

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
12 June 2003 (12.06.2003)

PCT

(10) International Publication Number
WO 03/048739 A1

(51) International Patent Classification⁷: G01N 1/24, 1/14

(74) Agent: CAMERON, Norman, M.; Suite 1401 - 1166 Alberni Street, Vancouver, British Columbia V6E 3Z3 (CA).

(21) International Application Number: PCT/CA02/01860

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(22) International Filing Date: 4 December 2002 (04.12.2002)

(25) Filing Language: English

(26) Publication Language: English

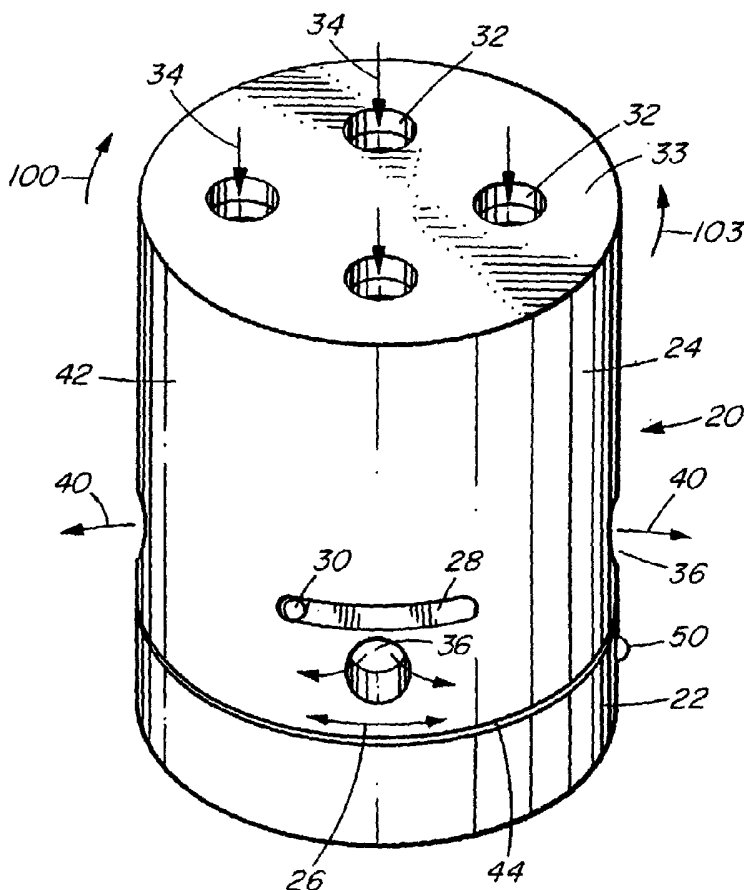
(30) Priority Data:
2,364,407 5 December 2001 (05.12.2001) CA

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant and
(72) Inventor: VAN NETTEN, Christiaan [CA/CA]; 11666 Wilson Street, R.R. #7, Mission, British Columbia V4S 1B6 (CA).

[Continued on next page]

(54) Title: PERSONAL AND ENVIRONMENTAL FLUID SAMPLING APPARATUS



(57) Abstract: A self sealing fluid sampling apparatus includes a body with a filter therein and a fluid moving device, such as a fan, mounted therein for moving fluid through the filter. There is a fluid inlet communicating with the filter. There is also a fluid outlet communicating with the filter. A manually operable control simultaneously opens the fluid inlet and the fluid outlet and operates the fluid moving device for moving fluid from the fluid inlet, through the filter and out through the fluid outlet. For example, the body may be cylindrical and have a cylindrical shell rotatably mounted thereon. The shell and the body have fluid inlet openings and fluid outlet openings which are aligned when the shell is rotated in one direction and become unaligned when the shell is rotated in an opposite direction thus sealing off the filter compartment from the outside environment. Rotation of the shell also closes a switch to operate the fluid moving device when the shell is rotated in the one direction. The fluid moving device includes a motor and an electrical power source mounted within the chamber in the body. The body has sealing means to seal the chamber from the fluid.

WO 03/048739 A1



Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

PERSONAL AND ENVIRONMENTAL FLUID SAMPLING APPARATUS

BACKGROUND OF THE INVENTION

5 This invention relates to fluid sampling devices and, in particular, to personal sampling devices easily operable by untrained people.

Flight crews and aircraft passengers are occasionally exposed to unfavourable air quality conditions. These conditions typically occur during one out of one thousand flight
10 segments, depending upon the airline and the maintenance of the aircraft. A large majority of these incidents are caused by contamination of the aircraft air from hydraulic fluid which leaks into the air intake of the Auxiliary Power Unit (APU) or from oil seal leakage into the compressor stages of the jet engines which are used to pressurize the aircraft and to provide the aircraft with fresh air.

15 Bleed air from these engines is exposed to elevated temperatures, often in excess of 500 degrees C. Any oil or hydraulic fluid contaminant in this air will pyrolyze, volatilize, or both. This often results in flight crews and passengers being exposed to smoke in the cabin. Acute and long-term symptoms experienced by flight crews during these incidents
20 are consistent with exposures to the agents associated with oil and hydraulic fluid constituents.

It is difficult however to measure exposure levels during these incidents because of their sporadic nature. This makes it virtually impossible to have trained individuals, and
25 specialized equipment, in aircraft when such incidents occur. The equipment previously available is expensive and difficult to operate for the average flight attendant or other member of the flight crew. Accordingly, very little exposure data is available.

Some of these incidents have resulted in near fatal accidents, i.e. both pilots becoming
30 incapacitated, as well as disabling flight attendants and pilots on a long-term basis. It is therefore critical to provide a practical means of measuring the exposures of flight crews and passengers when such events occur. The derived information can be used to provide

- 2 -

a basis for medical treatment as well as to prevent future incidents of such exposure to contaminants.

5 Accordingly it is an object of the invention to provide an improved air sampling apparatus which is inexpensive enough so that each individual crew member or aircraft can be provided with the apparatus on a routine basis.

