toward said pistol grip.

58. The apparatus of claim 57, wherein said trigger is pivotally hinged to said pusher member and said body.

59. The apparatus of claim 58, wherein a portion of said trigger has a fixed distance between a first pivot point connecting said trigger to said body and a second pivot point connecting said trigger to said pusher member.

60. The apparatus of claim 57, wherein said trigger includes a handle portion.

61. The apparatus of claim 57, wherein said pusher member comprises a slide and a sleeve, and

wherein said slide has a first end and a second end, is pivotally coupled to said trigger at said first end, and is pivotally coupled to said sleeve at said second end.

62. The apparatus of claim 61, wherein a portion of said sleeve defines a recess for accommodating said orthopedic rod.

63. The apparatus of claim 57, further comprising a set of fingers extending from said second end of said body for releasably gripping said orthopedic device.

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64. The apparatus of claim 63, wherein said set of fingers are elastic, and separable to receive and grip said orthopedic device therebetween.

65. The apparatus of claim 57, further comprising a cannula extending from said first end of said body to said second end of said body.

66. The apparatus of claim 65, wherein said cannula is formed by channels in said body and said pusher member.

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67. The apparatus of claim 57, further comprising a ratchet for controlling advancement of said pusher member.

68. The apparatus of claim 67, wherein said ratchet is located at said first end of said body.

69. The apparatus of claim 67, wherein said ratchet is located at said pistol grip and cooperates with said trigger.

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United States Patent [19]
Lichtman

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[45] **Date of Patent:** **Jun. 7, 1994**

- [54] **SURGICAL INSTRUMENT FOR ENDOSCOPIC SURGERY**
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[52] **U.S. Cl.** 606/205; 606/167; 128/751
[58] **Field of Search** 606/51, 52, 83, 174, 606/205-211, 167, 170; 128/750-755
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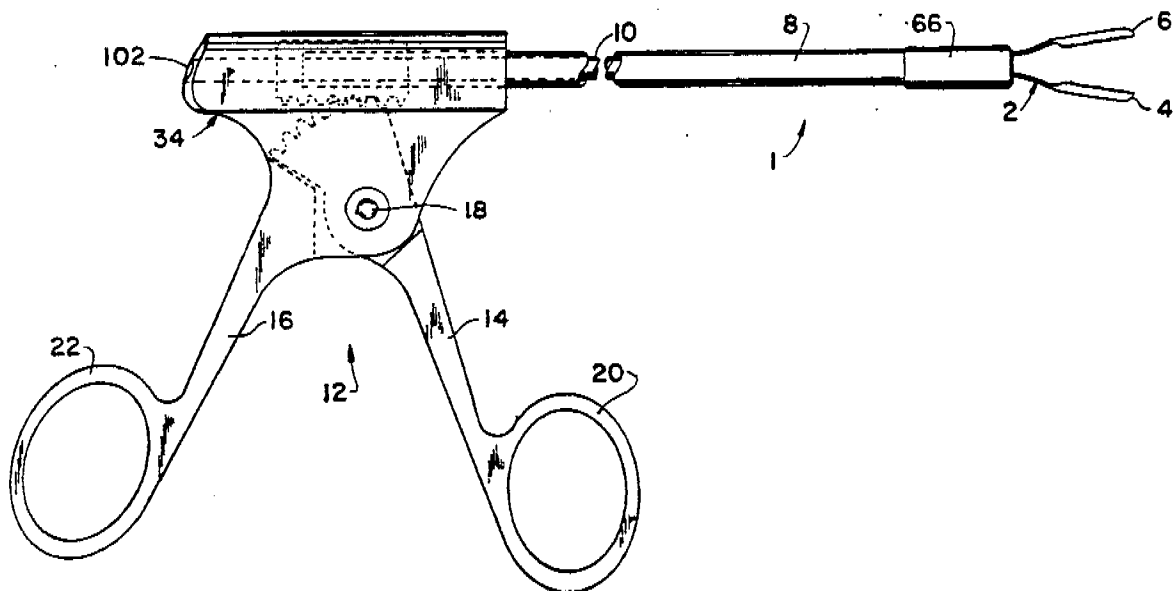
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[57] **ABSTRACT**

A surgical instrument is provided that comprises two coaxial tubes mounted for relative telescoping motion, and a unitary jaw piece of springy material affixed to the remote end of one of said tubes and having two jaws normally biased apart to a selected open position. The other one of said tubes is movable longitudinally relative to said one tube so that the forward end of the said other tube forces the jaws to close. The jaw piece includes a body section joined to the two jaws by spring leaves having a selected configuration, with the result that when the jaws are moved to closed position, the forward ends of the jaws engage one another before there is any engagement between the rear ends of the jaws. The jaw piece also has an opening permitting introduction of an ancillary device to a position permitting communication with the space between the jaws.

