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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.

Improvements relating to automatic injection devices

There are various forms of automatic injection device which when operated cause the needle of a syringe to be moved forwardly so that it projects from a protective housing prior to actuation of the syringe to express a dose of liquid through the needle. It is important to try to ensure that the syringe is moved bodily forward to expose the needle before the liquid charge is pressurised so that dribbling from the needle does not occur before the actual injection takes place. It is an object of this invention to provide a mechanism which operates in this desired manner.

According to the invention there is provided an injection device for causing a dose of liquid to be ejected from the needle at one end of a syringe located within a housing of the device, the syringe being movable by a plunger, upon release of an actuating bias member at one end of the housing, to move the syringe, from a first position wherein the needle is shrouded by the housing, to a second position wherein the needle projects from the other end of the housing, the plunger being in the form of a rod with a longitudinally centrally located flexible projecting portion which, prior to release of said actuating bias member, is situated beyond the other end of the syringe, such that a primary movement of the plunger, under the bias of the actuating bias member, will cause the projecting portion to bear against the other end of the syringe such that the syringe is moved from said first to said second position, whereupon arresting of further movement of the syringe, results in the flexible portion collapsing inwardly so that it enters the syringe, thus enabling the plunger to move by a secondary movement, within the syringe, into contact with and to act

upon a plug to compress the liquid within the syringe and cause expression of the liquid through the syringe needle.

With such an arrangement, the projecting portion will remain in its projecting position (in order to move the syringe from the first to the second position) until the force increases to such an extent which allows the projecting portion to collapse inwardly so that the plunger can then move within the syringe to cause the liquid to be expressed through the syringe.

The projecting portion can comprise one or more flexible elbows projecting beyond the normal circumference of the rod, but compressible into said circumference. This could be in the form of two elbows defined either side of a longitudinal slit in the rod. The elbows could be pre-formed as a pair of arms either side of the longitudinal slit between upper and lower solid portions of the rod.

Preferably the injection device will contain a return bias member acting between the syringe housing and the other end of the syringe to hold the syringe retracted within the housing until the actuating bias member is released.

One or more of the bias members provided within the housing can be in the form of a coil spring.

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

Figure 1 Figure 1 is a sectional view through an injection device of this invention prior to use; and

Figures 2 and 3 are similar views showing successive stages of operation

of the injection member.

The injection device shown in the drawings comprises a syringe 1 located within a protective housing 2. The syringe comprises a 3 incorporating a liquid dose held in place by a bung 4 and having a needle 5 through which the dose can be ejected by applying pressure to the bung 4. The 3 has an enlarged head 6. A plunger 7 is biased forwardly by a coil spring 8, but is held back in a latched position (Figure 1) until such time as a trigger shown schematically at 11 is actuated to release the plunger and the spring 8. Prior to use the syringe 1 is held retracted in the housing 2 by a coil spring 9.

It will be seen that the plunger 7 is in the form of a rod having a central portion which defines a pair of projecting elbows 10. These can be pre-formed as part of a moulded plunger 7. The projecting elbow portions 10 are flexible so that they can be moved inwardly to cause that portion of the rod to adopt a circumference similar to that of the rest of the rod. As can be seen in Figure 2, when the plunger is released and biased by the spring 8 the expanded region formed by the elbows 10 rests against the head 6 of the 3 and the force provided is sufficient to compress the spring 9 until such time as the head 6 abuts the top of the housing 2, whereupon further movement of the 3 is arrested. The continual bias created by the spring 8 then causes the elbows 10 to be compressed inwardly as they enter into the interior of the 3. With the elbows 10 in the collapsed state, the plunger can then move relatively easily within the 3 so as to act upon the bung 4 and thus cause the contents of the syringe to be ejected through the needle 5.

The illustrated configuration of the plunger 7 provides several technical

advantages. It can be moulded integrally. Also the collapsing movement of the projecting elbows provides an arrangement which can provide a suitable injection force to cause the needle to enter the skin to a suitable depth, but then provide a relatively low drag against the inner wall of the syringe container so that the major portion of the thrust of the spring for the remainder of its stroke is applied to the bung 4. It will be appreciated that other configurations of collapsing projection could be used in place of the collapsing elbows.

