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(71) Applicant *(for all designated States except US):* ANGLO INFUSER SYSTEMS LIMITED [GB/GB]; Unit 1B, Monk Road Industrial Estate, Monk Road, Alfreton, Derbyshire DE5 7RL (GB).

(72) Inventor; and
(75) Inventor/Applicant *(for US only) :* SMITH, Frank [GB/GB]; 61 Greenland Crescent, Chilwell, Nottingham NG9 5LD (GB).

(74) Agent: GOODMAN, Christopher; Eric Potter & Clarkson, 14 Oxford Street, Nottingham NG1 5BP (GB).

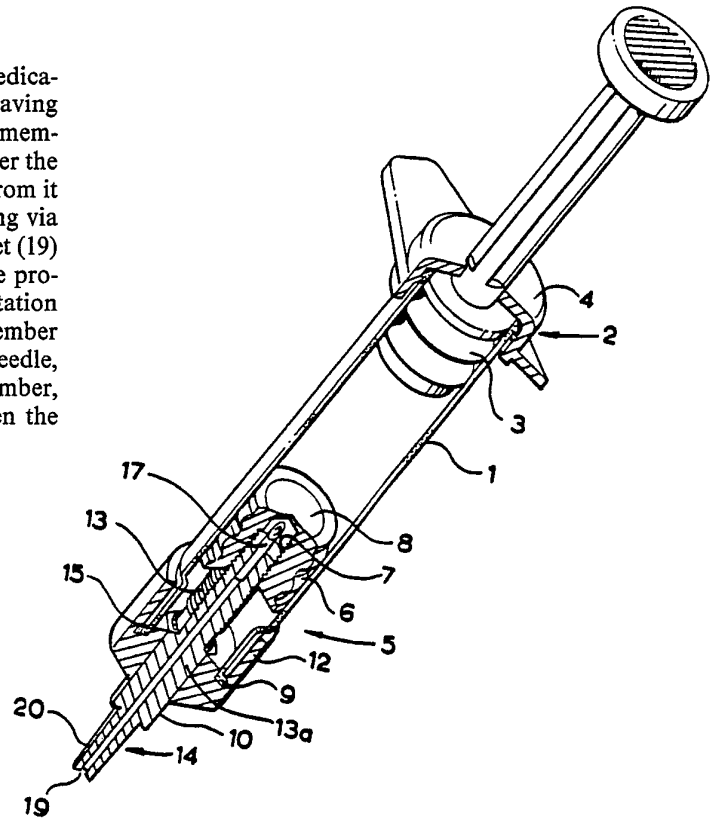
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(54) Title: FLUID INJECTOR

(57) Abstract

A fluid injector suitable for injecting medicaments into the human body comprises a tube (1) having a piston (3) slidable therein and a slidable sealing member (6) in one end thereof. A cap (10) is located over the one end and has a tubular needle (17) extending from it inwardly of the tube (1), the needle communicating via a fluid passage through the cap to an injector outlet (19) outside the tube. The cap and sealing member are provided with co-operating screw threads whereby rotation of the cap relative to the tube draws the sealing member along the tube and into engagement with the needle, which pierces a thin portion (8) of the sealing member, thereby establishing fluid communication between the interior of the tube and the injector outlet.



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FLUID INJECTOR

This invention relates to a fluid injector suitable, for example, for use in injecting medicaments.

According to the invention, a fluid injector comprises a tube having a piston slidable therein and a slidable sealing member in one end of the tube, and a cap located on the said one end of the tube and having a tubular needle extending therefrom inwardly of the tube, the needle communicating with a fluid passage through the cap to an injector outlet outside the tube, the cap and the sealing member being provided with co-operating screw threads whereby rotation of the cap relative to the tube draws the sealing member along the tube and into engagement with the needle, the sealing member having a portion thereof pierceable by the needle when the member is drawn on to the needle, thereby establishing fluid communication between the interior of the tube and the injector outlet.

