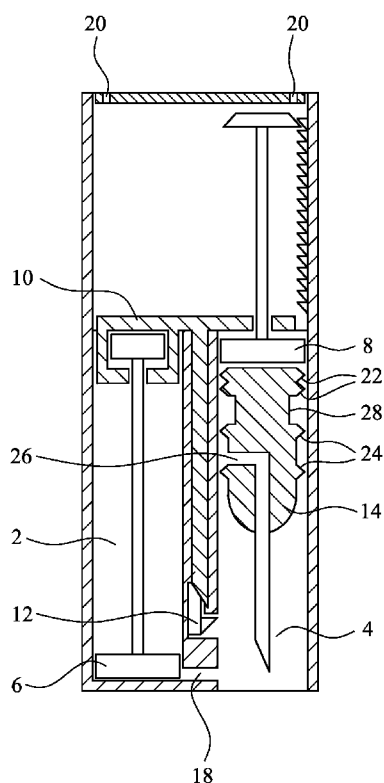




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[Continued on next page]

(54) Title: SYRINGE



(57) Abstract: A safety syringe designed to prevent an accidental needle prick after use, where the needle assembly is automatically retracted after use into a laterally attached safety compartment. Retraction of the needle assembly is accomplished from minimal moving parts according to a simple design. In some embodiments a vacuum is used to retract the needle assembly in others a spring or elastic material is used.

FIG. 3



HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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Syringe

This invention relates generally to a safety syringe of the type for use with a hollow needle. After use of the syringe the needle and assembly are retracted into a separate storage
5 chamber, specifically not the syringe fluid chamber and not the fluid plunger, thereby preventing accidental pricking after use and making the syringe so it cannot be re-used. The retraction of the needle and assembly is effected by the creation of a vacuum and/or applying torsion to a spring or elastic material during the normal operation of the syringe. A syringe of this general type is sometimes referred to as a "retractable syringe"; what is meant by this term
10 is that the needle retracts within the body of the syringe.

It is well known that many dangerous communicable diseases are spread through contacting the body fluids of an infected person. After use of a syringe, residual body fluids are likely to remain on or within the syringe needle. For this reason, syringes are typically intended for a
15 single use only. In order to be handled safely after use, the needle of a syringe must be covered to prevent it from accidentally pricking a person who is, for example, collecting the syringe for disposal, thereby releasing residual body fluids into such person. Typically, a protective cap is provided with the syringe, which after use of the syringe, can be used to cover the tip of the needle. However, it sometimes happens that persons attempting to cap a
20 used needle miss the cap and accidentally stab themselves, resulting in potential exposure to communicable diseases. Further, spread of communicable and dangerous diseases is effected by drug-addicted individuals sharing and re-using needles and syringes intended for single use. There have been several attempts to address this problem by incorporating into syringes, mechanisms for retracting the needle into the syringe following use and thereby preventing re-
25 use.

U.S. Patent No. 5,334,155 (Sobel, 2 August 1994) discloses a needle guard comprising an evacuated double walled protective sheath. Before use, the partial vacuum within the protective sheath causes the sheath to fold inwardly upon itself so that the needle extends
30 beyond the protective sheath and may be used for injections. Subsequent to injection, the double wall of the protective sheath can be breached in one place so that the inside of the protective sheath reaches atmospheric pressure. The protective sheath then extends to cover the projecting needle. However, the protective sheath may interfere with use of the syringe as it may obstruct the view of the point the needle is to be inserted into the patient. In addition, it
35 is inconvenient to use; after injection, the user must change the user's hand position on the syringe in order to breach the double wall and activate the sheath. In this manner activation of the safety mechanism is not automatic following injection of the medicament.

The protective safety device shown in U.S. Patent No. 5,188,614 (Hart, 23 February 1993) is a hollow cylindrical casing that encompasses the syringe. A dual component foaming agent is disposed at the downstream end of the casing. Following injection, the two components of the dual component foaming agent are mixed, creating an expanding foam mixture that forces the syringe back within the casing and encompasses the needle. However, this device suffers from the disadvantages that the casing may interfere with the use of the syringe in making injections as it is designed to fit over a conventional syringe thereby changing the size and feel of the device as compared to a conventional syringe. In addition, a considerable amount of material is necessary in order to make the protective sheath, increasing the expense of both making and disposing of the device.

U.S. Patent No. 6,193,695 (Rippstein, 27 February 2001) discloses a safety syringe comprising a vacuum chamber on the upstream side of the plunger head. Following injection of medicament, the plunger head engages the needle head, the ambient atmospheric pressure external to the needle head acts on the needle head, forcing the needle and plunger back against the vacuum into the syringe body. The plunger arm may then be snapped off by the user to prohibit further use of the needle. This device suffers from the disadvantage that accidental re-extension of the needle is possible if the plunger arm is not snapped off by the user. A further disadvantage of this device is that if the user does not apply a constant injection force, there is the possibility that the plunger will retract under the vacuum before the medicament is completely injected, thereby causing the syringe to work in reverse especially when clearing an air bubble in the fluid.

U.S. Patent No. 6,413,236 (Van Dyke, 2 July 2002) discloses a safety syringe comprising a vacuum chamber on the upstream side of the plunger head. Following injection of medicament, the plunger head engages the needle head, and the ambient atmospheric pressure external to the needle head acts on the needle head, forcing the needle and plunger back against the vacuum into the syringe body. In this patent, in contrast to U.S. Patent No. 6,193,695, the needle is lodged in the syringe body at an angle so that the piercing tip end of the needle is pressed against the inner surface of the syringe prohibiting re-extension of the needle even though the plunger arm is fully extended outside the syringe body. However, this device still has the disadvantage that if the user does not apply a constant injection force, there is the possibility that the plunger will retract under the vacuum before the medicament is completely injected, thereby causing the syringe to work in reverse especially when clearing an air bubble in the fluid.