10 It is also an object of the invention to provide an improved air sampling apparatus which is simple to operate so that a flight attendant or other member of a flight crew can easily operate the apparatus with minimal training or instructions.

15 It is a further object of the invention to provide an improved personal and environmental air sampling apparatus which is compact so that it does not occupy an inordinate amount of the limited space and can be carried in a purse or pocket.

It is a still further object of the invention to provide an improved air sampling apparatus which is rugged in construction and reliable in operation so that it will operate reliably without requiring delicate handling.

20 It is a still further object of the invention to provide an improved fluid sampling apparatus capable of sampling liquids, such as water.

SUMMARY OF THE INVENTION

25 In accordance with these objects, there is provided a fluid sampling apparatus which includes a body having a filter mounted therein and a fluid moving device mounted therein for moving fluid through the filter. The body includes a chamber. The fluid moving device includes a motor and an electrical power source mounted within the chamber. The body has sealing means to seal the chamber from the fluid. There is a
30 fluid inlet communicating with the filter. A fluid outlet also communicates with the filter. There is a manually operable control which simultaneously opens the fluid inlet

- 3 -

and the fluid outlet and operates the fluid moving device for moving fluid from the fluid inlet, through the filter and out through the fluid outlet. Preferably the control can simultaneously close the fluid inlet and the fluid outlet and render the fluid moving device inoperative.

5

The control may include an outer member movably mounted on the body. The fluid inlet includes at least one fluid inlet opening on the body and at least one fluid inlet opening on the outer member. The fluid outlet includes at least one fluid outlet opening on the body and at least one fluid outlet opening on the outer member. Said at least one fluid inlet opening on the body is aligned with said at least one fluid inlet opening on the outer member. Said at least one fluid outlet opening on the body is aligned with said at least one fluid outlet opening on the outer member when the outer member is moved in a first direction, to move fluid through the filter. Preferably said at least one fluid inlet opening on the body becomes unaligned with said at least one fluid outlet opening on the outer member and said at least one fluid outlet opening on the body becomes unaligned with said at least one fluid outlet opening on the outer member, when the outer member is moved in a second direction, to seal the apparatus.

The control may include a switch mounted on the body which is contacted by the outer member, to close the switch and operate the fluid moving device when the outer member is moved in the first direction, and to open the switch and stop the fluid moving device when the outer member is moved in the second direction.

The outer member may be rotatably mounted on the body. The first direction is then a first rotational direction and the second direction is then a second rotational direction which is opposite the first direction. For example, the body may be generally cylindrical and the outer member may be a cylindrical shell mounted on the body.

A fluid sampling apparatus according to the invention offers distinct advantages compared to the prior art. The apparatus can be operated by simply moving a manually operable control and this simultaneously opens the fluid inlet and fluid outlet and

30

- 4 -

operates the impeller or other fluid moving device which moves fluid through the filter. For example, this may simply be accomplished by rotating a cylindrical shell mounted on a cylindrical body containing the principal components. When the sampling process is completed, another movement of the manually operable control stops the fluid moving device and seals the openings. This is simply accomplished by rotating the shell in the
5 opposite direction for this preferred embodiment.

When the sample has been taken, the unit is economical enough to be sent to a laboratory in its entirety for analysis. There is no need for the flight crew or other user to remove and store filters which would necessitate disassembly of the apparatus and potential
10 contamination of the filter.

In brief, the apparatus can be easily operated by most people without any training at all and with simple instructions which can accompany the unit. Also the unit is simple and
15 inexpensive enough so all aircraft can carry such an apparatus for the relatively remote possibility that air contamination will occur during any particular flight.

BRIEF DESCRIPTION OF THE DRAWINGS

20 In the drawings:

Figure 1 is an isometric view of a fluid sampling apparatus according to an embodiment of the invention;

25 Figure 2 is a simplified, exploded side view thereof;

Figure 3 is a simplified, diametrical section of the embodiment of Figures 1 and 2;

Figure 4 is an isometric view of the lower portion of the filter cassette thereof;

30

Figure 5 is an isometric view of the fluid inlet housing of the body thereof;

- 5 -

Figure 6 is a reduced isometric view of the filter cassette thereof;

Figure 7 is a view similar to Figure 1 of an alternative embodiment with a centrifugal fan;

5 Figure 8 is a view similar to Figure 2 showing the embodiment of Figure 7;

Figure 9 is a view similar to Figure 7, showing an alternative embodiment for sampling liquids as well as gases; and

10 Figure 10 is a view similar to Figure 8 showing the embodiment of Figure 9.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, and first to Figure 1, this shows a fluid sampling apparatus 20
15 suitable for sampling gases such as air in aircraft or other locations where contaminants may occur. The apparatus in this example includes a cylindrical body 22 which has a cylindrical outer shell 24 mounted thereon for rotation in the directions indicated by arrows 26. The shell tightly engages the body for a sealing fit, apart from the openings described below. There is a slot 28 in the shell and a screw 30 extending through the slot
20 into the body which limit the amount of rotational movement of the shell on the body. The apparatus of this example fits within a cylinder 2.5 inches in diameter and 3 inches long although the size may vary in other embodiments.

The shell has four fluid inlet openings 32 in top 33 of the shell to admit fluid into the
25 apparatus as indicated by arrows 34. The number, size and positioning of the openings can vary in alternative embodiments. The shell also has four fluid outlet openings 36 for fluid exiting the apparatus as indicated by arrows 40 (only three being visible in Figure 1). In this example the openings are in cylindrical side 42 of the shell near its bottom 44 and are 90 degrees apart. In alternative embodiments the number and positions of the
30 openings can change. There is also a LED 50 which lights to indicate that the apparatus is operational.

- 6 -

The body 22 has a lower portion which comprises fan housing 54 shown in Figures 2 and 3. The fan housing includes a chamber 56 which contains a battery 58, a 9-volt battery in this example, and a fan 60 mounted above the battery. This particular fan is an axial flow fan powered by a motor 62 connected to the battery 58. There is a series of four fluid outlet openings 64 extending about the fan housing and spaced-apart 90 degrees (only three being visible in Figure 3). These correspond in number and position to the fluid outlet openings 36 in the shell. Openings 64, together with openings 36, comprise fluid outlets for the apparatus.

