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(71) Applicant *(for all designated States except US)*: **OWEN MUMFORD LIMITED** [GB/GB]; Brook Hill, Woodstock, Oxfordshire OX20 1TU (GB).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **MARSHALL, Jeremy** [GB/GB]; 16 Cranham Street, Jericho, Oxford OX2 6DD (GB).

(74) Agents: **WYNNE-JONES, LAINE & JAMES** et al.; Essex Place, 22 Rodney Road, Cheltenham GL50 1JJ (GB).

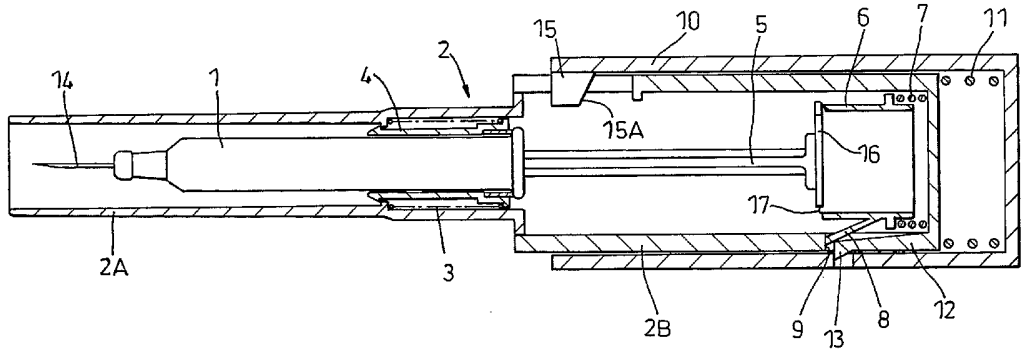
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**Published:**
— *with international search report*

*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.*

(54) Title: SYRINGE FIRING MECHANISM




(57) Abstract: When a cover (10) of a syringe firing mechanism is pushed downwardly towards a housing (2) a flexible arm (12) is moved inwardly to release a trigger (8). This enables a drive member (6) to push down a plunger (5) of the syringe under the bias of a spring (7). When the injection is completed, release of the cover (10) causes the cover (10) to move back into contact with a corner of the drive member (6). A cam surface (15A) then pushes a flap (16) across, whilst bending a hinge (17), until the flap (16) enters the hollow interior of the drive member (6), thus enabling the syringe (1) to be withdrawn within the housing (2) under the bias of a spring (3).

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# SYRINGE FIRING MECHANISM

Safety syringe mechanisms are known wherein the syringe is initially held fully within a housing and, after injection, the syringe is again drawn back into the housing. Such arrangements usually have a drive member which can be released and driven forward, firstly to cause the needle at least of the syringe to project from the housing, and then to cause a dose to be ejected from the syringe through the enclosed needle. At the end of the injection procedure, the syringe is caused to be withdrawn again into the housing by a return mechanism. This invention aims to provide a syringe firing mechanism of this nature which is relatively simple in construction and which can readily be operated to perform the two stages of exposing the needle of the syringe and withdrawing the syringe into a housing after injection.

According to the present invention there is provided a syringe firing mechanism for a syringe held within a housing, the housing incorporating a drive spring acting on a drive member provided with a release trigger which, when released, enables the drive member to act on a plunger of the syringe under the bias of the drive spring, firstly to drive the body of the syringe forwardly to cause the needle portion of the syringe to move out of the housing and secondly to cause a dose to be ejected from the syringe, the housing also incorporating a return spring to provide a reverse bias on the syringe body to enable the needle portion of the syringe to be withdrawn into the housing after ejection of a dose, and a cover positioned over the rear of the housing and movable in a first direction towards the syringe to actuate the release trigger or to provide access for actuation of the release trigger, and movable subsequently in the reverse

direction to actuate a release mechanism which will free the plunger from the drive member to allow the syringe to be withdrawn into the housing under the bias of the return spring.

With this mechanism the cover acts firstly to release the drive member and then to actuate a further release mechanism which causes the exposed needle to be withdrawn back into the housing. In the preferred arrangement, the release mechanism comprises a projection inwardly from the region of the cover nearest to the syringe which will, when the cover is moved in the reverse direction, release a flap on the drive member to enable the head of the syringe plunger to enter a hollow interior of the drive member.

