



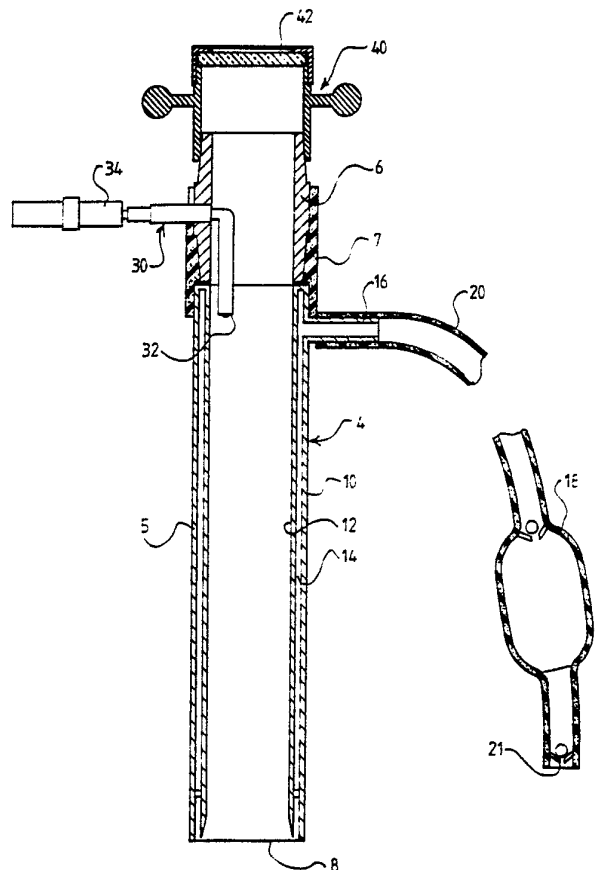
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification<sup>5</sup> : <b>A61B 1/00, 1/12</b></p>	<p><b>A1</b></p>	<p>(11) International Publication Number: <b>WO 92/10969</b> (43) International Publication Date: <b>9 July 1992 (09.07.92)</b></p>
<p>(21) International Application Number: PCT/GB91/02256 (22) International Filing Date: 17 December 1991 (17.12.91) (30) Priority data: 9027408.5 18 December 1990 (18.12.90) GB (71) Applicant (for all designated States except US): THE UNIVERSITY OF SHEFFIELD [GB/GB]; Western Bank, Sheffield S10 2TN (GB). (72) Inventor; and (75) Inventor/Applicant (for US only) : JOHNSON, Alan, Godfrey [GB/GB]; Broom Lawn, Stumperlowe Lane, Fulwood, Sheffield S10 3QQ (GB). (74) Agent: FORRESTER KETLEY &amp; CO.; Chamberlain House, Paradise Place, Birmingham B3 3HP (GB).</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, GB (European patent), GR (European patent), IT (European patent), JP, LU (European patent), MC (European patent), NL (European patent), SE (European patent), US.  <b>Published</b> <i>With international search report.</i></p>

## (54) Title: SURGICAL DEVICE

## (57) Abstract

A surgical device for carrying out visual exploration of the body cavity, or performing an operation on an internal body organ, comprises an elongate hollow member (4), having a forward section (5) and a rear section (6) conveniently secured together by a rubber sleeve (7). The forward section (5) has an open front end (8), and is provided in twin-walled construction, defining an annular chamber (14). Extending from the outer wall (10) is a hollow stem pipe (16) by which an air bulb (18) may be connected to the member (4) by a rubber hose (20). Extending longitudinally of the hollow member (4) is illumination means (30) comprising a light transmitting stem (32). In use the device may be inserted into the patients abdomen, and with the aid of light provided by the illumination means the surgeon may view the interior of the body cavity through an eye-piece (40). In the event that vision is impaired by internal tissue, the surgeon may squeeze the air bulb (18) to cause fluid to be puffed out of the annular chamber (14) surrounding the open front end, to blow such tissue to one side, clearing the view of the surgeon through the hollow member.



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	ES	Spain	MG	Madagascar
AU	Australia	FI	Finland	ML	Mali
BB	Barbados	FR	France	MN	Mongolia
BE	Belgium	GA	Gabon	MR	Mauritania
BF	Burkina Faso	GB	United Kingdom	MW	Malawi
BG	Bulgaria	GN	Guinea	NL	Netherlands
BJ	Benin	GR	Greece	NO	Norway
BR	Brazil	HU	Hungary	PL	Poland
CA	Canada	IT	Italy	RO	Romania
CF	Central African Republic	JP	Japan	SD	Sudan
CG	Congo	KP	Democratic People's Republic of Korea	SE	Sweden
CH	Switzerland	KR	Republic of Korea	SN	Senegal
CI	Côte d'Ivoire	LI	Liechtenstein	SU <sup>+</sup>	Soviet Union
CM	Cameroon	LK	Sri Lanka	TD	Chad
CS	Czechoslovakia	LU	Luxembourg	TG	Togo
DE*	Germany	MC	Monaco	US	United States of America
DK	Denmark				

+ Any designation of "SU" has effect in the Russian Federation. It is not yet known whether any such designation has effect in other States of the former Soviet Union.

