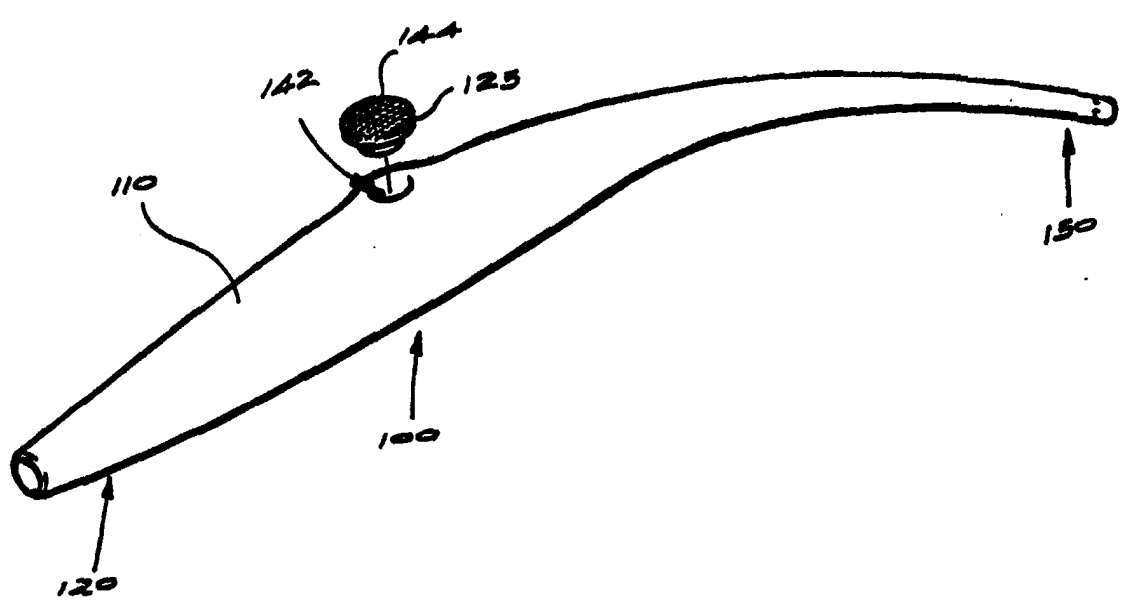




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/GB98/01423 (22) International Filing Date: 18 May 1998 (18.05.98) (30) Priority Data: 97/2370 19 May 1997 (19.05.97) ZA (71) Applicant (for all designated States except US): HARWILL INDUSTRIES (PTY.) LIMITED [ZA/ZA]; 2 Vygeboom, Durbanville, Western Cape (ZA). (71) Applicant (for MG only): GEMMELL, Peter, Alan [GB/GB]; 25 The Square, Martlesham Heath, Ipswich, Suffolk IP5 3SL (GB). (72) Inventor; and (75) Inventor/Applicant (for US only): MANTELL, John, Augustus, Dalton [ZA/ZA]; 14 Papenboom Grove, Newlands, Western Cape (ZA). (74) Agents: GEMMELL, Peter, Alan et al.; Dummett Copp, 25 The Square, Martlesham Heath, Ipswich, Suffolk IP5 3SL (GB).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: NOZZLE FOR SURGICAL SUCTION APPARATUS  (57) Abstract This invention relates to a nozzle for surgical suction apparatus, such as a Yankauer (100). The nozzle (100) comprises a suction tube (110) that is adapted for connection to the suction device at its connection end (120) and for location in the surgical area of a patient at its suction end (150). The nozzle (100) includes a finger controllable suction control aperture (142) and a filter constituted by a gas permeable, liquid impermeable membrane (144) that is incorporated in a plug (125) adapted to fit into the suction control aperture (142). The invention includes a method of operating such a nozzle (100).		

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NOZZLE FOR SURGICAL SUCTION APPARATUS**Background to the invention**

5 This invention relates to a nozzle for surgical suction apparatus.

Surgical suction devices are used for a number of purposes in surgery. One use of these devices is to suction
10 fluids, such as wound fluids and irrigation solutions, trauma debris and tissue debris from the wound or surgical area of the patient. The suction device is normally terminated in a suction nozzle of some kind that is connected, via a flexible tube, to the suction apparatus
15 itself. An example of such a nozzle is a simple device known as a Yankauer. This device normally consists of a tube that is tapered at the patient end and formed with a suction opening. The Yankauer is easily manoeuvred in the surgical area and various sizes of Yankauers are
20 available. Suction control is exercised by means of a finger control aperture, the effective opening of which is varied by the practitioner moving a finger to close, open or partly open the aperture.