Ideally a third spring will be provided between the cover and the housing to cause the cover to move back to its start position, to actuate the release mechanism, when the operator's actuating pressure on the cover is released. This ensures that the operation of the release mechanism happens automatically once the operator releases the device.

In the preferred arrangement, the drive head will carry the release trigger which is normally located on a ledge of the housing until it is moved off the ledge, for release of the trigger to enable the drive member to move within the housing under the bias of the drive spring. In one arrangement, the structure is such that movement of the cover in the first direction pushes the trigger off the ledge. In this case, the housing can have a flexible arm whose free end contacts the release trigger and also carries a projection which will be moved inwardly by movement of the cover in the first direction to any extent sufficient to actuate the release trigger.

As an alternative, the firing mechanism could be constructed such that there is a firing button, for actuating the release trigger, which projects through a side wall of the cover and is interlocked with the cover until the cover is moved in the first direction, whereupon the button can be pressed to actuate the release trigger. The firing button can be carried at the end of a flexible arm forming part of the housing.

The invention may be performed in various ways and two preferred embodiments thereof will now be described, with reference to the accompanying diagrammatic drawings, in which:

Figure 1 is a longitudinal cross-section through one example of a syringe firing mechanism of this invention;

Figures 2A to 2D illustrate sequential stages of operation of the mechanism shown in Figure 1; and

Figures 3A and 3B illustrate, in partial view and in a similar manner, two initial stages in the operation of an alternative form of firing mechanism.

Figure 1 shows a standard syringe 1 located within a housing 2. A spring 3 biases a syringe carrier 4 associated with the syringe in a direction such as to hold the syringe 1 fully within the lower part of the housing 2A. A plunger 5 projects from the syringe 1 into the upper part 2B of the housing. At the top end of the housing section 2B there is a drive member 6 biased by a drive spring 7. The drive member is held in place by a trigger 8 in the form of a flexible arm which rests on a ledge 9 in an opening in the side wall of the housing 2.

Surrounding the upper part of the housing 2B is a cover 10 which is biased outwardly by a spring 11. If the operator pushes the cover 10 towards

the syringe 1, a flexible arm 12 of the housing 2 is forced inwardly by engagement of the inner side wall of the cover 10 with a projecting boss 13 on the arm 12 until the condition is reached as shown in Figure 2B. The drive member 6 is now free to move within the housing portion 2B under the bias of the spring 7 and acts on the plunger 5 initially to cause the syringe 1 to move outwardly against the bias of the weaker spring 3 and then to cause the contents of the syringe to be ejected through the needle 14 as the plunger moves within the syringe 1. When the cover 10 is subsequently released, the spring 11 acts to move the cover 10 outwardly. This results in a trigger member 15 acting on a flap 16 forming part of the drive member 6 (as shown in Figure 2C). Further movement of the trigger member 15 to the position shown in Figure 2D causes the flap 16 to disengage from the side wall of the drive member 6. This results from the fact that the cam surface 15A pushes the flap 16 across by flexing a hinge 17 until the flap enters the interior of the hollow drive member 6. The flap 16 can then fold inwardly about the hinge 17 into the interior of the hollow drive member 6. This removes any pressure from the plunger 5 and the spring 3 acts to withdraw the syringe 1 back into the housing 2.

In the alternative arrangement shown in Figures 3A and 3B, the closing inwardly of the trigger 8 of the drive member 6 is performed in a different manner. Otherwise, the operation of the device is identical to that shown in Figures 1 and 2. In this instance, the flexible arm 12 of the housing portion 2B extends outwardly at the free end to form a button 18. In the condition shown in Figure 3A, this button cannot be moved inwardly because it rests against a portion 19 of the cover 10. However, when the cover 10 is moved inwardly to

the condition shown in Figure 3B (corresponding essentially to that shown in Figure 2A), the button 18 is free to move inwardly, when pressed, to move the latch inwardly to free it from the ledge 9. Again, the drive member 6 can then be driven with forward by the spring 7 and the subsequent stages of operation are equivalent to those shown in Figures 2B to 2D.