Claims

1. An injection device for causing a dose of liquid to be ejected from the needle at one end of a syringe (1) located within a housing (2) of the device, the syringe being movable by a plunger (7), upon release of an actuating bias member (8) at one end of the housing (2), to move the syringe (1), from a first position wherein the needle (5) is shrouded by the housing (2), to a second position wherein the needle projects from the other end of the housing, the plunger being in the form of a rod with a longitudinally centrally located flexible projecting portion which, prior to release of said actuating bias member, is situated beyond the other end (6) of the syringe (1), such that a primary movement of the plunger (7), under the bias of the actuating bias member (8), will cause the projecting portion (10) to bear against the other end (6) of the syringe such that the syringe is moved from said first to said second position, whereupon arresting of further movement of the syringe, results in the flexible portion (10) collapsing inwardly so that it enters the syringe, thus enabling the plunger (7) to move by a secondary movement, within the syringe, into contact with and to act upon a plug (4) to compress the liquid within the syringe and cause expression of the liquid through the syringe needle (5).

2. An injection device as claimed in claim 1, wherein the projecting portion (10) comprises one or more flexible elbows projecting beyond the normal circumference of the rod (7), but compressible into said circumference.

3. An injection device as claimed in claim 1 or claim 2, wherein two elbows (10) are defined either side of a longitudinal slit in the rod (7).

4. An injection device as claimed in any one of claims 1 to 3, wherein the elbows are preformed as a pair of arms (10) either side of the longitudinal slit between upper and lower solid portions of the rod (7).

5. An injection device as claimed in any one of claims 1 to 4,
5 including a return bias member (9) acting between the syringe housing (2) and the other end of the syringe (6) to hold the syringe (1) retracted within the housing (2) until the actuating bias member (8) is released.

6. An injection device as claimed in claims 1 to 5, wherein one or more of the bias members (8, 9) provided within the housing is in the form of a
10 coil spring.

7. An injection device comprising:

a housing (2);

a syringe (1) slideably mounted within said housing for movement between a shrouded retracted position and an extended injecting position;

15 a bung (4) slideably mounted in said syringe (1) and moveable to expel a liquid dose through a needle (5) at the distal end of the syringe;

a plunger (7) having an end operable to engage said bung (4) and transmitting an expulsion force thereto, and

a bias spring (8) operable to move said plunger from a first position to a
20 second position,

characterised in that said plunger is provided with at least one integrally formed collapsible projecting region (10) which is outside said syringe when said plunger (7) is at its first position but which in use on movement away from said first position engages the proximal end (6) of said syringe

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(1) to drive it to its extended position whereupon arresting of further movement of said syringe (1) causes said collapsible projecting region (10) to collapse inwardly to allow said plunger to engage said bung (4) and expel a liquid dose.

