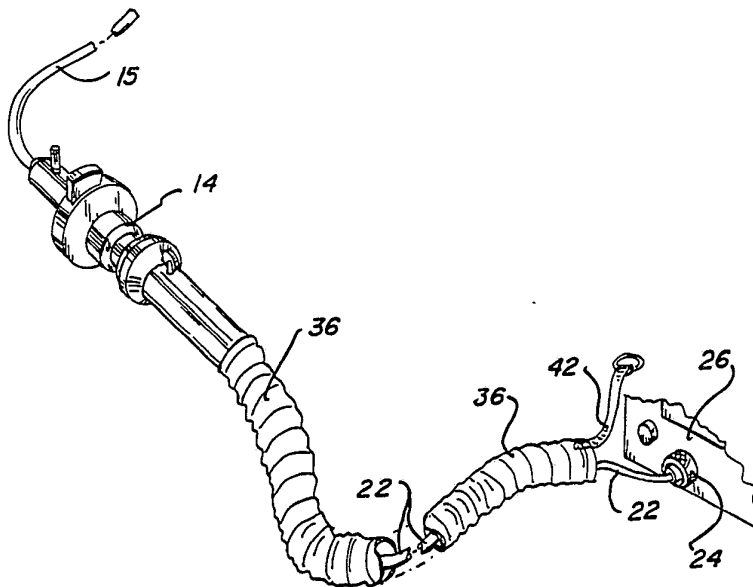




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<p>(21) International Application Number: PCT/US90/00126 (22) International Filing Date: 9 January 1990 (09.01.90) (30) Priority data: 306,809 3 February 1989 (03.02.89) US (71)(72) Applicant and Inventor: ADAIR, Edwin, L. [US/US]; 2800 South University Boulevard, Denver, CO 80210 (US). (74) Agent: FIELDS, Gary, D.; Fields, Lewis, Pittenger & Rost, 1720 South Bellaire Street, Suite 1100, Denver, CO 80222 (US).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent).</p> <p>Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>

(54) Title: STERILIZABLE VIDEO CAMERA COVER



(57) Abstract

A sterilizable video camera cover is provided which has a connector having a guideway for receiving an unsterile video camera (C) within it in a predetermined fixed orientation. A receptacle (10) is provided for holding the camera in this position against a window (32) at the distal end of the connector which serves as a bacteria barrier. A flared end is provided distally of the window for receiving a sterile "C" mount (14) and endoscope (15) in a fixed position with respect to the camera. An accordion folded sleeve (36) is positioned on the receptacle for being extended over the trailing cable (22) of the video camera to maintain the sterile environment within the operating room even though the camera and trailing cable are unsterile.

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STERILIZABLE VIDEO CAMERA COVERTechnical Field

05 This invention relates to a sterilizable video camera cover for use in an operating room environment and more particularly to such a cover which encloses and aligns an unsterile camera with a sterile "C" mount or beam splitter or other connecting type optical device and hence to a sterile endoscope.

Background Art

10 For many years, unsterile cameras have been used in surgery by placing them into a sterile plastic bag or drape which has an opening in one end which fits around the camera attachment to mate to an optical connector called a "C" mount. However, the act of aligning the
15 unsterile camera within the drape or bag for connecting to a "C" mount which fits through the hole in the drape and is threaded into the camera housing can create contamination. This always occurs if the connecting optic, such as a "C" mount must be replaced with a beam
20 splitter or other device such as a different focal length "C" mount. Such manipulations do not preserve sterile integrity.

25 A sterile pouch for containing a standard still picture camera for use in an operating room is shown in U.S. Patent No. 2,537,303 to Cobb, Jr. et al. However, there is no thought in this device of connecting the camera to other optical means.

30 Other containers for protecting cameras for underwater photography are shown in U.S. Patent No. 3,026,784 to Byers and in U.S. Patent No. 3,821,759 to Vooght. Another camera case for protecting a camera during use is shown in U.S. Patent No. 2,132,549 to

Wenstrom. However, none of these are intended for use in an operating room to maintain the environment within the operating room in a sterile condition even when the camera is not sterile.

05 If properly constructed, the camera itself can be made sterile by soaking it in a sterilizing solution or through low temperature gas sterilization. However, a camera which can withstand such procedures, without being damaged, is very expensive so that many hospitals and small clinics can not afford it. However, small
10 cameras are available which would be satisfactory for use in the surgical area if they can be placed in a sterile drape or cover which will maintain the surgical area in a sterile condition and which cover can be
15 removed and disposed of after each operation and replaced with another similar sterile cover for the next operation.