30 Claims, 6 Drawing Sheets



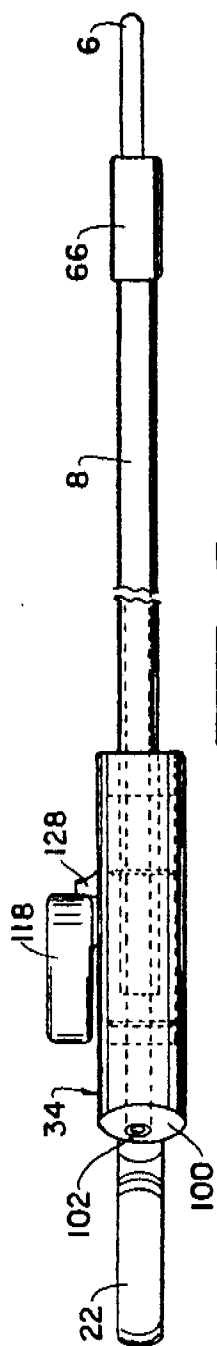


Fig. 3

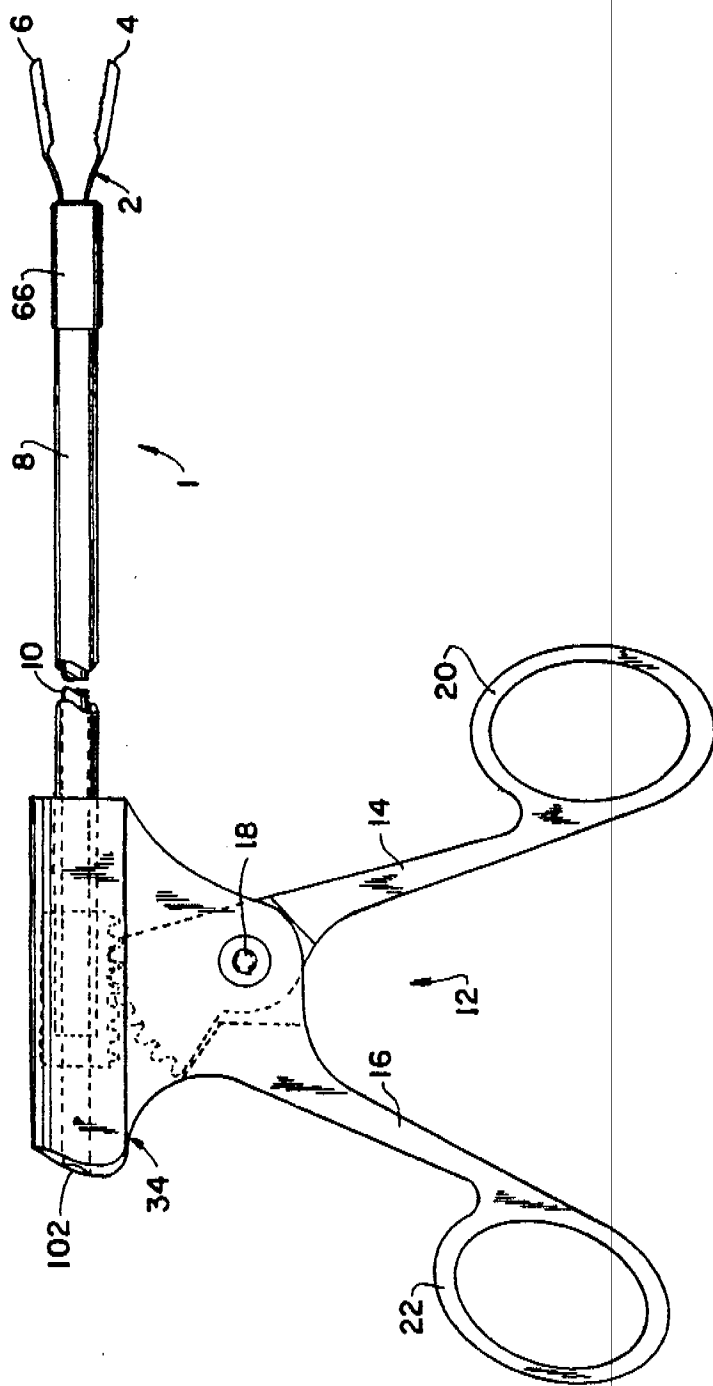


Fig. 1

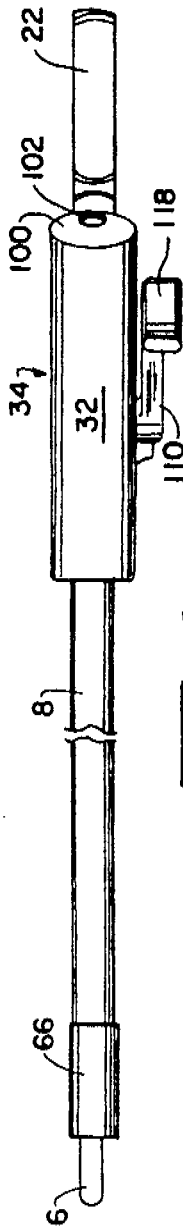


Fig. 4

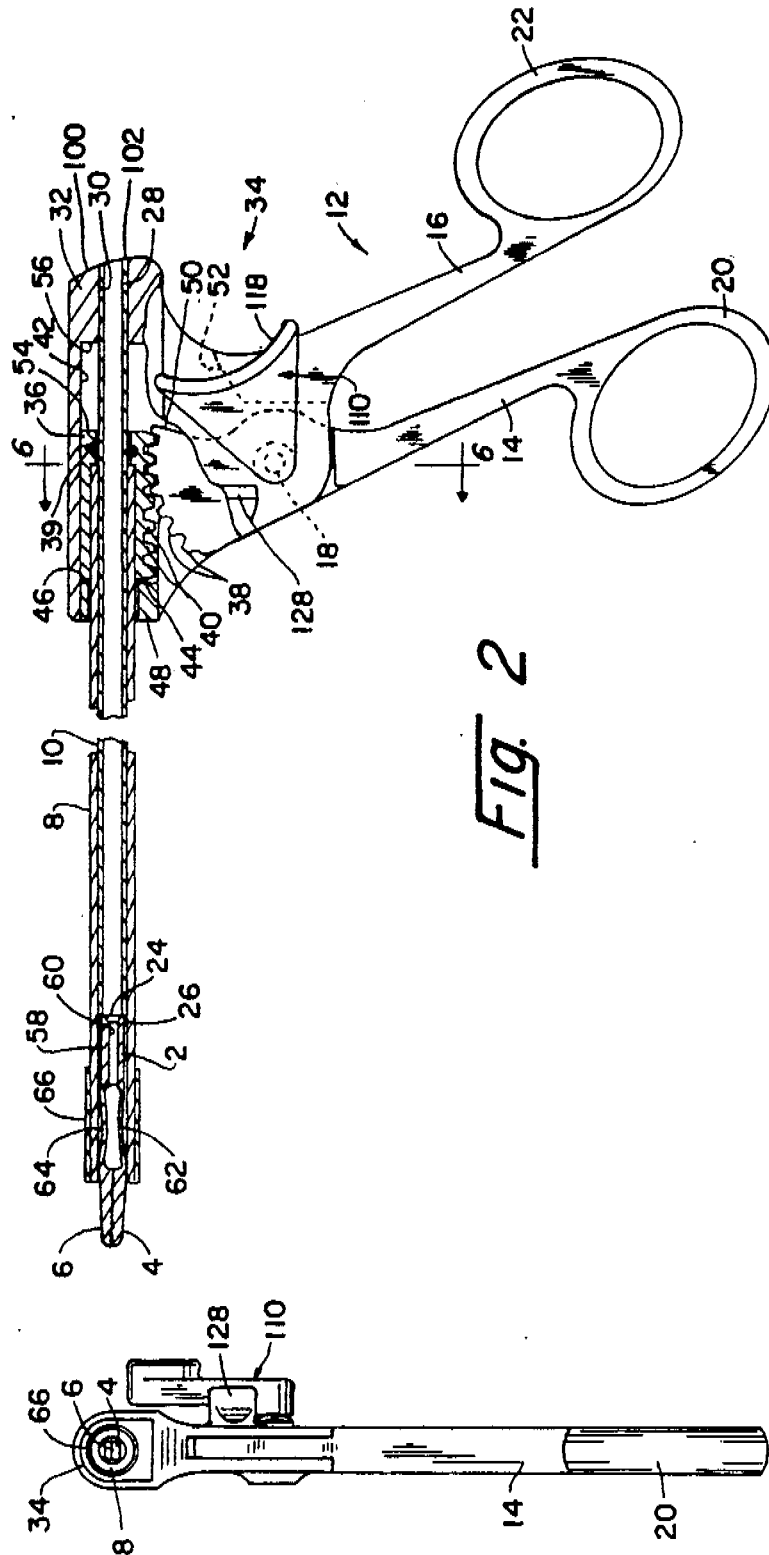


Fig. 2

Fig. 5

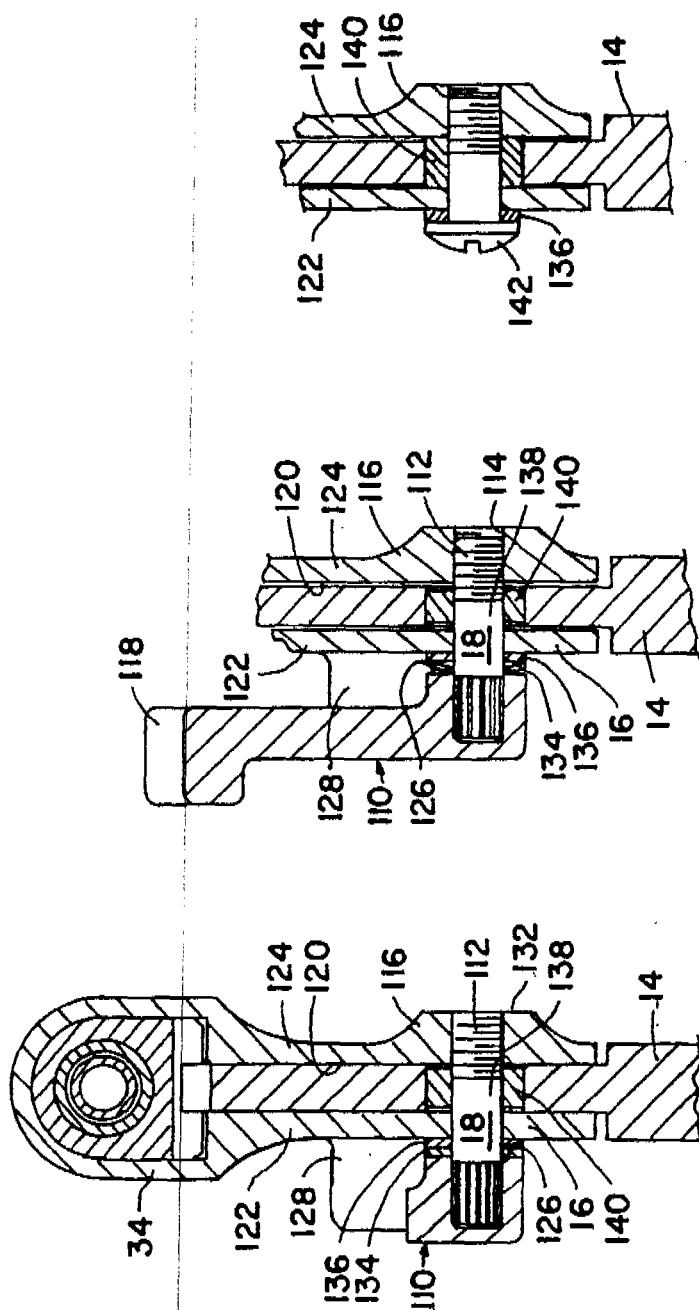


Fig. 6 Fig. 7 Fig. 8

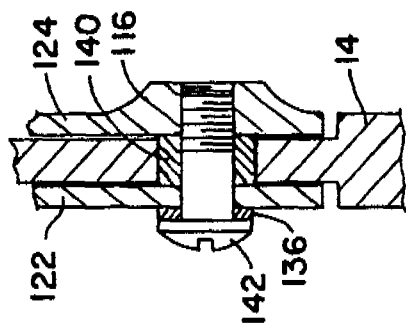
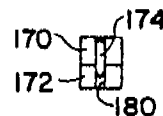
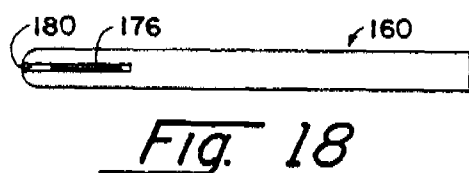
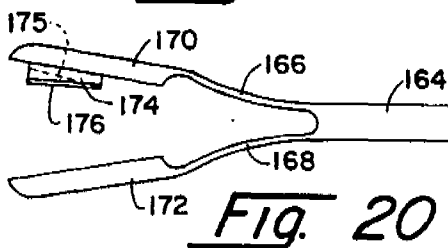
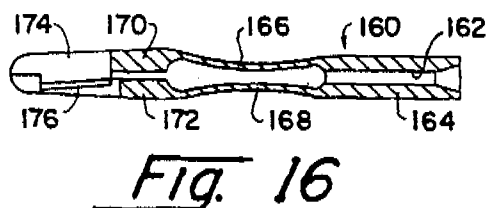
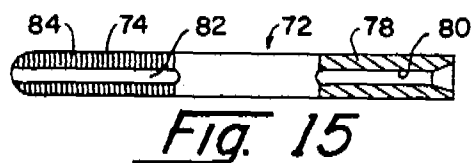
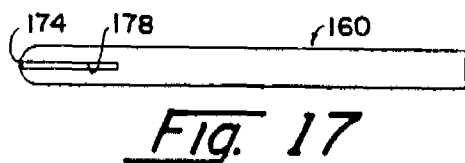
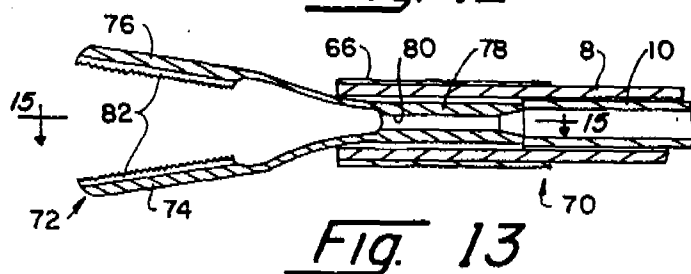
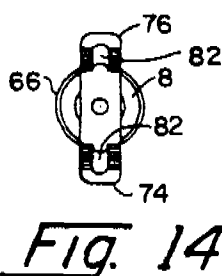
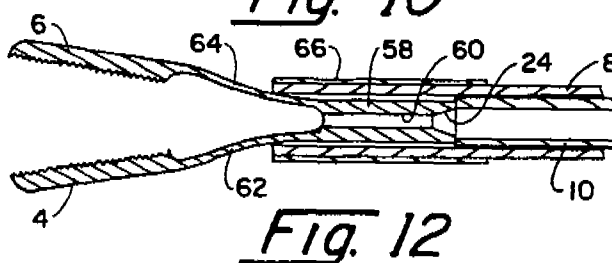
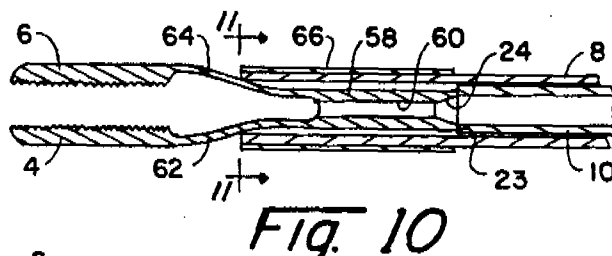
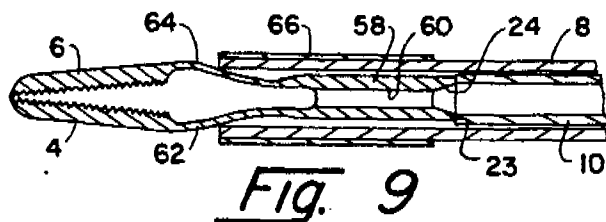
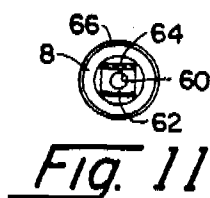


Fig. 8



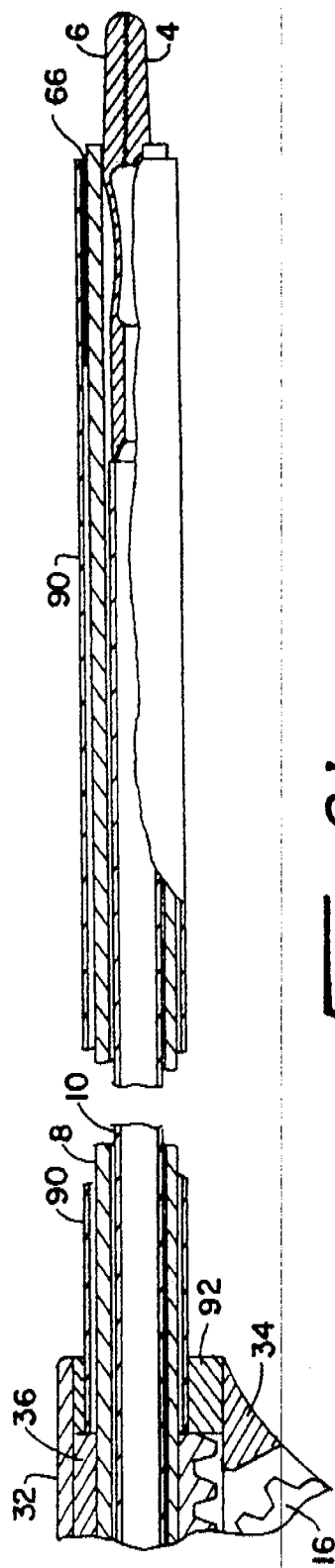


Fig. 21

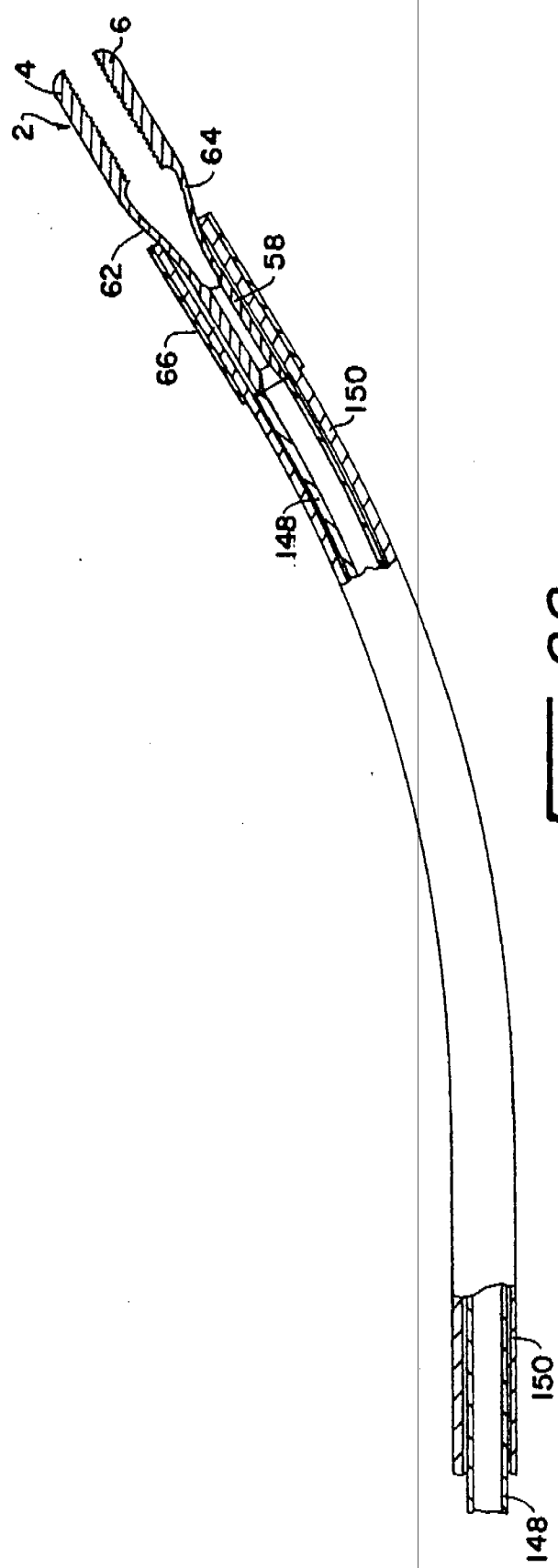
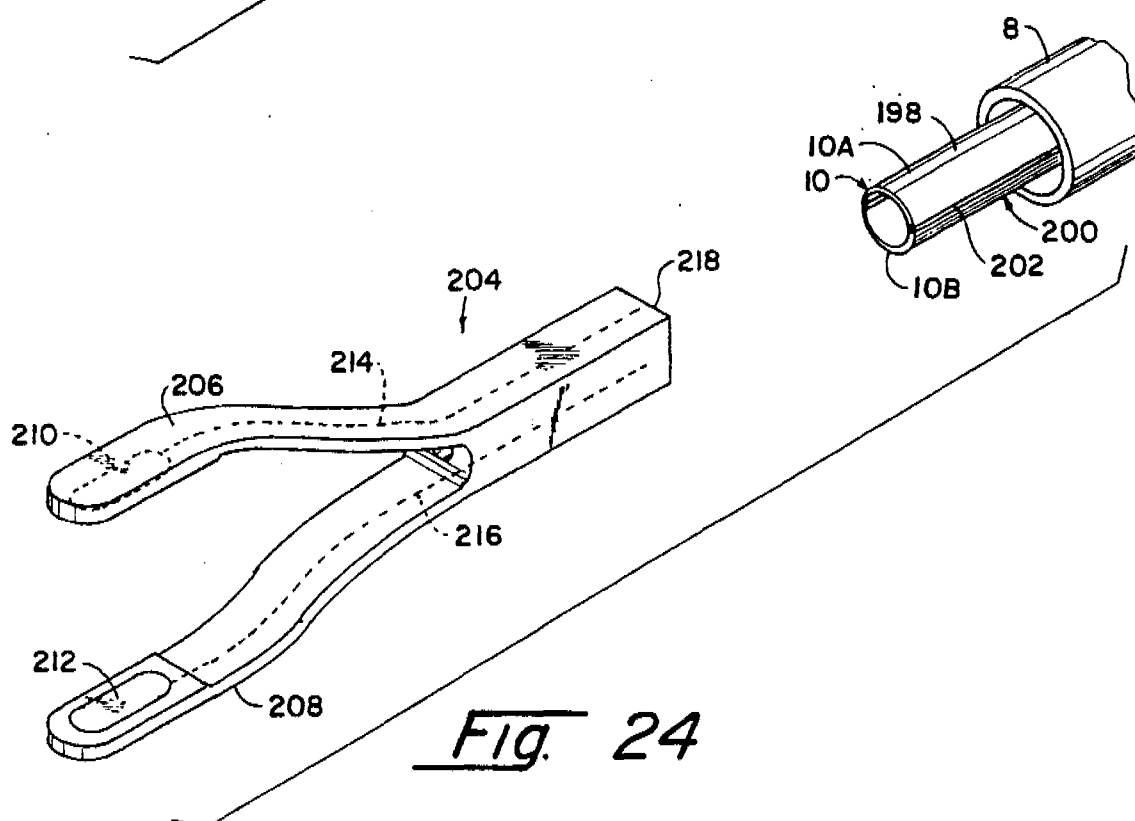
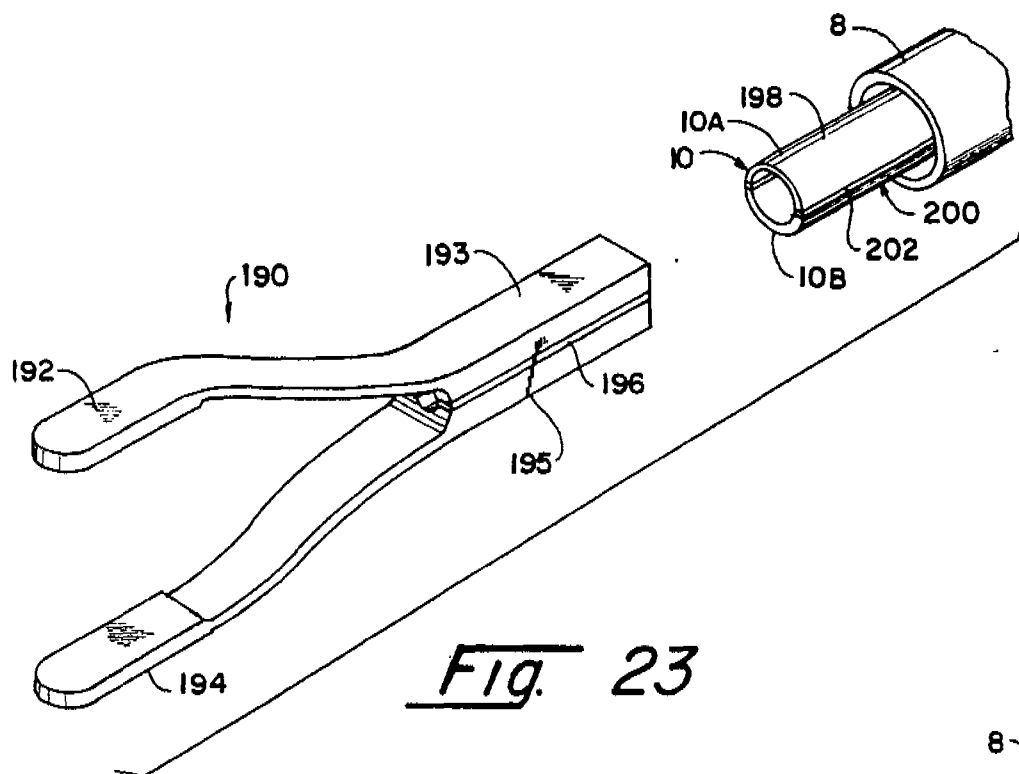