**Title: "Surgical Device"**

**Description of Invention**

This invention is concerned with improvements relating to surgical devices.

A problem is encountered in carrying out surgical exploration of a body cavity, in that little capability exists for the surgeon to inspect an organ visually, with minimum intrusion. Additionally, where a surgeon is to carry out a biopsy on [e.g.] the liver of a patient, it is currently difficult for him reliably to locate the organ, inspect surface parts of it visually, and then if necessary perform the biopsy, or perform the biopsy on a part of the organ which looks to be at risk without the use of a general anaesthetic.

Additionally in certain laparoscopic procedures it is necessary to admit air under pressure to the peritoneal cavity, to lift the abdomen wall, to improve access (visually or physically) to internal organs. Conventionally this involves the insertion of a needle through the abdomen wall, and the injection of air under pressure through the needle. In this procedure there is an inherent danger, that when the needle is inserted "blind", there is a possibility that it may puncture one of the internal organs which may be lying adjacent to the abdominal wall.

According to this invention there is provided a surgical device comprising an elongate hollow member having an open front end to enable, as the device is inserted into a body cavity, the interior of the body cavity to be viewed through the member, wherein supply means is provided to enable fluid under pressure to be ducted through the hollow elongate member.

In this manner, as the device is entered into the body cavity, internal tissue such as fat, or body organs, may be moved out of the way from the front end, clearing the view of the surgeon through the hollow member.

Alternatively in relation to laparoscopic procedures, the abdomen wall may be incised sufficient to allow the elongate hollow member to be inserted

through the abdomen wall, it being appreciated that the dangers of damage to an internal organ which is encountered on the insertion of a needle into the peritoneal cavity are not present when effecting an incision in the abdomen wall, and on completion of insertion of the hollow member through the incision, air under pressure may be admitted to lift the abdomen wall, and/or to observe the situation in relation to the interior of the peritoneal cavity to assist in the introduction of an air needle through the abdomen wall.

Conveniently said supply means comprises a bulb, together with a one way valve, connected to the outer end region of the member, enabling a surgeon as he is inserting the device into the body cavity, to squeeze the bulb to emit a pulse of fluid exiting forwardly of the device to cause internal tissue to be pushed to one side, allowing clearer forward vision and unobstructed advance.

Alternatively or in addition the supply means may comprise an external source of fluid under pressure.

Preferably the device comprises one or more outlets extending around the central opening. Thus a plurality of outlets may be disposed in a ring extending around the opening, particularly where the fluid is a liquid [e.g. saline]. Preferably however the fluid is gas [e.g. air or nitrogen, but referred to hereafter simply as air] and conventionally a substantially annular cavity is provided which extends around the central opening, similarly being open in the forward direction, and preferably air under pressure is admitted to the annular cavity. Thus conveniently a connection means [e.g. in the form of a stem pipe] is provided which extends from the annular cavity, and preferably the supply means is connected to the stem pipe by a flexible tube, e.g. of rubber.

Preferably the hollow member is substantially enclosed other than at its forward end, preventing dissipation of fluid fed by the supply means back into the hollow member. Thus a rear end of the hollow member may be enclosed by an eye piece, enabling a surgeon to look through the eye piece along the hollow member.

Preferably the eye piece is removable from a position in which it closes said rear end of the hollow member, to an open position to allow instruments to be inserted through the hollow member to carry out surgical operations through the hollow member. Thus the eye piece may be hinged on the hollow member and movable between said closed position, in which it effectively seals the rear end of the hollow member, and an open position allowing access to the interior of the hollow member.

Preferably illumination means extends into the hollow member conveniently in the form of a light pipe directing light towards the front end, conveniently having an exterior connection to enable it to be connected by a flexible conduit to a remote light source.

Preferably means is provided to enable air or liquid to be withdrawn from the annular chamber, to allow the device to be secured by suction to an internal body organ, ensuring stability between the body organ and the device, enabling a surgeon to perform an operation on the organ through the hollow body.

