AMENDED

AUSTRALIAN SEC. 1 PATENT OFFICE

AUSTRALIA

PATENTS ACT 1990

655482

PATENT REQUEST : STANDARD PATENT

I/We being the person(s) identified below as the Applicant(s), request the grant of a patent to the person(s) identified below as the Nominated Person(s), for an invention described in the accompanying standard complete specification.

Full application details follow:

[71/70] Applicant(s)/Nominated Person(s):

SMITH & NEPHEW DYONICS INC.

of

160 Dascomb Road, Andover, Massachusetts
01810, United States of America

[54] Invention Title:

Forceps

[72] Name(s) of actual inventor(s):

Parviz KAMBIN
Douglas D. SJOSTROM

[74] Address for service in Australia:

DAVIES COLLISON CAVE, Patent Attorneys, 1 Little Collins Street, Melbourne, Victoria, Australia.
Attorney Code: DM

Basic Convention Application(s) Details:

[31] Application Number	[33] Country	Code	[32] Date of Application
737223	United States of America	US	29 July 1991

DATED this 18th day of November 1992

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a member of the firm of DAVIES COLLISON CAVE for and on behalf of the applicant(s)

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NOTICE OF ENTITLEMENT

We, **Smith & Nephew Dyonics Inc.**, the applicant/Nominated Person in respect of Application No. 20500/92 state the following:-

The Nominated Person is entitled to the grant of the patent because the Nominated Person derives title to the invention from the inventors by assignment.

The Nominated Person is entitled to claim priority from the basic application listed on the patent request because the Nominated Person is the assignee of the applicants in respect of the basic application, and because that application was the first application made in a Convention country in respect of the invention.

DATED this FOURTH day of JANUARY 1993

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a member of the firm of DAVIES COLLISON CAVE for and on behalf of the applicant(s)

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(54) Title
FORCEPS

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(71) Applicant(s)
SMITH & NEPHEW DYONICS INC.

(72) Inventor(s)
~~PARVIS~~ KAMBIN; DOUGLAS D. SJOSTROM
PARVIZ

(74) Attorney or Agent
DAVIES COLLISON CAVE , 1 Little Collins Street, MELBOURNE VIC 3000

(56) Prior Art Documents
EP 412282
GB 2004749
DE 2748075

(57) Claim

1. Deflecting forceps, comprising a pair of handles movable relative to one another between open and closed positions;

an elongated tubular housing fixed at its proximal end to and extending from one of said handles and terminating in a distal free end;

forceps jaws;

linking means having a longitudinally extending axis extending through said housing, said linking means being connected at its proximal end to the other of said handles and at its distal end to said forceps jaws such that moving said handles between said positions thereby operates said forceps jaws;

an actuator cable means having a longitudinally extending axis; and

a manually operable actuator at the proximal end of said housing connected to the proximal end of said actuator cable means, the distal end of said actuator cable means being operatively associated with said forceps jaws such that manual operation of said actuator causes said actuator cable means to swing said forceps jaws from a first position where said forceps jaws are parallel to the longitudinal axis of said housing to a second position where said forceps jaws are transverse to said longitudinal axis; and wherein said actuator cable means comprises a spring urging said forceps jaws to said first position.

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COMPLETE SPECIFICATION

NAME OF APPLICANT(S):

Smith & Nephew Dyonics Inc

ADDRESS FOR SERVICE:

DAVIES COLLISON CAVE
Patent Attorneys
1 Little Collins Street, Melbourne, 3000.

INVENTION TITLE:

Forceps

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

The present invention relates to a deflecting forceps having forceps jaws that can be swung to reach tissue at a location remote from the normal position of the forceps jaws.

While generally useful in surgical procedures, such as endoscopic procedures, the present invention is particularly useful in the procedure described in Parviz Kambin United States Patent 4,573,448, issued March 4, 1989, which is incorporated herein by reference thereto. In that procedure, an access cannula is inserted into a herniated intervertebral disc, and thereafter fragments of tissue are removed from the disc through the access cannula. The area that is accessible to surgical tools inserted into the disc through the cannula is limited to tissue lying along a path coaxial with the longitudinal axis of the access cannula. While such surgical tools can be rotated about this axis, they cannot reach tissue located at a position remote from this axis.