25 The invention will be described with reference to Yankauers by way of a non-limiting example.

Summary of the invention

30 According to this invention a nozzle for a surgical suction device comprises a suction tube that is adapted for connection to the suction device at the one end of the tube and for location in the surgical area of a patient at its other end, the nozzle including suction control
35 means intermediate the ends of the tube, which control

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means includes a finger controllable suction control aperture in fluid communication with the interior of the suction tube and a filter constituted by a gas permeable, liquid impermeable membrane.

5

In use, suction control is exercised by the practitioner moving a finger to close, open or partly open the finger controllable suction control aperture.

10 The membrane is intended not to interfere significantly with air flow through the finger control aperture. To this end, the membrane must be gas permeable to permit the passage of air into the suction tube.

15 The membrane must, however, prevent the egress of liquids such as wound fluids from the aperture in order to be effective in preventing or at least minimising contact between the practitioner's finger and fluid entrained in the air flow through the suction tube. To this end, the
20 membrane must be liquid impermeable.

It will be appreciated, however, that the term "impermeable", when used in this specification is intended to refer to greatly reduced liquid permeability rather
25 than absolute liquid impermeability, which might be difficult to achieve in practice.

Examples of such membranes include microfilters and hydrophobic filters with appropriate pore sizes.

30

The membrane may be discrete from and secured to the tube, in which case it could be incorporated in a discrete insert that is adapted to fit onto the nozzle over the suction control aperture.

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Alternatively, the membrane may be formed integrally with the tube.

5 The invention includes a method of operating a surgical suction device nozzle comprising a suction tube adapted for connection to the suction device at the one end of the tube and for location in the surgical area of a patient at its other end, the nozzle including suction control means intermediate the ends of the tube, which control
10 means includes a finger controllable suction control aperture in fluid communication with the interior of the suction tube, the method including the steps of locating a filter comprising a gas permeable, liquid impermeable membrane over the control aperture.

15

Brief description of the drawings

In the drawings:

20 Figure 1 is a side elevation of a Yankauer incorporating the invention;

Figure 2 is a partial cross-sectional side elevation on the suction control aperture of the
25 Yankauer of Figure 1; and

Figure 3 is a diagrammatic isometric view of a Yankauer and a plug therefore according to the invention.

30

Description of embodiments of the invention

In Yankauers, the suction aperture of the Yankauer tube
35 is often blocked by contact with the soft tissue in the

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surgical area. This is because the suction aperture of the tube is forward facing and the rim of the aperture tends to make suction contact with the soft tissue in the surgical area drawing the tissue partly into the tube and
5 blocking the tube. Manual manipulation of the tube end in the surgical area is then required to relocate the tube if the suction efficiency of the suction apparatus is to be restored.

10 In an attempt to address this problem, the end of the Yankauer tube is formed with a plurality of small apertures adjacent the patient end of the tube.

The Yankauer tube also includes a suction control aperture
15 intermediate the ends of the tube that permits finger control of the suction applied at the suction aperture. To vary the suction (to the extent permitted by the low pressure within the tube), the size of the suction control aperture is merely varied by the practitioner, using a
20 finger to open or close the aperture to a greater or lesser extent.

In this way, suction in the Yankauer tube is broken simply by opening the suction control aperture to permit air
25 being drawn into the suction control aperture.

It will be appreciated that, notwithstanding the widespread use of surgical gloves, the possibility of contamination exists. For instance it is possible that
30 the practitioner's skin could come into contact with the wound fluids within the Yankauer and that the patient infects the practitioner or vice versa.

Because of the possibility of such contamination, the
35 manufacturers of Yankauers in particular have developed

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various types of non-contact suction controls such as valves, shutters, slides and the like.

5 In addition to being complex and expensive, these suction controls provide only indirect suction control. They lack the fine control that is possible with the more natural control exhibited by a finger controllable suction tube.

10 With a simple finger controllable suction control, the control action is achieved by means of the perfectly natural and intuitive movement of pressing the finger down onto the suction control aperture to a greater or lesser degree.

15 This invention aims to address these problems and it will be described with reference to a conventional suction nozzle or Yankauer 10, 100 as is illustrated in the drawings.

20 The Yankauer 10 of Figure 1 comprises a connector tube 20 in fluid communication with a curved suction tube 50 that extends from the connector tube 20. The connector tube 20 and suction tube 50 may be integrally moulded or, as is illustrated, they may be formed in two parts and glued
25 together.