Fig. 22



SURGICAL INSTRUMENT FOR ENDOSCOPIC SURGERY

FIELD OF THE INVENTION

This invention relates generally to a surgical tool or instrument for use in endoscopic surgery which is especially useful for grasping, cutting, or otherwise remotely manipulating bodily tissues during surgery; and is more particularly concerned with such a tool in which an unobstructed longitudinal bore or channel is provided so as to permit another surgical instrument, such as a fiber optic light guide or other ancillary device, to be passed between operating jaws of the tool for purposes of irrigating, visualizing, or further manipulation of the tissues.

BACKGROUND OF THE INVENTION

Surgery frequently requires the grasping or cutting of tissues and organs situated at some distance from the surgeon's hand, such as within a body cavity. In particular, endoscopic surgery often requires that the surgical site be a substantial number of centimeters from the initial incision. In endoscopic surgery, relatively small incisions are made by means of a trocar. The work is observed by means of a slender optical device (endoscope) inserted through a small incision into which a cannula may be placed. Endoscopic techniques, which are minimally invasive and relatively non-traumatic, are displacing conventional open surgery for many procedures, and instruments for endoscopy are proliferating.

A typical instrument employed in endoscopic surgery has a pair of articulated jaws, and a handle mechanism comprising two members, one movable with respect to the other, which can conveniently be manipulated so as to cause the jaws to open and close. Serrations, blades, or other features (depending upon the use for which the tool is intended) enable the jaws to perform various surgical functions, such as grasping or cutting. The articulated jaws are located at the distal end of a relatively long extension of the handle mechanism. The length of the shaft extension is determined by the depth of the surgical site, while its cross-sectional dimensions are established by the maximum permissible incision size.

Many ingenious linkages have been devised for converting the surgeon's manual efforts at the handle end of the instrument into opening and closing of the tool's jaws. Typically, although with some exceptions, the handle has a stationary member rigidly joined to a hollow shaft and a movable member pivotally attached to an operating rod that is mounted and is capable of reciprocal movement within the shaft. When the surgeon squeezes the stationary and movable handle members together, the operating rod acts upon the jaws (to which it is rotatably fastened by pins, or by tracks or levers kinematically equivalent to pins) in such a way as to make the jaws close. When the surgeon spreads the stationary and movable members apart, the motions are reversed and the jaws open. The jaws are rotatably attached to the end of the shaft by known means, e.g., by pins or kinematically equivalent tracks. In some cases, levers or other intermediate pieces are interposed between the operating rod and the jaws for causing the latter to open and close in response to relative movement of the stationary and movable handle members.

Although their constructional details and relationships to each other vary widely, such pins, tracks, le-

vers, and other connecting components tend to preclude the presence, or limit the size, of a bore in the instrument through which an ancillary device, e.g., a fiber optic light guide, may be introduced adjacent to or between the jaws. These components cannot be miniaturized without limit, for reasons of strength; nor can they be relocated without disturbing the critical geometry of the linkages. Furthermore, it is not advisable to increase the shaft's diameter, which would necessitate a larger incision and detract from the benefits of the endoscopic method.

When operating the jaws of typical tools as described above, surgeons have experienced difficulty in grasping slippery tissues because the jaws close first at their rear ends and thereby tend to propel or push the tissues out from between the jaws. Consequently trauma of the tissues may result from repeated and increasingly aggressive attempts to grasp the tissue.

OBJECTS OF THE INVENTION

The primary object of the present invention is to provide the surgeon with a tissue-manipulating instrument which is relatively atraumatic.

A further object of the invention is to provide a tissue-manipulating instrument having a bore or channel through which useful ancillary devices, such as a laser-conducting fiber optic light guide or another surgical instrument can be conveyed so as to make contact or near-contact with the tissues being grasped, cut, or otherwise manipulated.

Another object is to provide a tissue-manipulating instrument for endoscopic procedures having a bore or channel extending through the instrument to permit irrigation or aspiration through said bore or channel, without the need for a separate cannula.

Yet another object is to provide a tissue manipulating surgical instrument having the capability of working around corners; that is, the instrument may be curved along the length of its shaft so that the axis of motion of its jaws is offset from the proximal end of the shaft (i.e. the end of the shaft attached to the handle mechanism is displaced laterally from the plane of engagement of the jaws where the jaws are used to grasp, incise or dissect tissue).

Still another object is to provide an instrument for endoscopic procedures having a bore or channel extending longitudinally therethrough for accommodating and supporting an endoscope. The instrument is effectively a sheath for the endoscope, so that the tissues being manipulated can be visualized from close up, and in some procedures making possible the elimination of a separate incision for the endoscope.

A further object of the invention is to combine, in one instrument, the grasping action of serrated jaws with the cutting action of a laser, so that the endoscopic removal of tissues is facilitated.

Another specific object is to provide a surgical instrument of the character described comprising tissue-manipulating jaws and manually-operated means remote from said jaws for causing said jaws to open and close in a predetermined manner.

Still further objects of the invention include providing an improved surgical instrument for the endoscopic procedures which may take the form of incisors, scissors, dissectors, forceps, cauterizers or needle holders.

SUMMARY OF THE INVENTION

In a preferred embodiment of the invention, a surgical instrument for endoscopic procedures is provided having a jaw subassembly comprising two opposing jaws which are made from a single piece of springy material, with the integral jaw subassembly being formed so that the jaws are normally biased to a wide open position. The jaw subassembly is housed partially within a tube which is operatively movable longitudinally of the instrument by the movable member of an instrument handle. By squeezing together the moving and stationary members of an instrument handle, the surgeon can cause the tube to override or envelop a portion of the two jaws. Since the jaws normally diverge at a considerable angle, and since their end separation is much greater than the diameter of the tube, movement of the tube forward toward the jaws forces the jaws together in the manner of a collet. Reversing the motion of the handle enables the springy jaws to open again. This arrangement causes the jaws to grasp the tissue immediately upon being brought together without propelling or pushing the tissue being addressed out from between the jaws.

Because the one-piece jaw assembly requires no articulation, thereby eliminating pins, levers, tracks, and other potential obstructions, there is room for an axial bore which extends completely through the instrument and through which may pass, completely unimpeded, fiber optic light guides, lasers, cauterizing means, surgical tools, endoscopes, and other surgical devices. These auxiliary devices can traverse the space between the jaws and project beyond them, so as to touch the tissues between or ahead of the jaws. The axial bore also can conduct fluids to and from the tissues, e.g. for aspiration or irrigation purposes.

An optional locking means enables the surgeon to lock the handle members in any relative position within their range of motion, and consequently to lock the jaws in any position to which they have been moved.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other advantages will become more readily apparent upon a reading of the detailed description following hereafter and upon an examination of the drawings, in which like parts are identically numbered, and in which:

FIG. 1 is a right-hand side view in elevation of a preferred embodiment of the surgical apparatus of the invention, partially in phantom, showing the jaws wide open and, correspondingly, the handle members spread as far apart as possible;

FIG. 2 is a left-hand side view in elevation of the preferred embodiment shown in FIG. 1, partially in longitudinal cross-section through the shaft axis, showing the jaws completely closed and, correspondingly, the handle members squeezed together as far as possible, and also showing the locking lever in its fully locked position;

FIG. 3 is a plan view of the preferred embodiment, partially in phantom, with the jaws wide open and the locking lever in its fully unlocked position;

FIG. 4 is a plan view of the preferred embodiment, with the jaws fully closed and the locking lever in its fully locked position;

FIG. 5 is a front end view in elevation of the same preferred embodiment, with the jaws fully closed and the locking lever in its fully unlocked position;

FIG. 6 is a partial cross-sectional view taken along line 6—6 of FIG. 2, but showing the locking lever in its fully locked position;

FIG. 7 is a partial cross-sectional view similar to FIG. 6 but showing the locking lever in its fully unlocked position;

FIG. 8 is a fragmentary cross-sectional view, similar to FIG. 7, of another embodiment in which the lock has been eliminated altogether and the apparatus is permanently unlocked;

FIG. 9 is a longitudinal sectional view in side elevation of the tip (or jaw end) portion of the preferred embodiment shown in FIG. 2, except that the jaws are shown incompletely closed, contact between them having just been initiated at the remote outermost end of the jaws;

FIG. 10 is a longitudinal sectional view similar to FIG. 9 except that the jaws are shown partially opened in an intermediate position;

FIG. 11 is a cross-sectional view taken along line 11—11 of FIG. 10;

FIG. 12 is a longitudinal sectional view in side elevation, similar to FIG. 9, except that the jaws are shown fully opened;

FIG. 13 is a sectional view like FIG. 12 of a further embodiment of the invention, with the jaws having centrally located grooves that permit the passage of an ancillary device even when the jaws are fully closed;

FIG. 14 is a front end view of the embodiment of FIG. 13;

FIG. 15 is a longitudinal cross-sectional view, taken along line 15—15 of FIG. 13 showing details of one of the jaws;

FIG. 16 is a longitudinal sectional view of the jaw end of a further embodiment of the invention wherein a cutting blade is provided;

FIG. 17 is a plan view of the embodiment of FIG. 16;

FIG. 18 is a bottom view of the embodiment of FIG. 16;

FIG. 19 is a front end view of the embodiment of FIG. 16, indicating the fully closed position of the jaws and cutting blade; FIG. 20 is a side view of the embodiment of FIG. 16 showing the jaws wide open;

FIG. 21 is a longitudinal sectional view in side elevation of an embodiment similar to the one shown in FIG. 2 that includes an outer sheath;

FIG. 22 is a fragmentary side view in elevation, partly in section, of an embodiment similar to the one shown in FIG. 2, except that the shaft is curved;

FIG. 23 is an exploded perspective view of the tip portion of a further embodiment of the invention for use in bi-polar electrosurgery; and

FIG. 24 is an exploded perspective view of the tip portion of a still further embodiment of the invention for use in bi-polar electrosurgery.