Preferably, the tube and the cap are provided with co-operating formations retaining the cap on the tube but allowing rotation relative to the tube. For example, the tube may be provided on its outer surface with a circumferential groove which receives a corresponding circumferential rib on the inwardly facing surface of the cap. It is also preferable to mould the cap in a resilient material, such as a plastics material, so that the cap may be pushed on to the tube, the rib then snapping into the groove, or over and into engagement with a rib on the tube. Alternatively, the cap may be provided with a plurality of resiliently deflectable portions each having a rib portion engageable in the groove. The tube is suitably formed of a chemically-inactive glass.

The fluid injector of the invention is simple in construction and use.

Reference is made to the drawings, in which:

Figure 1 is a part-sectioned perspective view of an injector according to one embodiment of the invention; and

Figure 2 is a sectional elevation of a portion of the injector shown in Figure 1, after piercing of the seal.

The injector comprises a tube 1, suitably of glass, having in one end 2 thereof a piston or plunger 3 retained by an end cover 4 secured over the end of the tube. The opposite end 5 of the tube 1 is closed by a rubber sealing member 6, which has a threaded bore 7 therein, and one end of which includes a thin wall 8, having a thickness of 1 to 2 mm.

The tube 1 has a circumferential rib 9 around the outer surface thereof adjacent the end 5. The end 5 of the tube is enclosed within an end cap 10 which has a flange 12, extending therefrom around the circumference thereof, an externally screw-threaded core portion 13 extending in the same direction as, and coaxially with, the flange 12, and a needle-connecting portion 14 extending in the opposite direction to the core portion 13. The core and needle-connecting portions 13 and 14 are suitably moulded separately from the remainder of the cap and may then have a hexagonal section portion 13a which can be an interference fit, or be cemented into a correspondingly-shaped aperture through the cap 10. A rib 15 extends around the inwardly-directed surface of the rim 12, and can engage with the rib 9 to retain the cap 10 on the tube 1. The rib 15 and the rib 9 have tapered profiles on one side only so that the cap may readily be engaged on the tube, but may not readily be removed therefrom.

A passage 16 extends along the axis of the cap and communicates at one end with a tubular needle 17 extend-

ing from the end face 18 of the core portion 13, and at the other end with an outlet 19 at the end of the needle-connecting portion 14. The needle 17 may suitably be formed of a pharmaceutically inert plastics material. The needle-connecting portion 14 is adapted to receive thereon a hypodermic needle or the like having a moulded socket which fits tightly over the reduced-diameter section 20 of the portion 14.

In use, the injector will suitably be provided in two parts, the first of which consists of the tube 1, with the plunger 3 and sealing member 6 closing off opposite ends, the tube containing the liquid medicament to be injected, for example. The second part consists of the cap 10, to which a hypodermic needle may subsequently be fitted. The cap is pushed on to the end 5 of the tube, and being formed of a resilient plastics material, can deform outwardly to allow the rib 15 to be deflected over the rib 9 on the end of the tube 1. The cap 10 is then rotated relative to the tube and the thread thereon engages with the thread in the sealing member 6 to draw the member 6 along the tube towards the cap. As the sealing member 6 moves along the tube, the needle 17 passes through the thin wall 8, thereby allowing the liquid contained in the tube to be expelled through the passage 16 to the hypodermic needle (not shown) and into the patient, when the plunger 3 is pressed. Figure 2 shows a portion of the injector after the needle 17 has pierced the thin wall 8. Movement of the sealing member 6 along the tube 1 is limited by a shoulder 21 formed by reducing the diameter of the tube 1 over the end portion 5.

The injector of the invention may be used for the mixing of measured doses of, for example, a liquid and a powder, without risk of contamination. Two similar injectors are used, one containing the liquid and the other the powder. The needle-connecting portion 14 of the cap 10 of the liquid-containing injector is dimensioned so as

to be received within the corresponding portion 14 of the cap 10 of the powder-containing injector as a sealing fit, and a retaining clip is provided to hold the two caps in sealing engagement while liquid is injected into the powder-containing injector. After mixing, the resulting liquid may be injected by fitting a suitable hypodermic needle on to the cap 10 of the powder-containing injector, after separation of the two injectors.