The connector tube 20 is formed with an externally ribbed connector 22 located distally of the free end of the suction tube 50. The connector 22 is dimensioned to fit
30 tightly within conventional surgical suction hoses. The connector tube 20 is provided with grip formations 24 along its sides.

The suction tube 50 is provided with a forward facing
35 suction aperture 52 at the free end thereof. Two pairs

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of opposed suction relief apertures 54 are formed adjacent the free end of the suction tube 50.

On the upper surface of the connector tube 20, a raised
5 lip or ridge formation 26 encloses a suction control 40.

Referring more specifically to Figure 2, the suction control 40 is shown to include a suction control aperture 42 that is open to the suction passage within the
10 connector tube 20. The upper end of the aperture 42 is fitted with a filter membrane that covers the entire area of the aperture 42.

The filter membrane is constituted by selectively
15 permeable membrane 44 that is seated on a peripheral shoulder 26.2 formed internally of the ridge formation 26.

Another form of Yankauer 100 is illustrated in Figure 3. The Yankauer 100 comprises a unitary tube 110 having
20 tapered ends constituted by a suction end 150 and a connection end 120, the latter end being tapered for insertion into a conventional suction hose. The Yankauer 100 may conveniently be blow moulded, extruded or injection moulded in plastics.

25 Suction control is normally exercised by means of a conventional suction control aperture 142.

A filter membrane 144 is incorporated in a plug 125 that
30 is adapted to fit into the suction control aperture 142. The plug 125 is a friction fit in the aperture 142.

In both forms of the invention, the membranes 44, 144 are gas permeable, liquid impermeable membranes which, in use,
35 would permit the passage of air into the suction passage

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and prevent the egress of wound fluids from the suction passage. The most convenient filter membrane would be constituted by an air permeable, hydrophobic material, a number of which are known.

5 The finger control apertures 42, 142 of the Yankauers illustrated in the drawings are dimensioned to be closed by the tip of a finger, even with the membrane-covered plug 125 covering the control aperture 142 of the Yankauer 100 of Figure 3.

10

In use, the Yankauers 10, 100 are secured to the end of a conventional suction hose of a surgical suction apparatus and held firmly by the practitioner using middle finger and thumb with the tip of the index finger over the
15 suction control aperture. The Yankauers 10, 100 are then used in the conventional manner to suction wound fluids and wound debris from the surgical area of the patient.

Total blockage by tissue obstruction of the surgical area
20 is minimised by the transverse apertures formed adjacent the tip of the Yankauer. If, however, the transverse apertures are inadvertently blocked, the practitioner simply lifts the tip of the index finger from the suction control aperture partially to release the suction in the
25 tube.

Because of the membrane covering the suction control aperture, the possibility of contamination by wound fluids is greatly reduced. In addition, the danger of a
30 practitioner accidentally infecting a patient is likewise reduced.

An additional advantage is that by covering the suction control aperture with a membrane to avoid contamination
35 and infection, no indirect control is introduced. Suction

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control in Yankauers of the invention remains direct,
natural and intuitive.

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Claims

1. A nozzle (10, 100) for a surgical suction device, the nozzle (10,100) comprising a suction tube (20, 110) that
5 is adapted for connection to the suction device at the one end (22, 120) of the tube (20, 110) and for location in the surgical area of a patient at its other end (50, 150), the nozzle (10, 100) including suction control means intermediate the ends of the tube (20, 110) constituted
10 by a finger controllable suction control aperture (42, 142) in fluid communication with the interior of the suction tube (20, 110), characterised in that the suction control aperture (42, 142) is covered with a filter constituted by a gas permeable, liquid impermeable
15 membrane (44, 144).
2. A nozzle according to claim 1 in which the membrane (44, 144) is discrete from and secured to the tube (20, 110).
20
3. A nozzle according to claim 2 in which the membrane (44, 144) is incorporated in a discrete insert that is adapted to fit onto the nozzle (10, 100) over the suction control aperture (42, 142).
25
4. A nozzle according to claim 1 in which the membrane (44, 144) is formed integrally with the tube (20, 110).
5. A method of operating a surgical suction device
30 nozzle that comprises a suction tube (20, 110) adapted for connection to the suction device at the one end of the tube (20, 110) and for location in the surgical area of a patient at its other end, the nozzle (10, 100) including suction control means intermediate the ends of the tube
35 (20, 110), which control means includes a finger controllable suction control aperture (42, 142) in fluid