DETAILED DESCRIPTION OF THE INVENTION

As shown in FIGS. 1-5, the instrument of the invention in its preferred embodiment is seen to comprise a jaw piece 2 divided at its front end into two or more jaws 4 and 6; an outer tube 8, inside of which resides an inner tube 10; and a stationary housing 34 having a handle 12. The latter includes a movable handle member 14 that is rotatable with respect to a stationary handle member 16 about a pivot pin 18. Handle member 16 is formed integral with or fixed to housing 34. Operation of the handle members is facilitated by a finger loop

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20 on movable handle member 14 and a finger loop 22 on stationary handle member 16. Other means of grasping and manipulating movable member 14 and stationary member 16 may be provided. For example, stationary handle member 16 can take the shape of a pistol grip and movable member 14 may be a trigger, the two members being spring loaded apart so that only contractile hand motions are required of the surgeon to close the jaws, obviating the need for finger loops.

As seen best in FIG. 2, jaw piece 2 is shown to be rigidly connected to and spaced from stationary handle member 16 by inner tube 10, such as by welding the rear end face 23 of jaw piece 2 to the front end 26 of inner tube 10. The rear end 28 of the inner tube 10 is secured in a bore 30 formed in barrel portion 32 of the stationary housing 34 by a press fit or other suitable means.

With further reference to FIG. 2, outer tube 8, which is coaxial with and freely fitted over inner tube 10, is rigidly joined to a gear rack 36 such as by press fitting or molding. Outer tube 8 and gear rack 36 slide freely relative to inner tube 10. An O-ring 39 is provided in a groove in gear rack 36 so as to be in sliding engagement with tube 10, whereby to prevent leakage of fluid into the cavity 42, and therefrom to the atmosphere. Movable handle member 14 is provided with gear teeth 38 which engage gear teeth 40 of gear rack 36. When movable handle member 14 is rotated about the axis of its pivot pin 18, the meshing of gear teeth 38 and 40 causes gear rack 36 to translate axially in cavity 42 of barrel portion 32 of stationary housing 34. Other means may be employed for causing gear rack 36 to translate within cavity 42. For example, a single tooth or peg might extend radially from movable handle member 14 and engage a single transverse slot in gear rack 36 to effect translation of gear rack 36 within cavity 42.

As gear rack 36 translates within cavity 42, outer tube 8 translates identically since the two parts are securely joined together. Since jaw piece 2 is rigidly attached to stationary handle member 16 via inner tube 10, jaws 4 and 6 remain at a fixed distance from stationary handle member 16. By contrast, outer tube 8 moves axially toward or away from stationary handle member 16 as gear rack 36 is forced to reciprocate within cavity 42 by the rotation of movable handle member 14 with respect to stationary handle member 16. Thus, outer tube 8 can override or envelop jaws 4 and 6 to a degree that depends on the relative lengths of outer tube 8 and inner tube 10, and the relative rotational positions of movable handle member 14 and stationary handle member 16. These relative rotational positions are limited in the contractile direction (as shown in FIG. 2) by the abutting of the front end 44 of gear rack 36 against the rear face 46 of a plug 48. Plug 48 is tightly secured in the front end of cavity 42 and establishes the forward termination of cavity 42. In the extensile direction (as shown in FIG. 9) the relative rotational limit positions of the handle members 14 and 16 are reached when an edge surface 50 (see FIG. 2) of movable handle member 14 abuts surface 52 within stationary housing 34. As indicated in FIG. 2 an alternative limit position could be achieved by rear face 54 of gear rack 36 contacting a surface 56 that terminates cavity 42 within barrel 32 of housing 34.

FIGS. 12, 10, and 9 and the like portion of FIG. 2 depict in sequence the relative orientation of jaws 4 and 6 from fully open to fully closed position. Jaw piece 2 has three distinct sections. A rear section 58 is attached rigidly, as described above, to the front end of inner

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tube 10. Rear section 58 (see FIG. 9) has an axial hole 60 extending therethrough beginning at the rear end face 23, and preferably the rear end of hole 62 is tapered as shown at 24. Ancillary devices may pass through this hole 60 via inner tube 10, with insertion thereof being assisted by the taper 24. Forward of rear section 58, jaw piece 2 divides into two (as shown) or more flexible cantilevered leaves 62, 64, which comprise the center section of jaw piece 2.

Still further forward of rear section 58, the leaves 62, 64 thicken into the form of relatively inflexible jaws 4 and 6, the latter forming the front section of jaw piece 2. Jaws 4 and 6 are shown in FIGS. 2, 9, 10 and 12 as being serrated for purposes of grasping tissues securely. However, jaws 4, 6 can assume many other shapes, e.g., they may be smooth, tapered, grooved, and/or toothed. It should be observed that in their unrestrained state (FIG. 12), leaves 62, 64 diverge from rear section 58 at a substantial angle. Because of the angle of divergence between leaves 62 and 64, there is a considerable gap between jaws 4 and 6 in their free state, particularly at their forwardmost ends. This gap is sized to admit a suitable thickness of tissue for being grasped or otherwise manipulated.

Leaves 62, 64 are long enough and thin enough to be elastically flexible over the range of motion depicted sequentially in FIGS. 12, 10, 9 and 2. The length and thickness of leaves 62 and 64 must be carefully dimensioned since the proper functioning of the apparatus is strongly dependent upon proper selection of these parameters. It should be noted that leaves 62 and 64 are not straight. In their free state, as shown in FIG. 12, leaves 62, 64 are seen to arc in a convex manner away from each other where they join rear section 58. Just rearward of the junction of leaves 62 and 64 with jaws 6 and 4, however, leaves 62, 64 undergo an inflection so as to arc in a concave manner toward each other.

Leaves 62, 64 are sufficiently wide, as viewed normal to their thickness (see FIG. 11), to resist strongly any lateral deflection, that is, deflection transverse to the plane of FIG. 2. If the leaves 62, 64 are made of a metal such as steel, they are heat treated so that they will not deform plastically, even if forced open considerably more than is shown in FIG. 12. However, leaves 62 or 64 are not so hard or brittle that they are prone to fracture if so deformed. It should be noted that the jaws 4 and 6 can be so formed that one of them is connected to rear section 58 by a leaf 62 or 64 as described above, while the second leaf may be thicker and hence stiffer or more inflexible all the way to its junction with rear section 58, with the result that the thick-leaved jaw remains relatively motionless even when the thin-leaved jaw deflects as shown in FIGS. 12, 10, 9, and 2. If desired, multiple pairs of jaws may be provided, with all of the jaws having flexible spring leaf sections 62, 64, or one or more pairs of jaws 4 being attached to relatively inflexible spring leaf sections, and one or more pairs of jaws 6 being attached to relatively flexible spring leaf sections.

Jaw piece 2 can be fabricated from a piece of square-section spring steel or a steel blank of round cross section, in which case it might be split into three or more jaws, instead of the two opposed jaws shown in the drawings.

As shown in FIGS. 13, 14, and 15 the instrument of the invention may provide for the insertion or passage of ancillary devices, even with the jaws in closed position. An instrument 70 (FIG. 13) is provided with a jaw

piece 72 comprising jaws 74 and 76 and a rear section 78 which is provided with an axial hole 80 in alignment with the interior of inner tube 10. The jaws are grooved axially as shown at 82 in FIGS. 14 and 15 so that even when they are completely closed, an ancillary device can be inserted between them. Passage of an ancillary device through tube 10, hole 80 and grooves 82 is thus made possible, even when the jaws are fully closed. This is essential in the case where jaw piece 72 has one leaf that is substantially thicker and hence stiffer than the thinner leaf of the other jaw, to prevent the relatively inflexible thicker leaf or leaves from impeding the passage of an ancillary device into the center section of jaw piece 72 even when jaws 74, 76 are open. Serrations 84 may be provided on the jaws to aid in gripping tissue.

Where it is desired to provide an instrument that enables the cutting or dissecting of tissue, an embodiment as shown in FIGS. 16-20 may be employed. In this arrangement a modified jaw piece 160 (FIG. 16) is provided. This jaw piece 160 is substantially identical to the jaw piece 2 of the embodiment of FIG. 2 in that it is formed with an axial hole 162 through the rear section 164, and the latter is connected by means of cantilevered leaves 166 and 168 to the jaws 170 and 172, respectively (FIGS. 16 and 20). In the position where the jaws are fully opened (FIG. 20) any ancillary device may pass through the hole 162 and between the jaws 170, 172 as in the previously described embodiments. However, in this embodiment, the jaws are provided with cutting means. A cutting blade 174, having a sharpened cutting edge 176, is mounted within a slot 178 (FIG. 17) located in jaw 170. Blade 174 is fixed in slot 178, e.g., by welding, so that the blade remains fixed to jaw 170 during operational use. Jaw 172 is provided with a slot 180 having a width slightly greater than the thickness of blade 174 so as to enable easy manipulation of the blade into and out of the jaw piece 172 while promoting a suitable cutting action. Because of the ability to flex the leaves 166, 168, the jaws 170, 172 may be closed against one another (see FIG. 16) when the sleeve or outer tube 8 (see FIG. 2) is fully extended. The jaws 170, 172 may be so dimensioned that the final closing, as brought about by positioning outer tube 8 from the position of FIG. 9 to that of FIG. 2, will cause the cutting edge 176 of blade 174 to move into slot 180 so as to cut through the tissue being addressed. Additionally, a blade 174 larger than that shown in FIG. 16 may be used which projects forward beyond the front end of lower jaw 172, if desired, so that the instrument may be used for making an incision. A further option is to design blade 174 so that its leading edge is closer to jaw 170 than its rear or trailing edge (as shown in dotted lines 175 in FIG. 20), whereby when the jaws are brought partly into closing relation the rear end of the cutting blade will close first onto the lower jaw 172, whereupon the surgeon may extend the instrument forward to slit interfering tissue, in a manner similar to a paper splitter.

It should be noted that the instrument may be adapted for monopolar electro-surgery, simply by connecting an appropriate source of electrical power to inner tube 10. Where it is desired to provide an instrument for bipolar electro-surgery, the embodiments shown in FIGS. 23 and 24 may be employed. In one such arrangement (FIG. 23) a jaw piece 190 of conductive material such as spring steel may be provided. However, in this embodiment, the jaw piece 190 comprises separately formed jaws 192, 194. The latter are affixed to the inner tube 10 and insulated from one another by

an intervening non-conductive strip 196 extending between and preferably bonded to the rear sections 193 and 195 of jaws 192 and 194 respectively. In this embodiment it is preferred that inner tube 10 be a split conductive tube comprising opposed sections 10A and 10B separated by an insulation strip 202 as shown in FIG. 23, with tube 10 being made of electrically conductive material. With the foregoing arrangement, separate electrical connections may be made to conductive jaws 192 and 194 via sections 10A and 10B of tube 10, whereby the two jaws may serve as electrodes. If the tube 10 is made of a non-conductive material, the electrical connections to jaws 192, 194 may constitute conductors (not shown) embedded in the inner tube 10 which extend to the distal end of tube 10 and are brought into electrical contact with the rear section 193, 195 of jaws 192, 194, respectively.

In a further embodiment of an instrument for use in electrosurgery (see FIG. 24) a jaw piece 204 of non-conductive material is provided. This can be a one-piece unit characterized by a degree of springiness which keeps the jaws 206, 208 normally spread apart as shown in FIG. 24. Electrodes of any desired shape, including simple wires or the "shoes" 210 and 212 as shown, are embedded within the jaws 206, 208, respectively. Conductor strips 214, 216 lead from the electrodes 210, 212, respectively, through the rear end 218 of the jaw piece, where they are mated with the two sections 10A and 10B of inner tube 10 in a suitable electrical connection.

In operation of the preferred embodiment shown in FIGS. 1-5, assuming that the surgeon desires to grasp a bit of tissue between jaws 4, 6, which are wide open as shown in FIG. 12, he positions jaws 4, 6 so that the tissue lies between them and then squeezes movable handle member 14 toward stationary handle member 16, thereby causing outer tube 8 to translate toward jaws 4, 6 and commence to slide over or envelop them. As this envelopment proceeds, jaws 4, 6 are forced to close, precisely like a collet, so as to grasp securely the tissue between them. FIG. 10 shows the jaws 4 and 6 partially closed, as occurs on initial movement of handle member 14 toward stationary handle member 16. Upon further motion of the handles, as shown in FIG. 9, jaws 4, 6 have closed to the extent that their tips touch. Still further motion of the handles will result in closing the jaws substantially fully, as seen in FIG. 2. However, as explained hereafter, this does not necessarily imply that the tissues being manipulated have been mashed flat when the jaws are in the position shown in either FIGS. 9 or 2. In this connection, it is to be appreciated that the closing of jaws 4 and 6 is progressive, starting with engagement of only their forward ends and then progressing so as to cause the rear ends of the jaws to make contact with the tissue last, except where relatively thick tissue is being grasped, in which case the jaws may not be parallel or nearly so, but instead may be in a partly open position while still grasping the tissue.

It is clear that the design geometry of jaws 4, 6 can be varied a great deal, so as to accelerate or retard the rate of closure of jaws 4, 6 as a function of the relative positions of handle members 14 and 16. Also, in order to manipulate different types of tissues, the jaws may be configured for differing force distributions along the lengths of jaws 4, 6.

