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(71) Applicant (for all designated States except US): **SMITHS  
GROUP PLC** [GB/GB]; 765 Finchley Road, London  
NW11 8DS (GB).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **HART, Steven,  
Christopher** [GB/GB]; 7 Millstream Close, Hertford,  
Hertfordshire SG14 1LJ (GB). **HILBORNE, David, Gra-  
ham** [GB/GB]; 2c Beechwood Park, Hemel Hempstead,  
Hertfordshire HP3 0DY (GB).

(74) Agent: **FLINT, Jonathan, Mcneill**; 765 Finchley Road,  
London NW11 8DS (GB).

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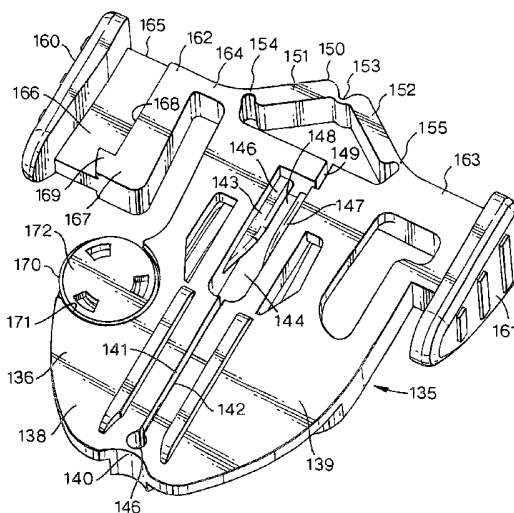
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(54) Title: INFUSION AND FLOW PREVENTERS



(57) Abstract: A syringe pump has a cover (5) enclosing a syringe (5) and mounted at its rear end (6) on the pump casing (7) by a pivotal and sliding joint (52, 53). Latches (59, 55, 60, 56) on the casing (7) hold the cover (5) closed when it is pivoted down and pushed rearwardly. The syringe (8) is connected with an infusion set tube (132) extending through a flow preventer clip (135) engaged in the forward end of the pump. The clip (135) has two arms (138) and (139) interconnected at one end (140) and separated by a slit (141). The tube (132) extends through the slit (141), which is urged closed by a U shape metal spring (137) to prevent flow along the tube. The opposite end of the arms are bridged by a V shape linkage (150). The apex (153) of the linkage (150) is engaged by a part (78) of the cover (5) when it is slid closed, thereby opening the slit (141), and allowing flow along the tube (132). A sensor (195) in the pump detects the presence of a magnet (170) on the flow preventer (135) and prevents pump operation until the flow preventer is correctly inserted.



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## **INFUSION PUMPS AND FLOW PREVENTERS**

### **Technical Field**

This invention relates to flow preventers of the kind in the form of a clip having two arms separated from one another by a slot through which a compressible tube can be extended.

### **Background Art**

Medical infusion pumps are used to supply liquid from a reservoir to a patient via a tube. Usually the tube is connected to the reservoir before the reservoir is loaded in the pump. In the case of a volumetric pump, the reservoir may be separate from the pump, the tubing connected to the reservoir being extended through a part of the pump. It is important that liquid cannot flow to the patient until the reservoir and tubing are correctly assembled with the pump. One way of preventing such flow is by means of a clip on the tubing that remains closed until opened by actuation of components of the pump, such as described in US 5017192, US 5401256 and US 5964738. A similar clip is used on the Volumetric 500 pump sold by Graseby, Inc of St Paul, Minnesota, USA. If the clip is not correctly inserted it does not actuate a switch within the pump, thereby preventing operation of the pump.

### **Disclosure of the Invention**

It is an object of the present invention to provide an alternative flow preventer and infusion pump.

According to one aspect of the present invention there is provided a flow preventer of the above-specified kind, characterised in that the clip includes a lateral actuating member extending between the two arms towards one end of the clip, and that the actuating member is movable between a first, natural position in which the two arms are relatively together and the slot is sufficiently narrow to close the tube and prevent flow along it and a second position in which the arms are relatively separated and the slot is sufficiently wide to enable flow along the tube.

The actuating member preferably includes a linkage of V shape formed by two beams attached with respective ones of the arms and attached with one another at an apex such that the two arms can be separated by pushing on the apex. The actuating member may be moulded from a plastics material integrally with the arms as a single piece. The slot preferably has an enlarged portion through which the tube can extend in an open state before use. The flow preventer preferably includes a catch member by which the flow preventer can be retained in an infusion pump, and the catch member may be mounted resiliently with one of the arms. The flow preventer may include a finger grip mounted with each arm by which the flow preventer can be handled. The flow preventer preferably includes a magnet attached therewith. The preventer may be moulded from a plastics material and include a spring wire arranged to urge the one end of the two arms together. The spring wire is preferably of U shape.

According to another aspect of the present invention there is provided an infusion administration set including a flow preventer according to the above one aspect of the invention and a tube terminated at its ends by respective connectors.

The flow preventer is preferably arranged such that the tube cannot be separated from the flow preventer without damaging the tube or flow preventer.

According to a third aspect of the present invention there is provided a medical infusion pump including a flow preventer according to the above one aspect of the invention.

According to a fourth aspect of the present invention there is provided a medical infusion pump including an infusion administration set according to the above other aspect of the present invention.

According to a fifth aspect of the present invention there is provided a medical infusion pump according to the above third or fourth aspect of the invention including a fluid reservoir, means to expel fluid from the reservoir to a tube extending through the flow preventer, and an openable cover for enclosing the reservoir, characterised in that the cover is arranged to open the flow preventer and allow flow along the tube when the cover is fully

closed and to allow the flow preventer to close when the cover is open so that fluid cannot flow along the tube.