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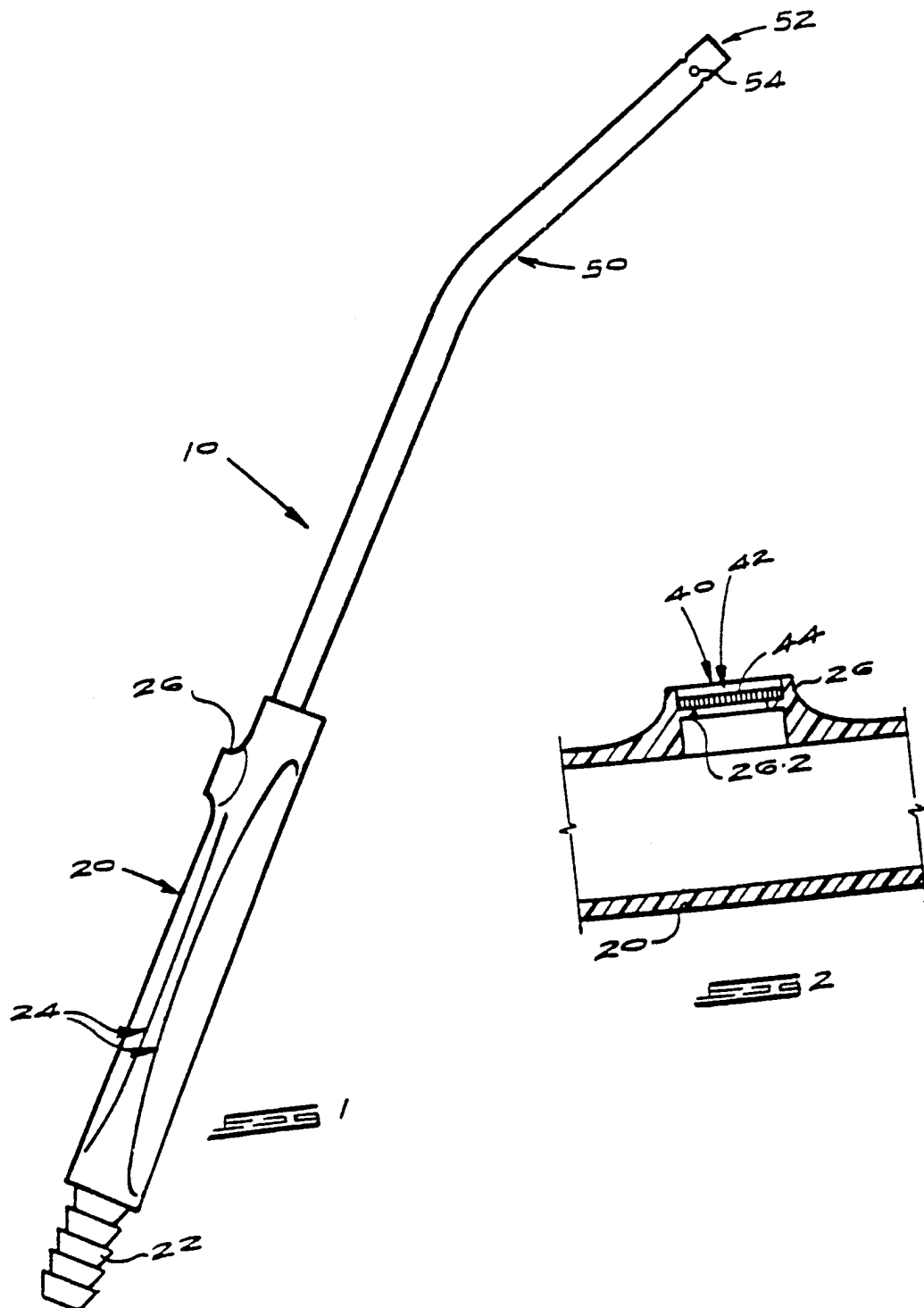
communication with the interior of the suction tube (20, 110), the method including the steps of locating a filter comprising a gas permeable, liquid impermeable membrane (44, 144) over the control aperture (42, 142).