It is to be noted that the gap between jaws 4 and 6, and the angle of divergence between them, are not determined purely by the geometry of the apparatus, but also by the resistive properties of the tissues being

manipulated. This results from the inherent flexibility of the jaw piece, e.g., leaves 62 and 64. When a thick or tough bit of tissue is grasped, it is possible to squeeze members 14 and 16 all the way together without causing jaws 4, 6 to close fully on one another so as to damage the tissue disposed between them. Instead, due to the resistance offered by the tissue being manipulated and the resiliency of the leaves 62 and 64, jaws 4 and 6 may remain partially open and at some angle of divergence, without however relinquishing a firm grip on the tissues between them. In other words, the arrangement of parts in the apparatus of the invention is such that it is forgiving of excessive force as applied by the surgeon to handle members 14 and 16. The force actually applied to the tissues is limited by the spring rate of leaves 62, 64 which can be varied to meet precisely the requirements of the particular surgical application for which the apparatus is intended. Similarly, the apparatus is relatively insensitive to the thickness of the tissues being manipulated. Thus handle members 14 and 16 may be fully contracted, whereby the tissues may be held securely by the jaws, even though the tissue is so thick that the jaws cannot close completely.

In the preferred embodiment of the apparatus, outer tube 8 is made wholly or partially (and particularly where it envelops jaws 4 and 6) of a material such as polytetrafluoroethylene or PTFE, which is available from DuPont and sold under the trademark Teflon. Such material has extremely low and nearly equal coefficients of static and sliding friction when mated with jaws 4 and 6 when the latter are made of a polished metal. This ensures that relatively little force is needed to translate outer tube 8 over jaws 4 and 6, notwithstanding the resistive force offered by jaws 4, 6 (and their contents) to movement of outer tube 8. Due to the acuteness of the angle of divergence between jaws 4 and 6, in a substantially frictionless or low friction embodiment of the apparatus, a relatively small amount of translational force applied to outer tube 8 is sufficient to urge closed even a relatively strong set of leaves 62, 64, and hence jaws 4, 6. If outer tube 8 is made of PTFE and jaws 4, 6 of polished spring steel, the apparatus approaches the frictionless ideal, with the result that the mechanical advantage of the apparatus is enhanced.

Leaves 62 and 64 are capable of back-driving or forcing outer tube 8 rearward (thereby allowing the jaws to reopen) unless outer tube 8 has progressed forward sufficiently far to cover the inflection where leaves 62, 64 merge with jaws 4, 6. Thereafter, although outer tube 8 continues to translate easily over jaws 4, 6 the latter may no longer be able to feed their expansive force back to outer tube 8 so as to urge it rearward, the reason being that no longer is the interface between outer tube 8 and jaws 4, 6 at an acute angle to the axis of the apparatus. Instead, the forces at said interface act radially or at right angles to the axis of outer tube 8. Consequently, outer tube 8 tends to remain where it is placed. Thus, until jaws 4, 6 are substantially closed (or as closed as they can be when resistive tissues are being grasped), leaves 62, 64 act as return springs resisting the surgeon's contractile finger effort. After jaws 4, 6 are fully enveloped by outer tube 8, as shown in FIG. 2, whether or not the jaws themselves are partially held open by the tissues between them, the return spring action ceases and an inherent locking-in-place action obtains.

Referring again to FIGS. 1-5, because PTFE and some other suitable materials for outer tube 8 may not

have enough strength to resist deformation by the radial forces that leaves 62, 64 exert upon outer tube 8, it may be desirable to place a rigid sleeve 66 firmly over the distal end of outer tube 8. Sleeve 66 is preferably made of a material, such as stainless steel, having a relatively high modulus of elasticity. As a result, sleeve 66 prevents any substantial deformation of outer tube 8. This is true even if the wall thickness of sleeve 66 is relatively small, so that sleeve 66 need not increase unduly the diameter of the apparatus. As an alternative measure, tube 8 may be provided with a reduced diameter front end to accommodate sleeve 66 and the latter may have an o.d. equal to that of tube 8, so as to eliminate any surface discontinuities.

Referring now to FIG. 21, although jaw piece 2 does not move longitudinally relative to stationary handle member 16 as the apparatus is used, outer tube 8 does so move, and therefore it may also move with respect to the tissue surrounding the incision through which the apparatus enters the body of the patient undergoing surgery. Therefore, in surgical circumstances where relative motion between outer tube 8 and the tissue surrounding the incision (or between outer tube 8 and a cannula interposed between the tissue surrounding the incision and the apparatus of this invention) is intolerable or undesirable, it may be advantageous to enclose outer tube 8 in a loosely fitting protective tube 90 (FIG. 21), rigidly secured (as by press fitting) on the inner diameter of a plug 92 that is secured to housing 34. Tube 90 is radially spaced from outer tube 8 as shown in FIG. 21. Protective tube 90 may have the same outer diameter as sleeve 66, provided that protective tube 90 is sufficiently short that it can never butt against sleeve 66, regardless of the positioning of tube 8. In this case, the surrounding tissues, if any, may be exposed to the movement of only that portion of outer tube 8 that is not enclosed by protective tube 90.

The instrument of the invention provides an unobstructed passage along its axis in the form of the internal bore through which ancillary devices may be passed, e.g., a laser-conducting optical fiber light guide, a cauterizing device, and the like. As shown in FIGS. 2 and 3, this bore may commence at rear surface 100 of stationary housing member 34 where the rear end of inner tube 10 has its opening 102 flush with surface 100. Alternatively, inner tube 10 may be extended rearward and, if desired, equipped with any well known connector means to facilitate attaching a hose or tube for conducting fluids through the apparatus, e.g., for irrigation or aspiration purposes, and also for attaching a source of electrical power for electrosurgery. Also the rear termination of inner tube 10 may be machined or otherwise modified to accommodate various ancillary devices which require threaded or other attachment means. In any case, the axial bore of tube 10 continues forward for the entire length of that tube to where it abuts and is joined to jaw piece 2. Hole 60 of jaw piece 2 may be larger than, the same size as, or smaller than the inside diameter of inner tube 10. In the event hole 60 is smaller in diameter than the passage in tube 10, the transitional taper surface 24 eases the passage of an ancillary device past the junction of inner tube 10 and jaw piece 2. It should be noted that although leaves 62, 64 may, when in certain possible positions, such as the position shown in FIG. 2, assume a concave or hourglass shape with respect to each other, nevertheless at their point of closest approach the space between leaves 62, 64 is still

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large enough to admit at least partial passage of an ancillary device in hole 60.

As previously discussed, there is an inherent locking effect that obtains when outer tube 8 has been translated fully forward and therefore maximally envelops jaws 4, 6. It also may be desirable to have the ability to lock jaws 4, 6 in any possible position regardless of the position of tube 8. As shown in FIGS. 1-7, the preferred embodiment may be equipped with a locking lever 110 which is firmly secured to pivot pin axle 18. The exterior of locking lever 110 can have a variety of shapes. The shape illustrated in the FIGS. 1-7 is designed for thumb operation by a right-handed surgeon. Clearly, a similar lever can be provided on the opposite side of the apparatus for convenient use by a left-handed person, although this will require that the thread 112 (see FIGS. 6, 7) on the axle 18, as well as thread 114 on the boss 116, be a left-hand thread. Furthermore, for a left handed version boss 116 would be relocated to the opposite side of housing 34. Alternatively, if axle 18 is extended outward a substantial distance beyond the outer face of boss 116, locking lever 110 as shown in the FIGS. 1-7 can be supplemented by a second locking lever that is a mirror image of locking lever 110. Said second locking lever may be immovably secured to said extension of axle 18 so as to make use of the locking provision of the apparatus ambidextrous.

It is obvious from FIGS. 2 and 6, which show locking lever 110 in the locked position, and FIG. 7, which shows it in the unlocked position, that the operating arc through which locking lever 110 rotates is relatively small. It is also evident that the shape of thumb surface 118 of locking lever 110 may be shaped to permit the surgeon's thumb to move locking lever 110 in either rotational direction without the need for the surgeon to shift his grip on the apparatus (see FIG. 2). Thumb surface 118 is preferably smooth, rather than serrated, so that the thumb can slide freely and comfortably along thumb surface 118 as the operating arc of locking lever 110 is traversed. Many other ergonomic arrangements, such as variations in the shape and rotational direction of locking lever 110, will be envisioned by those skilled in the art, and are understood to fall within the scope of the present invention.

The operation of locking lever 110, in the preferred embodiment of the invention, depends on friction, although obviously a ratchet or other means also might be employed. As seen most clearly in FIGS. 6, 7 and 8, movable handle member 14 rotates within a slot 120 in stationary handle member 16. This slot 120 is bounded laterally by side walls 122 and 124 of stationary handle member 16. The gap between side walls 122 and 124, i.e., the slot width, is slightly greater than the thickness of that portion of movable handle member 14 which is located between side walls 122 and 124. FIG. 7 shows the apparatus unlocked, with movable handle member 14 free to rotate between side walls 122 and 124 of stationary member 7.

In FIG. 6, locking lever 110 has been rotated clockwise (as viewed in FIG. 2) to its fully locked position. This action has caused the right-hand male screw threads 112 of axle 18 to advance along the mating female screw threads 114 (FIG. 7) in boss 116 of side wall 124 of stationary handle member 16, thereby enabling shoulder 126 of locking lever 110 to squeeze side walls 122 and 124 together, capturing by friction that portion of movable handle member 14 that lies between side walls 122, 124. It is obvious that the amount of

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locking action is progressive and is regulated by the angle through which locking lever 110 is rotated from its unlocked position. As described in more detail hereafter, locking lever 110 is installed on axle 18 in such an angular orientation that the locking action begins almost immediately after locking lever 110 is rotated away from its unlocked position stop. This stop position is shown in the FIGS. 2, 5 and 6 as comprising protuberance 128 integral with stationary handle member 16. The locking action becomes progressively more pronounced until locking lever 110 has attained approximately the position shown in FIG. 2, which represents the fully locked position and corresponds to the maximum force the surgeon can apply comfortably to locking lever 110. Thus, no mechanical limit stop is needed in the locking direction of locking lever 110, although a second protuberance similar to protuberance 128 could easily be incorporated into stationary handle member 16 for that purpose. In the preferred embodiment, said second protuberance has been omitted for reasons of comfortable gripping of the apparatus as well as the absence of need for it, although some surgeons may wish to have a positive full-lock stop in order to avoid the possibility of over-tightening screw threads 112.

In the fully locked condition of the apparatus (see FIG. 2), the locking action is sufficiently strong to lock jaws 4, 6 securely in whatever position is desired by the surgeon. In intermediate conditions between fully locked and fully unlocked, a selectable amount of frictional drag is possible according to the surgeon's preferences. It should be observed that the frictional locking effect might be augmented by providing mating male and female radial serrations or ridges on side walls 122, 124 and movable handle member 14, which might also impart a ratcheting feel to the partially locked apparatus.

The squeezing together of side walls 122, 124 as locking lever 110 is rotated toward its fully locked position, thereby advancing screw threads 112 of axle 18 into boss 116 of stationary handle member 16, requires that shoulder 126 of locking lever 110 apply force against left side wall 122, urging it toward side wall 124. This cannot occur unless locking lever 110 is immovably attached to axle 18. Otherwise, locking lever 110 might slip on axle 18 and prevent said squeezing action. The attachment of locking lever 110 to axle 18 can take many forms. As shown in FIGS. 6 and 7, locking lever 110 is tightly press fitted over knurls or flutes 130 on axle 18. Knurls 130, and the mating hole in locking lever 110, are so configured that neither axial nor radial movement between axle 18 and locking lever 110 is possible under operating conditions once they are pressed together. The choice of straight knurls, instead of many other possible attachment methods obvious to those skilled in the art, is based on practical considerations.

For rapid assembly of the apparatus, axle 18 can be screwed into boss 116 until the end of axle 18 is flush with the outer face 132 of boss 116. Thereafter, locking lever 110 can be positioned rotationally so that it is in the fully locked attitude as shown in FIG. 2, and, being held in that orientation, can be pressed hard onto axle 18 until it is stopped by the full compression of side wall 122 against movable handle member 14, and the latter in turn against side wall 124. Following the pressing operation as just described, the apparatus is in the fully locked condition, locking lever 110 is correspondingly in its fully locked position, and upon counterclockwise

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rotation of locking lever 110 toward protuberance 128, the apparatus will unlock and be ready for use, and thereafter the lock will perform as described above.

As seen in FIGS. 6 and 7, a spring washer 134 and a flat washer 136 may be interposed between shoulder 126 of locking lever 110 and left side wall 122 of stationary handle member 16. The purpose of flat washer 136 is to prevent scoring of stationary handle member 16, which may be made of a much softer material than spring washer 134. The function of spring washer 134 is to provide frictional resistance against the rotation of locking lever 110, to prevent rattling or unintended rotation of locking lever 110 when it is not in its fully locked position, and also to provide locking lever 110 with an instrument-like feel. Locking lever 110 may be provided with a detent (not shown) that restrains it in the unlocked position.

It will be observed (see FIGS. 6 and 7) that the smooth shank central portion 138 of axle 18 is loosely fitted to a bushing 140 having a length slightly less than the thickness of the surrounding portion of movable handle member 14. It is envisioned that movable handle member 14 may be fabricated of a relatively soft plastic material, in which case shank 138 might tend, after protracted operation of the apparatus, to wear oversize an unbushed hole in movable handle member 14. Bushing 140, which is made of a relatively hard material, is intended to prevent such wear. Bushing 140 is pressed into movable handle member 14, so that any rotational motion of movable handle member 14 is relative to axle 18 rather than to bushing 140. Bushing 140 may be superfluous where the instrument is intended to be used once and then disposed.