Conveniently such means may be provided by the connection means by which fluid under pressure may be admitted to the annular chamber, as described above, and conveniently the means to withdraw fluid from the chamber may be provided by reversing the bulb, so that it sucks rather than blows.

Preferably however connection means is provided by which the annular chamber may be connected to a source of vacuum.

Preferably in addition connection means is provided by which the annular chamber may be connected to a remote source of fluid under pressure.

Preferably means is provided to enable the annular chamber to be connected selectively to a bulb, as aforesaid, or to a remote supply of fluid under pressure, or to a supply of vacuum.

Conveniently the hollow member is tubular, preferable being of circular cross-section, although if desired, the hollow member may be of elliptical cross-section.

According to this invention there is also provided a method of performing an operation involving the making of an incision in the abdomen wall, and inserting through the incision a device as set out above.

There will now be given a detail description, to be read with reference to the accompanying drawings, of a surgical device which is a preferred embodiment of this invention, having been selected for the purposes of illustrating the invention by way of example.

The accompanying drawings:

**FIGURE 1** is a schematic sectional view of the preferred embodiment;

and

**FIGURE 2** is a part view illustrating part of a modification of the preferred embodiment.

The device which is the preferred embodiment of the invention is a surgical device for carrying out either a visual exploration of the body cavity, or an operation on an internal body organ, or both, and comprises an elongate hollow member 4, preferably of stainless steel, having a forward section 5 and a rear section 6 secured together by a rubber sleeve 7. The forward section 5 has an open front end 8, and is provided in twin-walled construction, having an outer wall 10 and an inner wall 12 defining an annular chamber 14 therebetween, the inner wall 12 being chamfered as shown, and terminating slightly rearwardly of the termination of the outer wall 10.

Extending through the outer wall 10 from the chamber 14 is a hollow stem pipe 16 to which an air bulb 18 may be connected to the hollow member 4 by a rubber hose 20. The air bulb is provided with a one way valve 21, allowing air to be drawn into the air bulb and fed through the hose 20 and stem pipe 16 into the chamber 14 under a slight pressure, by squeezing of the air bulb.

Projecting radially through the rear section 6 is an illumination means 30, comprising a forwardly-directed light transmitting stem 32 extending parallel to the longitudinal axis of the hollow member 4, close to the inner wall thereof. The illumination means 30 comprises a connection 34, by which it may be

connected, by means of a flexible connection, to an exterior light source, causing light to be emitted along the hollow member 4 towards the open front end 8 thereof.

Releasable mounted on the end of the rear section 6 is an eye piece 40, the eye piece 40 comprising a transparent plate 42, effectively enclosing the rear end of the hollow member 4 in a substantially air tight manner.

In the use of the device which is the preferred embodiment of the invention, a surgeon will make an incision in [for example] the patients abdomen, and insert the hollow member, open end first, through the incision into the interior body cavity. With aid of light provided by the illumination means, he may view the interior of the body cavity through the eye piece 40, and advance the device towards the interior area to be explored. In the event that his vision, or advancement of the device is impaired by internal tissue, such as fat, he may squeeze the air bulb 18 to cause air to be puffed out of the annular chamber 14 surround the open front end, to blow such tissue to one side, improving visibility, and continue advancement of the device. He may thus approach an internal organ, such as the liver, and inspect it visually.

In the event that the surgeon needs to carry out a surgical operation, for example to perform a biopsy, he may visually select the area of the organ to be excised, and press the front end of the device against the organ over said area.

By removal of the rubber hose 20 and connection of the stem pipe 16 to a source of vacuum, he may clamp the device onto the organ by suction against the open front end. He may then remove the eye piece 40, and enter surgical instruments along the hollow member 4 to perform the biopsy [or such other operation as he may wish] in a convenient manner, the suction between the open front end and the body organ providing adequate front end stability.

The device may also be used in principle to perform more major internal operations, for example as described in U.K. Patent Specification A-2214428, or gynaecological operations.

Further, the device may be used in the performance of laparoscopic operations, involving the entry of the device through an incision in the abdomen wall, and, either viewing the location of internal organs through the device, to enable an air needle safely to be admitted to the peritoneal cavity for the admission of air under pressure thereto, or if desired air under pressure may be admitted to the peritoneal cavity through the annular chamber 14. Thus, a modification is shown in Figure 2, in which similar numerals with the suffix a have been utilised to indicate parts similar to those of the preferred embodiment, involving a connection to the stem pipe 16b of a three-way valve 36, enabling the stem pipe selectively to be connected by the rubber hose 20b to a ball valve 18, or by a stem pipe 38 to a remote source of air under pressure, or by a stem pipe 40 to a remote source of vacuum.