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CLAIMS

1. A syringe firing mechanism for a syringe held within a housing, the housing incorporating a drive spring acting on a drive member provided with a release trigger which, when released, enables the drive member to act on a plunger of the syringe under the bias of the drive spring, firstly to drive the body of the syringe forwardly to cause the needle portion of the syringe to move out of the housing and secondly to cause a dose to be ejected from the syringe, the housing also incorporating a return spring to provide a reverse bias on the syringe body to enable the needle portion of the syringe to be withdrawn into the housing after ejection of a dose, and a cover positioned over the rear of the housing and movable in a first direction towards the syringe to actuate the release trigger or to provide access for actuation of the release trigger, and movable subsequently in the reverse direction to actuate a release mechanism which will free the plunger from the drive member to allow the syringe to be withdrawn into the housing under the bias of the return spring.

2. A syringe firing mechanism according to claim 1, wherein said release mechanism comprises a projection inwardly from the region of the cover nearest to the syringe which will, when the cover is moved in the reverse direction, release a flap on the drive member to enable the head of the syringe plunger to enter a hollow interior of the drive member.

3. A syringe firing mechanism according to claim 1 or claim 2, wherein a third spring is provided between the cover and the housing to cause the cover to move back to its start position, to actuate the release mechanism, when the operator's actuating pressure on the cover is released.

4. A syringe firing mechanism according to any one of claims 1 to 3, wherein the drive head carries the release trigger which is normally located on a ledge of the housing until it is moved off the ledge, for release of the trigger to enable the drive member to move within the housing under the bias of the drive spring.

5. A syringe firing mechanism according to claim 4, wherein movement of the cover in the first direction pushes the trigger off the ledge.

6. A syringe firing mechanism according to claim 5, wherein the housing has a flexible arm whose free end contacts the release trigger and also carries a projection which will be moved inwardly by movement of the cover in the first direction to any extent sufficient to actuate the release trigger.

7. A syringe firing mechanism according to claim 4, wherein a firing button for actuating the release trigger projects through a side wall of the cover and is interlocked with the cover until the cover is moved in the first direction, whereupon the button can be pressed to actuate the release trigger.

8. A syringe firing mechanism according to claim 7, wherein the firing button is carried at the end of a flexible arm forming part of the housing.

9. Any novel combination of features of a syringe firing mechanism as described herein and/or as illustrated in the accompanying drawings.