According to the present invention there is provided a deflecting forceps, comprising a pair of handles movable relative to one another between open and closed positions;

an elongated tubular housing fixed at its proximal end to and extending from one of said handles and terminating in a distal free end;

forceps jaws;

linking means having a longitudinally extending axis extending through said housing, said linking means being connected at its proximal end to the other of said handles and at its distal end to said forceps jaws such that moving said handles between said positions thereby operates said forceps jaws;

an actuator cable means having a longitudinally extending axis; and

a manually operable actuator at the proximal end of said housing connected to the proximal end of said actuator cable means, the distal end of said actuator cable means being operatively associated with said forceps jaws such that manual operation of said actuator causes said actuator cable means to swing said forceps jaws from a first position where said forceps jaws are parallel to the longitudinal axis of said housing to a second position where said forceps jaws are transverse to said longitudinal axis; and wherein said actuator cable means comprises a spring urging said forceps jaws to said first position.

A deflecting forceps according to an embodiment of the invention provides a means for reaching tissue at these remote locations, since the forceps jaws can be swung from a normal position parallel to or lying along the axis of the cannula to a position transverse to the axis. Tissue located away from the axis can be readily reached and removed, whereas it would have been left untouched by conventional forceps.

Preferably, the forceps are provided with a suction conduit communicating the interior of the housing to a source of suction to facilitate removal of tissue by pulling tissue by suction to the forceps jaws. In addition, smaller bits of tissue can be removed from the surgical site by being aspirated through the housing.

An embodiment of the invention will now be described by way of example only with reference to the accompanying drawings, in which:

Figure 1 is an elevational view of an embodiment of the forceps of the invention;

Figure 2 is a detail top plan view, in enlarged scale, partly in section, of the distal end of the forceps of Figure 1.

Figs. 3 and 4 are sections taken along lines 3-3 and
4-4 in Fig. 1, respectively.

Fig. 5 is a detail elevational view, in section, of the distal end of the forceps of Fig. 1;

Fig. 6 is a detail view, in perspective, of the distal end of the forceps;

Fig. 7 is a detail elevational view, in section, in enlarged scale, of the proximal end of the forceps of Fig. 1;

Fig. 8 is a detail elevational view, in section, of the actuator for the jaws of the forceps of Fig. 1.

Referring to Fig. 1, the forceps 1 has an elongated tubular housing 2, a pair of forceps jaws 3 at the distal end 2a of housing 2 and a pair of normally open handles 4a, 4b at the proximal end 2b of housing 2. Movable handle 4a is connected to one end of a cable 5, while the other end of cable 5 is connected to a pantograph linkage 6 (Fig. 2), which in turn is connected to jaws 3. Closing and opening the handles 4a, 4b opens and closes the jaws 3, respectively, via cable 5 and linkage 6, as is conventional.

Actuator 7 is located at the proximal end 2b of housing 2. While shown as pivotally mounted on fixed handle 4b, actuator 7 can, if desired, be mounted instead on the proximal end 2b of housing 2. Cable 8 is connected to actuator 7 and is looped through bore 9 in collar 10. As

presently preferred, lengths 8a, 8b of cable 8 extend from collar 10 through the interior 2c of housing 2 and are fastened to the underside of actuator 7, as shown in Fig. 8. In the embodiment of the forceps 1 shown in the drawings, collar 10 is secured, as by brazing, to linkage 6 and hence to jaws 3 (Fig. 6). However, the linkage 6 may include an integral portion (not shown) having a bore for receiving the loop 8c of cable 8. Alternatively, collar 10 can be rotatably linked to cable 8 by other means, such as by connecting a loop (not shown) at the distal end of cable 8 to a post (not shown) carried by collar 10.

It is presently preferred to locate cable 8 within sleeve 14, which is in turn located within housing 2. However, sleeve 14 can also be located on the outside of housing 2 (not shown) with the cable 8 thus passing through sleeve 14 externally of housing 2. Furthermore, sleeve 14 can even be omitted entirely, with the cable 8 simply being located inside or outside of housing 2.

