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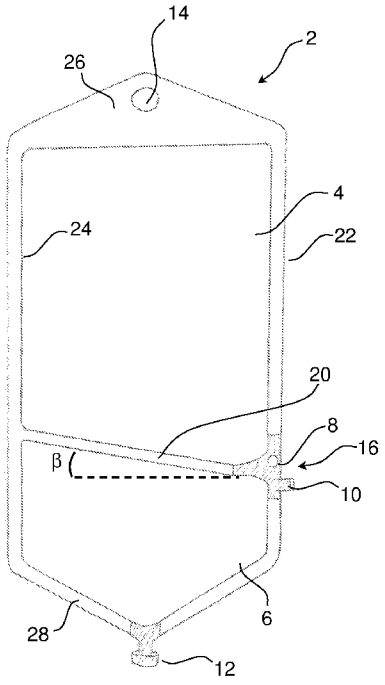
(54) Title: INTRAVENOUS BAG

(57) Abstract: An intravenous (IV) bag for providing IV fluid to a patient is disclosed. The IV bag (2) comprises a first compartment (6) separated from a second compartment (4) by means of a wall member (20). The IV bag (2) comprises an outlet port (12) provided in the lower end of the IV bag (2) for dispensing the IV bag (2). The IV bag (2) comprises an activation member (8f 8', 8") configured to establish fluid connection between the first compartment (6) and the second compartment (4). The activation member (8, 8f, 8") may be a push button or a rotatable button.



A)

Fig. 5

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Intravenous Bag

Field of invention

The present invention relates to a medical fluid system. The present invention more particularly relates to an intravenous (IV) bag for providing IV fluid to patients.

Prior art

IV treatment is widely used for infusion of liquid substances directly into veins. IV treatment is applied for several purposes including delivery of preparations and medications, correction of electrolyte imbalances and dehydration treatment.

From WO 98/16183 A1, EP 0 145 825 A1, WO 2012/076690 A1, WO 83/01569 A1, US 4,465,488 A, WO 99/27885 A1, WO 2005/074861 A1, US 4,997,083 A, EP 0 442 406 A1 and EP 0 974 331 A2, respectively, IV bags for intravenous administration of fluids to a patient are known. The IV bags comprises at least a first chamber and a second chamber separated by a wall-like structure. The IV bags have an outlet opening at the emptying end. Furthermore, the IV bags have an element, by which a fluid connection between the chambers can be establish. The element may e.g. be a valve, a breakable bung, or a heat-sealed weld. However, such element may be difficult to operate and may even be prone to malfunction, resulting in failure in establishing the adequate connection between the chambers.

When present IV bags are applied, the healthcare practitioners carrying out IV treatment as well as the patients receiving the treatment are exposed to aerosols containing medicine (in small doses) in the respirated air during the IV treatment. The contamination takes place when the preparation (medicine) is coupled to the patient. The tubing contains the preparation which has access to the air when the container cap is unscrewed. Before the tubing is connected to the patient's venous catheter, contamination takes place.

When the spike from the tubing is removed from an empty preparation receptacle (e.g. a medicine bottle) and inserted into a saline (saline solution) bag the healthcare practitioners carrying out the IV treatment will be exposed to aerosols.

Further, today, it is not possible to empty the preparation receptacle completely since residual preparation (e.g. medicine) will be present in the tubing and the spike applied to carry out the IV treatment. Accordingly, doses of approximately 5-20 ml will not be used. This is a rather large percentage since the total dose is typically 100-120 ml. As residual preparation (e.g. medicine) is present, the waste is categorised as toxic waste which poses substantial or potential threats to public health or the environment.

When using the present IV bags, it can be difficult for the healthcare practitioners carrying out IV treatment to positively determine if a patient has received one or two treatments (e.g. medicine doses) or only saline whenever the healthcare practitioners forgets to sign for administrating the treatment in either the corresponding computer 5 system or at the patient's liquid chart. Accordingly, there is risk for inappropriate medication that can cause the patients to get worse.

Today, the treatment (e.g. medicine) and the saline are kept in separate containers. If the healthcare practitioners forget the saline for rinsing, it is time-consuming to go back to get it when the treatment (e.g. medicine) has been given. Thus, there is a need for an improved IV bag that reduces or even eliminates the above-mentioned disadvantages of the prior art.

It is an object of the invention to provide an IV bag that increases the safety of the healthcare practitioners carrying out IV treatment and reduces the frequency of allergies and eczema among healthcare practitioners carrying out IV treatment.

It is a further object of the invention to provide an IV bag that does not need

to be disposed of as toxic waste.

Summary of the invention

The object of the present invention can be achieved by an IV bag as defined in the claims. Preferred embodiments are defined in the dependent sub claims, explained in the following description and illustrated in the accompanying drawings.

The IV bag according to the invention is an IV bag for providing IV fluid to a patient, wherein the IV bag comprises a first compartment separated from a second compartment by means of a wall member, wherein the IV bag comprises an outlet port provided in the lower end of the IV bag for dispensing the IV bag. The IV bag comprises an activation member configured to establish fluid connection between the first compartment and the second compartment, wherein the activation member is a button configured to establish fluid connection between the first compartment and the second compartment when being activated.

Hereby, it is possible to deliver all the preparation (medicine) to the patient so that no residual preparation will be present in the IV bag after use. Therefore, it is not necessary to dispose of the IV bag as toxic waste.

The invention makes it possible to provide an IV bag that increases the safety of the healthcare practitioners carrying out IV treatment and reduces the frequency of allergies and eczema among healthcare practitioners carrying out IV treatment.

The IV bag according to the invention is an IV bag for providing IV fluid to a patient. The IV bag may be applied to carry out all types of IV treatment.

The IV bag comprises a first compartment separated from a second compartment by means of a wall member. The IV bag, however, may comprise several more compartments.

The IV bag may comprise a first compartment separated from a second adjacent compartment by means of a wall member and a third compartment separated from the adjacent second compartment.

The IV bag may comprise a first compartment separated from a second adjacent compartment by means of a wall member, a third compartment separated from the second adjacent compartment and a fourth compartment separated from the adjacent third compartment.

The IV bag comprises an outlet port provided in the lower end of the IV bag for dispensing the IV bag. Hereby, the dispensing process is eased (due to gravity).