10. A syringe firing mechanism substantially as herein described with reference to the accompanying drawings.

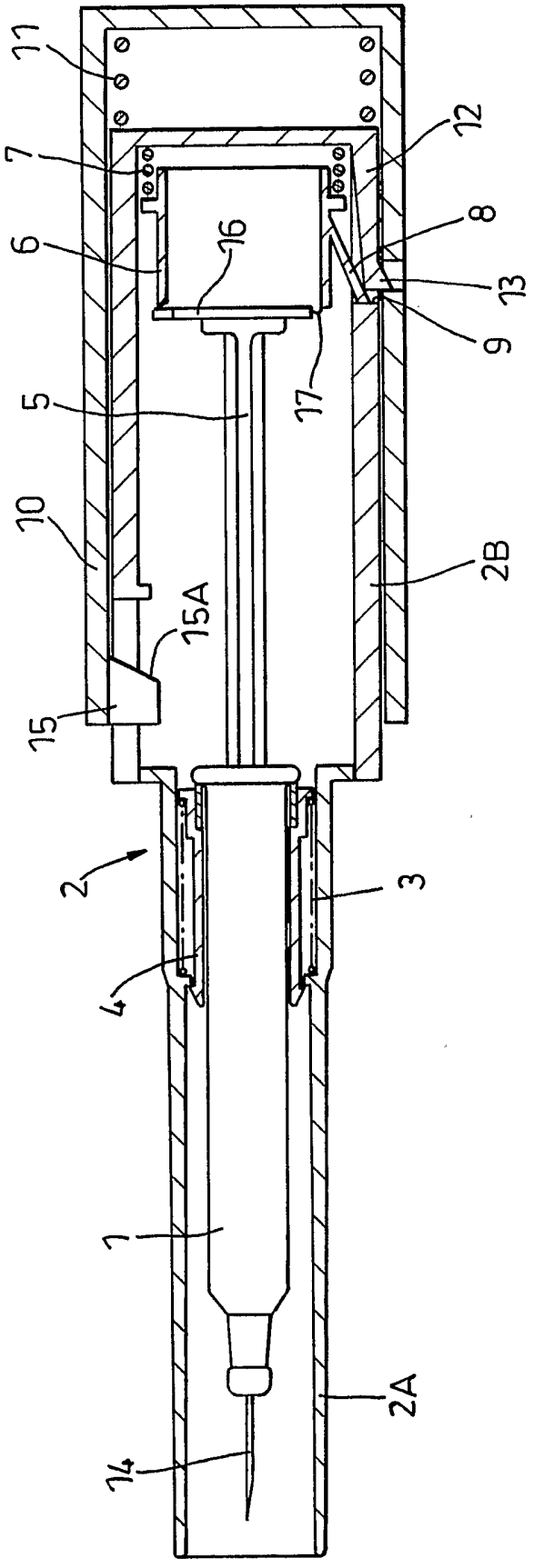



*Fig. 1*

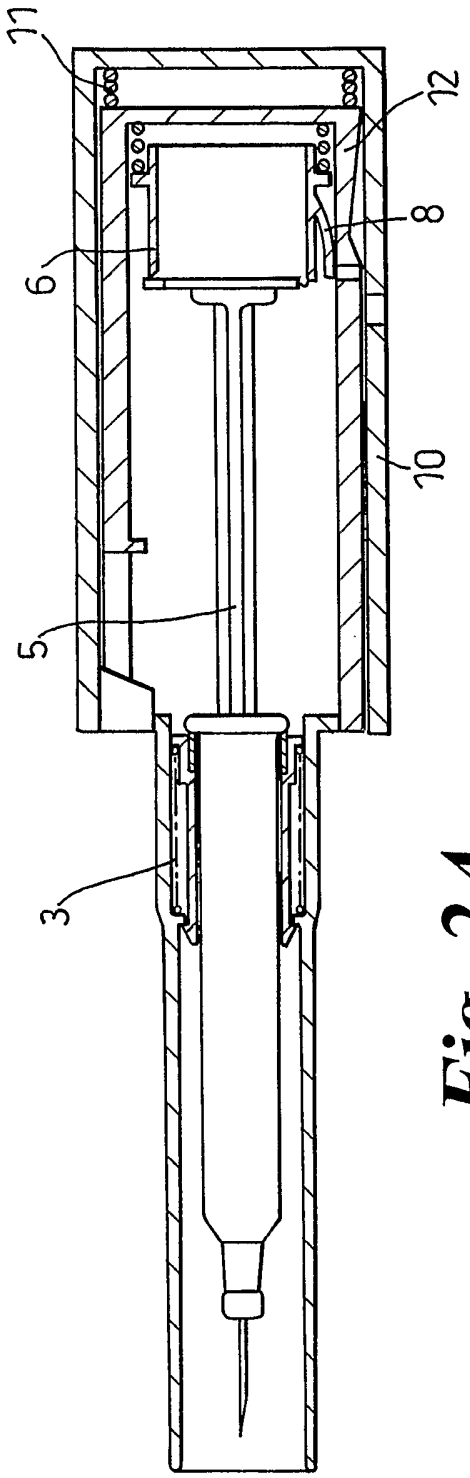



Fig. 2A

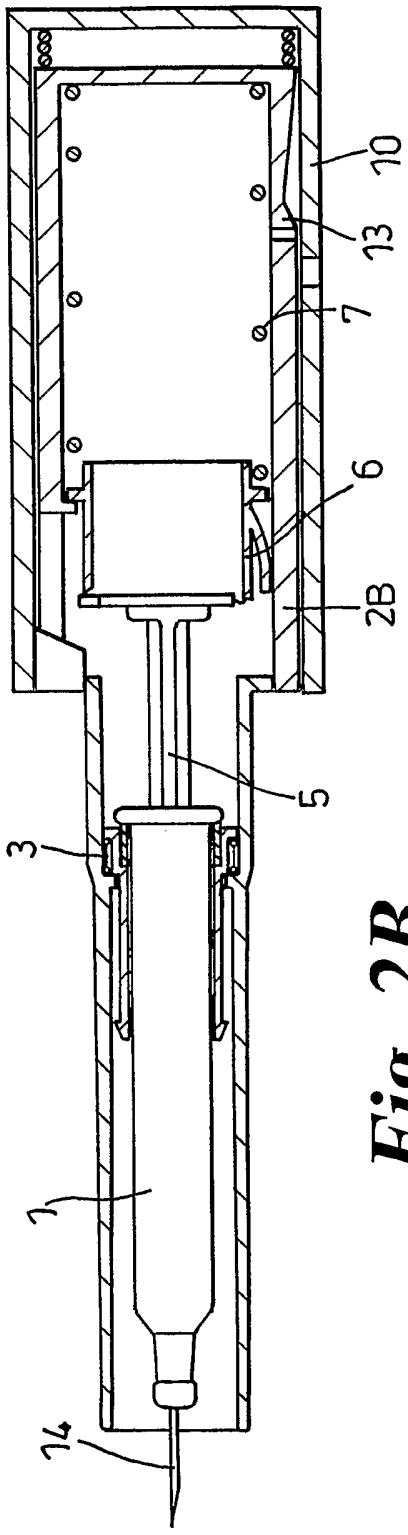



Fig. 2B

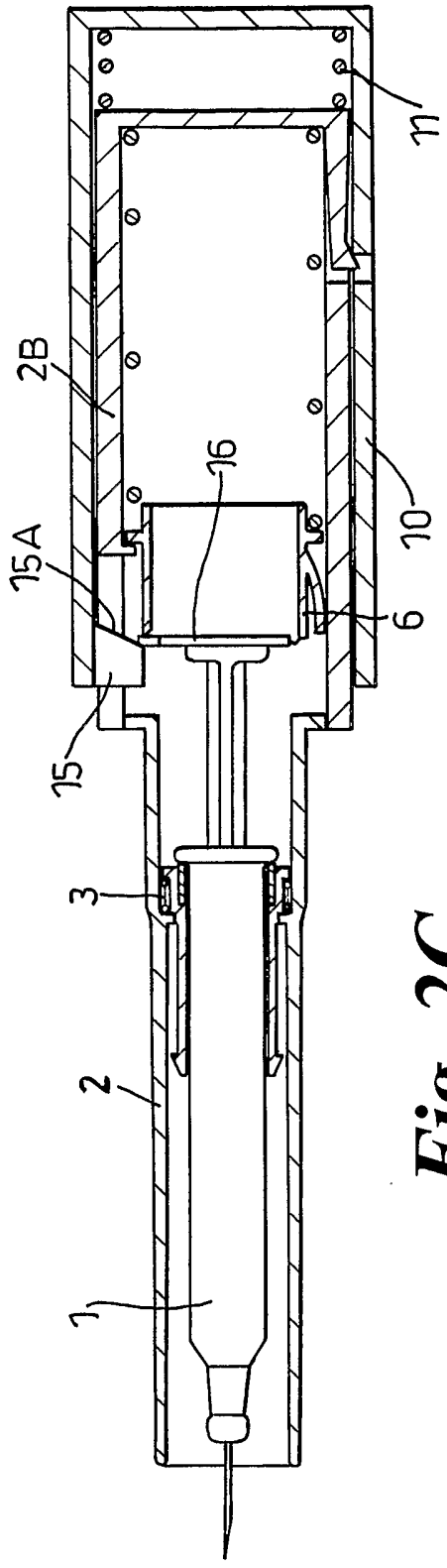



Fig. 2C

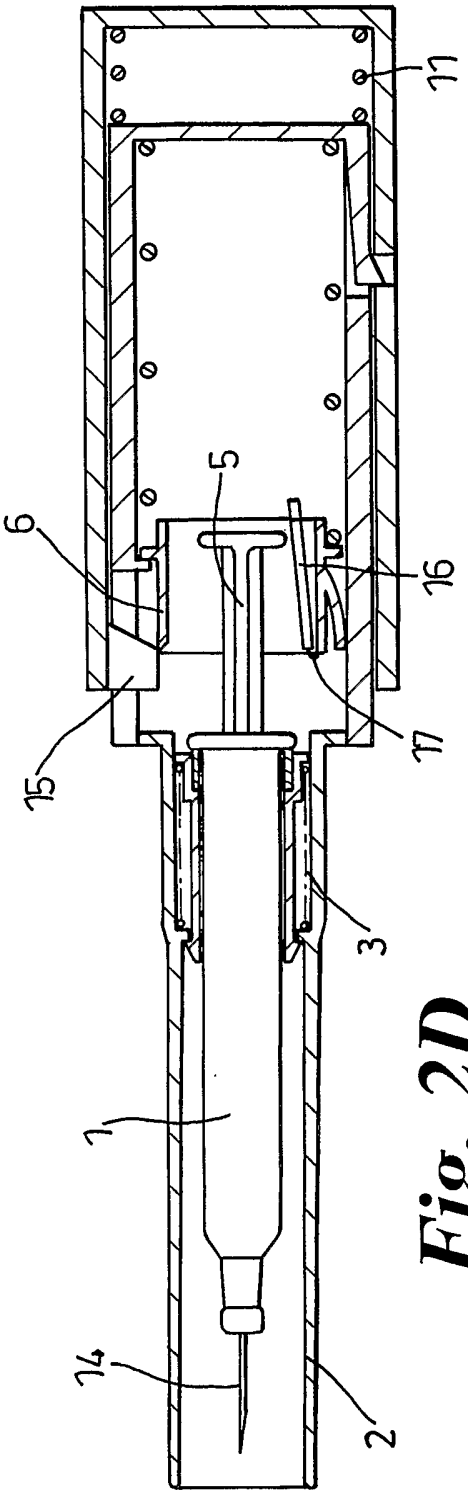