Disclosure of the Invention

20 An apparatus is provided for enclosing a non-sterile video camera and trailing cable in a sterile enclosure for use of the camera in the sterile environment of an operating room. The apparatus includes a generally cylindrical housing having an outer surface and an inner surface with a diameter of a size
25 to snugly receive a camera through a first open end. A transparent window is mounted at a second end of the housing which is contacted by the end of the camera when the camera is in place. Means is provided for aligning the camera within the housing in a fixed position. A
30 flared annular mounting is attached and extends from the second end of the housing. Means are provided for attaching an optical transmitting means to the mounting to provide light images to the camera through the

05 window. A sleeve is attached to the outer surface of
the housing which is extended back over the trailing
cable of the camera for a substantial distance. The
aligning means comprises a longitudinal slot in the
inner surface of the sterile housing for receiving a
corresponding rib on the camera. A set screw is
provided for locking the camera in position against the
window. The attaching means can comprise internal
10 threads for receiving a "C" mount or beam splitter, the
threads being clocked to properly align the optical
transmitting means when it is fully tightened. The
sterile sleeve is arranged in an accordion shape over
the housing prior to use.

15 Stated another way, the invention includes a
sterile enclosure for a video camera and trailing cable
when in use in an operating room. This enclosure
includes a generally cylindrical connector for
interconnecting a sterile "C" mount and endoscope to a
non-sterile video camera, the connector including a
20 first end for attachment to the proximate end of the "C"
mount and endoscope and a second end with a receptacle
for receiving the camera and a transverse window between
the endoscope and "C" mount connector and the
receptacle. Means is provided to fix the orientation
25 between the "C" mount and endoscope and the camera and
flexible sterile means on the connector extend over the
camera and a substantial portion of the trailing cable.
The first end of the connector is flared and has a
greater diameter than the second end. A longitudinal
30 groove is provided in the receptacle for receiving a rib
on the camera to properly orient the camera within the
connector. Clocked internal threads on the first end
for connecting the "C" mount and endoscope in a
predetermined orientation with the camera are provided.

05 The flexible means includes an accordion folded sleeve received over the receptacle, means attaching the end of the sleeve adjacent the proximate end of the receptacle and a pull tab on the distal of the sleeve for pulling the sleeve down over itself and along the trailing camera cable.

10 With the cover just described, it is possible to use an inexpensive camera in a sterile operating room environment and still maintain the requisite sterility. The sterile "C" mount and endoscope are separated from the unsterile camera by the window which serves as a barrier to bacteria and all contamination. The camera and trailing cable are covered by the sleeve to provide a bacteria barrier to the operating area.

15 Additional advantages of this invention will become apparent from the description which follows, taken in conjunction with the accompanying drawings.

Brief Description of the Drawings

20 Figure 1 is a perspective view of a sterilizable video camera cover constructed in accordance with this invention;

Figure 2 is a perspective view of a video camera for use within the video camera cover of Figure 1;

25 Figure 3 is a perspective view showing the camera of Figure 2 installed in the camera cover of Figure 1;

Figure 4 is an enlarged, fragmentary longitudinal section, taken along line 4-4 of Figure 3, showing how the camera interconnects with the camera housing;

30 Figure 5 is a vertical section, taken along line 5-5 of Figure 4, showing further details of the invention; and

Figure 6 is a perspective view similar to Figure 3

but showing the cover extended along the trailing cable of the video camera.

Best Mode For Carrying Out the Invention

05 Typically a sterile endoscope is connected by means of a "C" mount to a sterile camera. The distal end of the endoscope can be introduced into an internal body site for viewing. The maintenance of sterility is critical.

10 In accordance with this invention a disposable sterilizable cover S, as shown in Figure 1, is provided for use with the unsterile camera C shown in Figure 2 to provide a bacteria barrier between the unsterile camera and a sterile endoscope. The overall structure of cover S can best be seen by viewing Figures 1 and 4. It
15 comprises a sterile cylindrical housing or sheath 10 for receiving camera C, as described below and includes a flared annular mounting 12 into which an optical transmitting means, such as a "C" mount 14 and endoscope
20 15, can be threadably received. The distal end of the endoscope placed at a site under investigation within the body of a patient.