It may be an advantage that the activation member is a press button configured to establish a fluid connection between the compartments, when pressed. The activation member may be a rotable button configured to establish a fluid connection between the compartments, when rotated. The activation member may be a member configured to establish a fluid connection between the compartments upon being displaced, pulled or pushed in one of several directions such as sideways.

The IV bag comprises an activation member configured to establish fluid connection between the first compartment and the second compartment.

The activation member may be provided in any suitable position and have any suitable form.

The IV bag may comprise more than two compartments, wherein the IV bag may comprise more inlet ports, including an inlet port connected to the first compartment or the second compartment.

The activation member is a press button configured to establish fluid connection between the first compartment and the second compartment when pressed, or a rotatable button configured to establish fluid connection

between the first compartment and the second compartment when rotated, or a member configured to establish fluid connection between the first compartment and the second compartment upon being displaced, pulled or pushed in one or several directions e.g. sideways. The activation member may be any suitable member capable of establishing fluid connection between the first compartment and the second compartment upon being activated either manually or electrically by using any suitable electrical activation means including automatic electric activation means.

Hereby, it is possible to establish the desired fluid communication between the adjacent compartments by simple, reliable, user-friendly means.

It may be beneficial that the IV bag comprises an inlet port for injection of a fluid into the IV bag. Hereby, a preparation (e.g. medicine) may be injected into the IV bag through the inlet port.

The inlet port may comprise a sealing member provided at the distal end of the inlet port.

The inlet port may comprise a non-return valve for preventing back flow.

The inlet port may be provided together with an activation unit that may be arranged at an outer wall of the IV bag.

It may be advantageous that the inlet port is connected to the first compartment. Hereby, it is achieved that a preparation (e.g. medicine) can be introduced into the first compartment which may contain a fluid such as saline. The IV bag can be connected to a patient's venous catheter for carrying out an IV treatment comprising the preparation introduced into the first compartment. When the patient has received the preparation introduced into the first compartment, the fluid in the second compartment (preferably a rinsing or flushing fluid) is led into the first compartment by activating the activation member. Accordingly, all medicine will be flushed out and dispensed through the outlet port of the IV bag. Therefore, the IV bag and

the tubing connected to the outlet port of the IV bag will be "cleaned" by the rinsing or flushing fluid, and the contamination risk will be reduced significantly. Moreover, the IV bag can be disposed of as ordinary waste (not toxic waste).

It may be an advantage that the IV bag comprises an activation unit comprising an activation member and an inlet port.

Hereby, the healthcare practitioners carrying out IV treatment can easier carry out the IV treatment as both the activation member and the inlet port are provided close to each other at the activation unit. It is preferred that both the activation member and the inlet port are provided close to each other in order to reduce the size and cost of the activation unit.

The activation member may be a push button which can be activated manually or automatically by using an external or a build-in activation device. The activation member may be configured to establish fluid connection between the first compartment and the second compartment upon being displaced, pulled or pushed in one or several directions e.g. sideways. The activation member may be any suitable member capable of establishing fluid connection between the first compartment and the second compartment upon being activated either manually or electrically by using any suitable electrical activation means including automatic electric activation means.

In general, an activation member may be provided to establish fluid connection between any set of adjacent compartments.

It may be beneficial that the IV bag comprises a third compartment and a fourth compartment.

Hereby, it is possible to deliver two different preparations to the same patient by means of one single IV bag.

It may be beneficial that the IV bag comprises a third compartment, a fourth compartment, a fifth compartment and a sixth compartment.

Hereby, it is possible to deliver three different preparations to the same patient by means of one single IV bag.

It may be beneficial that the IV bag comprises a third compartment, a fourth compartment, a fifth compartment, a sixth compartment, a seventh compartment and an eighth compartment.

Hereby, it is possible to deliver four different preparations to the same patient by means of one single IV bag.

It may be advantageous that the IV bag comprises a second activation member configured to establish fluid connection between the second compartment and the third compartment.

Hereby, it is possible to let the fluid in the third compartment flow into the second compartment.

It may be an advantage that the IV bag comprises a third activation member configured to establish fluid connection between the third compartment and the fourth compartment. Hereby, it is possible to let the fluid in the fourth compartment flow into the third compartment.

It may be beneficial that the compartments are defined by lower wall member(s) that are angled relative to horizontal for facilitating the emptying process. Hereby, it is easier to dispense the compartments by means of gravity when the IV bag is suspended (orientated vertically).

It may be advantageous that the two adjacent compartments are separated by a membrane which is configured to be ruptured when the IV bag is squeezed by hand. Hereby, it is possible to carry out the IV treatment without introducing a preparation into the IV bag. Accordingly, the treatment

is safer, faster and more user-friendly.

It may be an advantage that the IV bag comprises a thin membrane separating two adjacent compartments, and that the IV bag comprises a thick membrane separating two adjacent compartments, wherein the thin membrane is configured to be ruptured when the IV bag is squeezed by hand, wherein the thick membrane is configured to be ruptured when the IV bag is squeezed by hand with a larger force than is required to rupture the thin membrane.

Hereby, it is possible to carry out the IV treatment involving two preparations without introducing any preparation into the IV bag. Moreover, it is possible to control the order (sequence) in which the membranes are ruptured.

It may be advantageous that the IV bag comprises another compartment separated from the first compartment by means of a thick membrane, and separated from the third compartment by means of a thin membrane.

Hereby, it is possible to provide a one-piece IV bag containing all ingredients for carrying out an IV treatment.

It may be an advantage that the outlet port is formed as a dispensing nozzle member, preferably provided with a sealable cap.

It may be beneficial that the activation button is configured to keep its position when activated (pressed, rotated og moved). Hereby, it is achieved that the fluid communication between (adjacent or connected) compartments is maintained when established.

It may be advantageous that the IV bag comprises an electrical unit configured to automatically detect when the activation button has been activated.

Hereby, it is possible to automatically detect when the activation button has been activated. This information may be visually indicated by means of a mechanical or electrical visualisation member or optionally be sent to an external receiver.

It may be an advantage that the electrical unit is configured to send and/or receive information wirelessly.

It may be beneficial that the IV bag is configured to be controlled by an external electrical device.

It may be an advantage that the activation member is provided at the outer wall of the IV bag.

It may be beneficial that the inlet port is provided at the outer wall of the IV bag.

It may be advantageous that the activation member is provided at the central area of the IV bag.

It may be an advantage that the inlet port is provided at the central area of the IV bag.