The cover is preferably mounted with a casing of the pump such that it can be both pivoted and slid along its length, the cover preferably being elongate and mounted towards its rear end and the forward end of the cover being arranged to engage the flow preventer and open the flow preventer when the cover is slid rearwardly.

According to a sixth aspect of the present invention there is provided an infusion pump including a fluid reservoir, means to expel fluid from the reservoir to a tube, a device for preventing flow of fluid along the tube when closed and being openable when secured with the pump, characterised in that the pump includes a cover for enclosing the reservoir, that the cover is mounted for pivotal and sliding movement, and that the pump is arranged such that the device for preventing flow of fluid along the tube is located to be engaged by the cover such that it is opened to allow flow when the cover is slid to a closed, locking position.

The pump and cover preferably have cooperating latches that engage when the cover is slid to a closed position. The pump may have a surface formation arranged to engage a tube extending through the flow preventer and to displace the tube along a slot in the flow preventer when the flow preventer is inserted in the pump.

According to a seventh aspect of the present invention there is provided an infusion pump including a fluid reservoir, means to expel fluid from the reservoir to a tube, and a device for preventing flow of fluid along the tube when closed and being openable when secured with the pump, characterised in that the pump includes a non-contacting sensor responsive to proximity of the device, and that the pump is arranged to prevent expulsion of fluid from the reservoir until the sensor indicates the presence of the device.

The sensor is preferably a magnetic sensor and the device for preventing flow of fluid along the tube may include a magnet to which the sensor is responsive.

The pump is preferably a syringe pump.

A syringe pump according to the present invention will now be described, by way of example, with reference to the accompanying drawings.

#### Brief Description of the Drawings

- Figure 1 is an elevation view of the front of the pump;
- Figure 2 is an elevation view of the right-hand end of the pump;
- Figure 3 is a sectional elevation view along the axis of the syringe in the pump from the rear of the pump;
- Figure 4 is a perspective view of the upper surface of an anti free flow device used in the pump;
- Figure 5 is a perspective view of the lower surface of the device; and
- Figure 6 is a cross-sectional view from above showing the anti free flow device mounted in the pump

#### Best Modes for Carrying Out the Invention

With reference first to Figures 1 to 3, the pump has a generally rectangular shape with a substantially flat front face 1 supporting various controls 2 and a display 3. The rear surface 4 is also substantially flat and may have formations (not shown) for supporting the pump in a horizontal attitude. The upper surface of the pump is provided by a cover 5 hinged at its right-hand end 6 on the pump casing 7, which can be opened to allow access to a syringe 8 in the pump.

The cover 5 is moulded of a transparent plastics material has an inverted U shape in section and an upper surface 50, which is convex when viewed from above. Two lugs 51 depend downwardly at the right-hand end of the cover 5 on the front and rear surfaces. The

lugs 51 each have a short, elongate slot 52 extending parallel to the length of the cover, that is, in a horizontal direction when the cover is closed. The slots 52 receive respective pins 53 projecting outwardly from the pump casing 7. The shape of the pins 53 and slots are such as to allow the cover 5 to pivot about a horizontal axis through the pins and to slide a short distance along the length of the cover. The lower edge 54 of the cover on the front and rear surfaces has two L shape keyways one 55 located about midway along the cover 5 and the other 56 located towards its left-hand end. Each keyway 55 and 56 has a recess 57 located above a ledge 58 extending to the right. The keyways 55 and 56 receive corresponding L shape keys 59 and 60 projecting from the upper surface 61 of the casing 7. The keys 59 and 60 each have a short horizontal lip 61 projecting to the left and spaced a short distance above the upper surface of the casing. When the cover 5 is closed and pushed to the right, the ledges 58 of each keyway 55 and 56 move to the right under the lips 61 of each key 59 and 60 so that the keys and keyways act as latches to prevent the cover being lifted up.

The cover 5 and casing 7 include a cooperating lock mechanism 70 on the front surface between the two latches, the lock mechanism operating to prevent sliding movement of the cover to the left relative to the casing so that the keys 59 and 60 and keyways 55 and 56 cannot be disengaged. The locking mechanism 70 includes a catch 71 mounted on the casing and having an upwardly-projecting stud 72 mounted on a button 73 resiliently mounted with the casing 7 so that the button and stud are naturally in an upper position but can be pushed down by pressing down on the button. The stud 72 projects into a rectangular recess 74 on the lower edge 54 of the cover 5 as a close fit so as to prevent sliding movement of the cover along its length. Immediately above the recess 74 the cover 5 supports a rotatable catch mechanism 75, which may be of various different kinds. Typically, the mechanism includes a rotatable barrel 76 with an aperture 77 for receiving a removable key, the barrel being coupled with a pawl or the like (not shown) arranged to engage a formation on the stud 72 so as to prevent the stud being pushed down. In this way, the cover 5 can be locked down or unlocked by using the key to rotate the barrel 76 and move the pawl into an engaging or disengaging position with respect to the stud 72. The left-hand end of the cover 5, remote from the hinge, has a tongue 78 at the lower end of its end wall 79 projecting down to overlap the upper left-hand edge of the casing 7.

The upper surface 61 of the casing 7 supports a conventional syringe 8 beneath the cover 5. The syringe 8 is shown with its plunger 81 in an extended position relative to the barrel 82, that is, with the syringe full of medication. The barrel 82 is retained by a clamp 83 that grips one of the barrel ears 84. The head 85 of the plunger 81 is gripped by a plunger pusher mechanism indicated generally by the numeral 86. The pusher mechanism 86 is moved by means of a lead screw rotated by means of a motor (neither shown) in the usual manner.

It will be appreciated that the pump has various other features, such as a barrel size sensor, which are conventional and which it is not necessary to describe here in order to be able to understand the aspects of the present invention.