Fig. 2D

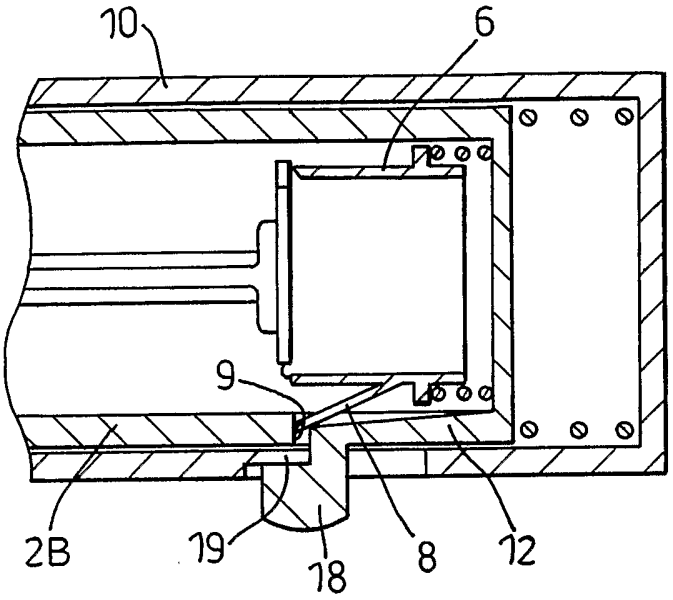



*Fig. 3A*

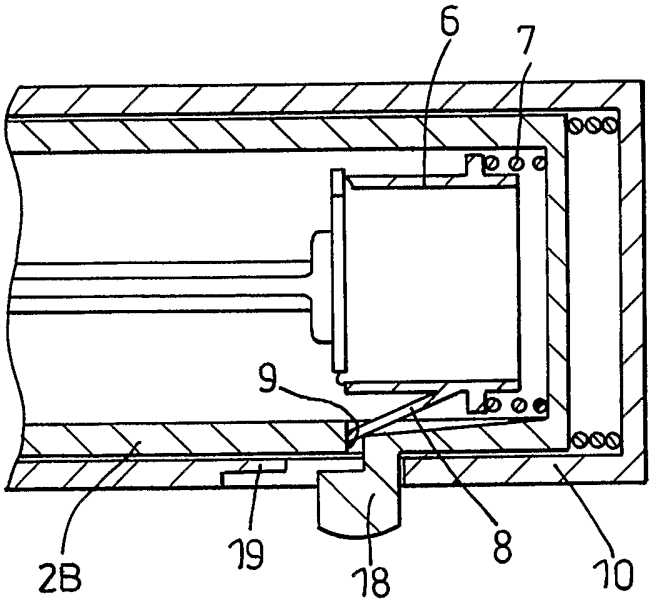



*Fig. 3B*

# INTERNATIONAL SEARCH REPORT

International Application No
/GB2004/002248

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61M5/20 A61M5/32

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 A61M

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | US 5 137 516 A (RAND PAUL K ET AL)<br>11 August 1992 (1992-08-11)<br>figures 7-10 | 1 |
| A | EP 0 516 473 A (OWEN MUMFORD LTD)<br>2 December 1992 (1992-12-02)<br>figures 1-4 | 1 |
| A | US 5 779 677 A (FREZZA PIERRE)<br>14 July 1998 (1998-07-14)<br>figures 7-11 | 1 |

☐ 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.