The camera C has a body 16 having a distal end with a lens 18 and a coupling 20 which spaces camera C from window 32 inside of sterile sheath 10. The proximate
25 end of body 16 includes a cable 22 having appropriate wiring for transmitting a signal from the camera to a connector 24 for attachment to a video processing unit 26 so that an image picked up by camera C can be processed and viewed on a monitor (not shown).

30 Conveniently, the camera body 16 is provided with a longitudinal rib 28 which is aligned with and received within a longitudinal groove 30 of cylindrical housing 10, as best seen in Figures 4 and 5. The camera is

05 inserted in housing 10 as far forwardly as possible so
that the lens 18 is as close as possible to transverse
window 32 which separates camera 16 from "C" mount 14
and endoscope 15 and serves as a bacteria barrier
between the sterile catheter and the unsterile camera.
The camera is held firmly in position by means of set
screw 34 which is aligned with rib 28, both of these
being at the twelve o'clock position. Thus, the camera
will always be oriented in the same manner with respect
10 to housing 10 and held in place by the thumb screw.
Also, the twelve o'clock position of the thumb screw
will provide a reference for the doctor to know when he
has the camera in an upright position, and particularly
when he is working in a dark operating room.

15 A sleeve 36 having accordion folds is placed over
housing 10, as shown, and has a flange 38 with an
adhesive backing or tape 40 for attachment to the
proximate end of cylindrical housing 10. Prior to use,
this sleeve extends longitudinally from the proximate
20 end toward the distal end as shown and has a pull strap
42 for pulling the sleeve inside out over the end of the
camera and cable 22 for a considerable distance, such as
8' or 10'. Conveniently, annular mounting 12 is
provided with internal threads 15 which are clocked so
25 that when "C" mount and endoscope 14 are attached
thereto, the catheter will have a specific orientation
with respect to housing 10 and camera C when all parts
are assembled together so that the image viewed by the
endoscope will always be in the proper orientation with
30 respect to the camera and provide an image properly
oriented on the video monitor.

The housing 10 and annular mounting 12 can be made
out a suitable plastic or metal material and the sleeve
36 can be made out of a plastic, all of which is

sterilized by gas sterilization or radiation sterilization before use. Suitable plastics are polyvinyl chloride and high impact polystyrene. Stainless steel or aluminum are suitable metals. The "C" mount and endoscope, which are also sterile can then be attached to the mounting 12. The camera, which is not sterile, is inserted within housing 10, as previously described and held in position by set screw 34, then pull tab 42 is pulled so that sleeve 36 is pulled back over itself and extended along cable 22 which is not sterile for a significant distance, such as 8' or 10'. Thus, the unsterile camera is covered by sterile sleeve 36 as is the trailing cable for a sufficient distance that the camera can be used in the operating room without compromising the sterility in the operating area. After use, the camera and endoscope are disconnected and the sterilizable cover is thrown away and a new sterile one is used for the next operation. With this apparatus, a camera can be used which does not need to be sterilized through heating, soaking or other sterilizing proceedings. Since it does not need to be waterproof, it can be a much less expensive camera making the combined device, which includes a camera, "C" mount and endoscope available at much lower cost to medical clinics and hospitals who otherwise would not be able to afford the apparatus.

This invention has been described in detail with reference to a particular embodiment thereof, but it will be understood that various other modifications can be effected within the spirit and scope of this invention.

Claims**In the Claims:**

1. An apparatus for enclosing a non-sterile video camera and its trailing cable in a sterile enclosure for use of the camera in the sterile environment of an operating room, said apparatus comprising:

05 a generally cylindrical housing having an outer surface and an inner surface with a diameter of a size to snugly receive a camera through a first open end;

10 a transparent window mounted at a second end of said housing which is contacted by the end of the camera;

means for aligning the camera within said housing in a fixed position;

15 a flared annular mounting attached to and extended from said second end of said housing;

means for attaching an optical transmitting means to said mounting to provide light images to the camera through said window; and

20 a sleeve attached to said outer surface of said housing extendable over the trailing cable of the camera for a substantial distance.

2. Apparatus, as claimed in Claim 1, wherein:
said aligning means comprises a longitudinal slot in the inner surface for receiving a corresponding rib on the camera.

3. Apparatus, as claimed in Claim 3, further including:

a set screw for locking the camera in position against said window.