The volume of the compartments can vary depending on the type of treatment.

The first compartment may comprise saline (e.g. in a concentration between 0.2-2%, such as 0.7-1.1%, including 0.9%). The volume of the first compartment may be in the range from 25-3000 ml, preferably between 60-2000 ml, such as 120-1020 ml.

In one embodiment, the first compartment has a volume of 120 ml saline, whereas the second compartment has a volume of 100 ml.

It may be preferred that the second compartment, the fourth compartment and the sixth compartment (if any) comprise a rinsing or flushing fluid e.g. in the form of saline or a glucose containing fluid. The volumes of the compartment may be varied in order to accommodate user-specific requirements.

The IV bag according to the invention provides a closed system that makes it possible for the healthcare practitioners to eliminate the risk for being exposed to aerosols when administrating IV medicine. The medicine is preferably introduced into the IV bag I a mixing chamber provided with an exhaust device.

Description of the Drawings

The invention will become more fully understood from the detailed description given herein below. The accompanying drawings are given by way of illustration only, and thus, they are not limitative of the present invention. In the accompanying drawings:

Fig. 1 A shows a schematic view of a first embodiment of an IV bag according to the invention;

Fig. 1 B shows a schematic view of a second embodiment of an IV bag according to the invention;

Fig. 1 C shows a schematic view of a third embodiment of an IV bag according to the invention;

Fig. 2 A shows a schematic view of a fourth embodiment of an IV bag according to the invention;

Fig. 2 B shows a schematic view of a fifth embodiment of an IV bag according to the invention;

Fig. 2 C shows a schematic view of a sixth embodiment of an IV bag according to the invention;

Fig. 3 A shows a schematic perspective view of an activation unit according to the invention;

Fig. 3 B shows a schematic perspective view of another activation unit according to the invention;

Fig. 3 C shows a schematic, cross-sectional view of an activation unit

according to the invention;

Fig. 4 A shows a schematic view of an embodiment of an IV bag according to the invention comprising four compartments;

Fig. 4 B shows a schematic view of an enlarged IV bag according to the invention;

Fig. 5 A shows a schematic view of an embodiment of an IV bag according to the invention;

Fig. 5 B shows a schematic view of a receptacle according to an embodiment according to the invention;

Fig. 6 A shows a close-up view of the receptacle shown in Fig. 5 B, in which the spike member is covered by a cap;

Fig. 6 B shows a close-up view of the receptacle shown in Fig. 6 A without a cap

Fig. 7 A shows a side view of an IV bag according to the invention;

Fig. 7 B shows a cross-sectional view of the IV bag shown in Fig. 7 A;

Fig. 7 C shows a close-up view of the lower portion of the IV bag shown in Fig. 7 B.

Fig. 8 A shows a schematic view of an IV bag according to the invention;

Fig. 8 B shows a close-up view of the lower portion of the IV bag shown in Fig. 8 A.

Fig. 9 A shows a side view of an IV bag according to the invention;

Fig. 9 B shows a cross-sectional view of the IV bag shown in Fig. 9 A and

Fig. 9 C shows a close-up view of the lower portion of the IV bag shown in Fig. 9 B.

Detailed description of the invention

Referring now in detail to the drawings for the purpose of illustrating preferred embodiments of the present invention, different embodiments of an IV bag 2 of the present invention are illustrated in Fig. 1.

Fig. 1 A illustrates a schematic view of a first embodiment of an IV bag 2 according to the invention. Fig. 1 B illustrates a schematic view of a second embodiment of an IV bag 2 according to the invention, and Fig. 1 C illustrates a schematic view of a third embodiment of an IV bag 2 according

to the invention.

The IV bags 2 comprise a plurality of compartments 4, 4', 6, 6' defined by an upper portion 26 and lower wall(s) 28, 28' connected by a first outer wall 22 and a second outer wall 24, respectively. A hole 14 for suspending the IV bag 2 is provided in the upper portion 26.

Referring now to Fig. 1 A, it can be seen that the IV bag 2 comprises a first compartment 6 for a rinsing fluid and a second compartment 4 for a crystalloid fluid which may be saline. The first compartment 6 is arranged above the second compartment 4. A wall member 20 separates the first compartment 6 and the second compartment 4. The major portion of the wall member 20 separating the first compartment 6 and the second compartment 4 is sloped (with an angle α relative to horizontal H, when the IV bag 2 is in an upright position like illustrated in Fig. 1 A).

The IV bag 2 comprises an activation unit 16 comprising an inlet port 10 for introducing a preparation (e.g. medicine) into the first compartment 6. The activation unit 16 also comprises an activation member 8 shaped as a button that upon being activated (e.g. by pushing or turning the activation button 8) creates an opening and thus a fluid connection between the first compartment 6 and the second compartment 4 so that the crystalloid fluid (such as saline) will flow into the first compartment 6 due to gravity (since the wall member 20 separating the first compartment 4 and the second compartment 6 is angled relative to horizontal H). The activation member 8 may be configured to establish fluid connection between the first compartment 6 and the second compartment 4 upon being displaced, pulled or pushed in one or several directions e.g. sideways. The activation member 8 may be any suitable member capable of establishing fluid connection between the first compartment 6 and the second compartment 4 upon being activated either manually or electrically by using any suitable electrical activation means including automatic electric activation means.

Hereby, it is possible to clean the first compartment 6 when the preparation

(e.g. medicine) introduced into the first compartment 6 is delivered to a patient through the outlet port 12 arranged in the bottom portion of the IV bag 2. Since the lower walls 28, 28' are angled (with angles β, β') relative to horizontal H, the preparation (e.g. medicine) introduced into the first compartment 6 can easily be delivered to a patient through the outlet port 12.

When the preparation (e.g. medicine) introduced into the first compartment 6 has been delivered to a patient through the outlet port 12, the activation button 8 is activated in order to create an opening and thus fluid connection between the second compartment 4 and the first compartment 6. Hereby, the crystalloid fluid (such as saline) is used to rinse the first compartment. Therefore, the IV bag 2 contains no residual preparation (e.g. medicine) after use. Accordingly, the IV bag can be disposed of as ordinary waste (since no residual preparation is left, the bag is not considered toxic waste).

In one embodiment, the first compartment 6 of the IV bag 2 may be pre-filled with a preparation (e.g. medicine). When using this IV bag, the safety of the patients receiving IV treatment and the healthcare practitioners carrying out IV treatment can be increased. Thus, neither the patients nor the healthcare practitioners carrying out IV treatment will be exposed to aerosols-containing medicine. Hereby, allergies and eczema among healthcare practitioners carrying out IV treatment may be prevented.