The forward end of the syringe barrel 82 has a conventional male luer lock fitting 130 connected to an infusion administration set 131. The set 131 comprises a length a flexible, compressible tubing 132, typically with an external diameter of about 2.5mm, a female luer connector 133 at one end, a connector 134 at its opposite end for connection to a suitable catheter (not shown) and an anti free flow device or clip 135. The female luer connector 133 is similar to conventional female luer connectors except that it has been modified to shorten the end attached with the tubing 132, the purpose of which will become apparent later.

The anti free flow device 135 is shown most clearly in Figures 4 and 5. The device 135 is in the form of a clip comprising two components namely a plastics moulding 136 and a metal spring 137 secured to the underside of the moulding. The moulding 136 has a generally U shape with two forwardly-extending side arms 138 and 139 joined together at their rear end by an integral, resilient web 140. The arms 138 and 139 are separated from one another along their length by a central slot 141 that extends through the thickness of the moulding 136 and substantially the length of the clip 135. The slot 141 is closed at its rear end by the web 140 and is formed with a small diameter enlarged region 142 of circular shape. The rear portion 142 of the slot 141 extends along about half its length and is relatively narrow. The rear portion 142 opens into a clamping portion 143 towards the forward end of the clip, which has a relatively wide entrance portion 144. Forwardly of the entrance portion 144, the slot 141 has two clamping jaws 146 and 147 of reduced thickness and which taper at their rear end.



The gap 148 between the two jaws 146 and 147 forms a clamping region. The forward end of the slot 141 opens between the two arms 138 and 139 via a dog-leg portion 149. The arms 138 and 139 are interconnected with one another at their forward end by a flexible linkage 150 formed as an integral part of the moulding and extending between outer regions of the arms. The length of the linkage 150 exceeds the distance between its two ends so that it has a V shape, projecting outwardly of the clip, similar to an arrow head. The linkage 150 comprises two rigid beams 151 and 152 forming the two arms of the V, which are connected at the apex by a thinner flexure section 153. The opposite ends of the beams 151 and 152 are connected to the arms 138 and 139 by similar flexure sections 154 and 155.

At its forward end, the clip 135 also has two finger grips 160 and 161 on opposite sides and supported by the forward end of the arms 138 and 139 respectively. The finger grips 160 and 161 are triangular and extend in a vertical plane parallel to the front and rear faces 1 and 4 of the pump. The finger grips 160 and 161 are supported by lateral extensions 162 and 163 of the arms 138 and 139 respectively. The extension 162 supporting the left-hand finger grip 162 has a resilient neck portion 164 of reduced width at its forward end adjacent the arm 138. The neck portion connects with a rigid, rearwardly-extending rectangular bar 165. The bar 165 is divided across its width into two regions 166 and 167 of different thickness by a step 168 on both its upper and lower surfaces, the region 166 adjacent the finger grip 160 being thinner than that adjacent the arm 138. The steps 168 on both surfaces are formed at their rear ends with a triangular catch formation 169. The extension 163 supporting the opposite finger grip 161 takes the form of a simple rigid bar.

The nature of the clip 135 is such that the arms 138 and 139 naturally extend parallel to one another and the linkage 150 projects outwardly. However, if the apex of the linkage 150 is pressed in, that is, rearwardly, it slightly separates the forward ends of the arms 138 and 139, opening the slot 141, so that the arms hinge away from one another at a small angle about the resilient web 140.

The clip 135 also includes a small permanent magnet 170 of disc shape located in a circular recess 171 about midway along the length of the arm 138 and held in place by a snap-fitted plastics cap 172.

The upper surface of the clip 135 is flat whereas the lower surface is shaped to retain the metal spring 137, which is in the form of a wire of circular section bent into a U shape. In particular, the lower surface has a generally U shape recess 180 extending around a central promontory 181 having two laterally-extending, undercut projections 182 and two small contact pips 183 on each side. The free ends of the spring 137 bear on the contact pips 183 applying a force resisting outward displacement of the arms 138 and 139 away from one another. The spring 137 is retained on the moulding 136 by engagement of the two arms of the spring under the undercut of the lateral projections 182.

The infusion administration set 131 is supplied with the tubing 132 extending through the wider, entrance portion 144 of the slot 141, the size of which is sufficient to receive the tubing without deforming it from its natural open passage. The female luer connector 133 on the infusion set 131 is usually connected to the syringe 8 before the syringe is loaded in the pump. After the syringe 8 has been correctly loaded, the finger grips 160 and 161 of the clip 135 are held between thumb and forefinger so that it can be pushed into a slot 190 in the left-hand end wall of the casing 7 just below its upper surface. The catch formations 169 deflect inwardly as they ride over cooperating surface formations 269 in the slot 190 causing the left-hand finger grip 160 to flex inwardly about the neck portion 164. The left-hand finger grip 160 then snaps outwardly with catches 169 engaged behind the surface formations 269 to give an audible and tactile confirmation of correct insertion. The engagement provided by the catches 169 is sufficient to prevent accidental removal of the clip 135.

When the clip 135 is fully inserted in the slot 190 the two finger grips 160 and 161 lie approximately level with the front and rear faces 1 and 4 of the pump casing 7.

The slot 190 has an upper abutment provided by an edge 191 and a lower abutment provided by a sloping surface 192 inclined at an angle of about 45°. The extent of insertion of the tubing 132 is limited by contact with the upper and lower abutments 191 and 192 so that it is pushed into the clamping region 148 as the clip 135 is inserted. The natural width of the clamping region 148 is such that the tubing 132 is squeezed closed between the two jaws 146 and 147 on the arms 138 and 139.

When the clip 135 has been fully inserted into the slot 190, the magnet 170 is positioned above a reed switch 195 or other detector, such as a Hall effect switch, which provides an output to a pump control unit 93 indicating correct insertion of the clip. The pump will not operate to dispense medication from the syringe 8 until the control unit 93 receives the appropriate output from the reed switch 195.