10 There is a standard 37 mm filter cassette 66 mounted above the fan in filter compartment 73 and which contains a filter disk 68 as shown in Figure 4. Other types of filters or size of filter cassette holders could be used in other embodiments. There is an upper filter housing 70 mounted on lower filter housing 71 of the filter cassette with an O-ring 72 compressed therebetween as seen best in Figure 6.

15 The body has a fluid inlet housing 76, shown best in Figure 5, mounted on top of the filter housing. The fluid inlet housing has four fluid inlet openings 78 in top 79 thereof, which correspond in position and number to the fluid inlet openings 32 in shell 24. The openings 78 and openings 32 together comprise fluid inlets for the apparatus. A screw 80 extends through opening 82 in the fluid inlet housing, through opening 84 in the fan housing and engages notch 86 on the filter cassette 66.

20 There is a switch 90 mounted on the fan housing which has a button 92. The button engages a ramp 94, on the inside of the shell 24, shown only in Figure 3, whereby the button is depressed to close the switch when the shell is rotated in one direction and is released, to open the switch, when the shell is rotated in the opposite direction. The switch is operatively disposed between the fan motor and the battery and thus controls operation of the fan.

30 In operation, with reference to Figure 1, the fluid sampling apparatus is operated by rotating the shell 24 in one rotational direction, for example clockwise as shown by arrow

- 7 -

100, the figure showing the shell partially rotated. A 45-degree twist is used in this example although this could vary in other embodiments. This twist causes the fluid inlet openings 32 on the shell to align with the fluid inlet openings 78 on the body to admit fluid into the apparatus. At the same time, the fluid outlet openings 36 of the shell align with fluid outlet openings 64 in the body to permit fluid to exit the apparatus. Simultaneously, the rotation causes ramp 94 on the inside of the shell to depress button 92 and close switch 90. This operates the fluid moving device, in the form of fan 60, by means of battery 58 powering motor 62.

10 The apparatus is operated for a preset period of time and may, in some embodiments, have an integral timer which operates the motor 62 for the preset time. The fluid enters the apparatus as indicated by arrows 34 in Figure 1 to cause suction of fan 60 as indicated by arrows 100 in Figure 3. This draws fluid through the filter 68. Fluid expelled by the fan exits the apparatus through the outlet openings 64 in the body, as shown by arrows 102 in Figure 3. In this example the fluid flow is between 0.5 and 1.0 litres per minute and the device can operate from 2-5 hours, depending upon the filter used. The device however can be scaled upward to use a larger fan, larger battery and larger filters, or scaled downward, for different fluid quality applications. In addition, the filter compartment can also be used to incorporate other fluid contaminant capturing agents such as absorbents and adsorbents to target specific contaminants.

After the apparatus has been operated for the preset time, the user rotates shell 24 in the opposite direction, counterclockwise in this particular embodiment, as illustrated by arrow 103 in Figure 1. This causes the fluid inlet openings 32 in the shell to become unaligned with fluid inlet openings 78 in the body. Simultaneously the fluid outlet openings 36 in the shell become unaligned with fluid outlet openings 604 in the body. Thus the inside of the apparatus, including the filter, are effectively sealed. At the same time, ramp 94 backs off of button 92 which causes the switch 92 to open and stops the fan motor 62. The unit can then be placed in a suitable storage position and forwarded to a laboratory for analysis at a convenient time.

- 8 -

A centrifugal fan 60.1, shown in Figures 7 and 8, can be substituted in alternative embodiment for the axial fan 60 shown in Figure 3. In this embodiment where like parts have like numbers as in the previous embodiment, with the additional designation ".1", the fluid outlet openings 64.1 are moved upwardly to be in alignment with the fan instead of being below the fan as is the case with the axial fan of the previous embodiment. Likewise outlet openings 36.1 in shell 24.1 are correspondingly raised.

Figures 9 and 10 show an alternative embodiment generally similar to the embodiment of Figures 7 and 8, but adapted for sampling liquids as well as gases. Like parts have like numbers as in the previous embodiments with the additional designation ".2". Since this is substantially the same as the previous embodiments, it will be described only with references to the differences.

Fluid sampling apparatus 20.2 is adapted to sample liquids as well as air or other gases. An impeller 60.2 replaces the fan of the previous embodiment. Also sealing has been added to protect motor 150 of impeller 60.2, battery 58.2, switch 90.2 LED 50.2 and associated wiring. It is important therefore to keep chamber 56.2 sealed from water or other liquids passing through the filter as illustrated by arrows 100.2. O-ring 152 extends about shaft 154 of the motor. A second O-ring 156 extends between cover 160 and body 162 of the impeller housing 54.2. Note that other suitable seals could be used in place of the O-rings. This ensures that the chamber 56.2 is kept dry. Only the filter compartment is in contact with the liquid. The motor 150 has a higher torque and lower rpm compared with the motor utilized in the fan of the previous embodiments.

Upon activation of the device, water, or another fluid, is drawn through the intake openings 32.2 and 78.2 and filter by means of the suction provided by the impeller. Filtered water or other filtered fluid is exhausted through the exhaust openings 64.2 and 36.2. The device can be activated incompletely submerged in a body of water which requires analysis. It can be left there for an appropriate time until the required volume of water has been sampled.

- 9 -

It will be understood by someone skilled in the art that many of the details provided above are by way of example only and are not intended to limit the scope of the invention which is to be interpreted with reference to the following claims.

WHAT IS CLAIMED IS:

1. A fluid sampling apparatus, comprising:

5 a body having a filter mounted therein and a fluid moving device mounted therein for moving fluid through the filter, the body including a chamber, the fluid moving device including a motor and an electrical power source mounted within the chamber, the body having sealing means to seal the chamber from the fluid ;

10

a fluid inlet communicating with the filter;

a fluid outlet communicating with the filter; and

15

a manually operable control which simultaneously opens the fluid inlet and the fluid outlet and operates the fluid moving device for moving fluid from the fluid inlet, through the filter and out through the fluid outlet.