The activation unit 16 extends along a section of the outer wall 22 and along a section of the separating wall member 20. Any suitable valve mechanism may be applied, including both mechanical and electronic valve mechanisms.

The IV bag 2 illustrated in Fig. 1 B comprises four compartments 4, 4', 6, 6'. The IV bag 2 comprises a first activation unit 16 provided along the outer wall 22 and extending along a portion of the first wall member 20. The activation unit 16 is equipped with an activation button 8 configured to establish a fluid connection between the fourth compartment 4' containing a fourth fluid (preferably a rinsing fluid or a crystalloid fluid such as saline) and

the third compartment 6' that contains a third fluid (preferably a preparation or saline for being mixed with a preparation) and/or is configured to receive a fluid (e.g. a preparation) through an inlet port that may be provided in the activation unit 16. Due to the inclination of the wall member 20 (the angle between the wall member 20 and horizontal H is α), the fluid in the fourth compartment 4' can flow into the third compartment 6' by means of gravity (when the IV bag 2 is arranged vertically).

The IV bag 2 comprises a second activation unit 16' provided along the outer wall 22 and extending along a portion of the second wall member 20'. The activation unit 16' is provided with an activation button 8' configured to establish a fluid connection between the second compartment 4 and the first compartment 6. Since the second wall member 20' is angled (the angle between the second wall member 20' and horizontal H is α'), the fluid in the second compartment 4 can flow into the first compartment 4 by means of gravity provided that the IV bag 2 is arranged vertically as intended.

The IV bag 2 comprises a third activation unit 16'' provided along the outer wall 22 and extending along a portion of the third wall member 20''. The activation unit 16'' has an activation member 8'' adapted for establishing fluid connection between the second compartment 4 and the first compartment 6 that contains a first fluid (e.g. a preparation or a saline for being mixed with a preparation) and/or is configured to receive a fluid (e.g. a preparation) through an inlet port that may be provided in the activation unit 16''. Due to the fact that the third wall member 20'' is angled (the angle between the third wall member 20'' and horizontal H is α''), the fluid in the second compartment 4 can flow into the firth compartment 6 due to gravity when the IV bag 2 is arranged vertically as intended.

The IV bag 2 comprises an outlet port 12 arranged in the lowest corner section of the IV bag 2. Since the lower wall 28 is angled (the angle between the lower wall 28 and horizontal H is α'''), the fluid in the first compartment 6' can flow out through the outlet port 12 into a tubing (not shown) connected to a patient's venous catheter.

In one embodiment according to the invention, the first compartment 6 and the third compartment 6' may contain saline and be configured to receive medicine through an inlet port provided in the activation unit 16, 16'''. Rinsing fluid may be provided in the second compartment 4 and in the fourth compartment 4'. Hereby, medicine may be introduced into the saline in order to achieve the correct medicine concentration.

Generally, it may be an advantage to have a compartment rinsing or flushing fluid in the compartments that are provided above and adjacent to each compartment provided with medicine or with an inlet for introducing medicine or another treatment. Hereby, the rinsing or flushing fluid can be used to rinse the medicine containing compartment.

Fig. 1 C illustrates another embodiment of an IV bag 2 according to the invention. The IV bag 2 comprises an outlet port 12 arranged in the lowest corner section of the IV bag 2. As the lower wall 28 is angled (the angle between the lower wall 28 and horizontal H is α'), the fluid in the first compartment 6 can flow out through the outlet port 12. Similarly, the wall member 20 is angled (the angle between the wall member 20 and horizontal H is α) allowing for the fluid in the first compartment 6 to flow out through the outlet port 12.

The IV bag 2 comprises an activation unit 16 provided along the lower wall 28 and extending along a portion of the wall member 20. The activation unit 16 comprises an activation button 8 adapted for establishing fluid connection between the second compartment 4 and the first compartment 6 that contains a fluid (e.g. a preparation or saline for being mixed with a preparation). The first compartment 6 is configured to receive a fluid (e.g. medicine) through an inlet port 10' provided at the activation unit 16. Likewise, the second compartment 4 is configured to receive a fluid (e.g. medicine) through an inlet port 10 provided at the activation unit 16. The activation button 8 is provided at the lowest portion of the wall member 20 and is configured to establish an opening between the first compartment 6

and the second compartment 4.

Fig. 2 A illustrates a schematic view of a fourth embodiment of an IV bag 2 according to the invention. Fig. 2 B illustrates a schematic view of a fifth embodiment of an IV bag 2 according to the invention, and Fig. 2 C illustrates a schematic view of a sixth embodiment of an IV bag 2 according to the invention.

The IV bags 2 comprise a plurality of compartments 4, 6, 6', 18 defined by an upper portion 26 and lower wall(s) 28, 28' connected by a first outer wall 22 and a second outer wall 24, respectively. A suspending hole 14 is provided in the upper portion 26.

Referring now to Fig. 2 A, it can be seen that the IV bag 2 comprises a second compartment 4 for a rinsing fluid and a first compartment 6 for a crystalloid fluid which may be saline. The second compartment 4 is arranged above the first compartment 6. A wall member 20 separates the first compartment 6 and the second compartment 4. The wall member 20 has two sections: a left section which is angled relative to horizontal (with an angle α relative to horizontal H) and a right section which is angled relative to horizontal (with an angle α relative to horizontal H) when the IV bag 2 is suspended.

The IV bag 2 comprises an activation unit 16 provided at the central portion of the wall member. The activation unit 16 comprises an activation button 8 adapted for establishing fluid connection between the first compartment 6 and the second compartment 4. The angled sections make it possible for the fluid in the second compartment 4 to flow into the first compartment 6 through the opening provided by means of the activation button 8. The first compartment 6 is configured to receive a fluid (e.g. medicine) through an inlet port 10 provided at the activation unit 16.

The lower wall comprises a left section 28 which is angled relative to horizontal (with an angle β relative to horizontal H) and a right section 28'

which is angled relative to horizontal (with an angle β' relative to horizontal H) when the IV bag 2 is suspended. Accordingly, the fluid in the first compartment 6 can be emptied through the outlet port 12 provided at the junction between the end of the left section 28 and the right section 28'.