05 4. Apparatus, as claimed in Claim 1, wherein:
said attaching means comprises internal threads for receiving a "C" mount, said threads being clocked to properly align the optical transmitting means when it is fully tightened.

5. Apparatus, as claimed in Claim 1, wherein:
said sleeve is arranged in accordion shape over said housing prior to use.

6. A sterile enclosure for a video camera and trailing cable when in use in an operating room, said enclosure comprising:

05 a generally cylindrical connector for interconnecting a sterile "C" mount and endoscope, having a proximate end, to a non-sterile video camera, said connector including a first end for attachment to the proximate end of the "C" mount, a second end with a receptacle for receiving the camera and a transverse
10 window between said catheter connector and said receptacle;

means for providing a fixed orientation between the "C" mount and the camera; and

15 flexible sterile means on said connector extendable over the camera and a substantial portion of the trailing cable.

7. Apparatus, as claimed in Claim 6, wherein:
said first end of said connector is flared and has a greater diameter than said second end.

8. Apparatus, as claimed in Claim 7, wherein said providing means includes:

a longitudinal groove in said receptacle for receiving a rib on the camera;

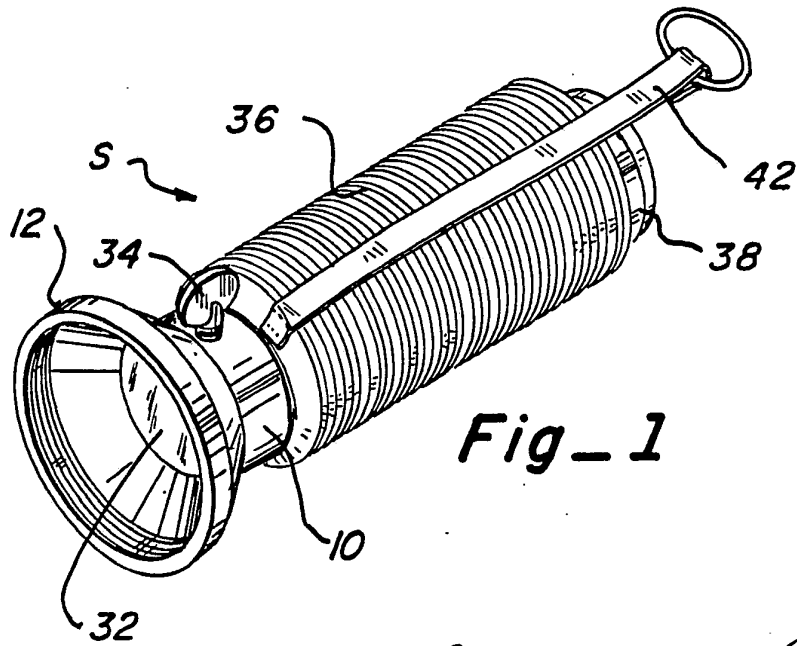
05 clocked internal threads on said first end for connecting the "C" mount in a predetermined orientation with the camera.

9. Apparatus, as claimed in Claim 6, wherein said flexible means includes:

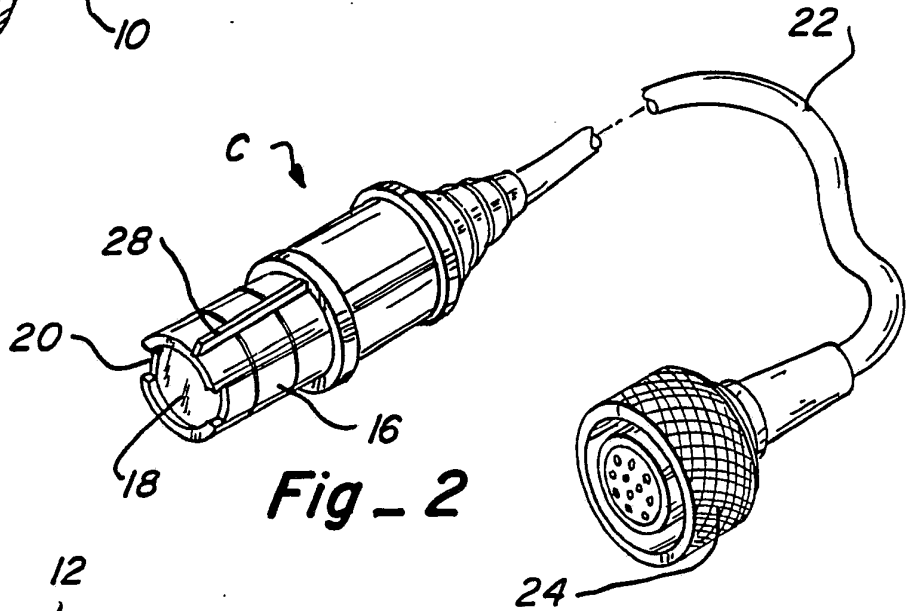
an accordion folded sleeve received over said receptacle;