In order to ensure that the tubing 132 is not kinked within the pump, there must be sufficient clearance between the female luer connector 133 and the inside of the cover 5 for the tubing to take up a smooth curve from the connector to the clip 135. The relatively short length of the female luer connector 133 enables this spacing to be provided in a pump that is shorter than would otherwise be the case.

The clip 135 remains closed, preventing flow of fluid through the tubing 132, until the cover 5 is fully closed. When the cover 5 is hinged down, the tongue 78 at its free end projects down a short distance beyond the apex of the linkage 150 of the clip 135. When the cover 5 is slid into its latching position, its tongue 78 contacts the linkage 150 and pushes its apex inwardly, thereby increasing the angle at the apex, pushing the two arms 138 and 139 away from one another and increasing the width of the clamping region 148 of the slot 141. The increased width of the slot 141 in the clamping region 148 is sufficient to ensure unimpeded flow of fluid along the tubing 132. When the cover 5 is opened to gain access to the syringe 8, it can be seen that this will allow the arms 138 and 139 of the clip 135 to close, thereby automatically closing the tubing 132 and preventing further medication being dispensed. The clip 135 can be removed from the casing 7 by squeezing the finger grips 160 and 161 slightly together to release the catches 169 and enable it to be pulled out.

Because the slot 141 is closed at one end 140 and the linkage 150 extends between the two arms 138 and 139 at the other end, the tubing 132 cannot be separated from the clip 135. The dog-leg formation 149 of the slot 141 also prevents the tubing 132 being accidentally pulled out of the slot. The space between the linkage 150 and the ends of the arms 138 and 139 is smaller than the width of the connectors 133 and 134 such that the connectors cannot be pulled through the space. Thus, the clip 135 cannot be removed from the tubing 132

without cutting the clip or tubing; similarly new tubing could not be inserted in the clip. This ensures that the clip is not reused so there is no risk of a clip, weakened through repeated use, being reused. It will be appreciated that this anti free flow clip could be used in other forms of pump, such as in volumetric infusion pumps having peristaltic pumping mechanisms.

The present invention can be used to provide a very compact syringe pump.

CLAIMS

1. A flow preventer (135) in the form of a clip having two arms (138 and 139) separated from one another by a slot (141) through which a compressible tube (132) can be extended, characterised in that the clip (135) includes a lateral actuating member (150) extending between the two arms (138 and 139) towards one end of the clip, and that the actuating member is movable between a first, natural position in which the two arms (138 and 139) are relatively together and the slot (141) is sufficiently narrow to close the tube (132) and prevent flow along it and a second position in which the arms (138 and 139) are relatively separated and the slot (141) is sufficiently wide to enable flow along the tube (132).
2. A flow preventer according to Claim 1, characterised in that the actuating member includes a linkage (150) of V shape formed by two beams (151 and 152) attached with respective ones of the arms (138 and 139) and attached with one another at an apex (153) such that the two arms can be separated by pushing on the apex.
3. A flow preventer according to any one of the preceding claims, characterised in that the actuating member (150) is moulded from a plastics material integrally with the arms (138 and 139) as a single piece.
4. A flow preventer according to any one of the preceding claims, characterised in that the slot (141) has an enlarged portion (144) through which the tube (132) can extend in an open state before use.
5. A flow preventer according to any one of the preceding claims, including a catch member (169) by which the flow preventer (135) can be retained in an infusion pump.
6. A flow preventer according to Claim 5, characterised in that the catch member (169) is mounted resiliently with one of the arms (138).

7. A flow preventer according to any one of the preceding claims, including a finger grip (160, 161) mounted with each arm (138, 139) by which the flow preventer (135) can be handled.
8. A flow preventer according to any one of the preceding claims including a magnet (170) attached therewith.
9. A flow preventer according to any one of the preceding claims, characterised in that the preventer is moulded from a plastics material and includes a spring wire (137) arranged to urge the one end of the two arms (138 and 139) together.
10. A flow preventer according to Claim 9, characterised in that the spring wire (137) is of U shape.
11. An infusion administration set including a flow preventer (135) according to any one of the preceding claims and a tube (132) terminated at its ends by respective connectors (133 and 134).
12. An infusion administration set according to Claim 11, characterised in that the flow preventer (135) is arranged such that the tube (132) cannot be separated from the flow preventer without damaging the tube or flow preventer.
13. A medical infusion pump including a flow preventer (135) according to any one of Claims 1 to 10.
14. A medical infusion pump including an infusion administration set according to Claim 11 or 12.
15. A medical infusion pump according to Claim 13 or 14 including a fluid reservoir (8), means (86) to expel fluid from the reservoir to a tube (132) extending through the flow preventer (135), and an openable cover (5) for enclosing the reservoir, characterised in that the cover (5) is arranged to open the flow preventer (135) and

allow flow along the tube (132) when the cover (5) is fully closed and to allow the flow preventer (135) to close when the cover (5) is open so that fluid cannot flow along the tube (132).