There are other designs where a vacuum is pre-formed at manufacturing stage in the plunger body. However this adds a manufacturing cost and there is a loss of vacuum over time which means the product has a shelf life and therefore cannot be described as totally reliable.

A syringe designed to provide an optimal solution to the problem of prevention of accidental needle pricking after the use of the syringe for injection would include the following characteristics:

- 5 1. The syringe mechanism should be relatively simple, in that it should be made from as few parts as possible, consistent with its design objectives, and should be simple to operate with no training required for use.
- 10 2. The syringe mechanism should reliably retract the needle so that accidental pricking is prevented.
- 15 3. The syringe should be as inexpensive to manufacture as possible.
- 15 4. There should be as little waste as possible from plastics and other materials on disposal of the redundant syringe.
- 20 5. Safety-related means should not appreciably interfere with the feel of the syringe in the user's hand.
- 20 6. Once the needle has been retracted, a reliable safety device should prevent the needle from becoming once again exposed.
- 25 7. The syringe should be ergonomically designed to give easier use and thus less suffering to the patient.

It is an object of one or more aspects of the present invention to provide an improved syringe with a retractable-needle that also achieves one or more of at least the objectives stated above as numbers 1 to 7 thereby solving one or more of the problems of the prior art.

- 30 According to a first aspect of the present invention, there is provided a syringe comprising a barrel and a needle assembly, the barrel comprising a fluid compartment and a safety compartment, the fluid compartment being operable to store fluid for dispensing from the syringe and the safety compartment being operable to store the needle assembly after use of the syringe.

35

Advantageously, the present invention proposes a syringe fitted with a conventional fluid compartment and separate safety compartment, after use the whole needle assembly will be drawn into the safety compartment such that the needle cannot prick anybody and the syringe cannot be re-used.

Preferably the fluid compartment and the safety compartment are distinct and separate, preferably the fluid compartment and the safety compartment are laterally displaced from one another, preferably the two compartments are arranged side by side,

5

Preferably the safety compartment is sized so as to completely house the needle arrangement, suitably without any needle protrusion from the compartment. Preferably the safety compartment is sized to accommodate any needle size that may be used within the needle arrangement.

10

Suitably, as is known in the art of syringes, the fluid compartment comprises a fluid plunger operable to draw fluid into the fluid compartment and to dispense fluid from the fluid compartment.

15 Preferably, the safety compartment comprises a safety plunger operable to create a retracting force within the safety compartment, preferably the retracting force is created between the safety plunger and the needle assembly

Preferably the retracting force is provided by a vacuum and/or elastic tension and suitably said
20 force acts on the needle assembly.

In an embodiment where the retracting force is provided by elastic tension, preferably the elastic tension is created by any means capable of elastically deformable movement, for example a spring, or rubber member.

25

Preferably the safety plunger is operable to be moved from a first downward position to a second upward position, wherein in the first position no retracting force is present in the safety compartment, and wherein in the second position a maximum retracting force is present in the safety compartment and acting on the needle assembly.

30

Suitably, the fluid plunger is also operable to be moved between a first downward position and a second upward position, wherein in the first position the fluid compartment is empty and in the second position the fluid compartment is full.

35 The fluid in the fluid compartment may be a gas and/or liquid, preferably the fluid is a liquid, more preferably a liquid for providing relief from and/or treatment and/or diagnosis of a disease.

Optionally, the syringe may be provided with the fluid compartment pre-filled, and suitably with the fluid plunger thereby in the second upward position ready for use.

Alternatively, a user may actuate the fluid plunger from the first position to the second position
5 to draw fluid into the fluid compartment via the needle assembly.

In both cases, once filled, the user suitably actuates the fluid plunger from the second upward position to the first downward position to dispense fluid from the syringe via the needle assembly.

10

Preferably, unlike the fluid plunger, the safety plunger can only be moved from the first downward position to the second upward position.

Preferably the safety plunger and the fluid plunger are moveable from the first downward
15 position to the second upward position together, preferably the plungers are moved together by a connecting plate.

Preferably the connecting plate allows the upward and downward movement of the fluid plunger between the first and second positions, but only allows the upward movement of the
20 safety plunger therewith.

Preferably the connecting plate therefore allows the fluid plunger to move independently of the safety plunger in downward movement. Preferably, the connecting plate comprises an aperture that allows engagement of both plungers in upward movement, and disengagement
25 of the safety plunger in downward movement.

Preferably the safety plunger is held at the second upward position by a ratchet as it is moved upwards,

30 Preferably, therefore, the safety plunger is restricted to upward movement, whilst the fluid plunger is capable of upward and downward movement as in a traditional syringe.

Advantageously, as the fluid plunger is drawn upwards to fill the fluid compartment with fluid, the safety plunger is simultaneously drawn upwards to create the retracting force within the
35 safety compartment. The safety plunger is then held at the second upward position and maintains the retracting force within the safety compartment as fluid is dispensed from the syringe by depression of the fluid plunger down to the first position.

Preferably the syringe further comprises a release mechanism operable to release the needle assembly into the safety compartment for storage therein, suitably for storage therein after use of the syringe.

- 5 Preferably the release mechanism comprises a retaining clip and an actuating bar.

Preferably the release mechanism is contained within a central portion of the syringe, the central portion preferably being located between the fluid compartment and the safety compartment. More preferably the actuating bar is located within a groove in the central
10 portion of the syringe and the retaining clip is located at the base of said groove.

Preferably the actuating bar is operable to be moved by the connecting plate, preferably the actuating bar is slideably retained in the groove, and moved therein by the connecting plate.