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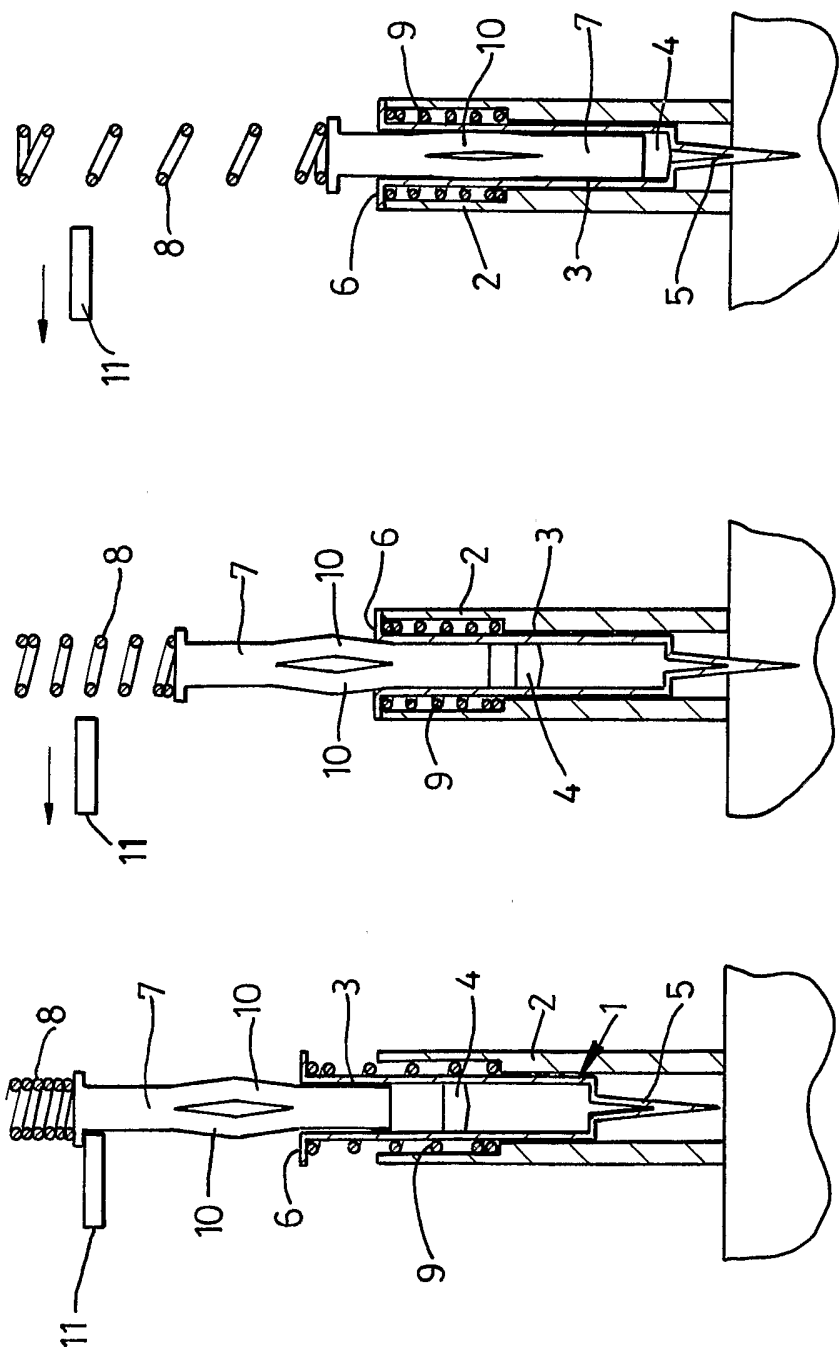