The IV bag 2 illustrated in Fig. 2 B almost corresponds to the one shown in Fig. 1 A. The activation button 8, however, is arranged differently. The activation button 8 does not protrude parallel to the inlet port 10 like in the embodiment shown in Fig. 1 A.

Fig. 2 C shows an embodiment of an IV bag 2 according to the invention. The IV bag 2 comprises a plurality of compartments 4, 6, 6', 18 defined by an upper portion 26 (provided with a suspension hole 14), two lower walls 28, 28', a first outer wall 22 and a second outer wall 24.

The left lower wall 28 is angled relative to horizontal (with an angle β relative to horizontal H) and the right lower wall 28' is angled relative to horizontal (with an angle β' relative to horizontal H) when the IV bag 2 is suspended. Therefore, the fluid in the first compartment 6 can be emptied through the outlet port 12 provided at the junction between the end of the left lower wall 28 and the right lower wall 28'.

The second compartment 4 is configured to be brought into fluid communication with the first compartment 6 by means of an activation button 8 provided in an activation unit 16 extending along a portion of the first outer wall 22 and a portion of the wall member 20. Since the major portion of the wall member 20 is angled (with an angle α relative horizontal H), the fluid in the second compartment 4 can (by means of gravity) flow into the first compartment 6 when an opening is established by means of the activation button 8 (e.g. a push button or a rotatable button).

The IV bag 2 comprises a third medical substrate compartment 18 filled with a substrate and a fourth compartment 6' containing a crystalloid fluid (e.g. saline) or sterile water.

A thin membrane 30' divides the third compartment 18 and the fourth compartment 4'. Likewise, a thicker membrane 30 separates the first compartment 6 and the third compartment 18 and the fourth compartment 4'.

The thin membrane 30' is configured to be ruptured when squeezed from the outside. Likewise, the thick membrane 30 is configured to be ruptured when squeezed, although by a larger force, from the outside. Accordingly, the sequence of the rupture process can be controlled so that the thin membrane 30' ruptures before the thicker membrane 30.

When applying this IV bag 2, there is no need for injecting a preparation (e.g. medicine) into the first compartment 6. Accordingly, the IV bag 2 increases the safety of the healthcare practitioners carrying out IV treatment. As no preparation (e.g. medicine) needs to be added to the first compartment 6 by means of an injection, the patients and the healthcare practitioners carrying out IV treatment will not be exposed to airborne contaminants. Accordingly, allergies and eczema among patients and healthcare practitioners may be reduced.

More activation units may be provided to establish fluid communication between the compartments. Such activation units may contain various types of activation members. The activation members may be configured to establish fluid connection between the compartments upon being displaced, pulled or pushed in one or several directions e.g. sideways. The activation members may be any suitable member capable of establishing fluid connection between the compartments upon being activated either manually or electrically by using any suitable electrical activation means including automatic electric activation means.

Fig. 3 A illustrates a schematic perspective view of an activation unit 16 according to the invention. The activation unit 16 comprises an inlet port 10 adapted for receiving a preparation (e.g. medicine) injected through the inlet

port 10 into a second compartment 6. The activation unit 16 comprises an activation member (push button) 8 slidably mounted to the activation unit 16 in such a manner that the push button 8 when pressed establishes fluid communication between a first compartment 6 and the second compartment 6, so that fluid from the second compartment 4 can flow into the first compartment 6 by means of gravity. The direction of the fluid flow is indicated with two arrows.

Fig. 3 B illustrates a schematic perspective view of another activation unit 16 according to the invention. The activation unit 16 comprises an inlet port 10 for receiving a preparation (e.g. medicine) injected through the inlet port 10 into a compartment. The activation unit 16 comprises an activation member 8 slidably or rotatably mounted to the activation unit 16. The activation member 8 is configured to establish fluid communication between the first compartment 6 and the second compartment 4, so that fluid from the second compartment 4 can flow into the first compartment 6 by means of gravity. The direction of the fluid flow is indicated with two arrows.

Fig. 3 C illustrates a schematic cross-sectional view of another activation unit 16 according to the invention. The activation unit 16 comprises an inlet port shaped like a tube 46 provided with an end sealing 48. The activation unit 16 comprises a push button 8 comprising an elongated body provided with an aperture 40 for establishing fluid communication between two compartments. The push button 8 is slidably arranged in a channel 44 provided with a radially extending hole 42. When the push button 8 is pushed, the aperture 40 and the hole 42 will be aligned so that fluid from a second compartment 4 can flow into the lower first compartment 6 through the opening as illustrated with the arrows.

Fig. 4 A illustrates a schematic view of an embodiment of an IV bag 2 according to the invention comprising four compartments 4, 6, 4′, 6′. The IV bag 2 comprises a first activation unit 16 provided along the outer wall 22 and extending along a portion of the first wall member 20. The activation unit 16 is equipped with an inlet port 10 (for injection of a preparation) and

an activation button 8 configured to establish a fluid connection between the fourth compartment 4' containing a fourth fluid (e.g. a rinsing fluid or a crystalloid fluid such as saline) and the third compartment 6'.

The third compartment 6' may contain a third fluid (e.g. a preparation or saline for being mixed with a preparation). The third compartment 6' is configured to receive a fluid (e.g. a preparation) through the inlet port 10 provided in the activation unit 16. Due to the inclination of the wall member 20 (the angle between the wall member 20 and horizontal H is α), the fluid in the fourth compartment 4' can flow into the third compartment 6' by means of gravity (when the IV bag 2 is arranged vertically).

The IV bag 2 comprises a second activation unit 16' provided along the outer wall 22 and extending along a portion of the second wall member 20'. The activation unit 16' is provided with an activation button 8' configured to establish a fluid connection between the third compartment 6' and the second compartment 4 which contains a second fluid (e.g. a rinsing fluid). As the second wall member 20' is angled (the angle between the second wall member 20' and horizontal H is α'), the fluid in the third compartment 6' can flow into the second compartment 4 by means of gravity provided that the IV bag 2 is arranged vertically as intended.

The IV bag 2 comprises a third activation unit 16'' provided along the outer wall 22 and extending along a portion of the third wall member 20''. The activation unit 16'' has an activation button 8'' adapted for establishing fluid connection between the second compartment 4 and the first compartment 6 which contains a first fluid (e.g. a preparation or saline for being mixed with a preparation) and/or is configured to receive a fluid (e.g. a preparation) through an inlet port 10 provided in the activation unit 16''. As the third wall member 20'' is angled (the angle between the third wall member 20'' and horizontal H is α''), the fluid in the second compartment 4 can flow into the first compartment due to gravity when the IV bag 2 is arranged vertically as intended.