It is to be appreciated that whilst the hollow member is described in the preferred embodiment as being of two part construction, this is not necessary.

Additionally, whilst the use of air is described, other fluids may be used, including saline solution, nitrogen, carbon dioxide and the like.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in the terms or means for performing the desired function, or a method or process for attaining the disclosed result, may, separately or in any combination of such features, be utilised for realising the invention in diverse forms thereof.



**CLAIMS:**

1. A surgical device comprising an elongate hollow member having an open front end to enable, as the device is inserted into a body cavity, the interior of the body cavity to be viewed through the member, wherein supply means is provided to enable fluid under pressure to be ducted through the hollow elongate member.
2. A device according to Claim 1 wherein the supply means comprises a bulb having one-way valve connected to the outer region of the elongate hollow member.
3. A device according to one of Claims 1 and 2 wherein the device comprises one or more outlets extending around the central opening.
4. A device according to any one of the preceding claims wherein the hollow member is substantially enclosed other than at its forward end.
5. A device according to Claim 4 wherein the rear end of the hollow member is enclosed by an eye piece.
6. A device according to Claim 5 wherein the eye piece is removable from a position in which it closes said rear end of the hollow member to an open position to allow instruments to be inserted through the hollow member.
7. A device according to Claim 6 wherein the eye piece is hinged on the hollow member.
8. A device according to any one of the preceding claims comprising

illumination means extending into the hollow member.

9. A device according to any one of the preceding claims comprising means to enable fluid to be withdrawn from the annular chamber.

10. A device according to Claim 9 comprising connection means by which the annular chamber may be connected to a source of vacuum.

11. A device according to one of Claims 9 and 10 comprising means by which the annular chamber may be connected to a source of air under pressure.

12. A device according to any one of Claims 9, 10 and 11 comprising valve means to enable the annular chamber to be connected selectively to a bulb, or to a remote supply of fluid under pressure, or to a supply of vacuum.

13. A method of performing an operation involving the step of incising the wall of the peritoneal cavity and inserting into the incision a device according to any one of the preceding claims.