5

6. A nozzle substantially as described in this specification with reference to the accompanying drawings.

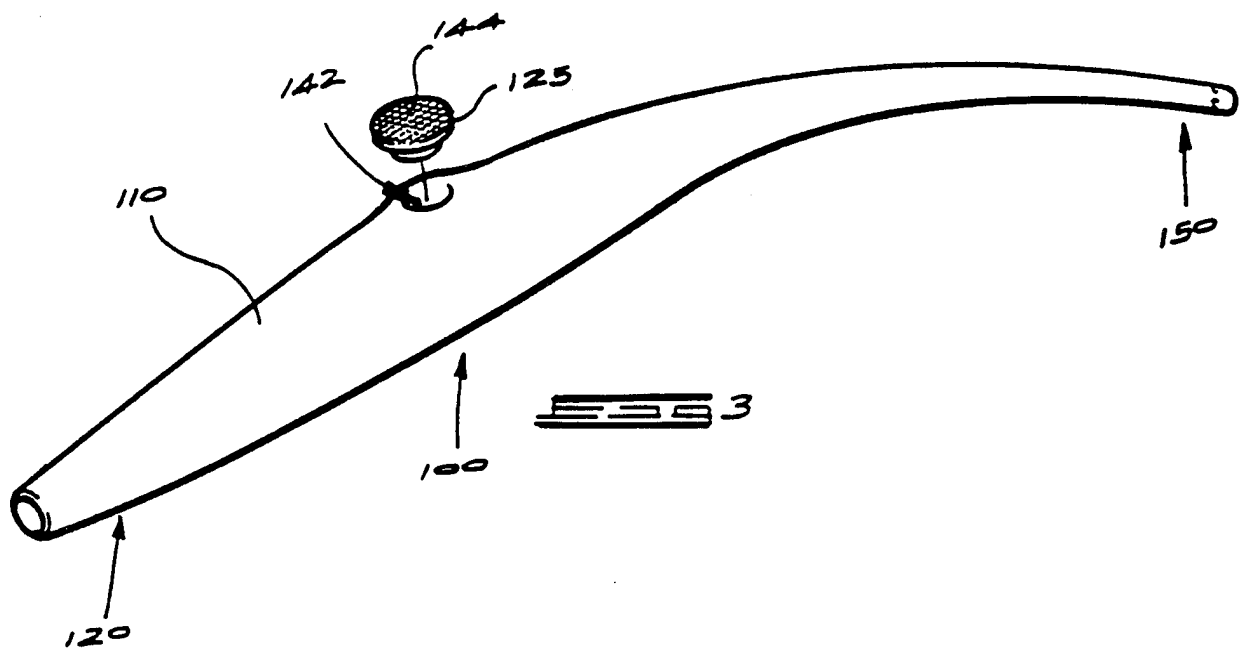
7. A method of operating a surgical suction device
10 nozzle substantially as described in this specification with reference to the accompanying drawings.

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SUBSTITUTE SHEET (RULE 26)

2/2



INTERNATIONAL SEARCH REPORT

Inte ional Application No
PCT/GB 98/01423

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A61M1/00

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 6 A61M A61C

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 049 000 A (WILLIAMS ROBERT W) 20 September 1977 see column 2, line 54 - line 65; figures 1-3 ---	1,2,5
A	US 4 735 606 A (DAVISON THOMAS W) 5 April 1988 see column 4, paragraph 2; figure 3 ---	1,2,5
A	EP 0 361 813 A (PFIZER HOSPITAL PROD) 4 April 1990 see claim 4; figures 4,5 ---	1,5
A	US 4 915 691 A (JONES CHARLES A ET AL) 10 April 1990 see claims 1,4,7; figures 2,3 --- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

2 September 1998

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 737 148 A (BLAKE LARRY W) 12 April 1988 see column 6, paragraph 2; claim 1; figures -----	

INTERNATIONAL SEARCH REPORT

International application No.
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Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 6, 7
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
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Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 98/01423

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4049000 A	20-09-1977	NONE	
US 4735606 A	05-04-1988	NONE	
EP 0361813 A	04-04-1990	US 4955874 A AT 131077 T AU 623175 B AU 4177989 A CA 1336667 A DE 68925020 D DE 68925020 T DK 473189 A ES 2080749 T FI 894543 A IE 71035 B JP 1980527 C JP 2147068 A JP 7008295 B MX 169388 B NO 175189 B NO 934056 A PT 91799 A,B	11-09-1990 15-12-1995 07-05-1992 05-04-1990 15-08-1995 18-01-1996 05-09-1996 28-03-1990 16-02-1996 28-03-1990 15-01-1997 17-10-1995 06-06-1990 01-02-1995 30-06-1993 06-06-1994 28-03-1990 30-03-1990
US 4915691 A	10-04-1990	NONE	
US 4737148 A	12-04-1988	NONE	