Depression of the actuator 7 to the dotted line position shown in Fig. 1, as by thumb pressure, will apply a swinging force to collar 10 via cable 8 and hence will swing the jaws 3 from the normal position shown in Fig. 5, wherein the jaws are parallel to the longitudinal axis of housing 2, to the dotted line position (Fig. 5), wherein the jaws 3 are transverse to the longitudinal axis of housing 2. Spring

11, which is in compression, urges the jaws 3 to return to the normal position.

In a preferred embodiment of the invention, a suction conduit 12 having an internal valve 13 communicates with the interior 2c of housing 2 as will be described in detail hereinafter. When conduit 12 is connected to a source of suction, tissue near the distal end of the forceps will be pulled by suction to the jaws 3, and smaller bits of tissue removed by jaws 3 can be aspirated from the surgical site through the interior 2c of housing 2. Valve 13 can be operated to control the degree of suction or to disconnect the interior 2c of housing 2 from the source of suction, as desired. If desired, the forceps 1 can be made without suction conduit 12 and valve 13.

Jaws 3 may take the form of any useful tool. As shown, jaws 3 comprise forceps cups 3a, 3b, which may have serrated edges (not shown) if desired. Other useful tools include scissors, graspers and the like.

It is presently preferred to use a pantograph linkage 6 (Fig. 2) comprising stationary pivot 6a carried by stationary arms 6b (Fig. 6), movable pivot 6c connected to the cable 5 (Fig. 5) and movable pivots 6d that pivotally connect jaws 3a, 3b to the movable linking members 6e. The use of a pantograph linkage to connect forceps jaws to a pull cable is conventional; other linkages may also be used.

As best seen in Fig. 6, arms 6b extend from a fitting having a frustoconical portion 6f that is brazed or otherwise fastened to spring 11. Collar 10 has opposed arcuate portions 10a and opposed tabs 10b that are bent into the slot formed between arms 6b to restrain rotational movement of the collar 10 and to add axial strength.

Spring 11 is press-fit into or is otherwise fastened to sleeve 15 (Fig. 6). As stated above, spring 11 is in compression. Sleeve 14 is welded to sleeve 15 by fillet 16 (Fig. 3). If desired, however, sleeve 15 can be omitted, in which case cable 5 will simply pass through housing 2. If sleeve 15 is omitted, the proximal end of spring 11 may be tack welded or otherwise fastened to housing 2 so that the proximal end of spring 11 is fixed in position relative to housing 2.

To facilitate the swinging of jaws 3 by cable 8, the distal end 2a of housing 2 is provided with a truncated arc 2d (Figs. 2 and 6), while the distal end of sleeve 14 terminates in an upturned flange 14a formed by bending sleeve 14 upwardly and cutting the bent portion at an angle. Flange 14a may be brazed or otherwise fastened to the interior of housing 2. Flange 14a and truncated arc 2d are proportioned to permit jaws 2 to swing through the desired angle, such as up to about 135°.

Referring to Fig. 7, suction conduit 12 is received in and fastened to fitting 20, as by brazing. The proximal end

of housing 2 is then inserted into bore 21, with sleeves 14 and 15 projecting through bores 21 and 22 and beyond fitting 20. Sleeve 14 is provided at its proximal end with an upturned portion 14b through which project cable portions 8a, 8b. Bore 22 is provided with a notch portion 23 to accommodate upturned portion 14b.

Handle 4b is inserted into bore 22 with sleeve 15 passing through bore 30 in handle 4b and upturned portion 14b being received by the notch 31. Handle 4b is fastened to fitting 20, as by brazing, while upturned portion 14b and the proximal end of sleeve 15, which projects slightly beyond handle 4b, are fastened to handle 4b, also as by brazing. Cables 8 and 5 are threaded through their sleeves 14 and 15 and fastened to actuator 7 and handle 4a, respectively.