CLAIMS

1. A fluid injector, comprising a tube having a piston slidable therein and a slidable sealing member in one end of the tube, and a cap located on the said one end of the tube and having a tubular needle extending therefrom inwardly of the tube, the needle communicating with a fluid passage through the cap to an injector outlet outside the tube, the cap and the sealing member being provided with co-operating screw threads whereby rotation of the cap relative to the tube draws the sealing member along the tube and into engagement with the needle, the sealing member having a portion thereof pierceable by the needle when the member is drawn on to the needle, thereby establishing fluid communication between the interior of the tube and the injector outlet.

2. A fluid injector according to Claim 1, wherein the tube and the cap are provided with co-operating formations retaining the cap on the tube but allowing rotation thereof relative to the tube.

3. A fluid injector according to Claim 2, wherein the tube is provided on the outer surface thereof with a circumferential groove which receives therein a corresponding circumferential rib on an inwardly facing surface of the cap.

4. A fluid injector according to Claim 2, wherein the tube is provided on the outer surface thereof with a circumferential rib which engages with a corresponding circumferential groove or rib on an inwardly facing surface of the cap.

5. A fluid injector according to Claim 3 or 4, wherein the cap is formed of a resilient material whereby the cap is resiliently expandable to fit the cap on to the tube.

6. A fluid injector according to Claim 3 or 4, wherein the cap is provided with a plurality of resiliently deflectable portions each bearing a portion of the rib or groove, thereby permitting the cap to be fitted on to the tube.

7. A fluid injector according to any of Claims 3 to 6, wherein the rib or ribs or the groove is shaped so as to resist removal of the cap from the tube.

8. A fluid injector according to any preceding claim, wherein the tube is formed of a chemically-inactive glass.

9. A fluid injector according to any preceding claim, wherein the sealing member is formed of rubber, the pierceable portion thereof being in the form of a thin wall.