- 15 Preferably the actuating bar is operable to be moved between a first downward position and a second upward position together with the fluid plunger, preferably via the connecting plate.

Preferably in the first downward position the actuating bar engages with the retaining clip and in the second upward position the actuating bar disengages the retaining clip.
20

Preferably in the first downward position, the retaining clip is in turn disengaged with the needle assembly, and in the second upward position the retaining clip is engaged with the needle assembly.

- 25 Preferably therefore, in the second upward position, the actuating bar is disengaged from the retaining clip and the retaining clip is engaged with the needle assembly to thereby retain the needle assembly outside of the safety compartment.

Preferably therefore, in the first downward position, the actuating bar is engaged with the
30 retaining clip and the retaining clip is disengaged from the needle assembly to thereby release the needle assembly into the safety compartment.

Advantageously, during normal use of the syringe, as the fluid is drawn into the fluid compartment and as it is dispensed from the fluid compartment by movement of the fluid
35 plunger, the needle assembly is held outside the safety compartment and exposed by the retaining clip. However, as soon as all of the fluid is dispensed from the fluid compartment and the fluid plunger and connecting plate are fully depressed in the first downward position, the actuating bar engages with the retaining clip and releases the needle assembly, which is then

drawn into the safety compartment by the retracting force thereon such that the needle assembly is no longer exposed.

5 Preferably the needle assembly comprises a head and a needle, preferably the head is operable to fit within the syringe, more preferably within the safety compartment of the syringe.

Preferably the needle assembly is operable to be clipped into the syringe, preferably the safety compartment, by engagement with the retaining clip.

10 Preferably the head of the needle assembly comprises one or more protrusions. Preferably the protrusions are annular. Preferably the protrusions extend from the head at least at two points, to form a channel. Preferably the channel is annular. Preferably the channel is operable to engage the retaining clip, more preferably the channel and protrusions either side thereof allow the retaining clip to grip the needle assembly.

15 In some embodiments, the one or more protrusions form a seal against the inside walls of the safety compartment, thereby maintaining the vacuum within the safety compartment. In such embodiments, preferably the protrusions are formed from a sealing material, such as for example a rubber or plastic material.

20 In some embodiments, the needle assembly may comprise an elastic member attached to the the top of the head thereof and connecting the needle assembly to the underside of the safety plunger.

25 Preferably the needle assembly further comprises a port for allowing fluid to be drawn into and dispensed from the fluid compartment and out through the needle. Preferably the assembly port is located substantially through the head and is in fluid communication with the fluid compartment and the needle, specifically the needle aperture.

30 Preferably the fluid compartment comprises a corresponding fluid port. Preferably the fluid port is positioned at the base of the fluid compartment, and extends through the centre portion into the safety compartment, preferably the fluid port aligns substantially with the assembly port in the head of the needle assembly. Preferably therefore a fluid path from the fluid compartment, into the head of the needle and out of the needle is established.

35 Preferably the fluid port and the assembly port are aligned and located within the channel of the head of the needle assembly, and between the protrusions thereof. Suitably, therefore, the protrusions form a sealed channel therebetween in which the fluid is transported from the fluid compartment to the needle without the fluid exiting the head of the needle assembly.

Advantageously, therefore the needle assembly helps to maintain the retracting force within the safety compartment and acts to isolate the fluid communication from the fluid compartment to the needle to minimise contamination. Furthermore, the retaining clip and needle assembly
5 allows simple installation of the needle assembly by pushing the syringe onto the head of the needle assembly.

Suitably, the needle assembly is loaded into the base of the safety compartment for retraction therein after use, suitably therefore the needle assembly is laterally displaced from the fluid compartment, yet suitably in fluid communication therewith via the assembly port and the fluid
10 port.

Optionally, the syringe may further comprise a cap for positioning over the safety compartment after the needle assembly has been retracted.

15 According to a second aspect of the present invention there is provided a needle assembly for use with the syringe according to the first aspect.

Preferred features of the needle assembly are as defined above in relation to the first aspect.

20 According to a third aspect of the present invention, there is provided a kit for administering a fluid to a user comprising:

- (a) A syringe as defined in relation to the first aspect;
- (b) One or more needle assemblies as defined in relation to the second aspect.

25 Preferably the user is a patient.

Preferably the fluid is a medicament, as defined hereinabove.

Optionally, the kit may comprise various needle assemblies of different gauges and shapes for
30 different applications.

Optionally the kit may comprise one or more fluids for use with the syringe, the fluid being defined as hereinabove.

35 Further preferred features of the kit are as defined above in relation to the first and second aspects.

Any of the above aspects and preferred features may be combined in any combination.

The invention will now be described solely by way of example and with reference to the accompanying drawings in which:

- Figure 1 shows one embodiment of a syringe prior to fitting the needle assembly;
- 5 Figure 2 shows one embodiment of a syringe with the needle assembly fitted and the fluid chamber full and ready to be dispensed;
- Figure 3 shows one embodiment of a syringe with the fluid dispensed and the needle assembly safely withdrawn into the safety storage chamber;
- Figure 4 shows front, side, top and bottom views of one embodiment of a typical
10 arrangement of the fluid chamber and safety storage chamber;
- Figure 5 Shows an exploded view of one embodiment of a typical arrangement of the syringe assembly components;
- Figure 6 Shows a detailed 3D style view of one embodiment of a needle and the complete needle assembly.

15

In Figure 1, a syringe assembly is shown prior to fitting the needle assembly, a fluid plunger 6 is shown prior to use attached to an externally fitted slider plate 10. The fluid chamber 2 is conventional but the filling/dispensing hole or port 18 is arranged at the bottom to one side. The safety storage chamber 4 has the safety plunger 8 in a forward position and this is also
20 attached to the external slider plate 10. In this arrangement the safety plunger 8 is shown with no spring or elastic material attached but in some arrangements a spring or elastic material may be attached. The ratchet system 16 that only allows upwards movement of the safety plunger 8 is shown as is the needle assembly retaining clip 12, the clip is shown ready to receive the needle assembly as it is protruding into the safety chamber 4. The slider 10, has a
25 bar with a chamfered tip that in the position shown in Figure 1 just contacts the top of the retaining clip 12.