In operation, a cannula (not shown) is inserted into the disc using the procedure described in United States Patent 4,573,448. At an appropriate time during the procedure, the forceps 1 is inserted through the cannula and into the disc. Forceps 1 is advanced to the desired position and operated to grasp and remove tissue by means of jaws 3. Forceps 1 can be rotated about its longitudinal axis, if desired. Where tissue to be removed is at a position remote from the longitudinal axis, and hence not accessible to jaws 3 when in their normal position, actuator 7 can be depressed by the thumb of the same hand holding the

handles 4a, 4b to swing jaws 3 through the desired angle to reach the remote tissue site.

Actuator 7 can be slightly depressed or fully depressed to the position shown in dotted line in Figure 1 depending on the desired angle through which the jaws are to be swung. Thereafter, the surgeon will maintain the actuator 7 in place to thereby maintain the jaws 3 in place. Handles 4a, 4b are then operated to open and close the jaws. Thereafter, jaws 3 can be moved to another position by operation of actuator 7 and/or by rotating and/or sliding forceps 1 within the cannula.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Deflecting forceps, comprising a pair of handles movable relative to one another between open and closed positions;

an elongated tubular housing fixed at its proximal end to and extending from one of said handles and terminating in a distal free end;

forceps jaws;

linking means having a longitudinally extending axis extending through said housing, said linking means being connected at its proximal end to the other of said handles and at its distal end to said forceps jaws such that moving said handles between said positions thereby operates said forceps jaws;

an actuator cable means having a longitudinally extending axis; and

a manually operable actuator at the proximal end of said housing connected to the proximal end of said actuator cable means, the distal end of said actuator cable means being operatively associated with said forceps jaws such that manual operation of said actuator causes said actuator cable means to swing said forceps jaws from a first position where said forceps jaws are parallel to the longitudinal axis of said housing to a second position where said forceps jaws are transverse to said longitudinal axis; and wherein said actuator cable means comprises a spring urging said forceps jaws to said first position.

2. Deflecting forceps as claimed in claim , wherein said distal end of said tubular housing has a truncated arcuate opening to facilitate the swinging of said forceps jaws from said first position to said second position.

3. Deflecting forceps as claimed in claim 1 or claim 2, wherein a conduit means is secured to said tubular housing in communication with the interior thereof for applying suction to said housing, said housing being open at the distal end.

4. Deflecting forceps as claimed in any one of the preceding claims, wherein said linking means comprises a sleeve in said housing in fixed relation thereto, a pantograph linkage connected to the proximal end of said forceps jaws and a forceps

jaws cable within said sleeve having its distal end connected to said other handle.

5. Deflecting forceps as claimed in any one of the preceding claims, wherein said spring has a distal end connected to said forceps jaws for movement therewith as said forceps jaws swings between said positions and a proximal end that is fixed with respect to said housing.

6. Deflecting forceps as claimed in any one of claims 1 to 3 wherein said linkage means comprises a sleeve in said housing in fixed relation thereto, said proximal end of said spring being fastened to the distal end of said sleeve and a forceps jaws cable within said sleeve and said spring having its distal end operatively associated with said forceps jaws and its proximal end connected to said movable handle.

7. Deflecting forceps as claimed in any one of the preceding claims wherein an actuator cable sleeve is provided in said housing in fixed relation thereto, said actuator cable means passing through said actuator cable sleeve.

8. Deflecting forceps substantially as hereinbefore described with reference to the accompanying drawings.

DATED this 10th day of October 1994
Smith & Nephew Dyonics Inc.
By Its Patent Attorneys
DAVIES COLLISON CAVE

ABSTRACT

FORCEPS

There is disclosed a forceps having forceps jaws (3) operated by manually operable handle (4a,4b) and also having a cable (8) connected between the forceps jaws (3) and a manually operable actuator (7) such that the forceps jaws (3) are swung to a desired position when the actuator (7) is operated.
(Figs, 1 & 2)