The IV bag 2 comprises an outlet port 12 arranged in the lowest section of the IV bag 2. Since the lower wall 28 is angled, the fluid in the fourth compartment 6' can flow out through the outlet port 12 into tubing (not shown) connected to a patient's venous catheter.

Fig. 4 B illustrates a schematic view of an enlarged IV bag 2 according to the invention comprising a second compartment 4 and a first compartment 6. The IV bag 2 comprises an activation unit 16 provided along the outer wall 22 and extending along a portion of the first wall member 20. The activation unit 16 is equipped with an inlet port 10 (for injection of a preparation) and an activation button 8 configured to establish a fluid connection between the second compartment 4 containing a second fluid (e.g. a rinsing or flushing fluid or a crystalloid fluid such as saline) and the first compartment 6.

The first compartment 6 may contain a first fluid (e.g. a preparation or saline for being mixed with a preparation). The first compartment 6 is configured to receive a fluid (e.g. a preparation) through the inlet port 10 provided in the activation unit 16. Due to the inclination of the wall member 20 (the angle between the wall member 20 and horizontal H is β), the fluid in the second compartment 4 can flow into the first compartment 6 by means of gravity (when the IV bag 2 is arranged vertically).

The IV bag 2 comprises an outlet port 12 arranged in the lowest section of the IV bag 2. Since the lower wall 28 is angled, the fluid in the first compartment 6 can flow out through the outlet port 12 into tubing (not shown) connected to a patient's venous catheter.

Fig. 5 illustrates a system according to the invention. The system comprises an IV bag 2 shown in Fig. 5 A and a receptacle 32 according to an embodiment according to the invention.

The IV bag 2 shown in Fig. 5 A basically corresponds to the one shown in Fig. 4 B.

The receptacle 32 contains a fluid such as sterile water. A spike member extends from the receptacle 32. A cap 36 covers the spike member in order to keep the spike member sterile.

The receptacle 32 is intended for medicine in powder form that needs to be dissolved in sterile water. Instead of applying a separate hypodermic needle, a separate cartridge and a separate container with sterile water, the receptacle 32 contains all three elements. Accordingly, time can be saved since no separate parts are required to be assembled. Moreover, it is easier and time saving to keep the product sterile since no members need to be coupled.

Fig. 6 A illustrates a close-up view of the receptacle 32 shown in Fig. 5 B, in which the pointed end of the spike member 34 is covered by a cap 36. Fig. 6 B illustrates a close-up view of the receptacle 32 shown in Fig. 6 A without the cap 36. It can be seen that the distal end 38 of the spike member 34 is pointed.

Fig. 7 A illustrates a side view of an IV bag 2 according to the invention. The IV bag 2 comprises an activation member which is explained in further detail with reference to Fig. 7 B and Fig. 7 C.

Fig. 7 B illustrates a cross-sectional view of the IV bag 2 shown in Fig. 7 A. Fig. 7 C illustrates a close-up view of the lower portion of the IV bag 2 shown in Fig. 7 B. The IV bag 2 comprises a first compartment 6 and a second compartment 4 for a rinsing or flushing fluid (e.g. saline). An outlet port 12 is provided at the lowest positioned section of the first compartment 6. The outlet port 12 is configured to receive a spike in order to deliver a treatment to a patient through the outlet port.

The IV bag 2 comprises a first inlet port 10' configured to receive a fluid (e.g. liquid medicine). Hereby, it is possible to introduce a fluid into the first compartment 6. Likewise, the IV bag 2 comprises another inlet port 10 configured to receive a fluid (e.g. saline). Hereby, it is possible to introduce a

fluid into the second compartment 4.

The IV bag 2 moreover comprises an activation member 8 adapted to establish fluid communication between the second compartment 4 and the first compartment 6. The activation member 8 may be adapted to establish fluid communication between the second compartment 4 and the first compartment 6 when rotated, pushed, pulled by means of electrical means (not shown).

Fig. 8 A illustrates a front view of an IV bag 2 according to the invention. The IV bag 2 comprises an activation member which is explained in further detail with reference to Fig. 8 B. Fig. 8 B illustrates a close-up view of the lower portion of the IV bag 2 shown in Fig. 8 A.

The IV bag 2 comprises a first compartment 6 and a second compartment 4 for a rinsing or flushing fluid (e.g. saline). At the lowest positioned section of the first compartment 6 an outlet port 12 is provided. The outlet port 12 is adapted to receive a spike in order to deliver a treatment to a patient through the outlet port 12.

The IV bag 2 comprises a first inlet port 10' configured to receive a fluid such as a liquid medicine treatment. Accordingly, it is possible to introduce a fluid into the first compartment 6. The IV bag 2 comprises another inlet port 10 adapted to receive a fluid such as saline. Accordingly, it is possible to introduce a fluid into the second compartment 4.

The IV bag 2 comprises an activation member 8 adapted to establish fluid communication between the second compartment 4 and the first compartment 6 when being pulled.

In Fig. 8 B it can be seen that the activation member 8 comprises a stop member 50 adapted to restrict the displacement of the activation member 8. When the activation member 8 is pulled in the indicated direction X (downwards when the IV bag is in use), a flange member 52 provided in the

proximal end of the activation member 8 will bear against the stop member 50 and hereby stop the displacement of the activation member 8. When the activation member 8 is pulled in the indicated direction X fluid communication is established between the second compartment 4 and the first compartment 6.

Fig. 9 A illustrates a cross-sectional view of the IV bag 2 shown in Fig. 8. The IV bag 2 comprises an activation member which is explained in further detail with reference to Fig. 9 B and Fig. 9 C.

Fig. 9 B illustrates a cross-sectional view of the IV bag 2 shown in Fig. 9 A. Fig. 9 C illustrates a close-up view of the lower portion of the IV bag 2 shown in Fig. 9 B. The IV bag 2 has a first compartment 6 and a second compartment 4 for a rinsing or flushing fluid (e.g. saline). At the lowest section of the first compartment 6 an outlet port 12 is provided. The outlet port 12 is configured to receive a spike in order to deliver a treatment to a patient through the outlet port 12.