"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 2 September 2004 | 15/09/2004 |

| Name and mailing address of the ISA | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL – 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,<br>Fax: (+31-70) 340-3016 | Schultz, O |

:ernational application No.
PCT/GB2004/002248

# INTERNATIONAL SEARCH REPORT

## Box II Observations where certain claims were found unsearchable (Continuation of item 2 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.: 9,10
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:
see FURTHER INFORMATION sheet PCT/ISA/210

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 9,10

Rule 6.2 (a)

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

onal Application No
GB2004/002248

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 5137516 A | 11-08-1992 | AT 240790 A ,B | 15-09-1995 |
| | | AU 639955 B2 | 12-08-1993 |
| | | AU 6691290 A | 06-06-1991 |
| | | BE 1003835 A5 | 23-06-1992 |
| | | BR 9006006 A | 24-09-1991 |
| | | CA 2030742 A1 | 29-05-1991 |
| | | CH 687234 A5 | 31-10-1996 |
| | | CZ 9702029 A3 | 11-08-1999 |
| | | DE 4037418 A1 | 29-05-1991 |
| | | DK 281990 A | 29-05-1991 |
| | | ES 2038088 A6 | 01-07-1993 |
| | | FI 905832 A | 29-05-1991 |
| | | FR 2654938 A1 | 31-05-1991 |
| | | GB 2239180 A ,B | 26-06-1991 |
| | | GR 90100824 A ,B | 17-04-1992 |
| | | HK 19295 A | 17-02-1995 |
| | | HR 940630 A1 | 28-02-1997 |
| | | HU 61207 A2 | 28-12-1992 |
| | | IE 904240 A1 | 05-06-1991 |
| | | IL 96487 A | 26-05-1995 |
| | | IN 179332 A1 | 27-09-1997 |
| | | IT 1243541 B | 16-06-1994 |
| | | JP 3222962 A | 01-10-1991 |
| | | JP 3399524 B2 | 21-04-2003 |
| | | KR 158446 B1 | 16-11-1998 |
| | | LU 87851 A1 | 25-08-1992 |
| | | NL 9002598 A ,B, | 17-06-1991 |
| | | NO 905125 A ,B, | 29-05-1991 |
| | | NZ 236219 A | 23-12-1992 |
| | | PL 287996 A1 | 12-08-1991 |
| | | PT 96005 A ,B | 31-08-1992 |
| | | SE 469262 B | 14-06-1993 |
| | | SE 9003776 A | 29-05-1991 |
| | | SG 168894 G | 28-04-1995 |
| | | SI 9012289 A | 31-08-1997 |
| | | RU 2108116 C1 | 10-04-1998 |
| | | ZA 9009514 A | 27-11-1991 |
| EP 0516473 A | 02-12-1992 | DE 69208287 D1 | 28-03-1996 |
| | | DE 69208287 T2 | 18-07-1996 |
| | | EP 0516473 A1 | 02-12-1992 |
| | | JP 3292747 B2 | 17-06-2002 |
| | | JP 5161712 A | 29-06-1993 |
| | | US 5300030 A | 05-04-1994 |
| US 5779677 A | 14-07-1998 | FR 2715071 A1 | 21-07-1995 |
| | | AT 174226 T | 15-12-1998 |
| | | AU 1539195 A | 01-08-1995 |
| | | CA 2181255 A1 | 20-07-1995 |
| | | DE 69506521 D1 | 21-01-1999 |
| | | DE 69506521 T2 | 10-06-1999 |
| | | DK 740557 T3 | 16-08-1999 |
| | | EP 0740557 A1 | 06-11-1996 |
| | | ES 2127510 T3 | 16-04-1999 |
| | | WO 9519194 A1 | 20-07-1995 |
| | | GR 3029338 T3 | 28-05-1999 |
| | | JP 9507416 T | 29-07-1997 |