In Figure 2 the needle assembly 14 has been fitted and is held in position by the retaining clip 12 which is located into the groove 28 of the needle assembly. During fitting of the complete
30 needle assembly 14 the chamfered edges of the vacuum seals 22 push the corresponding chamfer on the retaining clip 12 thus allowing the needle assembly 14 to push the retaining clip 12 out of the way during fitting the assembly 14 into the safety storage chamber 4. The groove 28 has parallel square edges that do not allow the clip 12 to be moved irrespective of whether the assembly 14 is pulled or pushed. Thus when the clip 12 is located in the groove
35 28 the assembly 14 cannot be moved upwards or downwards. The slider 10 is shown in the upwards position and has caused the fluid plunger 6 to move upwards drawing fluid in through the needle assembly 14 via the assembly port/hole 26 and the filling/dispensing hole or port 18. In Figure 2 the assembly port/hole 26 is shown as a hole made on one side of the assembly 14 and located directly opposite the filling/dispensing hole or port 18, this is for ease

of drawing only. The port/hole 26 can be in any orientation and fluid can still pass in both directions during filling and dispensing because of the groove around the assembly created between the two seals 24. Also in some designs the port/hole 26 is made right through the assembly 14 and this is shown more specifically in Figure 6. In this arrangement shown in
5 Figure 2 the movement of slider 10 has also caused the safety plunger 8 to move upwards forming a vacuum in the safety chamber 4, the double seals 22 on the needle assembly prevent the loss of vacuum. In other arrangements the movement of slider 10 upwards may torsion a spring or elastic material attached to the top of the assembly 14 and the safety plunger 8. It should be noted that air bubbles in the fluid chamber 2 are easily cleared by
10 inverting the syringe and pushing the slider 10, towards the needle, the ratchet 16 prevents the safety plunger from moving thus holding the vacuum created as shown in this arrangement Figure 2. In other arrangements using springs or elastic material the torsion or tension is also maintained by the ratchet system 16 that prevents loss of torsion or tension even though the slider is moved downwards. The design of the slider 10 means it can push or pull the fluid
15 plunger 6 but only pull the safety plunger 8. The seals 24 prevent fluid escaping into the safety chamber 4 or past the clip 12 or outside the main body of the device. There are two air escape holes 20 in the top of the device that prevent pressure build up, be that positive or negative, during operation of the syringe.

20 In Figure 3, the fluid has all been dispensed and the fluid plunger 6 has been pushed by means of the slider 10 to the bottom of the fluid chamber 2 dispensing all the fluid out of the hole/port 18. The bar with the chamfered tip that runs down the underside of the slider plate 10 has engaged with the top of the retaining clip 12, this has been forced back into the central groove thus the vacuum created in the safety storage chamber 4 has acted upon the needle
25 assembly 14 and drawn the whole assembly 14 upwards into the storage chamber as shown. In other arrangements using springs or elastic material as the action of the slider plate 10 on the retaining clip 12 forcing this back into the central groove allows the torsion or tension created to act upon the needle assembly and draw the assembly 14 upwards into the storage chamber. The whole syringe assembly can now be disposed of safely without danger of the
30 needle pricking somebody or the syringe being re-used.

In Figure 4 there are different views of the arrangement of the components as described and referred to in figures 1, 2 and 3. The groove or slot in which the slider plate 10 runs up and down is shown clearly in this drawing on the C – C and B – B end views.

35

In Figure 5 the exploded view of the components used in this particular syringe assembly are shown for clarity. The slider plate 10 is shown and the means of attaching the fluid plunger 6 and the safety vacuum plunger 8 is shown more graphically. The holes 20 in the top cover

plate are shown that allow air to pass in or out to prevent pressure build up during operation of the syringe are shown more clearly.

5 In Figure 6 the needle assembly 14 is shown in a 3D view to more clearly show the arrangement of the two vacuum retaining seals 22, the retaining clip housing 28 and the fluid filling and dispensing port 26 with the associated seals 24 that prevent fluid escaping when it is being drawn in or dispensed. In this case the fluid filling and dispensing port 26 is shown as a hole right through the body of the needle assembly

10 Attention is drawn to any accompanying documents, including the priority document, filed with or in relation to the present application which documents are hereby incorporated by reference.

15 All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

20 Each feature disclosed in this specification (including any accompanying claims, abstract and drawings) may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

25 The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

Claims

1. A syringe comprising a barrel and a needle assembly, the barrel comprising a fluid
5 compartment and a safety compartment, the fluid compartment being operable to store
fluid for dispensing from the syringe and the safety compartment being operable to store
the needle assembly after use of the syringe.
2. A syringe according to claim 1, wherein the fluid compartment and the safety
10 compartment are laterally displaced from one another.
3. A syringe according to claims 1 or 2, wherein the fluid compartment comprises a fluid
plunger operable to draw fluid into the fluid compartment and to dispense fluid from the
fluid compartment.
15
4. A syringe according to any of claims 1-3, wherein the safety compartment comprises a
safety plunger operable to create a retracting force within the safety compartment.
5. A syringe according to claim 4, wherein the retracting force is created between the
20 safety plunger and the needle assembly.
6. A syringe according to claims 4 or 5, wherein the retracting force is provided by a
vacuum and/or elastic tension.
- 25 7. A syringe according to any of claims 4-6, wherein the safety plunger is operable to be
moved from a first downward position to a second upward position, wherein in the first
position substantially no retracting force is present in the safety compartment, and
wherein in the second position a maximum retracting force is present in the safety
30 compartment.
8. A syringe according to any of claims 3-7, wherein the fluid plunger is operable to be
moved between a first downward position and a second upward position, wherein in the
first position the fluid compartment is substantially empty and in the second position the
fluid compartment is substantially full.
35
9. A syringe according to claim 8, wherein the safety plunger and the fluid plunger are
moveable from the first downward position to the second upward position together by a
connecting plate.