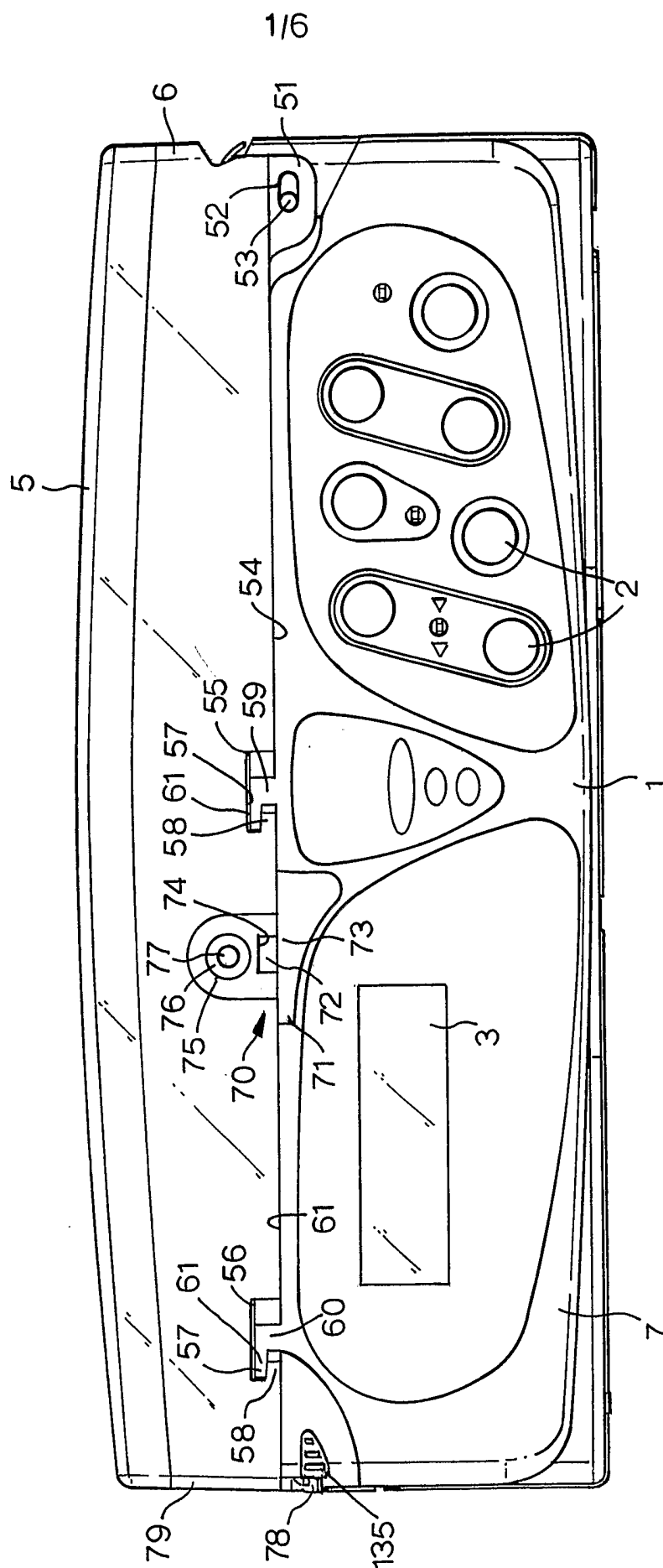
16. A pump according to Claim 15, characterised in that the cover (5) is mounted with a casing (7) of the pump such that it can be both pivoted and slid along its length.
17. A pump according to Claim 16, characterised in that the cover (5) is elongate and is mounted towards its rear end (6), and that the forward end (78) of the cover is arranged to engage the flow preventer (135) and open the flow preventer when the cover is slid rearwardly.
18. An infusion pump including a fluid reservoir (8), means (86) to expel fluid from the reservoir to a tube (132), a device (135) for preventing flow of fluid along the tube (132) when closed and being openable when secured with the pump, characterised in that the pump includes a cover (5) for enclosing the reservoir (8), that the cover (5) is mounted for pivotal and sliding movement, and that the pump is arranged such that the device (135) for preventing flow of fluid along the tube (132) is located to be engaged by the cover (5) such that it is opened to allow flow when the cover is slid to a closed, locking position.
19. A pump according to any one of Claims 16 to 18, characterised in that the pump and cover (5) have cooperating latches (59, 55 and 60, 56) that engage when the cover is slid to a closed position.
20. A pump according to any one of Claims 13 to 19, characterised in that the pump has a surface formation (191, 192) arranged to engage a tube (132) extending through the flow preventer (135) and to displace the tube along the slot (141) in the flow preventer when the flow preventer is inserted in the pump.
21. An infusion pump including a fluid reservoir (8), means (86) to expel fluid from the reservoir to a tube (132), and a device (135) for preventing flow of fluid along the

tube (132) when closed and being openable when secured with the pump, characterised in that the pump includes a non-contacting sensor (195) responsive to proximity of the device (135), and that the pump is arranged to prevent expulsion of fluid from the reservoir (8) until the sensor (195) indicates the presence of the device (135).

22. An infusion pump according to Claim 21, characterised in that the sensor is a magnetic sensor (195).
23. An infusion pump according to any one of Claims 13 to 22, characterised in that the device (135) for preventing flow of fluid along the tube (132) includes a magnet (170) to which the sensor (195) is responsive.
24. A pump according to any one of Claims 13 to 23, characterised in that the pump is a syringe pump.



**Fig. 1.**



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Fig.2.