20

2. The fluid sampling apparatus as claimed in claim 1, wherein the control can simultaneously close the inlet and the outlet and render the fluid moving device inoperative.

25

3. The fluid sampling apparatus as claimed in claim 2, the control including an outer member movably mounted on the body, the inlet including at least one inlet opening on the body and at least one inlet opening on the outer member, the outlet including at least one outlet opening on the body and at least one outlet opening on the outer member, said at least one inlet opening on the body being aligned with said at least one inlet opening on the outer member and said at least one outlet opening on the body being aligned with said at least one outlet opening on the outer member when the outer member is moved in a first direction, to move fluid through the filter.

30

4. The fluid sampling apparatus as claimed in claim 3, wherein said at least one inlet opening on the body becomes unaligned with said at least one inlet opening on the outer member and said at least one outlet opening on the body becomes unaligned with said at least one outlet opening on the outer member, when the outer member is moved in a second direction, to seal the apparatus.
- 5
5. The apparatus as claimed in claim 4, wherein the control includes a switch mounted on the body which is contacted by the outer member, to close the switch and operate the fluid moving device when the outer member is moved in the first direction, and to open the switch and stop the fluid moving device when the outer member is moved in the second direction.
- 10
6. The apparatus as claimed in claim 5, wherein the outer member is rotatably mounted on the body, the first direction being a first rotational direction and the second direction being a second rotational direction which is opposite the first rotational direction.
- 15
7. The apparatus as claimed in claim 6, wherein the body is generally cylindrical and the outer member is a cylindrical shell rotatably mounted on the body.
- 20
8. The apparatus as claimed in claim 7, wherein the body and the outer member each has a top and a cylindrical side, the inlet openings comprising openings in the tops of the body and the outer member respectively and the outlet openings comprising openings in the sides of the body and the outer member respectively.
- 25
9. The apparatus as claimed in claim 8, wherein the outer member has a ramp facing the switch on the body, the ramp closing the switch when the outer member is rotated in the first rotational direction and opening the switch when the outer member is rotated in the second rotational direction.
- 30

- 12 -

10. The apparatus as claimed in claim 1, wherein the fluid moving device includes an impeller.
- 5 11. The apparatus as claimed in claim 10, wherein the impeller is powered by an electric motor.
12. The apparatus as claimed in claim 11, including an impeller housing containing a chamber in the body, a battery mounted in the chamber and connected to the motor.
- 10 13. The apparatus as claimed in claim 12, wherein the motor has a drive shaft, the sealing means including a seal about the drive shaft of the motor
- 15 14. The apparatus as claimed in claim 12, wherein the impeller housing includes a body and a cover, a seal being located between the cover and the body.
- 15 15. The apparatus as claimed in claim 1, wherein the fluid is a liquid and the sealing means is liquid-tight.
- 20 16. The apparatus as claimed in claim 15, wherein the sealing means includes an O-ring.