10. A syringe according to claim 9, wherein the connecting plate allows the upward and downward movement of the fluid plunger between the first and second positions, but only allows the upward movement of the safety plunger therewith.
- 5 11. A syringe according to any of claims 7-10, wherein the safety plunger is held at the second upward position by a ratchet as it is moved upwards.
12. A syringe according to any preceding claim, wherein the syringe further comprises a release mechanism operable to release the needle assembly into the safety
10 compartment for storage therein.
13. A syringe according to claim 12, wherein the needle assembly comprises a retaining clip and an actuating bar.
- 15 14. A syringe according to claim 13, wherein in the first downward position the actuating bar engages with the retaining clip and in the second upward position the actuating bar disengages the retaining clip.
- 20 15. A syringe according to claims 13 or 14, wherein in the first downward position, the retaining clip is disengaged with the needle assembly, and in the second upward position the retaining clip is engaged with the needle assembly.
- 25 16. A syringe according to claims 14 and 15, wherein in the second upward position, the actuating bar is disengaged from the retaining clip and the retaining clip is engaged with the needle assembly to thereby retain the needle assembly outside of the safety compartment.
- 30 17. A syringe according to claims 14, 15 and 16, wherein in the first downward position, the actuating bar is engaged with the retaining clip and the retaining clip is disengaged from the needle assembly to thereby release the needle assembly into the safety compartment.
- 35 18. A syringe according to any preceding claim, wherein the needle assembly comprises a head and a needle.
19. A syringe according to any of claims 13-18, wherein the needle assembly is operable to be clipped into the safety compartment by engagement with the retaining clip.

20. A syringe according to claims 18 or 19, wherein the head of the needle assembly comprises one or more protrusions.
- 5 21. A syringe according to claim 20, wherein the protrusions extend from the head at least at two points, to form a channel operable to engage the retaining clip.
22. A syringe according to claims 20 or 21, wherein the one or more protrusions form a seal against the inside walls of the safety compartment, thereby maintaining the vacuum within the safety compartment.
- 10 23. A syringe according to any of claims 18-22, wherein the needle assembly further comprises an elastic member attached to the top of the head thereof and connecting the needle assembly to the underside of the safety plunger.
- 15 24. A syringe according to any of claims 18-23, wherein the needle assembly further comprises a port for allowing fluid to be drawn into and dispensed from the fluid compartment and out through the needle.
- 20 25. A syringe according to claim 24, wherein the assembly port is in fluid communication with the fluid compartment and the needle.
26. A syringe according to any preceding claim, wherein the fluid compartment comprises a fluid port.
- 25 27. A syringe according to claim 26, wherein the fluid port aligns substantially with the assembly port in the head of the needle assembly such that a fluid path from the fluid compartment, into the head of the needle and out of the needle is established.
- 30 28. A syringe according to claims 26 or 27, wherein the fluid port and the assembly port are aligned and located within the channel of the head of the needle assembly, and between the protrusions thereof.
29. A needle assembly for use with the syringe according to any of claims 1-28.
- 35 30. A kit for administering a fluid to a user comprising:
 - (a) A syringe as defined in any of claims 1-28;
 - (b) One or more needle assemblies as defined in claim 29.