Fig. 1

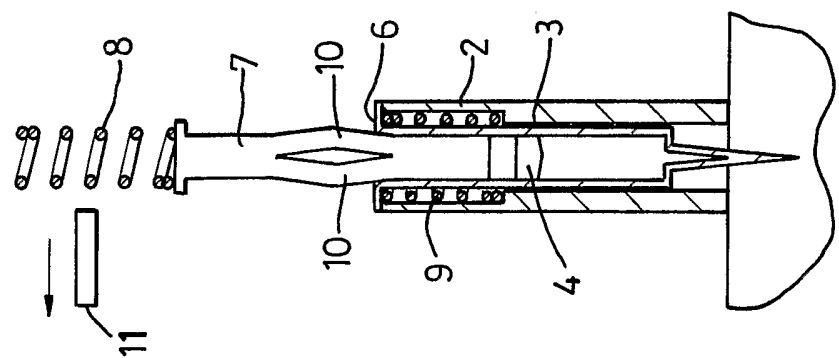


Fig. 2

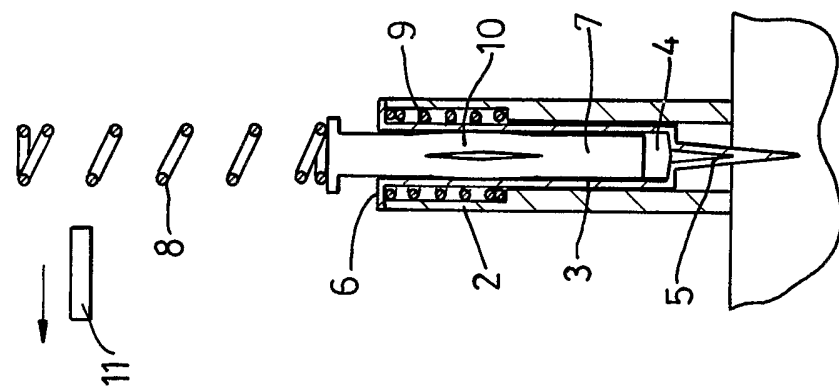


Fig. 3

INTERNATIONAL SEARCH REPORT

Int: I Application No
PCT/GB2005/002487

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61M5/20

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, 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.
X	US 3 742 948 A (POST H, NL ET AL) 3 July 1973 (1973-07-03) column 3, line 1 - column 4, line 39; figures 1-3	1-7
X	US 3 797 489 A (SARNOFF S, US) 19 March 1974 (1974-03-19) column 4, line 62 - column 5, line 62; figures 1-3	1-7
X	US 2001/005781 A1 (BERGENS THOMAS ET AL) 28 June 2001 (2001-06-28) paragraphs '0031! - '0033!; figures 1A-2G	1-7
X	GB 2 388 033 A (* PA CONSULTING SERVICES LIMITED) 5 November 2003 (2003-11-05) page 14, line 24 - line 28 page 17, line 21 - line 12; figure 6	1-7
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Int I Application No
PCT/GB2005/002487

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1 364 667 A (OWEN MUMFORD LIMITED) 26 November 2003 (2003-11-26) figures 1-4 -----	5
P,X	WO 2005/002653 A (OWEN MUMFORD LIMITED; ROLFE, STEVEN, MARK, GUY; MARSHALL, JEREMY) 13 January 2005 (2005-01-13) page 3, line 17 - page 4, line 8; figures 1-4 -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/GB2005/002487

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3742948	A	03-07-1973	NL 6912969 A	01-03-1971
			AT 312792 B	25-01-1974
			BE 755224 A1	24-02-1971
			CA 956195 A1	15-10-1974
			CH 512250 A	15-09-1971
			DE 2040076 A1	04-03-1971
			DK 126898 B	03-09-1973
			ES 382971 A1	16-12-1972
			FI 50061 B	01-09-1975
			FR 2059187 A5	28-05-1971
			GB 1327212 A	15-08-1973
			HK 38576 A	02-07-1976
			IE 35129 B1	26-11-1975
			IL 35148 A	30-06-1974
			JP 50014835 B	30-05-1975
			NO 124814 B	12-06-1972
			SE 374659 B	17-03-1975
			TR 16754 A	01-05-1973
			ZA 7004975 A	23-02-1972
US 3797489	A	19-03-1974	AR 194037 A1	12-06-1973
			AU 5179473 A	08-08-1974
			BE 795162 A1	08-08-1973
			CH 554174 A	30-09-1974
			DE 2305842 A1	16-08-1973
			DK 133327 B	03-05-1976
			FR 2171304 A1	21-09-1973
			GB 1382941 A	05-02-1975
			IT 978895 B	20-09-1974
			JP 48091885 A	29-11-1973
			NL 7301684 A	14-08-1973
US 2001005781	A1	28-06-2001	US 6270479 B1	07-08-2001
			AT 285805 T	15-01-2005
			AU 1589300 A	15-05-2000
			DE 69922992 D1	03-02-2005
			EP 1124601 A1	22-08-2001
			ES 2234321 T3	16-06-2005
			JP 2002528182 T	03-09-2002
			WO 0024441 A1	04-05-2000
			TW 445156 B	11-07-2001
GB 2388033	A	05-11-2003	AU 2003229994 A1	17-11-2003
			CA 2483935 A1	13-11-2003
			EP 1503816 A1	09-02-2005
			WO 03092771 A1	13-11-2003
			US 2005124940 A1	09-06-2005
EP 1364667	A	26-11-2003	EP 1364667 A2	26-11-2003
			DE 69822160 D1	08-04-2004
			DE 69822160 T2	30-12-2004
			DE 69829787 D1	19-05-2005
			EP 0996473 A2	03-05-2000
			WO 9903529 A2	28-01-1999
			JP 2001512038 T	21-08-2001
			US 2003093036 A1	15-05-2003
WO 2005002653	A	13-01-2005	WO 2005002653 A1	13-01-2005