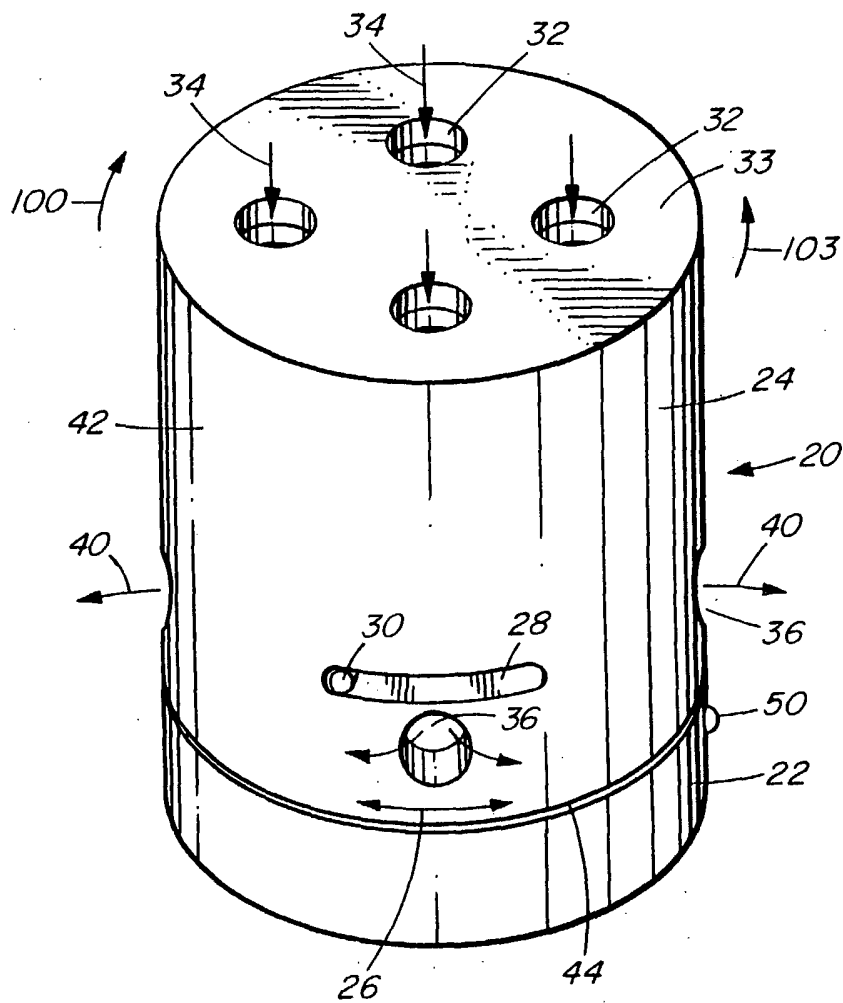


FIG. I

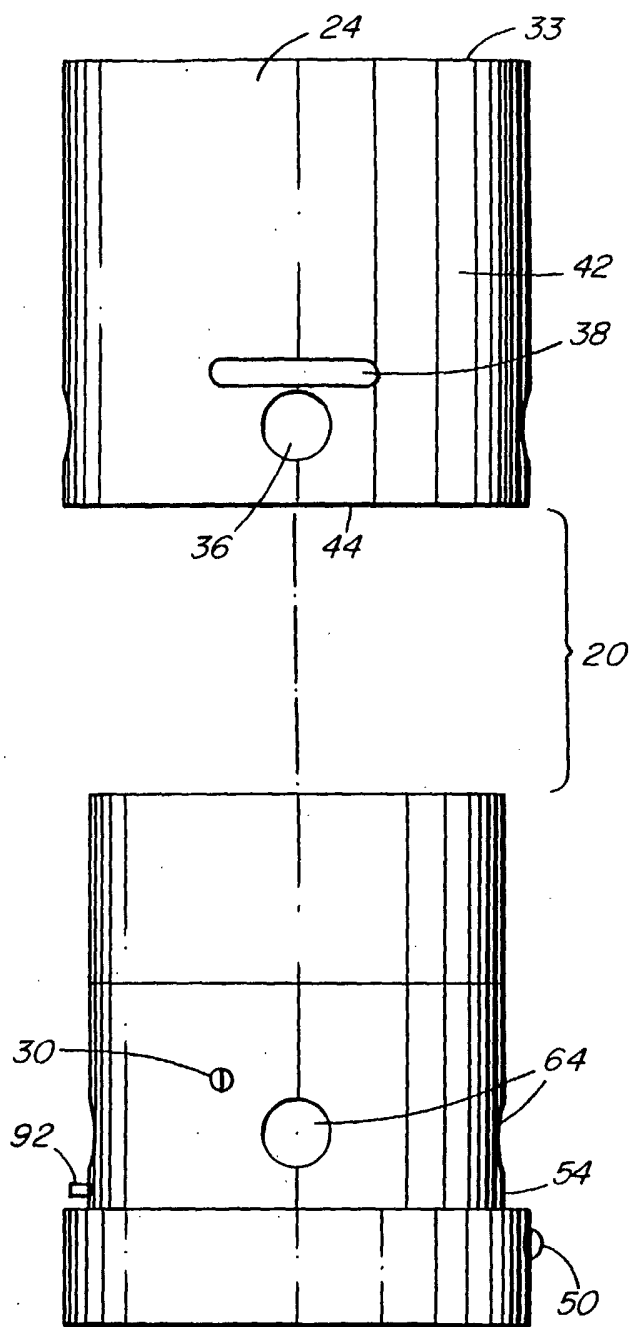


FIG. 2

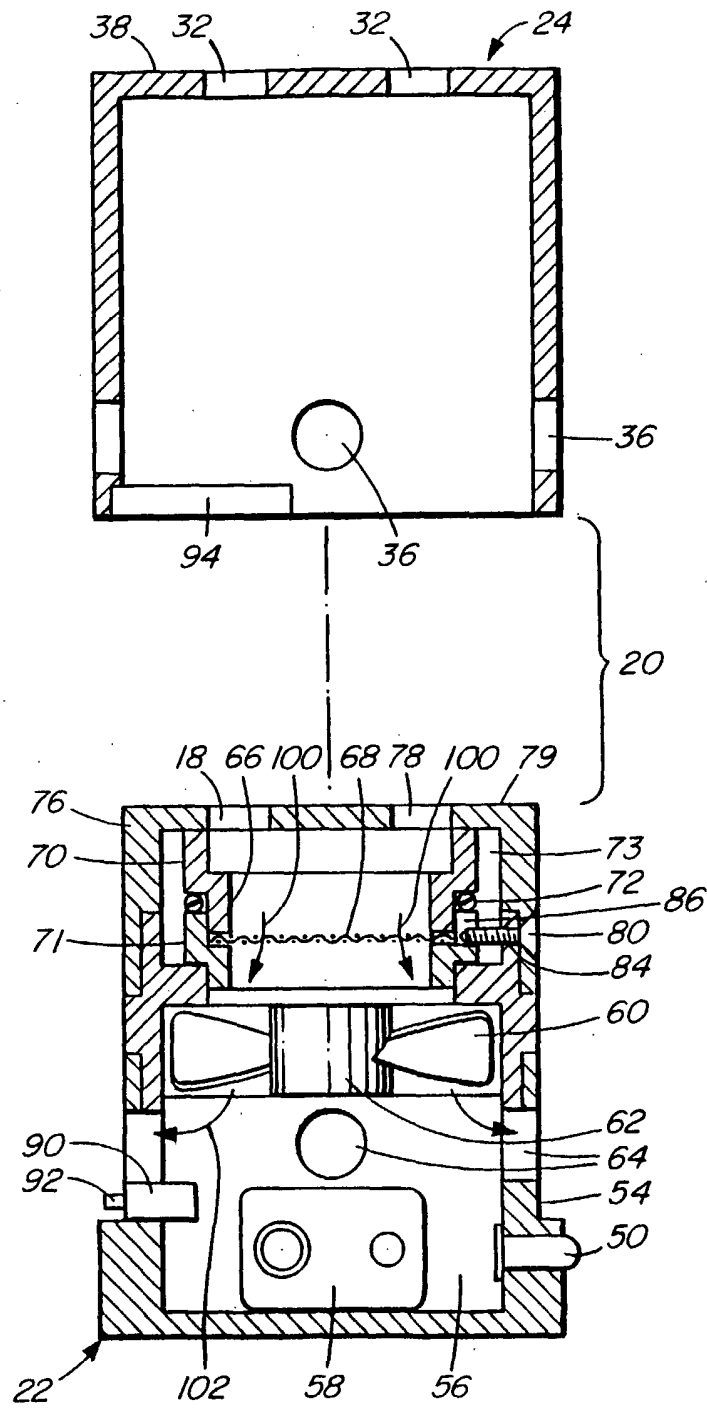