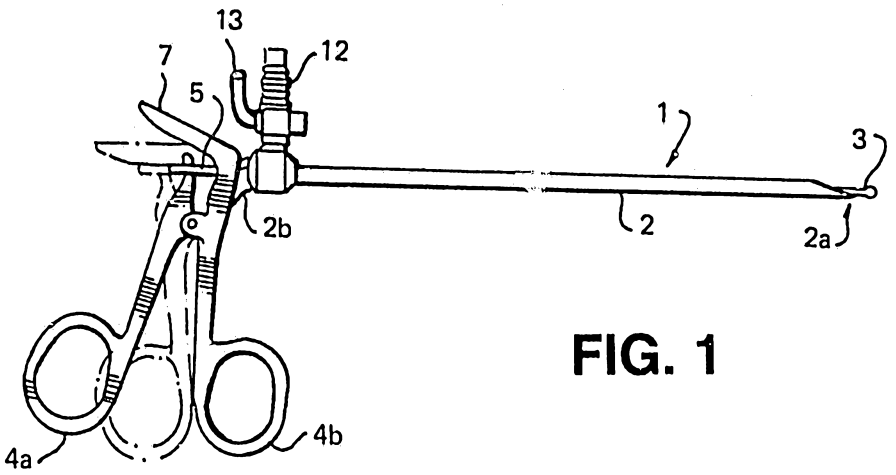

FIG. 1

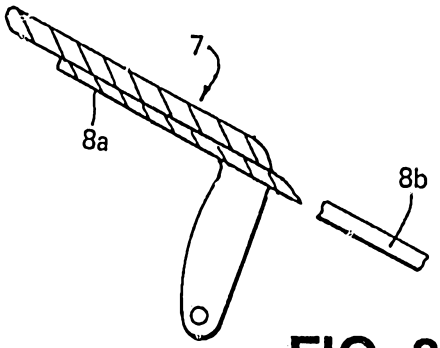

FIG. 8