The IV bag 2 is provided with a first inlet port 10' adapted to receive a fluid. Thus, it is possible to introduce a fluid into the first compartment 6. The IV bag 2 comprises another inlet port 10 configured to receive a fluid such as saline. Accordingly, it is possible to introduce a fluid into the second compartment 4.

The IV bag 2 comprises an activation member 8 adapted to establish fluid communication between the second compartment 4 and the first compartment 6. The activation member 8 is adapted to establish fluid communication between the second compartment 4 and the first compartment 6 when pulled in the indicated direction X.

As it can be seen in Fig. 9 C the activation member 8 comprises a stop member 50 configured to restrict the displacement of the activation member 8. When the activation member 8 is pulled in the indicated direction X, a flange member 52 provided in the proximal end of the activation member 8

will abut the stop member 50 and hereby stop the displacement of the activation member 8. When the activation member 8 is pulled in the indicated direction X, fluid communication is established between the second compartment 4 and the first compartment 6.

List of reference numerals

2	IV bag
4, 4′	Compartment (e.g. for a rinsing fluid)
6, 6′	Compartment (e.g. for saline)
8, 8′, 8″	Activation member
10, 10′	Inlet port
12	Outlet port
14	Hole
16, 16′, 16″	Activation unit
18	Medical substrate compartment
20, 20′, 20″	Wall member
22, 24	Outer wall
26	Top portion
28, 28′	Lower wall
30, 30′	Membrane
32	Receptacle
34	Spike member
36	Cap (or foil)
38	Pointed end
40	Aperture
42	Hole
44	Channel
46	Tube
48	End sealing
50	Stop member
52	Flange member
α, α', α'', α'''	Angle
β, β', β''	Angle
H	Horizontal
X	Direction

Claims

1. An intravenous (IV) bag for providing IV fluid to a patient, wherein the IV bag (2) comprises a first compartment (6) separated from a second compartment (4) by means of a wall member (20), wherein the IV bag (2) comprises an outlet port (12) provided in the lower end of the IV bag (2) for dispensing the IV bag (2), **characterised in** that the IV bag (2) comprises an activation member (8, 8', 8'') configured to establish fluid connection between the first compartment (6) and the second compartment (4), wherein the activation member (8, 8', 8'') is a button (8) configured to establish fluid connection between the first compartment (6) and the second compartment (4) when being activated.

2. An IV bag (2) according to claim 1, **characterised in** that the activation member (8, 8', 8'') is a press button (8) configured to establish fluid connection between the first compartment (6) and the second compartment (4) when pressed or a rotatable button (8) configured to establish fluid connection between the first compartment (6) and the second compartment (4) when rotated or a member (8) configured to establish fluid connection between the first compartment (6) and the second compartment (4) upon being displaced, pulled or pushed in one or several directions e.g. sideways.

3. An IV bag (2) according to claim 1 or claim 2, **characterised in** that the IV bag (2) comprises an inlet port (10, 10') for injecting a fluid into the IV bag (2).

4. An IV bag (2) according to claim 3, **characterised in** that the inlet port (10, 10') is connected to the second compartment (4).

5. An IV bag (2) according to one of the preceding claims, **characterised in** that the IV bag (2) comprises an activation unit (16, 16', 16'') comprising an activation member (8, 8', 8'') and an inlet port (10, 10').

6. An IV bag (2) according to one of the preceding claims, **characterised in** that the IV bag (2) comprises a third compartment (6') and a fourth

compartment (4').

7. An IV bag (2) according to claim 6, **characterised in** that the IV bag (2) comprises a second activation member (8') configured to establish fluid connection between the second compartment (4) and the third compartment (6').

8. An IV bag (2) according to claim 6 or claim 7, **characterised in** that the IV bag (2) comprises a third activation member (8'') configured to establish fluid connection between the third compartment (6') and the fourth compartment (4').

9. An IV bag (2) according to one of the preceding claims, **characterised in** that the compartments (4, 4', 6, 6') are defined by (a) lower wall member(s) (20, 20', 20'', 28, 28') that are angled relative to horizontal (H) for facilitating the emptying process.

10. An IV bag (2) according to one of the preceding claims, **characterised in** that the IV bag (2) comprises a compartment (18) separated from the first compartment (6) by means of a thick membrane (30) and separated from the third compartment (6') by means of a thin membrane (30').

11. An IV bag (2) according to claim 10, **characterised in** that the adjacent compartments (6, 6', 18) are separated by a membrane (30, 30') that is configured to be ruptured when squeezing the IV bag (2) by hand.

12. An IV bag (2) according to claim 11, **characterised in** that the thin membrane (30') is configured to be ruptured when squeezing the IV bag (2) by hand, wherein the thick membrane (30) is configured to be ruptured when squeezing the IV bag (2) by hand with a larger force than is required to rupture the thin membrane (30').

13. An IV bag (2) according to one of the preceding claims, **characterised in** that the activation button (8) is configured to remain in its position when

activated (pressed, rotated or moved).

14. An IV bag (2) according to one of the preceding claims, **characterised in** that the IV bag (2) comprises an electrical unit configured to detect when the activation button (8) has been activated.