The apparatus may be constructed without provision for a locking lever (see FIG. 8). In this case, screw 142 takes the place of axle 18. The length of a bushing 144 is made equal to the width of the slot 120 in stationary handle member 16 bounded by side walls 122, 124, and spring washer 134 is eliminated. When screw 142 is fully tightened, side walls 122, 124 bear against the faces of bushing 140. Since bushing 140 is longer than the thickness of adjacent movable handle member 14, the latter remains free to rotate and no locking action is provided, except the inherent locking action of outer tube 8 enveloping jaws 14.

Referring now to FIG. 22, since outer tube 8 preferably is made of a flexible material such as PTFE, it is a simple matter to provide an instrument with a curved shaft. In this embodiment of the invention, inner tube 148 is bent to the desired curvature, and outer tube 150 (due to the low coefficients of friction and low modulus of elasticity of PTFE material) assumes the same curvature and slides easily over inner tube 148. Ancillary devices which are intended to pass through the apparatus must also be capable of conforming to the curvature of inner tube 148. It is also possible to fabricate inner tube 148 as a flexible member, such as a tightly-wound coil spring or a spiral-wound tube like a flexible electrical conduit, so that the entire shaft of the apparatus can be bent to the desired shape at the time of use. If inner tube 148 is made as a tightly-wound coil spring, it will maintain its curvature only while being held in that position. If inner tube 148 is made similarly to a spiral-wound electrical conduit, the shaft will remain substantially as bent, even after it is released by the surgeon.

Economic advantages of the apparatus of the invention are that there are relatively few parts, and they are easily manufactured of low-priced materials. Addition-

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ally, assembly is simple and straightforward and the parts are, in most cases, suitable for molded plastic fabrication. Consequently, the apparatus can be made as a disposable item at low cost. Further, manufacturing tolerances are relatively loose, effecting further economies.

It is obvious that the present invention is useful for various surgical applications, so that it is by no means limited to the specific applications and uses herein described, and that a wide variety of ancillary devices may be inserted into the jaw piece in the manner previously described. Furthermore, it is clear that various modifications may be made while still providing an apparatus which comes within the spirit and scope of the invention. For example, the jaw piece may be narrowed or curved in one or more dimensions so that the tool may function as a needle holder. Also, the jaw piece may be in the form of a triple equiangularly-spaced jaws and leaves. Additionally, since use of an instrument having inner and outer tubes will result in wearing the circular interior surface by repeated manipulation of some ancillary devices, the inner tube may be initially formed with a square hole.

What is claimed is:

1. A surgical instrument comprising:

a housing provided with an internal bore, and at least first and second concentrically arranged tubular elements extending longitudinally away from said housing, said first tubular element having proximal and distal ends and being affixed at its proximal end so as to be immobile with respect to said housing, and said second tubular element surrounding said first tubular element and being arranged to translate longitudinally with respect to said first tubular element;

translation means for causing said second tubular element to translate longitudinally relative to said first tubular element, said translation means comprising a stationary handle member and a movable handle member pivotally secured to said stationary handle member, and means on said movable handle member for engaging means affixed to said second tubular element for translating said second tubular element relative to said first tubular element in response to relative movement of said handle members, said means affixed to said second tubular element comprising a gear rack provided with a series of teeth, and said means on said movable handle member comprising at least a toothed gear member in engagement with the teeth of said gear rack, said housing also having means for limiting movement of said gear rack in the forward and reverse direction; and

a jaw piece affixed to said distal end of said first tubular element, said jaw piece being an integral structure comprising at least two jaws which are biased and normally deployed away from one another, a rear section, and intermediate leaf spring elements connecting each of said jaws to said rear section, said second tubular element being arranged to slide over said two jaws, whereby when said second tubular element is caused to translate towards the distal end of said first tubular element, said second tubular element will slide over said jaw piece and cause said jaws to close towards one another.

2. The instrument of claim 1 wherein each of said intermediate leaf spring elements is configured to provide a convex curvature at its joinder with said rear

section and a concave curvature at its joinder with its respective jaw.

3. The instrument of claim 1 wherein said rear section of the jaw piece has a hole extending through and communicating at one end with the interior of said first tubular element and at its other end to the space between said jaws, thereby permitting an ancillary device to be extended through said first tubular element to the jaws.

4. The instrument of claim 1 wherein said housing has a distal end and a proximal end, and the proximal end of said first tubular element terminates at the proximal end of said housing, thereby adapting said instrument for introduction of an ancillary device.

5. A surgical instrument comprising:

a housing provided with an internal bore, and at least first and second concentrically arranged tubular elements extending longitudinally away from said housing, said first tubular element having proximal and distal ends and being affixed at its proximal end so as to be immobile with respect to said housing, and said second tubular element surrounding said first tubular element and being arranged to translate longitudinally with respect to said first tubular element;

translation means for causing said second tubular element to translate longitudinally relative to said first tubular element; and

a jaw piece affixed to said distal end of said first tubular element, said jaw piece being an integral structure comprising at least two jaws which are biased and normally deployed away from one another, a rear section, and intermediate leaf spring elements connecting each of said jaws to said rear section, said second tubular element being arranged to slide over said two jaws, whereby when said second tubular element is caused to translate towards the distal end of said first tubular element, said second tubular element will slide over said jaw piece and cause said jaws to close towards one another; said translation means comprising a stationary handle member and a movable handle member pivotally secured to said stationary handle member, and means on said movable handle member for engaging means affixed to said second tubular element for translating said second tubular element relative to said first tubular element in response to relative movement of said handle members; and

means for selectively locking said movable handle member to said stationary handle member to retain the jaws in a selected position determined by translation of said second tubular element relative to said first tubular element.

6. The instrument of claim 5 wherein the portion of said stationary handle member to which said movable handle member is pivotally secured is bifurcated, and said movable handle member has a tongue section extending into the bifurcated portion of said stationary handle member, said movable handle member being rotatable about a pivot axis extending through said tongue section and said bifurcated portion of said stationary handle member.

7. The instrument of claim 6 further wherein said pivot axis is a pivot pin that projects from one side of said stationary handle member, and further including a locking lever rotatably attached to said pivot pin, and threaded means on said pivot pin and said stationary handle member, wherein when said locking lever is

rotated relative to said pivot pin in a given direction, said bifurcated portion of said stationary handle member is compressed so as to hold said movable handle member against further movement.

8. A surgical instrument comprising;

a housing provided with an internal bore, and at least first and second concentrically arranged tubular elements extending longitudinally away from said housing, said first tubular element having proximal and distal ends and being affixed at its proximal end so as to be immobile with respect to said housing, and said second tubular element surrounding said first tubular element and being arranged to translate longitudinally with respect to said first tubular element;

translation means for causing said second tubular element to translate longitudinally relative to said first tubular element; and

a jaw piece affixed to said distal end of said first tubular element, said jaw piece being an integral structure comprising at least two jaws which are biased and normally deployed away from one another, a rear section, and intermediate leaf spring elements connecting each of said jaws to said rear section, said second tubular element being arranged to slide over said two jaws, whereby when said second tubular element is caused to translate towards the distal end of said first tubular element, said second tubular element will slide over said jaw piece and cause said jaws to close towards one another;

each of said jaws being provided with a groove located so as to be in alignment with said first tubular element when said jaws are in a closed position, thereby providing a passage extending from the exterior of said housing through said first tubular element and said jaw piece for introduction of an ancillary device even when said jaws are closed.

9. The instrument of claim 8 in which said jaw piece comprises a rear section having a hole extending axially therethrough and each of said jaws is connected to said rear section by an intermediate spring leaf element.

10. The instrument of claim 9 wherein each said intermediate leaf spring element is configured to provide a convex curvature at its joinder with said rear section and a concave curvature at its joinder with its respective jaw, whereby when said jaws are drawn into closed position so as to grasp tissue which is being addressed, the forward ends of said jaws close on one another before the rear ends of said jaws, whereby there is an absence of forward motion of said jaws so as to reduce trauma to the grasped tissue regardless of the positioning of said jaws.

11. A surgical instrument comprising:

a housing provided with an internal bore, and at least first and second concentrically arranged tubular elements extending longitudinally away from said housing, said first tubular element having proximal and distal ends and being affixed at its proximal end so as to be immobile with respect to said housing, and said second tubular element surrounding said first tubular element and being arranged to translate longitudinally with respect to said first tubular element;

translation means for causing said second tubular element to translate longitudinally relative to said first tubular element; and

a jaw piece affixed to said distal end of said first tubular element, said jaw piece being an integral struc-

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ture comprising at least two jaws which are biased and normally deployed away from one another, a rear section, and intermediate leaf spring elements connecting each of said jaws to said rear section, said second tubular element being arranged to slide over said two jaws, whereby when said second tubular element is caused to translate towards the distal end of said first tubular element, said second tubular element will slide over said jaw piece and cause said jaws to close towards one another; one of said jaws having a cutting blade attached thereto that extends substantially parallel to the axes of said tubular elements, and the other of said jaws having a groove for receiving said cutting blade.

12. A surgical instrument comprising:

a housing provided with an internal bore, and at least first and second concentrically arranged tubular elements extending longitudinally away from said housing, said first tubular element having proximal and distal ends and being affixed at its proximal end so as to be immobile with respect to said housing, and said second tubular element surrounding said first tubular element and being arranged to translate longitudinally with respect to said first tubular element;

translation means for causing said second tubular element to translate longitudinally relative to said first tubular element;

a jaw piece affixed to said distal end of said first tubular element, said jaw piece being an integral structure comprising at least two jaws which are biased and normally deployed away from one another, a rear section, and intermediate leaf spring elements connecting each of said jaws to said rear section, said second tubular element being arranged to slide over said two jaws, whereby when said second tubular element is caused to translate towards the distal end of said first tubular element, said second tubular element will slide over said jaw piece and cause said jaws to close towards one another;

a sheath affixed to the forward end of said housing and surrounding and protecting said second tubular element, said sheath extending longitudinally with said second tubular element, whereby when said instrument is placed into an incision and said instrument is operated so as to cause said second tubular element to translate within said housing, said second tubular element will translate within said sheath so as not to cause trauma to the patient.

13. A surgical instrument comprising:

a housing provided with an internal bore, and at least first and second concentrically arranged tubular elements extending longitudinally away from said housing, said first tubular element having proximal and distal ends and being affixed at its proximal end so as to be immobile with respect to said housing, and said second tubular element surrounding said first tubular element and being arranged to translate longitudinally with respect to said first tubular element;

translation means for causing said second tubular element to translate longitudinally relative to said first tubular element;

a jaw piece affixed to said distal end of said first tubular element, said jaw piece being an integral structure comprising at least two jaws which are biased and normally deployed away from one another, a

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rear section, and intermediate leaf spring elements connecting each of said jaws to said rear section, said second tubular element being arranged to slide over said two jaws, whereby when said second tubular element is caused to translate towards the distal end of said first tubular element, said second tubular element will slide over said jaw piece and cause said jaws to close towards one another; said first tubular element having a curved configuration, and said second tubular element being made of a material that enables it to assume the same curvature as said first tubular element as it undergoes translational movement.

14. A surgical instrument for grasping objects at a remote location comprising:

a housing;

first and second concentrically arranged longitudinally extending tubes, said first tube having proximal and distal ends and being fixed at said distal end to said housing, and said second tube surrounding said first tube and being arranged to translate longitudinally with respect to said first tube;

a unitary preformed jaw piece having at least two jaws, a rear section, and intermediate spring leaf elements connecting each jaw to said rear section, said spring leaf elements being arranged so as to normally bias and deploy said jaws so that they are in an open position relative to one another, whereby when said second tube is caused to translate towards the distal end of said first tube, said second tube will overlap said jaw piece and cause said jaws to close towards one another, each intermediate leaf spring element being configured so as to provide a convex flexure at its joiner with said rear section and a concave flexure at its joiner with its respective jaw.

15. The instrument of claim 14 wherein said rear section of said jaw piece has a hole extending through and communicating at one end with the interior of said first tube and at its other end to the space between said jaws, thereby permitting any device which is extended through said first tube to be presented at the space between the jaws.

16. The instrument of claim 14 including operating means for causing said second tube to move longitudinally relative to said first tube, said translation means comprising a stationary handle member and a movable handle member pinned to said stationary handle member for rotational movement with respect thereto, and means on said movable handle member for engaging means affixed to said second tube for moving said second tube longitudinally relative to said first tube in accordance with the relative positioning of said handle members.

17. The instrument of claim 16 including means for selectively locking the movable handle member to said stationary handle member.

18. The instrument of claim 16 wherein said stationary handle member has a bifurcated section, and said movable handle member has a section that extends into and is pivotally secured to the bifurcated section of said stationary handle member.

19. The instrument of claim 14 having two elongate jaws that extend lengthwise of said tubes, and further wherein said jaws are each provided with a groove so located that when said jaws are in closed position said grooves confront one another and are in alignment with said first tube.

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tubular element to move longitudinally relative to said housing and said first tubular element towards the distal end of said first tubular element far enough for said distal end of said second tubular element to slide over said jaw piece and force said leaf spring elements toward one another so as to cause said jaws to close towards one another.

27. An instrument according to claim 26 wherein said motion translating connection comprises a gear rack (36) connected to and movable with said second tubular element, and gear teeth (38) on said second manually-engagable member engaged with said gear rack, whereby movement of said second manually-engagable member relative to said first manually-engagable member and said housing will cause said second tubular element to move longitudinally relative to said first tubular element.