-1/4-

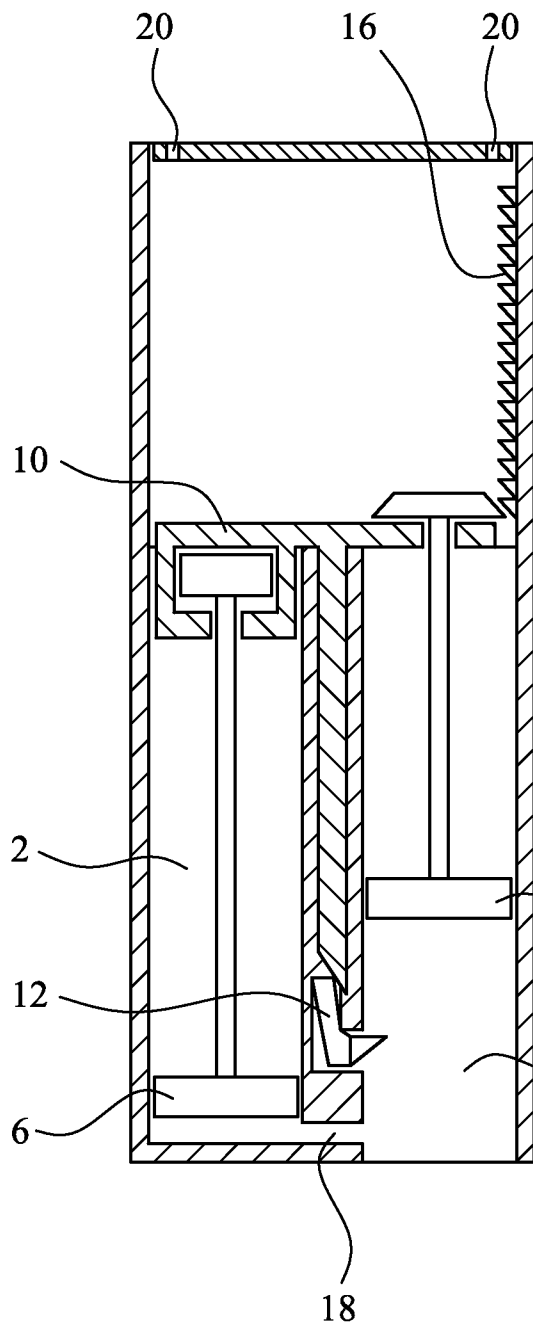


FIG. 1

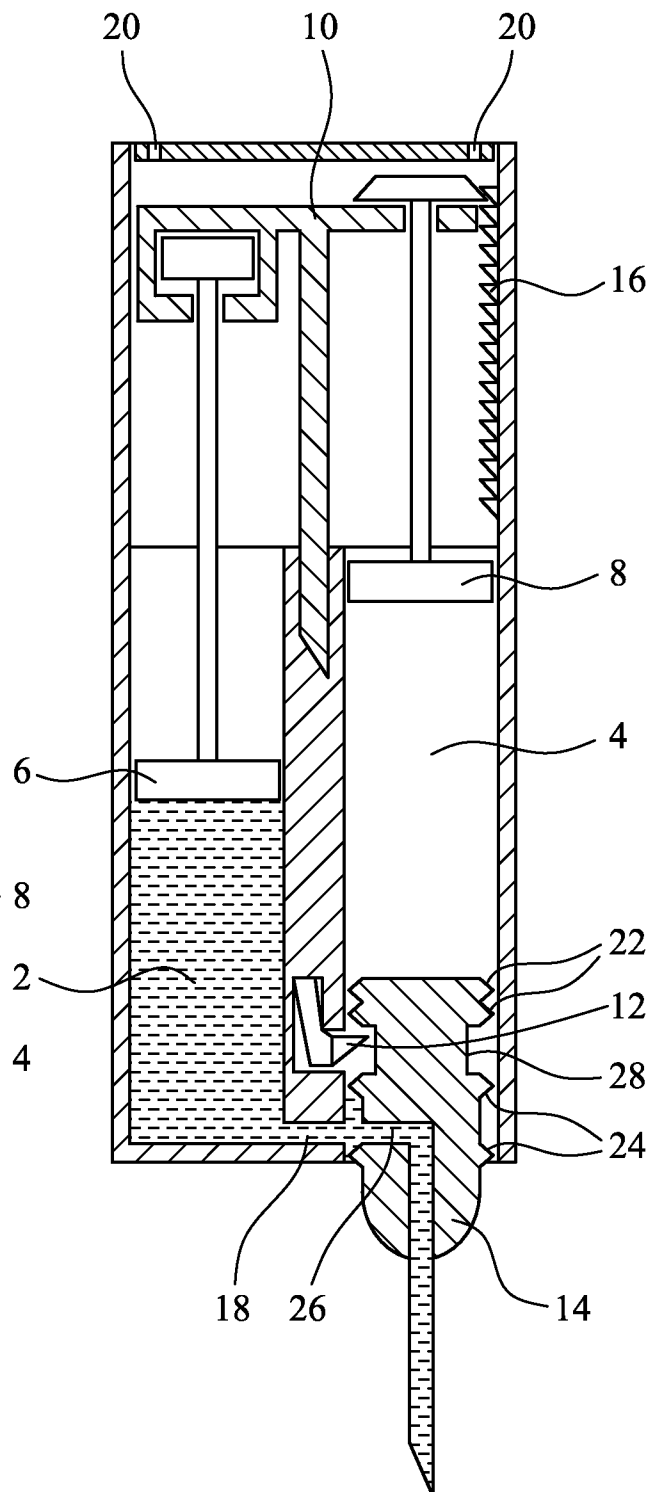


FIG. 2

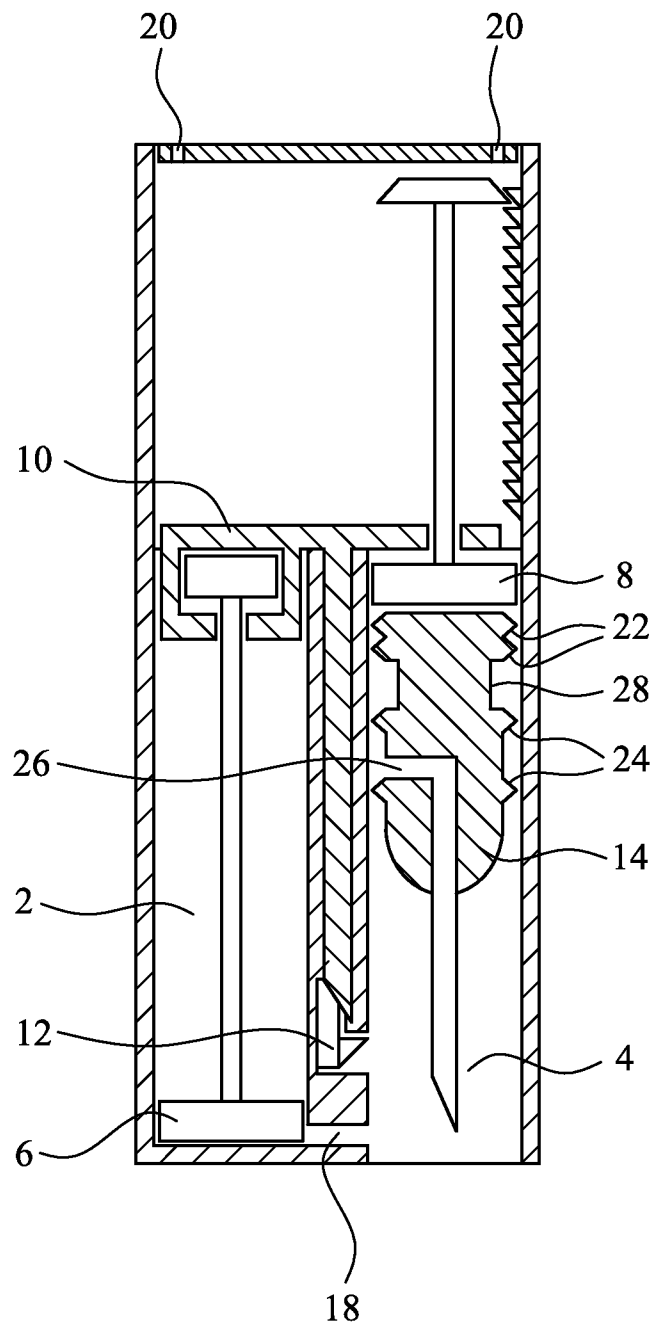


FIG. 3

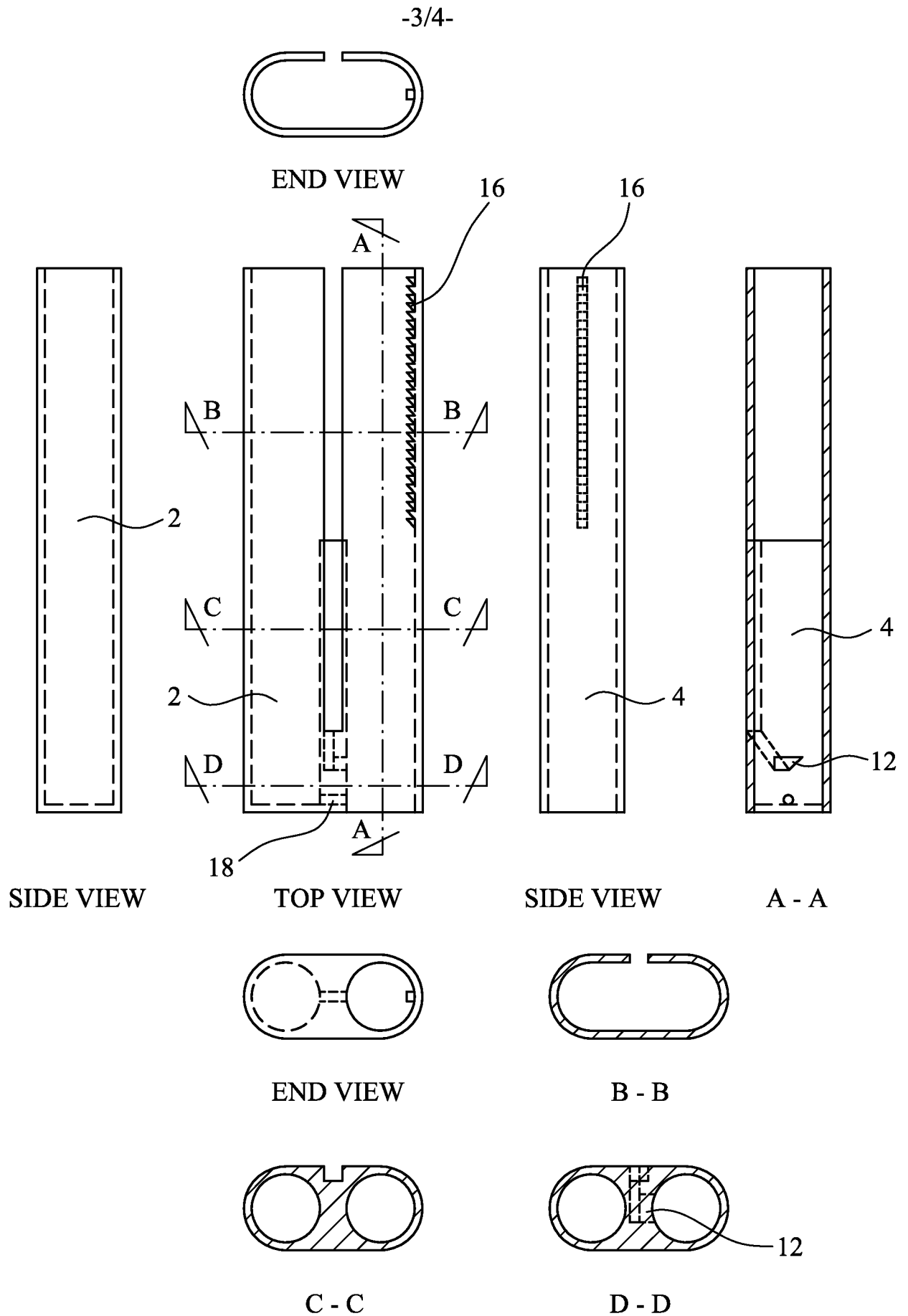


FIG. 4

-4/4-

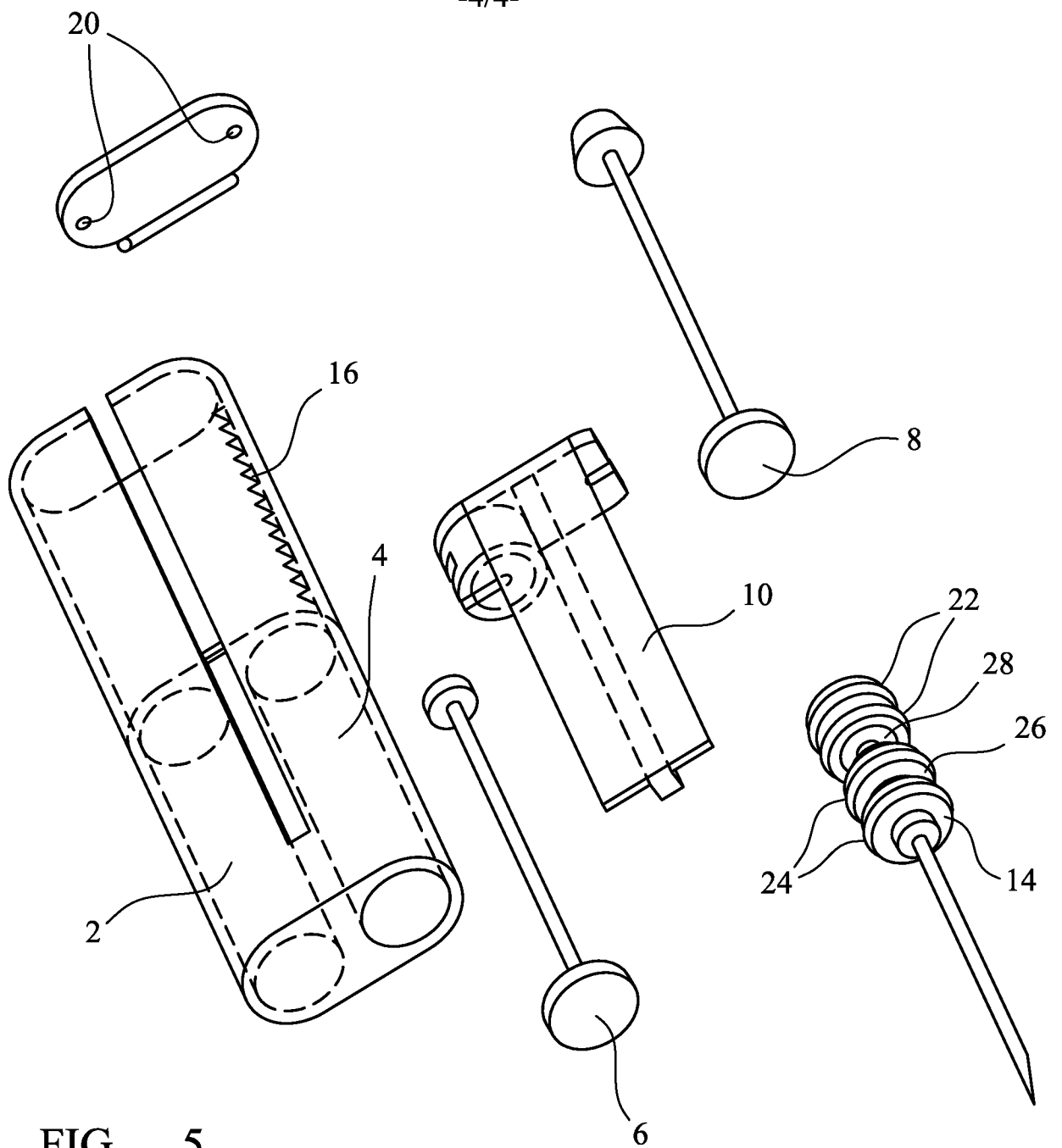


FIG. 5

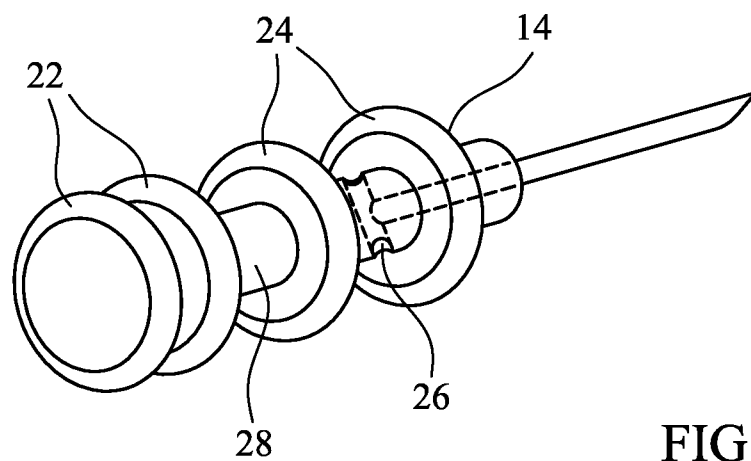


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2014/053192

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61M5/31 A61M5/34 A61M5/32
ADD.

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)
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 practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 413 236 B1 (VAN DYKE LEWIS R [US]) 2 July 2002 (2002-07-02) cited in the application	1