10. A fluid injector according to Claim 9, wherein the thin wall has a thickness of 1 to 2 mm.

11. A fluid injector, substantially as described with reference to, or as shown in, the drawings.

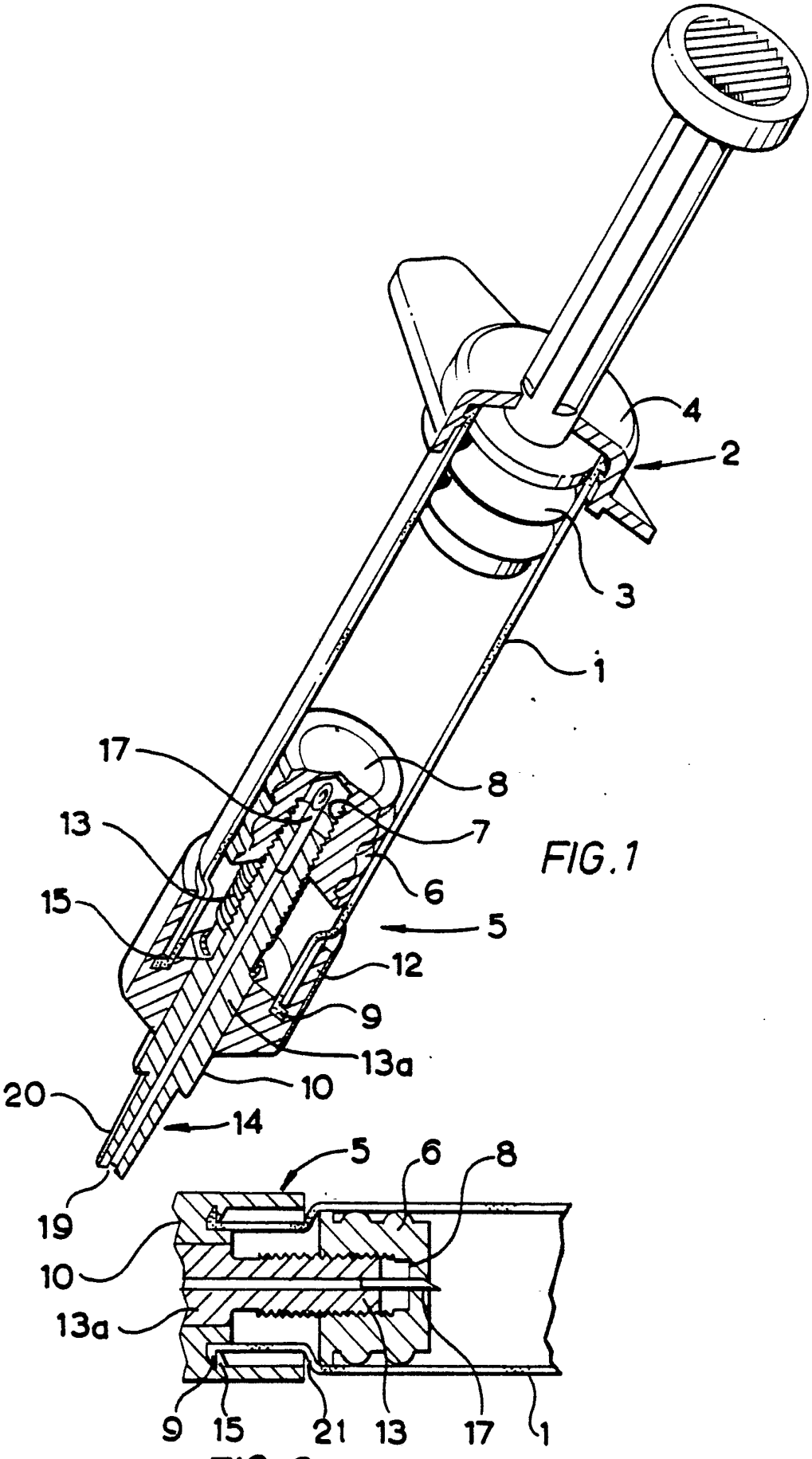


FIG. 1

FIG. 2

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 85/00355

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

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

IPC[4]: A 61 M 5/34

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[4]	A 61 M

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	US, A, 4365626 (HOUSE) 28 December 1982, see figures 1-10; column 3, line 60 - column 5, line 33	1,2,4,5,7-9
Y		3
Y	US, A, 3736932 (SATCHELL) 5 June 1973, see column 3, lines 54-56; figure 1	3
A	US, A, 3496937 (BALSON) 24 February 1970,	
A	FR, A, 2278350 (SCHWARZ) 13 February 1976,	

* Special categories of cited documents: [10]

"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.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
10th April 1986	25 AVR. 1986
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	M. VAN MOL

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

V. [X] OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE [1]

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

1. [ ] Claim numbers....., because they relate to subject matter not required to be searched by this Authority, namely:

2. [X] Claim numbers 1-11, 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 Rule PCT 6.2.a.

3. [ ] Claim numbers....., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. [ ] OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING [2]

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 of the international application.

2. [ ] As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. [ ] 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 claim numbers:

4. [ ] As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

[ ] The additional search fees were accompanied by applicant's protest.

[ ] No protest accompanied the payment of additional search fees.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/GB 85/00355 (SA 10373)

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 21/04/86

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

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A- 4365626	28/12/82	None		
US-A- 3736932	05/06/73	FR-A,B	2172101	28/09/73
		BE-A-	792131	16/03/73
		GB-A-	1375675	27/11/74
		AU-A-	4986672	13/06/74
		CA-A-	995994	31/08/76
		AU-B-	470970	08/04/76
		JP-A-	48093191	03/12/73
US-A- 3496937	24/02/70	None		
FR-A- 2278350	13/02/76	DE-A,B,C	2434046	29/01/76
		US-A-	3967621	06/07/76
		GB-A-	1511259	17/05/78