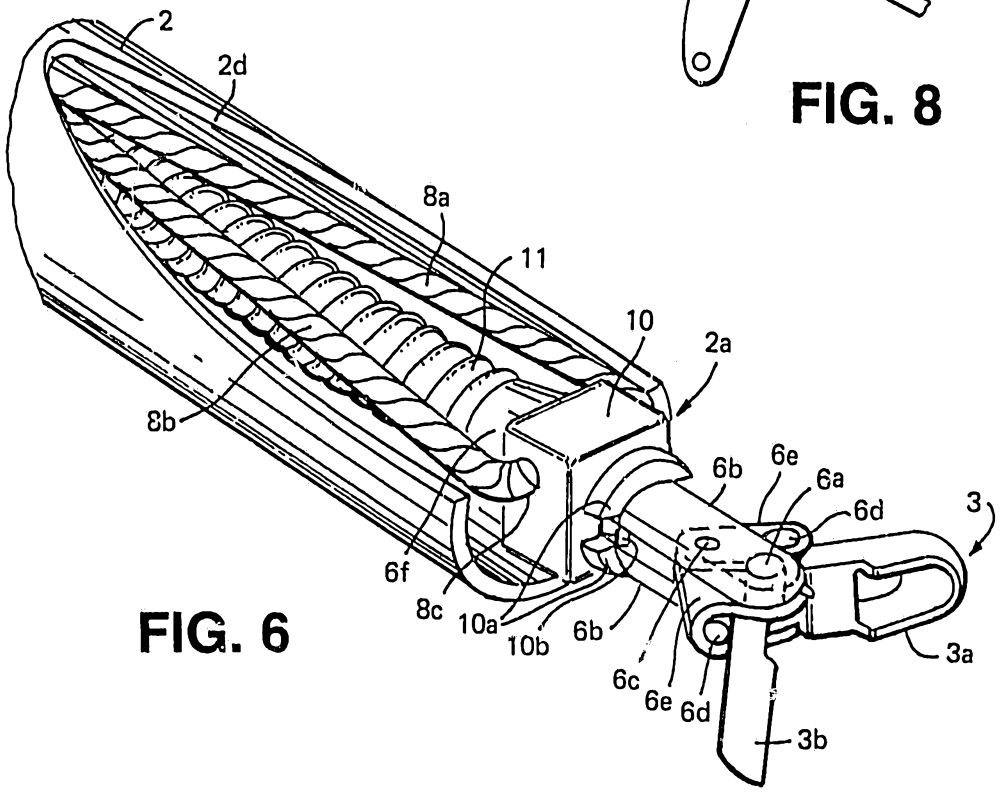

FIG. 6

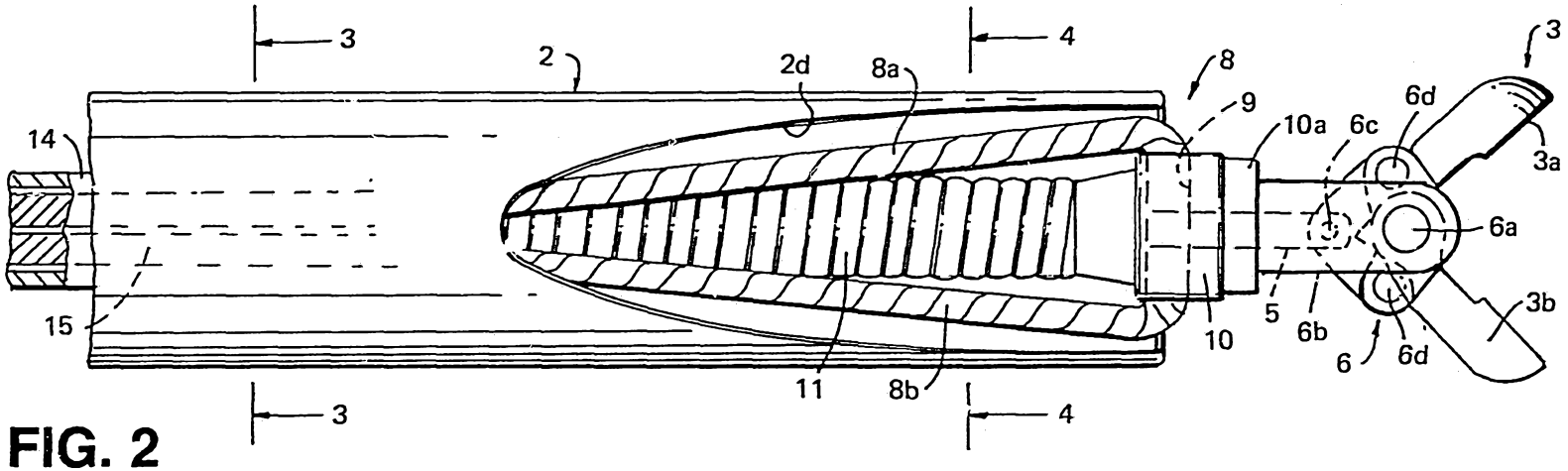

FIG. 2