05 means attaching the end of said sleeve adjacent the proximate end of said receptacle; and

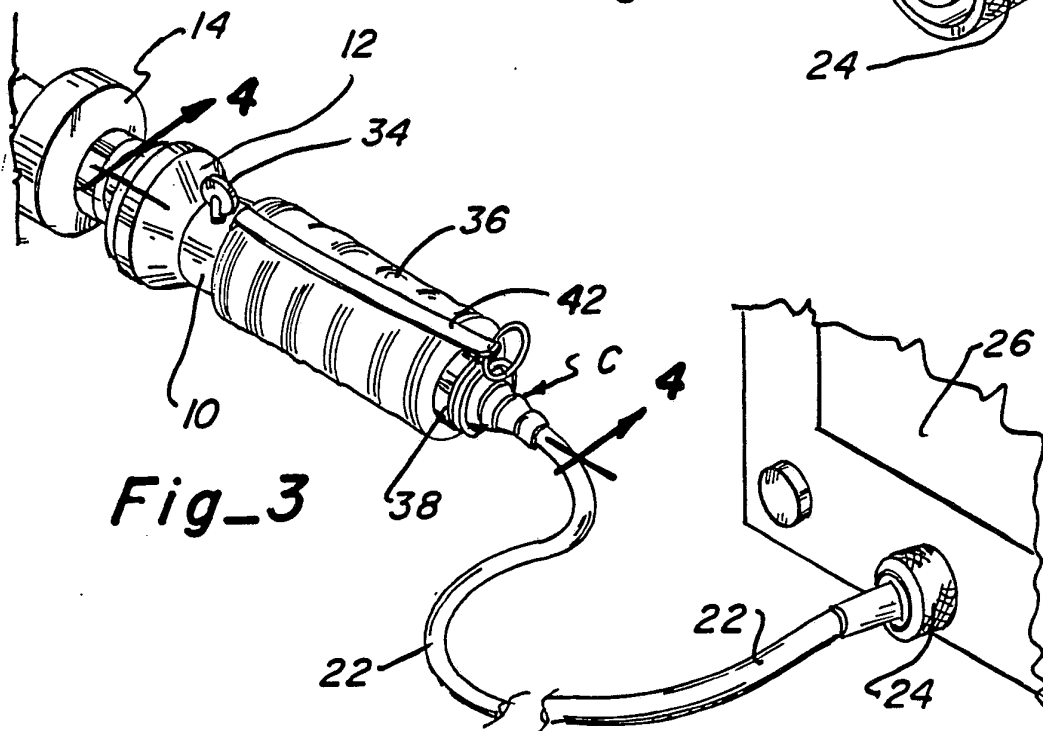
a pull tab on the distal end of said sleeve for pulling the sleeve down over itself and along the trailing camera cable.