1 / 2

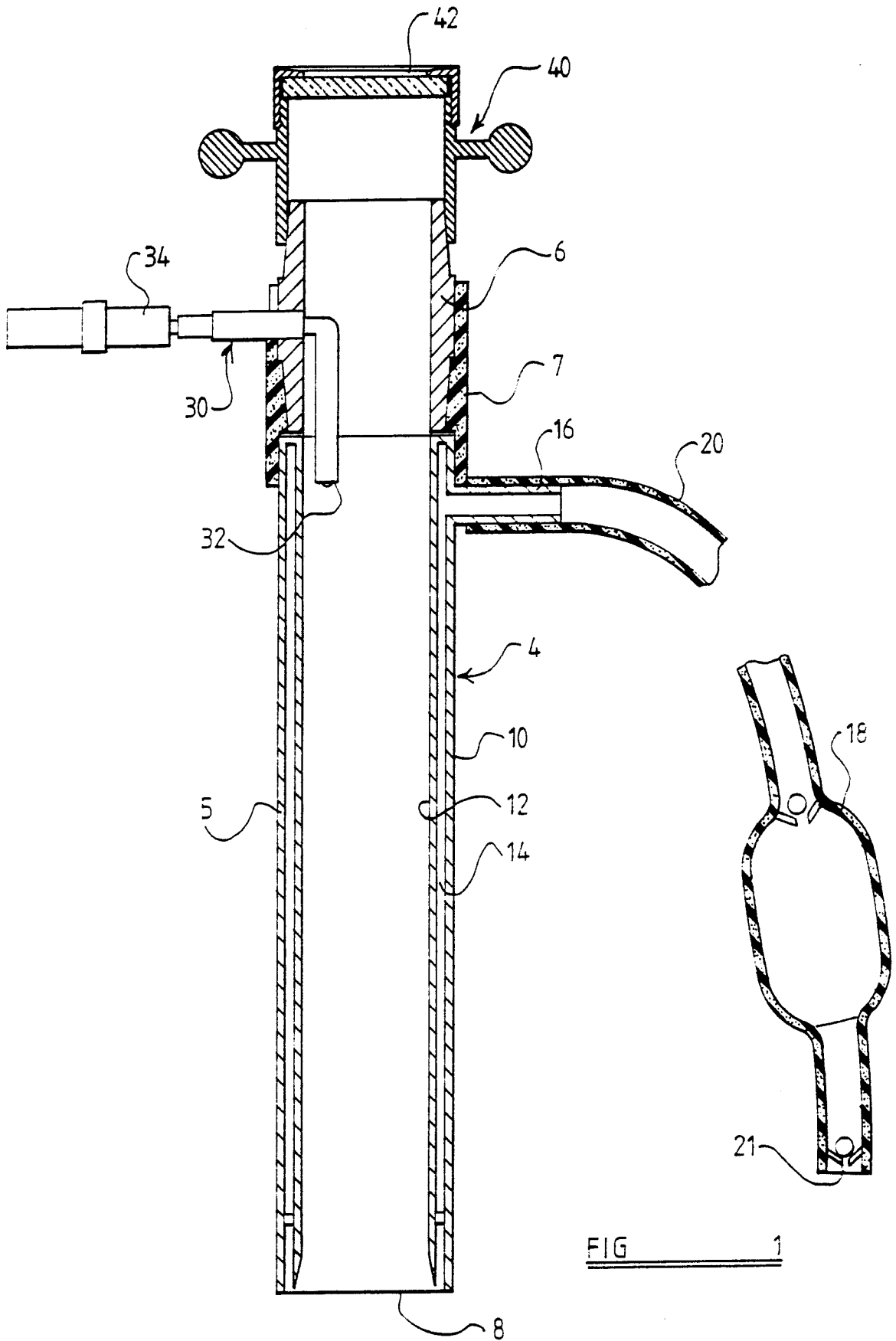


FIG 1

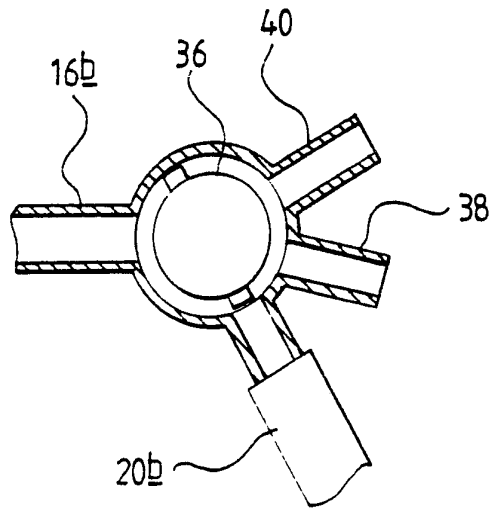


FIG 2

# INTERNATIONAL SEARCH REPORT

PCT/GB 91/02256

International Application No

**I. CLASSIFICATION OF SUBJECT MATTER** (if several classification symbols apply, indicate all)<sup>6</sup>

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 A61B1/00;                      A61B1/12

**II. FIELDS SEARCHED**

Minimum Documentation Searched<sup>7</sup>

Classification System	Classification Symbols
-----------------------	------------------------

Int.Cl. 5	A61B ;              A61M
-----------	--------------------------

Documentation Searched other than Minimum Documentation  
to the Extent that such Documents are Included in the Fields Searched<sup>8</sup>

**III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup>**

Category <sup>10</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X Y	US,A,4 254 762 (I.YOON) 10 March 1981 see the whole document ---	1,3-6 2,7-13
X Y	US,A,3 709 214 (J.R.ROBERTSON) 9 January 1973 see the whole document ---	1,8 13
Y	FR,A,811 074 (H.RIAZI) 6 Apr11 1937 see page 1, line 27 - line 50 ---	2
Y	US,A,4 112 932 (R.D.CHIULLI) 12 September 1978 see the whole document ---	7
Y	US,A,3 481 325 (J.A.GLASSMAN) 2 December 1969 see the whole document ---	8
Y	US,A,3 830 225 (J.P.SHINNICK) 20 August 1974 see the whole document ---	9-12
	-/--	

<sup>10</sup> Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "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)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"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.

"A" document member of the same patent family

**IV. CERTIFICATION**

Date of the Actual Completion of the International Search

26 MARCH 1992

Date of Mailing of this International Search Report

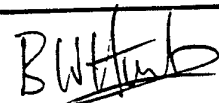
06.04.92

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

HUNT B.W.



III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		Relevant to Claim No.
Category °	Citation of Document, with indication, where appropriate, of the relevant passages	
X	EP,A,0 312 787 (RICHARD WOLF GMBH) 26 April 1989 see the whole document ---	1

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO. GB 9102256  
SA 54694**

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 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information. 26/03/92

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-4254762	10-03-81	None	
US-A-3709214	09-01-73	None	
FR-A-811074		None	
US-A-4112932	12-09-78	None	
US-A-3481325	02-12-69	None	
US-A-3830225	20-08-74	None	
EP-A-0312787	26-04-89	DE-U- 8714069	03-12-87

EPO FORM P0079

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82