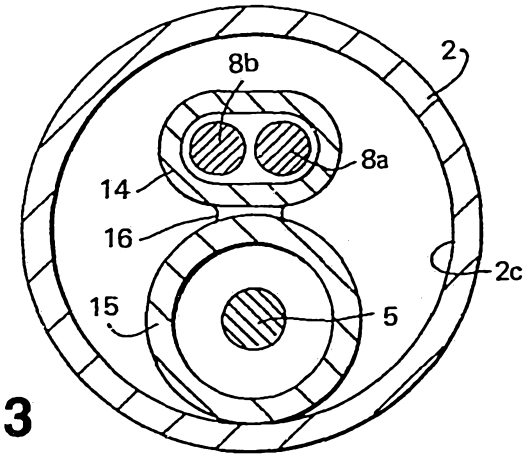

FIG. 3

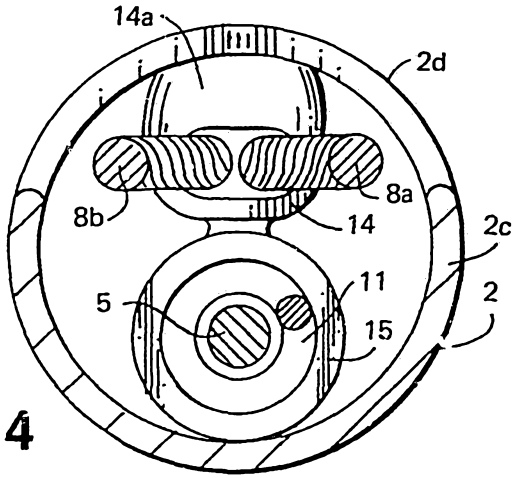

FIG. 4