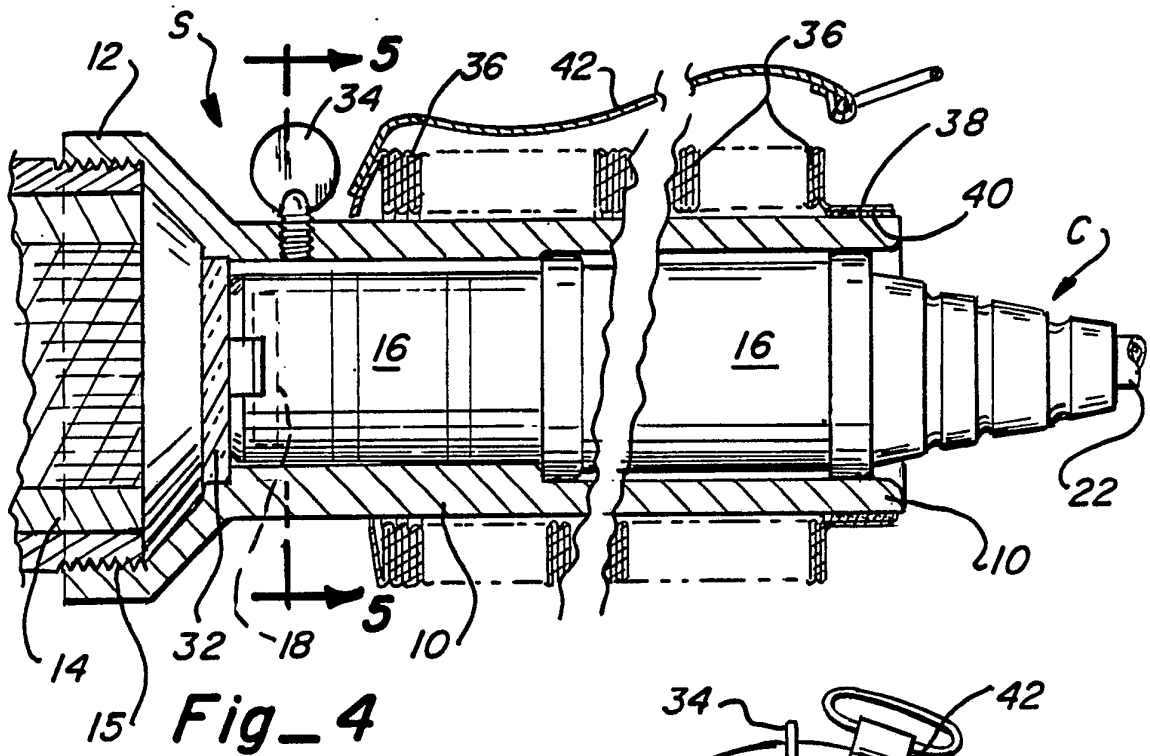
Fig_1



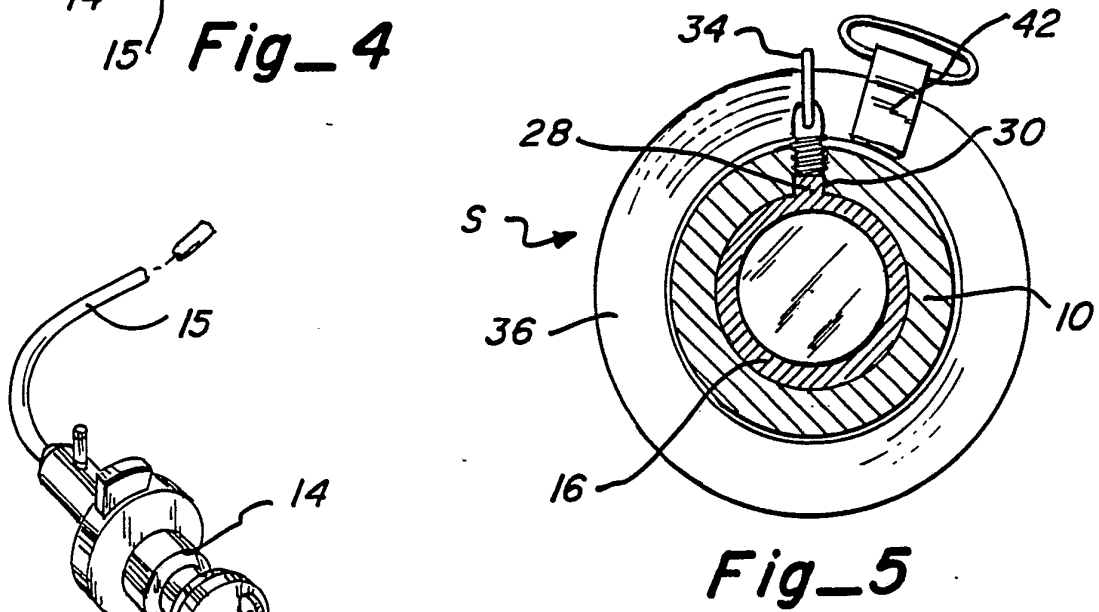
Fig_2



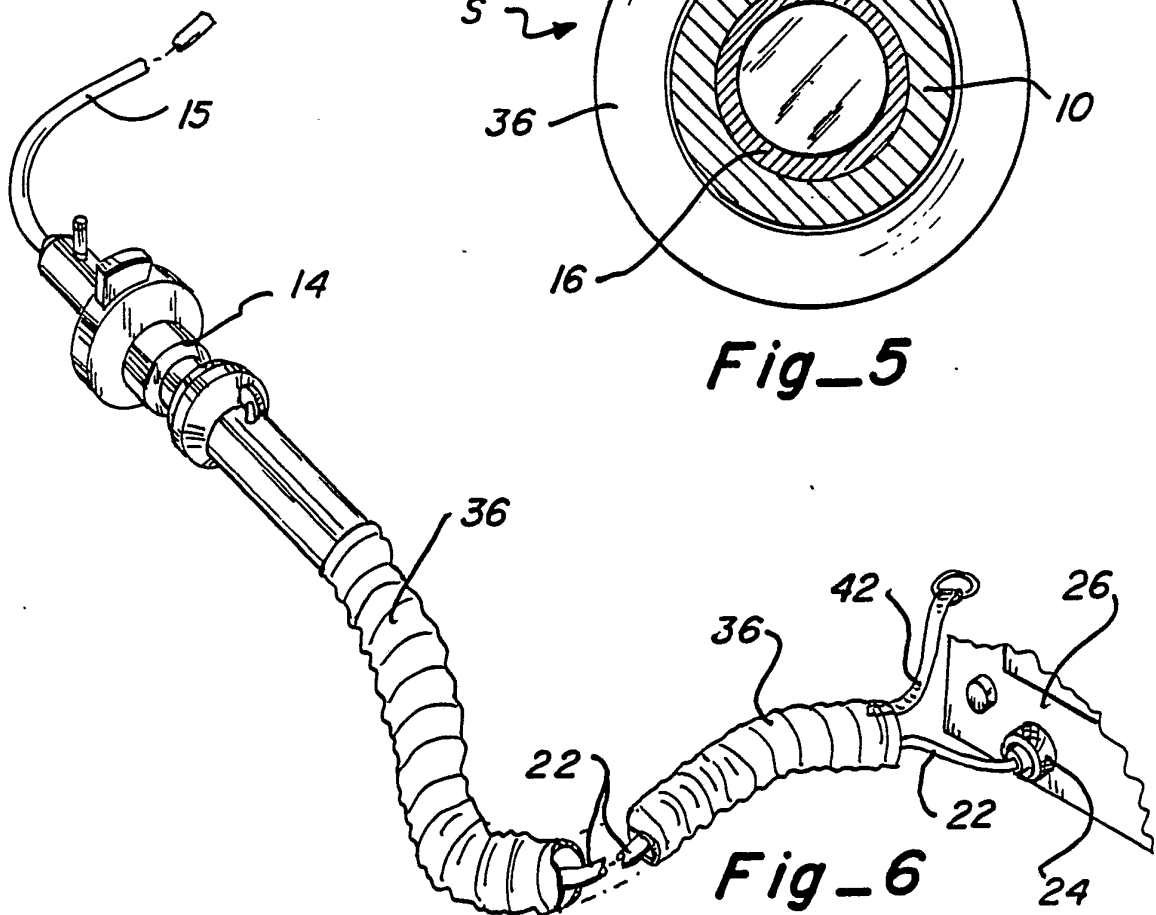
Fig_3



Fig_4



Fig_5



Fig_6

INTERNATIONAL SEARCH REPORT

International Application No PCT/US 90/00126

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC ⁵ : A 61 B 19/08		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System ¹	Classification Symbols	
IPC ⁵	A 61 B	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category ⁹	Citation of Document, ¹¹ with Indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	US, A, 4522196 (CUNNINGHAM) 11 June 1985 see column 2, lines 52-68; column 3, lines 61-67; figures --	1,6
A	DE, U, 8815549 (HERZBERG) 6 April 1989 see claim 1; figures --	1,6
A	DE, U, 8711189 (LEMKE) 3 December 1987 see claim 1; figures -----	1,6
<p>¹⁰ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
4th May 1990	- 7. 06. 90	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	M. Peiz	M. PEIZ

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

US 9000126
SA 34283

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 30/05/90. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4522196	11-06-85	None	
DE-U- 8815549	23-02-89	DE-U- 8812027 EP-A- 0360951	24-11-88 04-04-90
DE-U- 8711189	22-10-87	None	