28. An instrument according to claim 27 wherein said gear rack is disposed in said cavity.

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29. An instrument according to claim 27 wherein said gear rack forms part of a hollow extension member that is attached to said proximal end of said second tubular element and slidably surrounds said first tubular element, and further including an O-ring disposed between said hollow extension member and said first tubular member so as to prevent fluids from migrating between said hollow extension member and said first tubular member.

30. An instrument according to claim 26 wherein each jaw has a distal end and a proximal end located closest to said housing, and further wherein said leaf spring elements are contoured so that when said second tubular element slides over said jaw piece, said leaf spring elements will be biased by said second tubular element so as to cause said jaws to close progressively starting with the distal ends of the jaws and then progressing toward the proximal ends of the jaws, whereby the proximal ends of said jaws will make contact last with any tissue disposed between the jaws.

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20. The instrument of claim 14 including a sheath surrounding and protecting said second tube but being spaced therefrom, said sheath extending longitudinally with said second tubular element away from said housing;

whereby when said second tube translates longitudinally with respect to said first tube it will translate within said sheath and not subject said second tube to ambient conditions.

21. The tool of claim 14 wherein said first tube is of curved configuration, and said second tube is made of a material that enables it to assume the same curvature as said first tubular element as it translates thereover.

22. A surgical instrument for grasping objects at a remote location comprising:

first and second concentrically arranged longitudinally extending tubes, said first tube having proximal and distal ends and being fixed with respect to said second tube, and said second tube surrounding said first tube and being arranged to translate longitudinally with respect to said first tube;

a unitary jaw piece comprising a rear section affixed to said first tube at its distal end, at least two jaws, and intermediate spring leaf elements each connecting one of said jaws to said rear section and acting to bias said jaws away from one another to an open position, whereby when said second tube is caused to translate towards the distal end of said first tube, said second tube will overlap said jaw piece and cause said jaws to close towards one another;

operating means for causing said second tube to move longitudinally relative to said first tube, said translation means comprising a stationary handle member and a movable handle member pinned to said stationary handle member for rotational movement with respect thereto, and means on said movable handle member for engaging means affixed to said second tube for moving said second tube longitudinally relative to said first tube in accordance with the relative positioning of said handle members; and

said operating means comprises a gear rack provided with a series of teeth attached to said second tube, and a toothed element attached to said movable handle member in engagement with the teeth of said gear rack.

23. The instrument of claim 22 further including means for limiting movement of said second tube relative to said first tube.

24. A surgical instrument comprising:

a housing provided with an internal bore;

first and second elongate elements extending longitudinally away from said housing, said first element having proximal and distal ends with said distal end being furthest from said housing, said proximal end of said first element extending into said bore and being affixed to said housing, and said second element being a tubular shaft having proximal and distal ends corresponding to their relative positions to the proximal and distal ends of said first element, said second element concentrically surrounding said first element and being arranged to translate longitudinally with respect to said first tubular element;

translation means for causing said second element to translate longitudinally relative to said first element, said translation means comprising a station-

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ary handle member formed integral with said housing, a movable handle member pivotally secured to said stationary handle member, and means on said movable handle member for engaging means affixed to said second element for translating said second tubular element relative to said first element in response to relative movement of said handle members; and

a jaw piece in the form of an integral one-piece structure comprising at least two jaws, a rear section affixed to said distal end of said first element, and intermediate leaf spring elements connecting each of said jaws to said rear section, and biasing said jaws away from one another;

said second element being arranged to slide over said two jaws when said movable handle member is pivoted relative to said stationary handle member in a predetermined direction, whereby said second element will engage said leaf spring element and thereby force said jaws to close on one another.

25. A surgical instrument according to claim 24 wherein said jaws have a distal end and a proximal end with the distal ends of said jaws being furthest from said housing, and said leaf spring elements are arranged so that when engaged by said distal end of said second element they will cause the distal ends of said jaws to close before the proximal ends of said jaws.

26. A surgical instrument comprising:

a housing (34) having an internal cavity;

first and second concentrically arranged tubular elements (10,8) extending longitudinally away from said housing, said first and second tubular elements each having a proximal end and a distal end, said proximal end of said first tubular element (10) extending into and being fixed to said housing, and said second tubular element (8) surrounding said first tubular element and being arranged to move longitudinally with respect to said first tubular element and said housing, said proximal end of said second tubular element extending into said cavity; a preformed jaw piece (2) affixed to said distal end of said first tubular element, said jaw piece being an integral structure comprising a rear section (58) attached to the said distal end of said first tubular element, at least two jaws (4,6), and intermediate leaf spring elements (62,64) connecting each of said jaws to said rear section, said leaf spring elements biasing said jaws so that they are normally deployed away from one another;

first and second manually-engageable members (16,14) for holding and operating said instrument, said first manually-engageable member (16) being fixed to said housing and said second manually-engageable member (14) being movable relative to said first manually-engageable member and said housing; and

means (36,38,40) providing a motion-translation connection between said second manually-engageable member (14) and said second tubular element (8) whereby bi-directional movement of said second manually-engageable member relative to said first manually-engageable member will cause said second tubular member to undergo bi-directional movement longitudinally relative to said first tubular element; and

said second manually-engageable member being movable relative to said first manually-engageable member to an extent such as to cause said second

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SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
DIRECCION DE NUEVAS CREACIONES

2020
Bogotá, D.C.,

Abogado
✓ **Dr. GERMAN CASTILLO GRAU.**

ASUNTO	Radicación	06 - 113491
	Trámite	011
	Evento	379
	Actuación	430
	Oficio	05096
	Folios	23

Patente de Invención ☒ Patente de Modelo de Utilidad ☐

Vía Nacional ☐

Vía PCT (fase nacional) ☒ Cap. I ☒ Cap. II ☐

No. Sol. Internacional PCT/US2005/012115
Fecha de Presentación Internal. 2004/04/12

Como resultado del examen de fondo, realizado con fundamento en el artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se comunica:

1. Documentos estudiados

<u>Descripción:</u>	Folios: 07 a 22	Como se radico inicialmente.
<u>Reivindicaciones:</u>	Folios: 76 a 79	Modificación radicada inicial.
<u>Dibujos:</u>	Folios: 37 a 46	Como se radico inicialmente.
<u>Prioridad:</u>	Folios: 1	(US) 2004-10/822.599 (2004/04/12).

2. Objeto de la invención

Titulo de la invención: **"PERSUASOR DE VARILLA". (Folio 1).**

Problema Técnico Planteado:

- Facilitar la fijación y posición de las varillas vertebrales longitudinales cuando estas, se introducen dentro de un canal receptor de varilla que hace parte del implante vertebral.
- Evitar la desalineación de las varillas vertebrales con respecto al canal receptor de varilla que se encuentra ubicado en la cabeza del implante vertebral.

Solución:

- La solución a los problemas técnicos planteados es proporcionar un persuasor de varilla la cual es un instrumento quirúrgico para fijar una varilla espinal longitudinal dentro de un implante vertebral, el cual el instrumento comprende un ensamble de agarradera, un ensamble de liberación y un elemento actuante. El ensamble de liberación comprende un elemento tubular y un elemento impulsor, el elemento tubular tiene una configuración adecuada para ser dispuesto de forma deslizante dentro del ensamble de agarradera y el elemento impulsor teniendo una configuración adecuada para rodear de forma deslizante por lo menos una porción de la agarradera. El ensamble de agarradera tiene un par de dedos con un resalto que apunta hacia su interior, en donde su configuración es adecuada para entrar en contacto con la cara inferior del borde exterior de un implante vertebral, donde se accionan de una primera posición a una segunda posición por medio una compresión realizada, mediante el desplazamiento del ensamble de agarradera con respecto al ensamble de liberación.

IPC: **A61B17/56, A61B17/58, A61B17/88, A61F2/44, A61F5/00.**

3. Análisis de la solicitud de Patente

Reivindicaciones (*artículo 30 D 486, Art 22 PCT*).

Claridad:

- En los siguientes grupos de reivindicaciones independientes y dependientes, se evidencia que ilustran elementos, características, componentes o términos, que no son claros, no se definen de manera específica y concreta a que elementos se están refiriendo y/o cuales elementos pertenecen, así:
 - No.1. "Ensamblaje de mango", "Extremo proximal", "Extremo Distal".
 - No.1. "Par de ranuras alargadas diametralmente opuestas".
 - No.1. "Par de digitaciones", "ranura", "Ensamblaje de liberación".
 - No.1. "Elemento tubular", "Elemento empujador", "Muesca".
 - No.1. "Primer par de ranuras", "Elemento vertebral longitudinal".
 - No.1. "Elemento accionador", "Primera punta", "Segunda Punta".
 - No.1. "Par de ranuras formadas en el extremo proximal del elemento tubular".
 - No.2. "Extremo proximal del elemento tubular".
 - No.2. "Segundo par de ranuras".
 - No.2. "Ranuras formada en el ensamble de mango".
 - No.3. "Primer elemento de agarre", "Segundo elemento de agarre".
 - No.3. "Primer elemento de mordaza", "Primera punta", "Ranuras".
 - No.3. "Segundo elemento de mordaza", "Segunda Punta", "Pivote".
 - No.4. "Primer elemento de agarre", "Pin", "Ranura".
 - No.4. "Segundo elemento de agarre", "Primer elemento de mordaza".
 - No.4. "Elemento de Mordaza".
 - No.5. "Primeras puntas", "Segundas puntas", "Ranuras".
 - No.6. "Ensamblaje de Mango", "Elemento Tubular",
 - No.6 y 9. "Elemento accionador".
 - No.7. "Elemento empujador", "Porción de las digitaciones".

- No.8 y 9. "Digitaciones", "Implante vertebral".
- No.10. "Elemento empujador", "Superficie inferior", "Digitaciones".
- No.10. "Superficie exterior".
- No.11. "Digitación", "Reborde", "Extremo de la digitación respectiva".
- No.12. "Muesca en U", "Extremo distal del ensamblaje de mango".
- No.12. "Muesca formada en el elemento empujador".
- No.12. "Elemento vertebral", "Ensamble de mango".
- No.13. "Elemento empujador", "Abertura en su extremo distal".
- No.14. "Extremo distal del elemento tubular", "Orificio".
- No.14. "Abertura del elemento empujador".
- No.15. "Elemento Tubular", "Canulación", "Elemento de sujeción".
- No.16. "Extremo Proximal tubular", "Ranura", "Pin de alineación".

Se le sugiere al solicitante que coloque de manera específica y concreta a que elementos, características, componentes o términos, se está refiriendo, colocando al frente de la característica o del elemento, el número de referencia guardando correspondencia con el capítulo descriptivo, las gráficas o dibujos y dicho capítulo reivindicatorio, con el objetivo de comprender mejor la invención al momento de hacer el análisis y distinguir los elementos de dicha invención.

- Las reivindicaciones dependientes No.17 a la No.21, se evidencia que se está exponiendo son las características técnicas esenciales del tornillo llamado "*implante vertebral*", pero no se ilustra en ningún momento las características técnicas esenciales que conforman el "*Persuasor de Varilla*", la cual es el objeto de la invención. Lo que se pretende proteger son las características técnicas esenciales del "*implante vertebral*" mediante las características técnicas esenciales del "*Persuasor de Varilla*" ilustradas en el capítulo reivindicatorio.

El tornillo llamado "*implante vertebral*", no es, ni hace parte de los elementos o características técnicas esenciales que conforman el "*Persuasor de Varilla*".

El solicitante hace referencia al tornillo "*implante vertebral*", en su descripción como una referencia, la cual dice "...De preferencia, no obstante, el persuasor para varilla 10 tiene un tamaño y configuración adecuados para operar en conjunto con tornillos de pedículo poliaxiales vendidos por Synthes Spine ® bajo el nombre Axón ® que se describe en la solicitud pendiente de patente estadounidense No.10/682.999 presentada el 14 de octubre 2003, con el nombre de Poliaxial Bone anchor and Method of Spinal Fixation, el contenido de la cual se incorpora a la presente mediante referencia en su integridad", (Ver folio 11 línea (0031)).

Se le sugiere al solicitante que suprima o elimine estas reivindicaciones.

- En las reivindicaciones dependientes No.8 y No.9, se evidencia que exponen el mismo o similar contenido.

Se le sugiere al solicitante que unifique aquellas reivindicaciones dependientes que exponen el mismo o similar contenido.

Se le sugiere al solicitante que al presentar el nuevo capítulo reivindicatorio coloque los nombres de los elementos y/o componentes correctos guardando correspondencia con los elementos y/o componentes que se describen en el capítulo descriptivo.

Se le sugiere al solicitante, que en el capítulo reivindicatorio coloque los números de referencia al frente de todos los componentes y/o elementos que hacen parte o conforman la invención, guardando una correspondencia entre las graficas y/o dibujos, el capítulo descriptivo y dicho capítulo reivindicatorio, con el objetivo de comprender mejor la invención al momento de hacer el análisis, y a su vez distinguir los elementos de dicha invención.