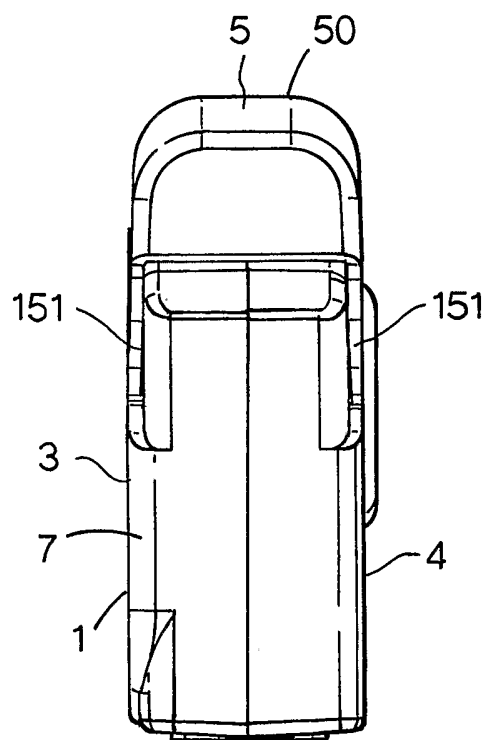
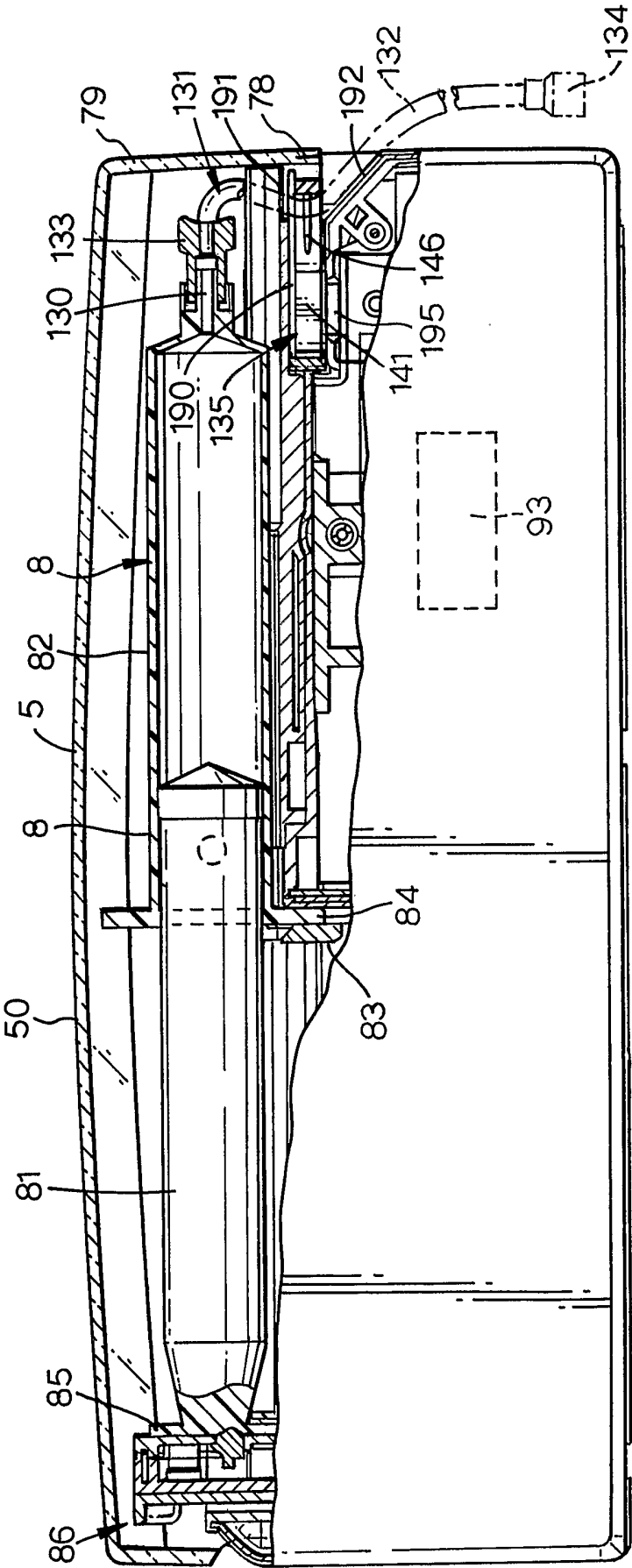
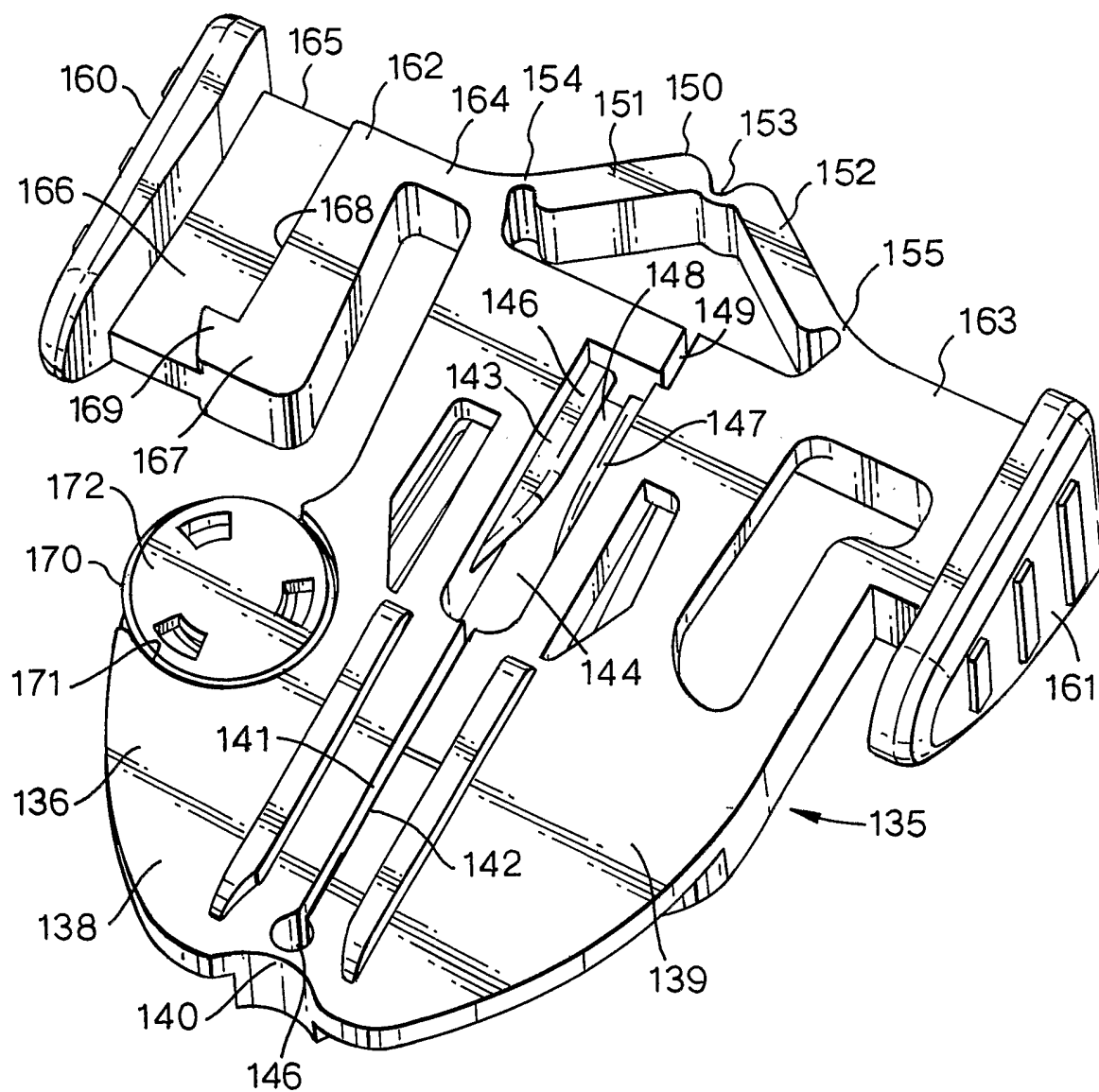