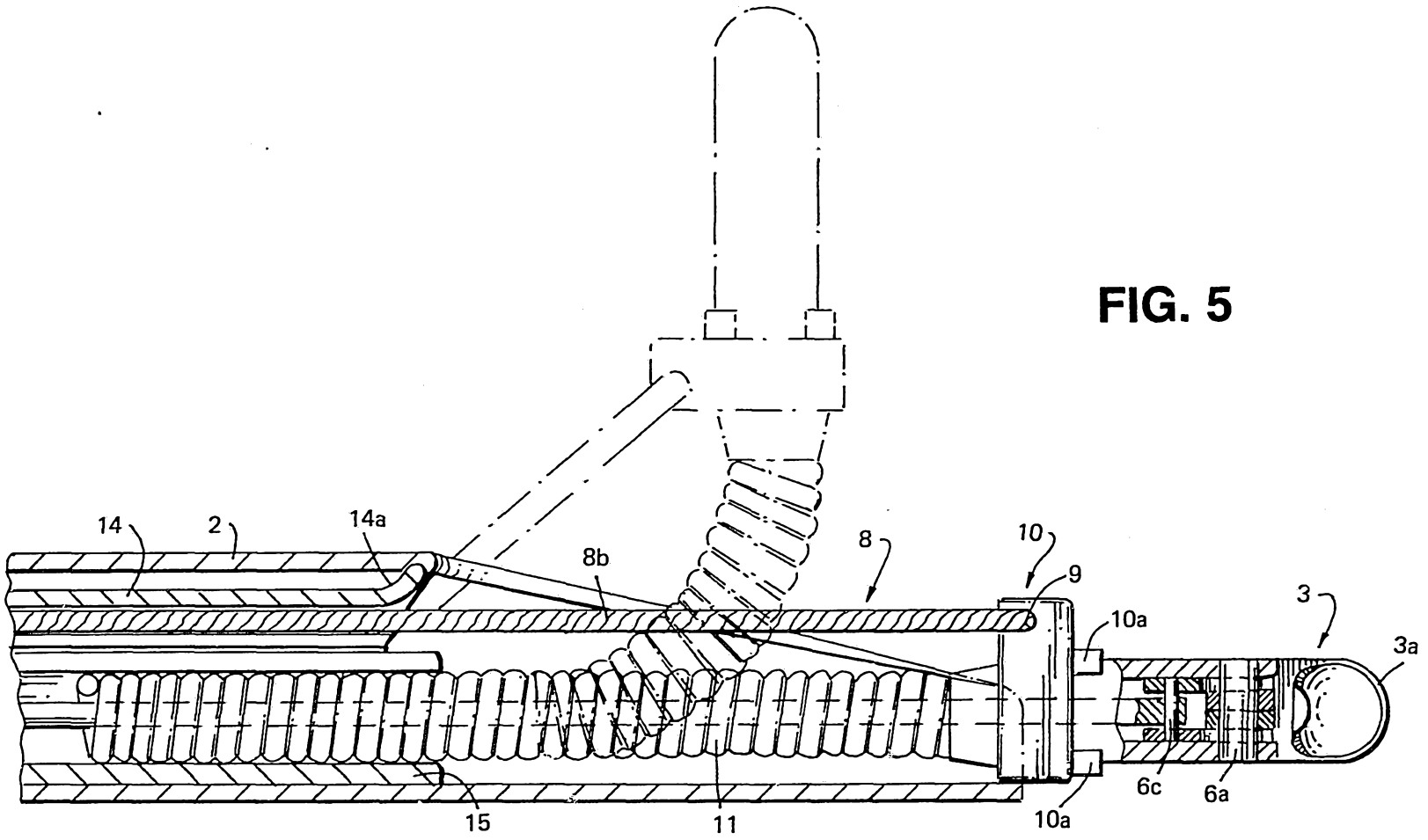

FIG. 5

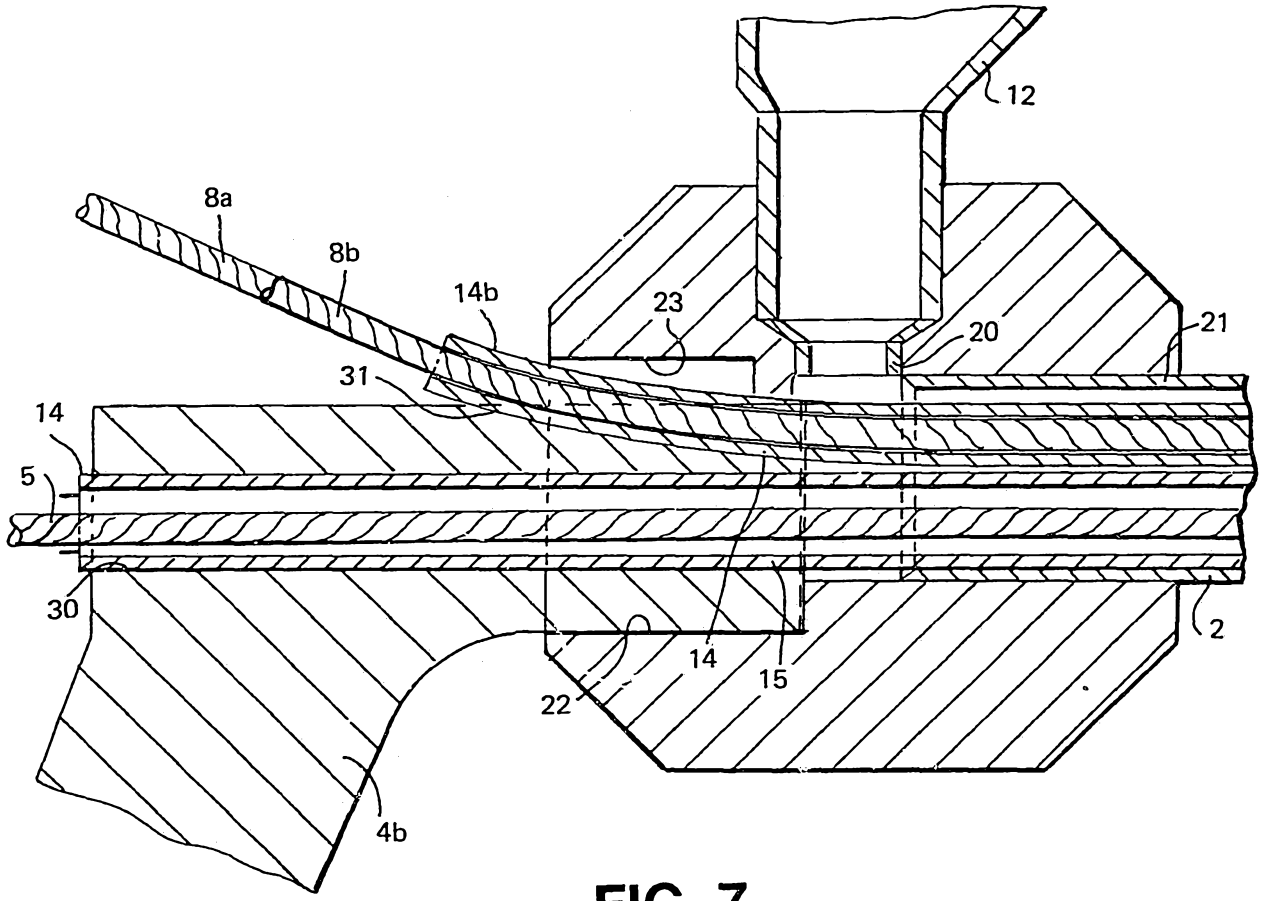

FIG. 7