Y	column 7, line 59 - column 9, line 13; figures 1-6	4-7,22, 23
X	US 6 193 695 B1 (RIPPSTEIN JR WAYLAND J [US]) 27 February 2001 (2001-02-27) cited in the application	1
Y	column 7, line 29 - column 8, line 59; figures 1-5	4-7,22, 23
	----- -/--	

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

☒ See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

1 April 2015

Date of mailing of the international search report

20/04/2015

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INTERNATIONAL SEARCH REPORT

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PCT/GB2014/053192

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012/078225 A1 (ZIVKOVIC IVAN [US] ET AL) 29 March 2012 (2012-03-29)	1-3,6, 8-10, 12-21, 24-30
Y	paragraphs [0117] - [0138], [0141] - [0148], [0156], [0157], [0161] - [0169], [0176], [0180] - [0188], [0193]; figures 1-65 -----	4-7,22, 23
X	US 2012/022464 A1 (ZIVKOVIC IVAN [US] ET AL) 26 January 2012 (2012-01-26)	1-3, 8-21, 24-30
Y	paragraph [0055] - paragraph [0123]; figures 1-27 -----	4-7,22, 23
X	EP 0 479 303 A1 (MORANDINI AMORINO [IT]) 8 April 1992 (1992-04-08)	1-3
A	column 2, line 24 - column 4, line 16; figures 1-4 -----	4-7,22, 23

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2014/053192

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