Fig.3.



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Fig.4.



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Fig.5.

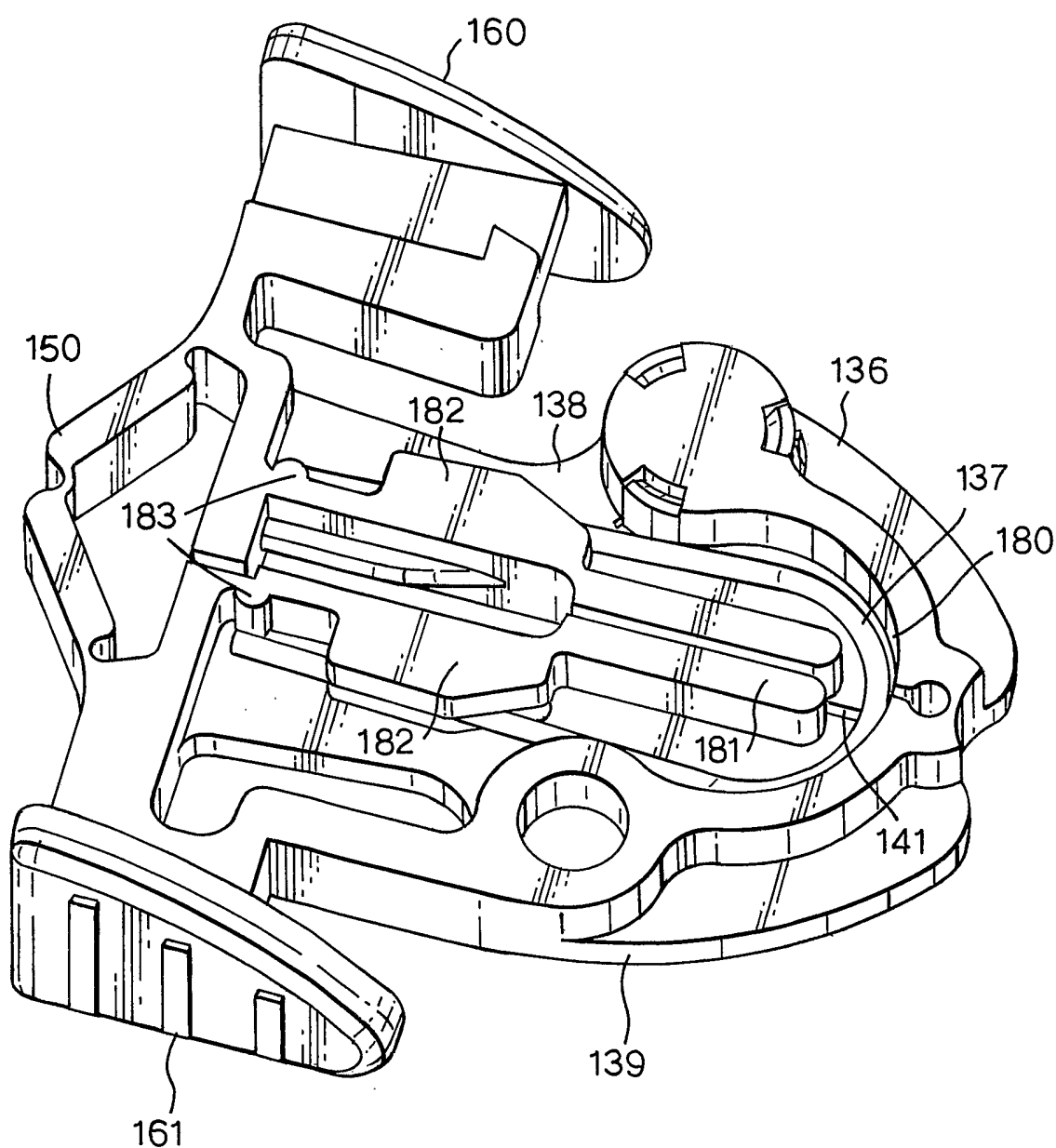
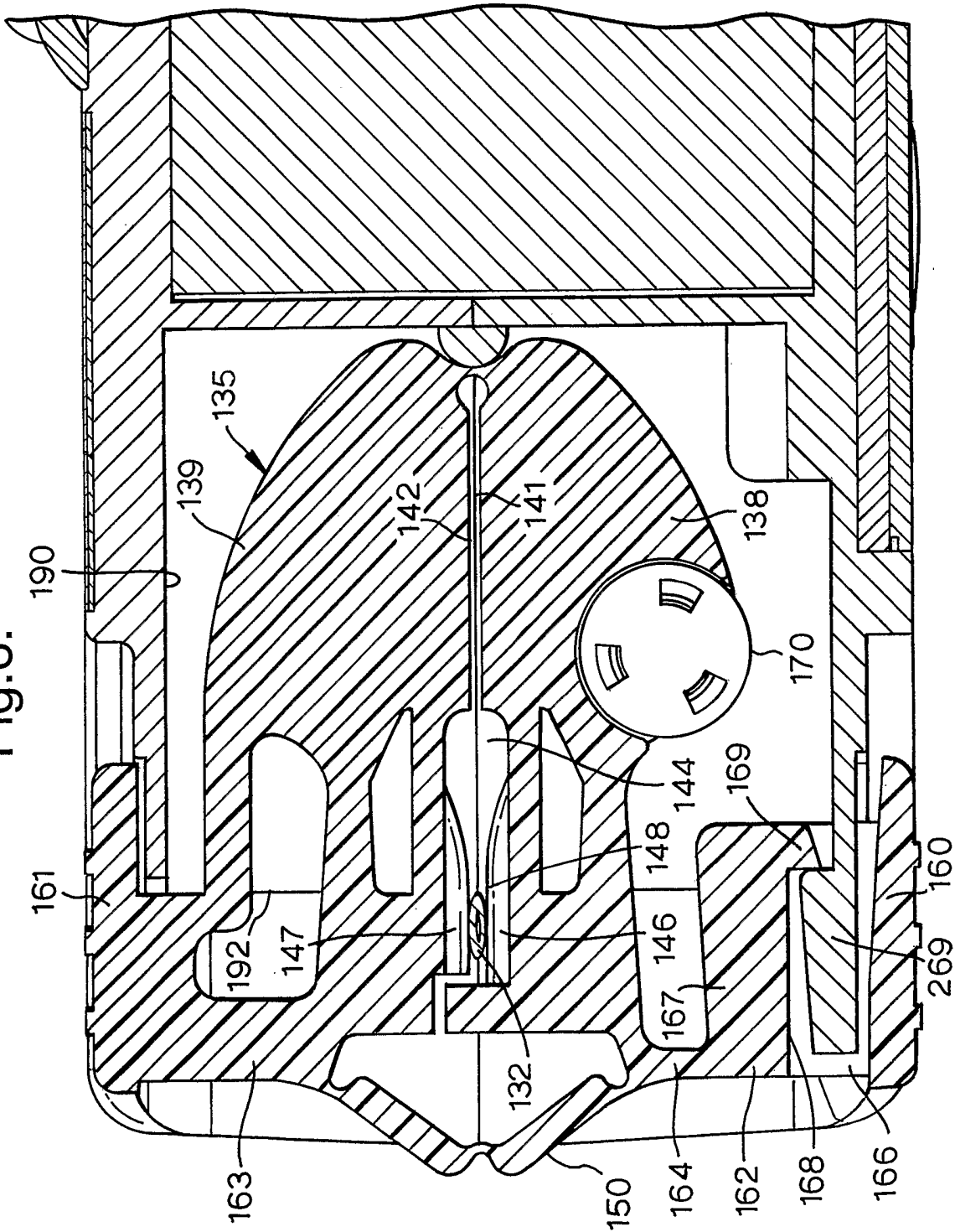