FIG. 3

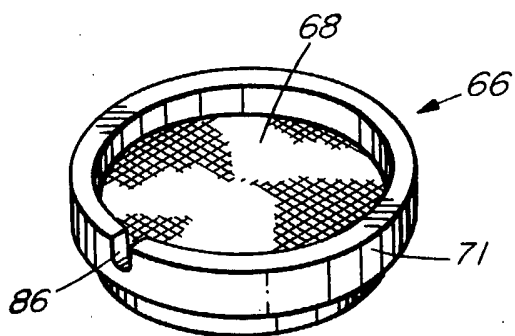


FIG. 4

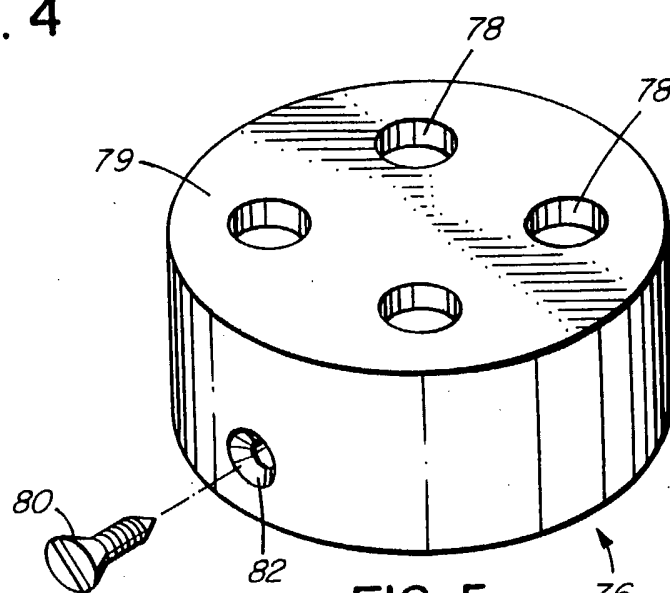


FIG. 5

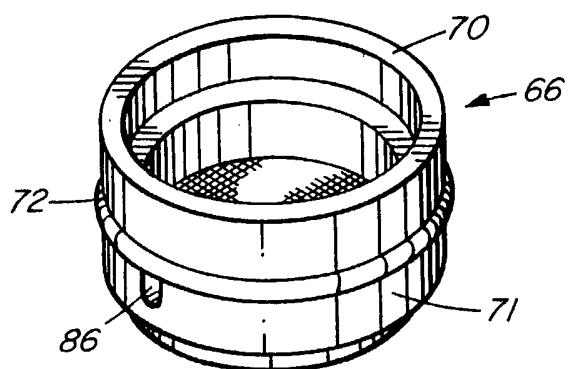