4. Determinación del Estado de la Técnica

Teniendo en cuenta la fecha de presentación nacional, con fecha del 08 de Noviembre del 2006, se encontraron los siguientes documentos relevantes:

Nº	Documento	Título	Fecha de Publicación
D1	US6660006	ROD PERSUADER	09/12/2003
D2	US5318589	SURGICAL INSTRUMENT FOR ENDOSCOPE SURGERY	07/06/1994

5. Análisis de Patentabilidad (Art 14 D486):

Nivel Inventivo (Art 18 D486)

1. Respecto a la solicitud en estudio:

La reivindicación No.1 dice: “Un instrumento quirúrgico para hincar un elemento vertebral....., el cual instrumento comprende:

Un ensamblaje de mango que incluye un extremo proximal y un extremo distal, el cual extremo distal incluye un par de ranuras alargadas diametralmente opuestas que definen un par de digitaciones para enganchar el implante vertebral, y el extremo proximal del ensamblaje mango incluye por lo menos una ranura;

Un ensamblaje de liberación que incluye un elemento tubular y un elemento empujador, el cual el elemento tubular se dispone de forma deslizable dentro del ensamblaje de mango, y el elemento empujador rodea de forma deslizable por lo menos una porción del ensamblaje de mango, cada uno del elemento tubular y el elemento empujador incluye un extremo proximal y un extremo distal, el extremo proximal del elemento tubular incluye un primer par de ranuras, el extremo distal del elemento empujador incluye una muesca para entrar en contacto con el elemento vertebral longitudinal;

Un elemento accionador que incluye una primera punta y una segunda punta, la cual la primera punta engancha la por lo menos una ranura formada en el extremo proximal del ensamblaje de mango y la segunda punta engancha el primer par de ranuras formadas en el extremo proximal del elemento tubular de manera que la acción del elemento accionador desplaza al ensamblaje de mango con respecto al elemento tubular e

impulsa al elemento vertebral para que se enganche con el implante vertebral". (Ver folio 76).

Para efectos del examen, se toma en cuenta como características técnicas esenciales las que se encuentran subrayadas por el examinador.

2. Respecto al estado de la técnica:

El documento **D1 US6660006** ilustra un aparato persuasor para posicionar una barra ortopédica de un dispositivo ortopédico tal como un implante vertebral o un elemento acoplado. (Ver "Abstract" "columnas 1 a 16" y las "figuras No.1A a 7B").

El documento **D2 US5318589** ilustra un instrumento quirúrgico, la cual comprende dos tubos coaxialmente montados entre sí realizando un movimiento telescópico, asimismo cuenta con una pinza, la cual lleva un resorte fijo, en donde esta pinza mueve remotamente dos dientes ubicados en los extremos de los tubos coaxialmente montados, estos dientes normalmente esta apartados para seleccionar una posición de apertura para agarrar un implante o dispositivo auxiliar de cirugía. (Ver "Abstract" "columnas 1 a 22" y las "figuras No.1 a 24").

3. Análisis de las diferencias con respecto al estado de la técnica:

En la tabla No.1 se ilustran en las casillas de comparación, la explicación de Afirmativa si las reivindicaciones están comprendidas dentro del estado de la técnica (documentos D1 y D2), en caso contrario se enunciara como No es Afirmativa.

Tabla No.1

ESTUDIO DE NIVEL INVENTIVO		
Características esenciales de la Solicitud en estudio	Documento D1	Documento D2
.....Un ensamblaje de mango que incluye un extremo proximal y un extremo distal, el cual extremo distal incluye un par de ranuras alargadas diametralmente opuestas que definen un par de digitaciones para enganchar el implante vertebral, y el extremo proximal del ensamblaje mango incluye por lo menos una ranura,	Afirmativa (Ver "Abstract" columna 5 (lin 29 a 35), columna 5 (lin 37 a 49), columna 6 (lin 7 a 16), columna 6 (lin 29 a 67), figuras 1A a 7B).	Afirmativa (Ver "Abstract" columna 4 (lin 59 a 68), columna 5 (lin 1 a 9), figuras 1 a 24).
Un ensamblaje de liberación que incluye un elemento tubular y un elemento empujador, el cual el elemento tubular se dispone de forma deslizable dentro del ensamblaje de mango,	No Afirmativa	Afirmativa (Ver "Abstract" columna 5 (lin 10 a 35), columna 5 (lin 1 a 9), figuras 2).
y el elemento empujador rodea de forma deslizable por lo menos una porción del ensamblaje de mango, cada uno del elemento tubular y el elemento empujador incluye un extremo proximal y un extremo distal, el extremo proximal del elemento tubular incluye un primer par de ranuras, el extremo distal del elemento empujador incluye una muesca para entrar en contacto con el elemento vertebral longitudinal;	Afirmativa (Ver "Abstract" columna 5 (lin 29 a 35), columna 5 (lin 37 a 49), columna 6 (lin 7 a 16), columna 6 (lin 29 a 67), columna 8 (lin 39 a 67), figuras 1A a 7B).	No Afirmativa
Un elemento accionador	Afirmativa (Ver "Abstract" columna 5 (lin 58 a 67), figuras 1A, 1B, 6A, 6B y 7A).	Afirmativa (Ver "Abstract" columna 4 (lin 59 a 68), columna 5 (lin 1 a 9), figuras 1 y 2).
..... que incluye una primera punta y una segunda punta, la cual la primera punta engancha la por lo menos una ranura formada en el extremo proximal del ensamblaje de mango y la segunda punta engancha el primer par de ranuras formadas en el extremo proximal del elemento tubular	No Afirmativa	No Afirmativa
de manera que la acción del elemento accionador desliza al ensamblaje de mango con respecto al elemento tubular e impulsa al elemento vertebral para que se enganche con el implante vertebral"	Afirmativa (Ver "Abstract" columna 5 (lin 29 a 35), columna 5 (lin 37 a 49), columna 6 (lin 7 a 16), columna 6 (lin 29 a 67), figuras 1A a 7B).	Afirmativa (Ver "Abstract" columna 3 (lin 3 a 40), columna 5 (lin 10 a 35), figuras 1 y 2).

4. Realizada la comparación y el análisis del documento D1, mediante la tabla No.1 con respecto a la solicitud en estudio donde se presenta la reivindicación No.1, se evidencia que las diferencias existentes que se encontraron en D1, con respecto a la solicitud en estudio fueron: *“Un ensamblaje de liberación que incluye un elemento tubular y un elemento empujador, el cual el elemento tubular se dispone de forma deslizable dentro del ensamblaje de mango” y “que incluye una primera punta y una segunda punta, la cual la primera punta engancha la por lo menos una ranura formada en el extremo proximal del ensamblaje de mango y la segunda punta engancha el primer par de ranuras formadas en el extremo proximal del elemento tubular”.*

El documento D2 enseña un dispositivo quirúrgico que posee *“un ensamblaje de liberación que incluye un elemento tubular y un elemento empujador, el cual el elemento tubular se dispone de forma deslizable dentro del ensamblaje de mango”,* (Ver *“Abstract”, “columna 5 (lin 1 a 35) y (lin 10 a 35)”* y las *“figura No.2”*).

Si bien en el documento D1 y D2, no se está ilustrando la característica técnica llamada elemento accionador, *“que incluye una primera punta y una segunda punta, la cual la primera punta engancha la por lo menos una ranura formada en el extremo proximal del ensamblaje de mango y la segunda punta engancha el primer par de ranuras formadas en el extremo proximal del elemento tubular”,* la cual expone un elemento accionador con una configuración diferente en su forma estructural, que comparado con los elementos accionadores expuestos en D1 y D2, su función es la misma, debido a que el propósito del elemento accionador es el de efectuar el deslizamiento del elemento tubular dentro del ensamblaje de mango para poder abrir o cerrar un par de digitaciones, dedos o dientes para poder fijar sobre el implante vertebral una barra o varilla vertebral, en donde este propósito o funcionamiento también se evidencia en los elementos accionadores ilustrados en D1 y D2, independientemente de su forma estructural.

La solicitud en estudio no tendría nivel inventivo porque para una persona versada en la materia se hubiese derivado de manera evidente del estado de la técnica con respecto a las características técnicas sugeridas en el documento D1 y D2, en donde se evidencia que el efecto técnico objetivo del ***“persuasor de varilla”***, es el de facilitar la fijación y posición de las varillas vertebrales longitudinales cuando estas, se introducen dentro de un canal receptor de varilla que hace parte del implante vertebral y evitar la desalineación de las varillas vertebrales con respecto al canal receptor de varilla que se encuentra ubicado en la cabeza del implante vertebral, enunciado en el documento de la solicitud en estudio, en donde la característica técnica esencial enunciada anteriormente comparada con respecto a los documentos D1 y D2, se evidencia que se está solucionado el mismo problema técnico objetivo, es decir no logra un resultado diferente o un efecto técnico inesperado aunque en dicha invención se expongan de forma diferente la configuración de sus elementos y de sus partes, como en este caso, por el empleo o utilización de un *“elemento accionador que incluye una primera punta y una segunda punta”*, en la invención.

Por lo tanto, la solicitud como esta reivindicada se considera obvia, porque para una persona versada en la materia que tenga que solucionar el problema y conozca el estado de la técnica haría la combinación de D1 (estado de la técnica más cercano), junto con D2, en donde se llegaría al contenido de la reivindicación independiente No.1.

Por tal razón la presente solicitud se ve afectada en su nivel inventivo.

Conclusión:

Los requisitos de patentabilidad de la presente solicitud se encuentran afectados así:

N°	Documento N°	Reivindicaciones Afectadas	Requisito que Afecta
D1	US6660006	1 a 22	Nivel Inventivo
D2	US5318589	1 a 22	Nivel Inventivo

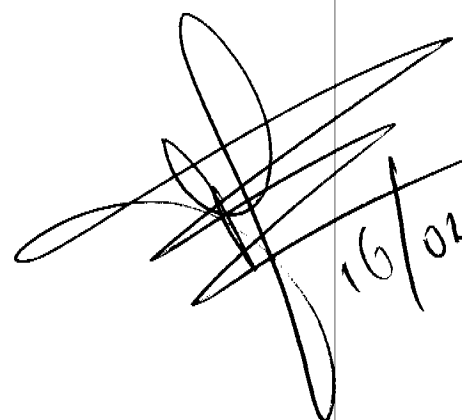
En cumplimiento del artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le indica que debe dar respuesta dentro del término de sesenta días contados a partir de la fecha de notificación de la presente comunicación. En caso de no dar respuesta al presente requerimiento, o si a pesar de la respuesta subsistieran los impedimentos para la concesión, se denegará la patente.

Notifíquese el presente oficio conforme a lo dispuesto en el numeral 5.2 literal e), del capítulo quinto del título primero de la circular única, No. 10 del 2001.


ALIX CESPEDES DE VERGEL
 Directora de Nuevas Creaciones (C)

El anterior requerimiento fue notificado por fijación en lista, de fecha 13 ABR 2013

CONCEPTO TECNICO Numero: 369	EXAMINADOR TECNICO Código No. 202072
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 16/04/10

EXAMEN DE FONDO Y/O PRELIMINAR DE BUSQUEDA		
Fecha del examen de Fondo:	24 de Marzo del 2009	
Codigo del Examinador:	202072	
INFORMACION GENERAL DE LA SOLICITUD DE PATENTE		
Titulo de la solicitud		
"PERSUASOR DE VARILLA"		
Solicitud Nacional:	No. de radicacion: 06 - 113491	Fecha de presentacion: 08/11/2006
Solicitud Inter/nal: X	No. de Prioridad: 10/822.599	Fecha de prioridad: 12/04/2004
PALABRAS CLAVES PARA LA BUSQUEDA		
SURGICAL INSTRUMENTS OR METHODS FOR TREATMENT OF BONES SPECIALLY OR JOINTS, DEVICES.	FOR OSTEOSYNTHESIS INSTRUMENTS METHODS OR MEANS FOR IMPLANTIG OR EXTRACTING INTERNAL	FORTLE SPINE VERTEBROUS
ORTHOPEDIAL METHODS DEVICES FOR NON- SURGICAL TREATMENT OF BONES OR JOINTS		
CLASIFICACIONES INTERNACIONALES ASIGNADAS A LA SOLICITUD O RELACIONADAS CON SU BUSQUEDA		
Asignadas originalmente (Oficina del pais donde se radico y/o Examen de forma)	Encontradas y/o Relacionadas	
A61B17/56	A61B17/58 A61B17/88	A61F2/44 A61F5/00
BASES DE DATOS CONSULTADAS		
ESPACENET: X	USPTO : X	JAPONESA:
MIMOSA :	WIPO:	COLOMBIANA:
EPOLINE: X	LATITPAT:	OTRAS:
DOCUMENTOS CORRESPONDIENTES EN OTROS PAISES DE LA SOLICITUD DE PATENTE		
No. De Patente original:	WO2005099602	
US2005228392	US7491207	ZA200608625
KR20070012706	JP2007532243	EP1740109
CN1972637	CA2563564	BRPI0509851
AU2005232697		
INFORMES DE EXAMENES DE BUSQUEDA HECHAS POR OTRAS OFICINAS QUE AFECTAN Y/O SE RELACIONAN CON LA SOLICITUD DE PATENTE		
Oficina	Fecha	Reiv. Afectadas
US6660006	09/12/2003	1 -13, 15, 21-37, 39, 45-50, 55-64, 51 - 53, 71-76
US5318589	07/06/1994	1 -13, 15, 21-37, 39, 45-50, 55-64, 51 - 53, 71-76
US5688274	18/11/1997	21-26, 45-50, 71-76
ANTERIORIDADES ENCONTRADAS		
Documento	Relevancia (Novedad o Nivel inventivo)	Reiv. Afectadas
US6660006	Nivel Inventivo	1 a 22
US5688274	Nivel Inventivo	1 a 22
LITERATURA FUERA DE LAS PATENTES		
Documento	Relevancia	Reiv. Afectadas
OBSERVACIONES		