Fig.6.



# INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 A61M39/28 A61M5/142

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)

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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)

EP0-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 944 485 A (BACHER FRED W ET AL) 31 July 1990 (1990-07-31)  column 3, line 3 - line 39 column 4, line 52 -column 5, line 6 column 6, line 25 - line 29 figures 1-7  ---	1,5,7, 9-11,13, 14
X	US 5 017 192 A (DODGE LARRY H ET AL) 21 May 1991 (1991-05-21) cited in the application column 2, line 57 -column 5, line 24; figures 1-4  ---	1,4-11, 13-23
X	US 5 865 813 A (CUNNINGHAM ROBERT M ET AL) 2 February 1999 (1999-02-02) abstract; figures 1,2,10-12  ---  -/-	1-3



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

16 September 2003

Date of mailing of the International search report

24/09/2003

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

Schönleben, J

# INTERNATIONAL SEARCH REPORT

Int'l Application No  
PCT/GB 03/02741

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	US 2002/161333 A1 (LUTHER RONALD B) 31 October 2002 (2002-10-31) figures 1,2 ----	1
A	US 4 473 369 A (BELLOTTI MARC ET AL) 25 September 1984 (1984-09-25) column 4, line 63 - line 68; figures 1,2 ----	2-4,11
A	US 6 261 262 B1 (HALL ALLEN C ET AL) 17 July 2001 (2001-07-17) abstract; figures 1,2 ----	11-14
A	US 5 954 485 A (JOHNSON JAY GREGORY ET AL) 21 September 1999 (1999-09-21) column 4, line 11 - line 20 -----	24



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/GB 03/02741

### 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.:  
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:
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 II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

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

see additional sheet

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.

## INTERNATIONAL SEARCH REPORT

International Application No. PCT/GB 03 02741

### FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-17,19,20,23,24

Flow preventer in the form of a clip and infusion set and infusion pump comprising such a flow preventer

2. Claims: 18-20

Infusion pump comprising a cover mounted for pivotal and sliding movement and a flow preventer located to be engaged by the cover

3. Claims: 21-24

Infusion pump comprising a contacting sensor responsive to proximity of a flow preventer arranged in the infusion pump

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 03/02741

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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