FIG. 6

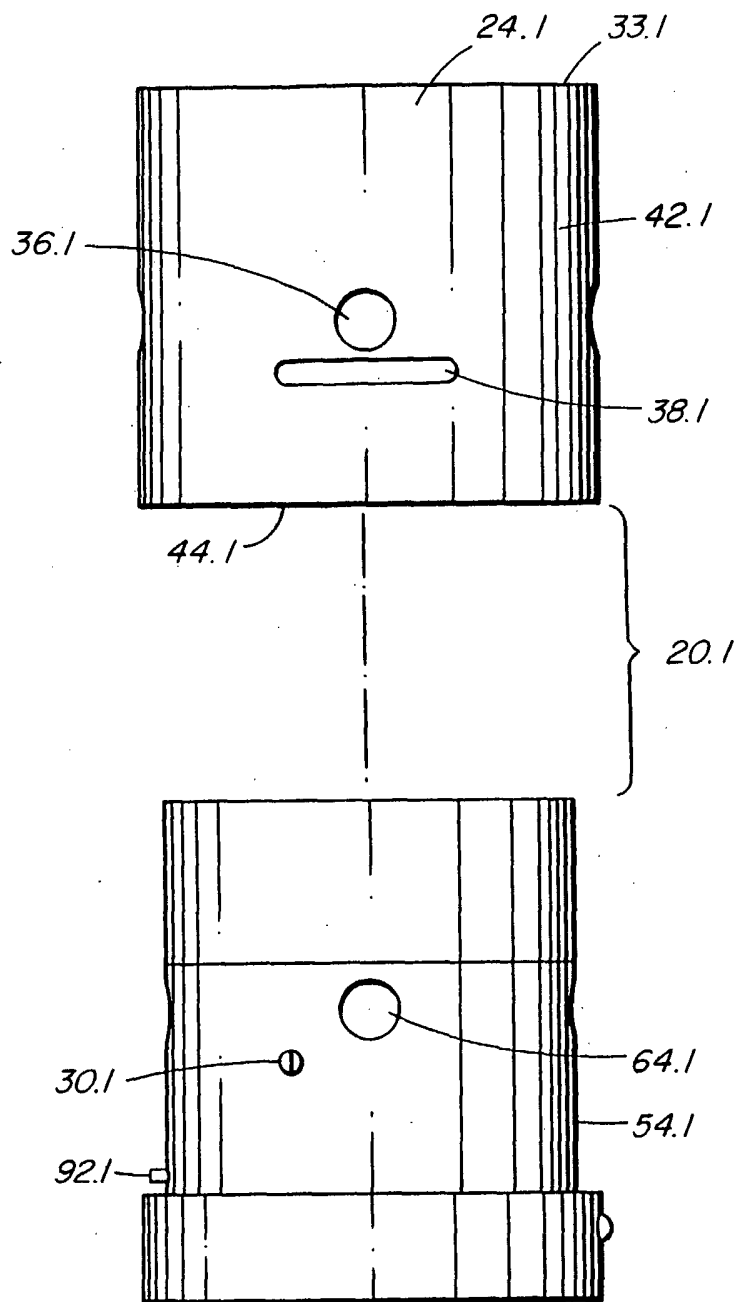


FIG. 7

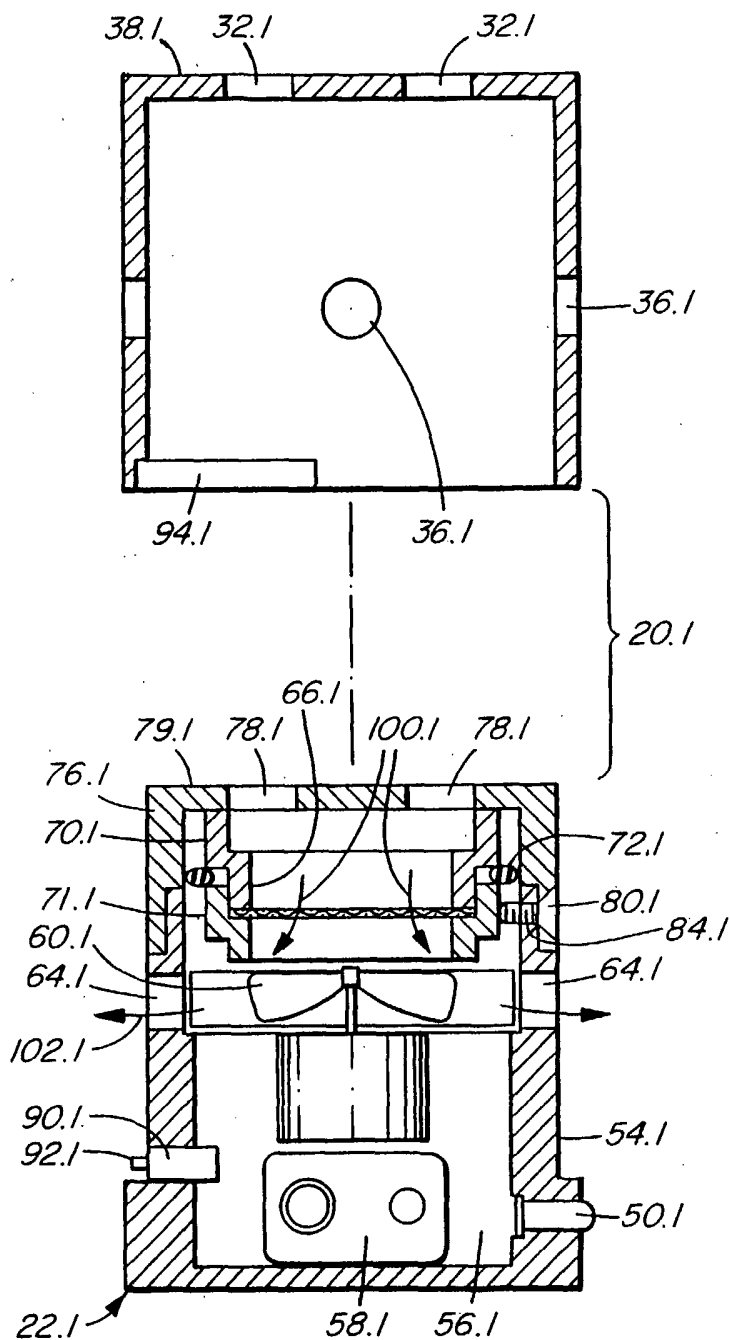
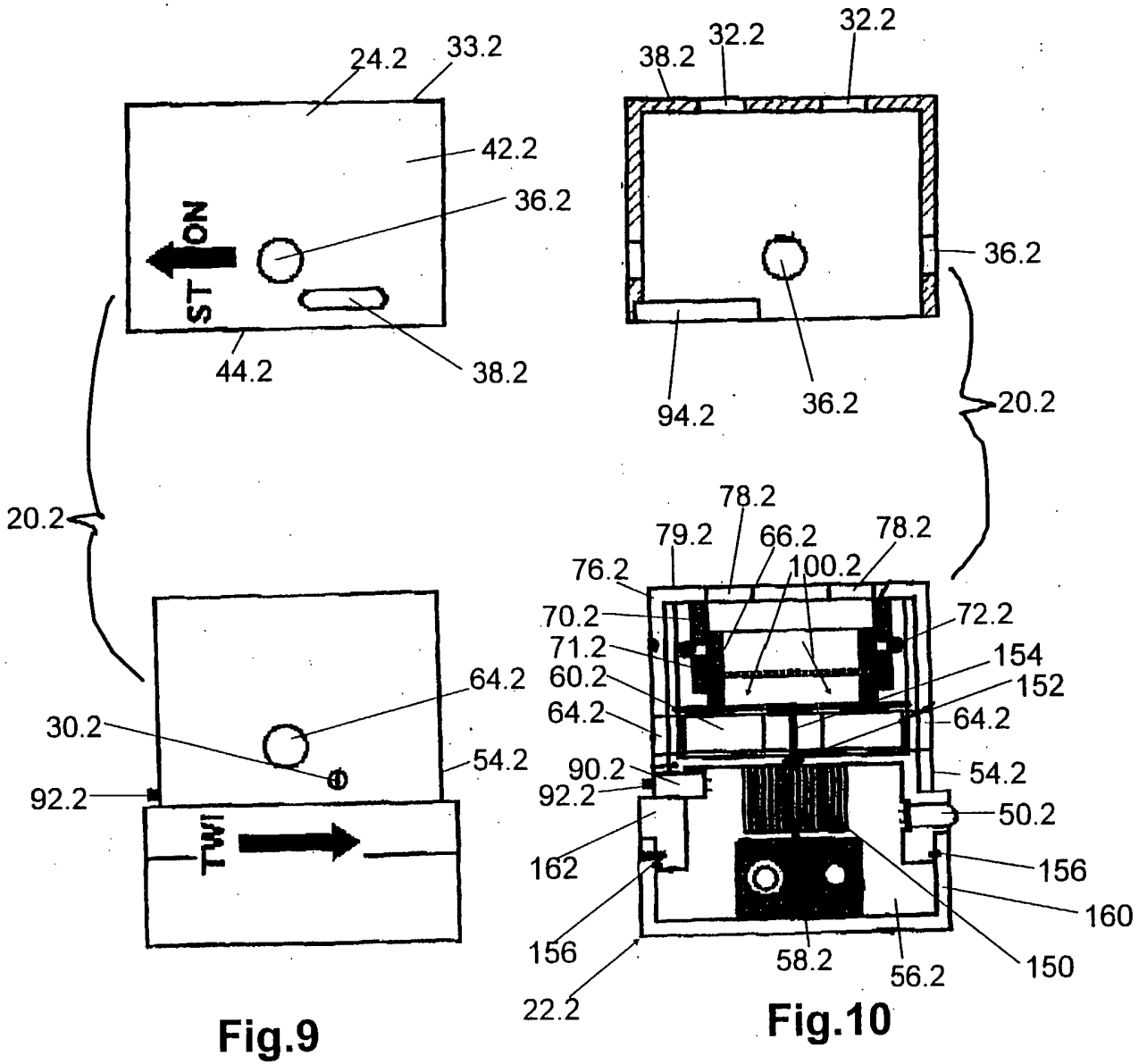


FIG. 8



INTERNATIONAL SEARCH REPORT

Internat Application No

PCT/CA 02/01860

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 G01N1/24 G01N1/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO 02 31468 A (NETTEN CHRISTIAAN VAN) 18 April 2002 (2002-04-18) the whole document	1-16
X	GB 1 165 769 A (C.E.A.) 1 October 1969 (1969-10-01) page 2, line 24-60; figure 1	1
Y		10-14
Y	US 5 018 395 A (HICKOX RICHARD M ET AL) 28 May 1991 (1991-05-28) column 1, line 20-40 column 3, line 26-57	10-14
X	US 2001/029793 A1 (KENNING VANESSA M ET AL) 18 October 2001 (2001-10-18) the whole document	1, 15, 16
	-/--	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° 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 when the document is taken alone
- *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.
- *Z* document member of the same patent family

Date of the actual completion of the international search

6 March 2003

Date of mailing of the international search report

13/03/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax: (+31-70) 340-3016

Authorized officer

Bockstahl, F

INTERNATIONAL SEARCH REPORT

 Internatic Application No
 PCT/CA 02/01860

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 267 016 B1 (BIRMINGHAM JOSEPH G ET AL) 31 July 2001 (2001-07-31) abstract; figures 3-6 column 7, line 29 -column 9, line 38 ----	1, 15, 16
A	US 4 432 248 A (LALIN HILL S) 21 February 1984 (1984-02-21) abstract column 8, line 54-57 ----	1
A	US 4 080 832 A (MOODY NORMAN FRANK ET AL) 28 March 1978 (1978-03-28) abstract column 4, line 39-44 ----	1
A	DE 88 12 640 U (RHEINISCH-WESTFÄLISCHER TÜV E.V.) 9 March 1989 (1989-03-09) page 8-9; figures 1-3 ----	1, 10-12
A	US 4 616 513 A (GIBSON HAROLD ET AL) 14 October 1986 (1986-10-14) column 1, line 48 -column 2, line 43 column 3, line 6-15 ----	1
A	WO 90 10282 A (HAMBURGER ROBERT N) 7 September 1990 (1990-09-07) page 5, line 21 -page 9, line 23 ----	1, 10-12
A	EP 0 373 045 A (CHARBONNAGES DE FRANCE) 13 June 1990 (1990-06-13) claim 1; figure 1 -----	1

INTERNATIONAL SEARCH REPORT

In relation on patent family members

International Application No

PCT/CA 02/01860

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 0231468	A	18-04-2002	AU 9359101 A WO 0231468 A2	22-04-2002 18-04-2002
GB 1165769	A	01-10-1969	FR 1511073 A BE 707544 A CH 483641 A DE 1648879 A1 ES 348248 A1 LU 55036 A1	26-01-1968 16-04-1968 31-12-1969 09-06-1971 01-11-1969 27-02-1968
US 5018395	A	28-05-1991	AT 147507 T AU 632668 B2 AU 7252991 A CA 2050685 A1 DE 69124021 D1 DE 69124021 T2 EP 0468030 A1 JP 7069252 B JP 4506261 T KR 9603192 B1 WO 9112512 A1	15-01-1997 07-01-1993 03-09-1991 09-08-1991 20-02-1997 17-04-1997 29-01-1992 26-07-1995 29-10-1992 06-03-1996 22-08-1991
US 2001029793	A1	18-10-2001	US 6267016 B1 US 6363800 B1 GB 2371768 A US 2002124664 A1 US 2002157993 A1	31-07-2001 02-04-2002 07-08-2002 12-09-2002 31-10-2002
US 6267016	B1	31-07-2001	US 2001029793 A1	18-10-2001
US 4432248	A	21-02-1984	US 4747315 A	31-05-1988
US 4080832	A	28-03-1978	NONE	
DE 8812640	U	09-03-1989	DE 8812640 U1	09-03-1989
US 4616513	A	14-10-1986	GB 2158233 A DE 3515432 A1 DE 3535538 A1 FR 2563914 A1 FR 2588662 A1 GB 2158234 A ,B US 4675034 A	06-11-1985 07-11-1985 09-04-1987 08-11-1985 17-04-1987 06-11-1985 23-06-1987
WO 9010282	A	07-09-1990	US 5001463 A AT 116463 T AU 5196790 A DE 69015622 D1 DE 69015622 T2 EP 0460066 A1 JP 2881710 B2 JP 4505655 T WO 9010282 A1	19-03-1991 15-01-1995 26-09-1990 09-02-1995 11-05-1995 11-12-1991 12-04-1999 01-10-1992 07-09-1990
EP 0373045	A	13-06-1990	FR 2640046 A1 AT 74430 T CA 2004657 A1 DE 68901134 D1	08-06-1990 15-04-1992 06-06-1990 07-05-1992

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/LA 02/01860

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0373045	A	EP 0373045 A1	13-06-1990
		ES 2030992 T3	16-11-1992
		GR 3004674 T3	28-04-1993
		ZA 8909323 A	29-08-1990