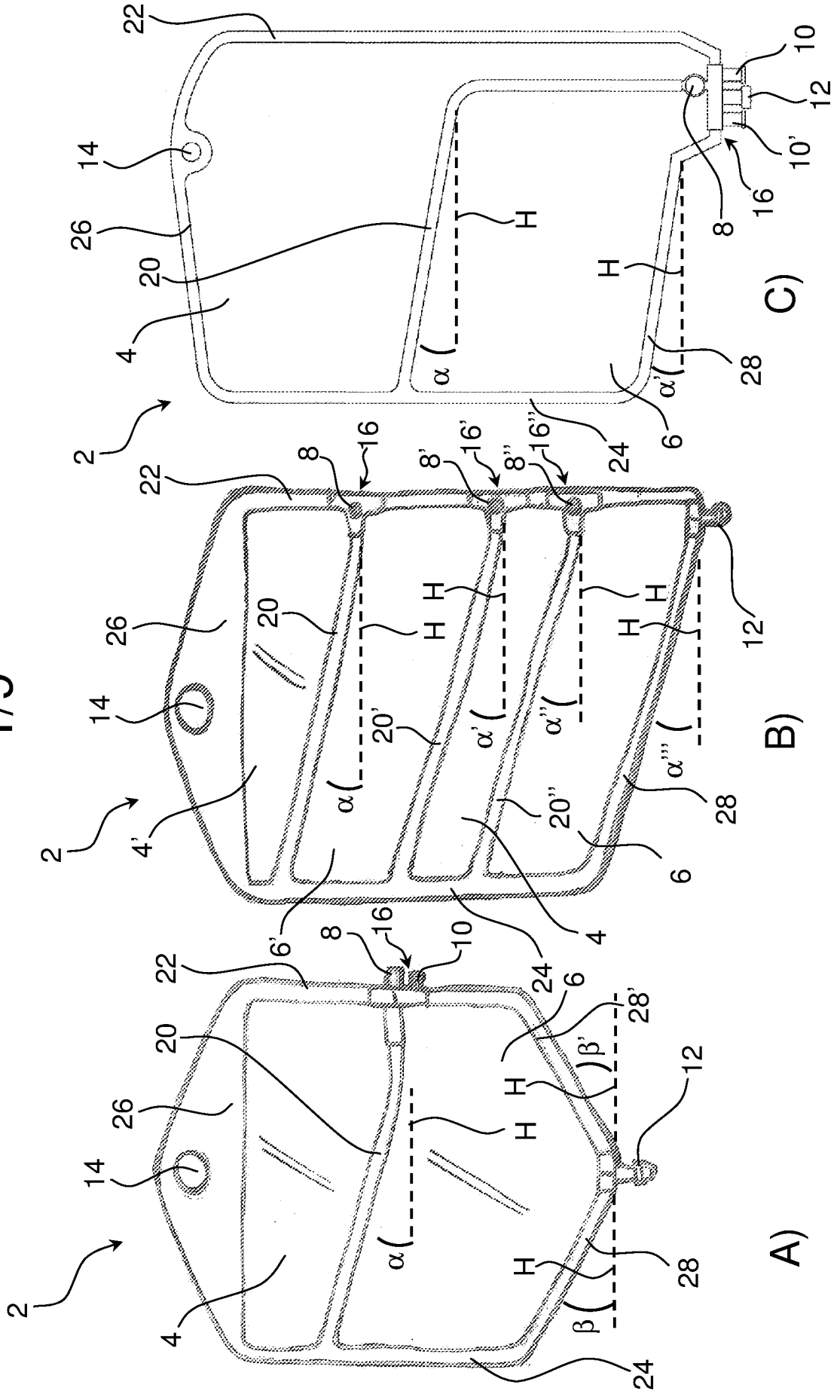


Fig. 1

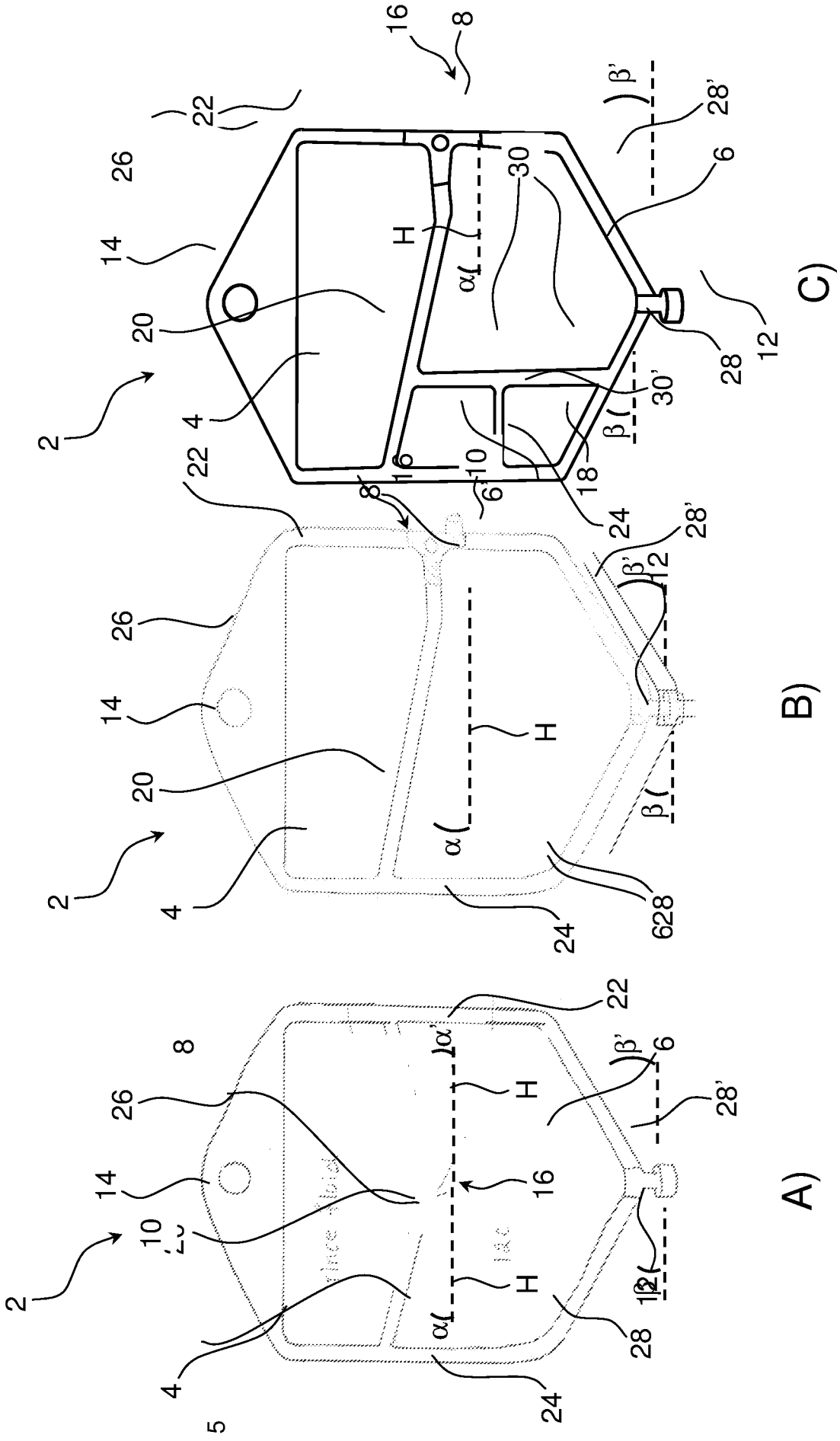
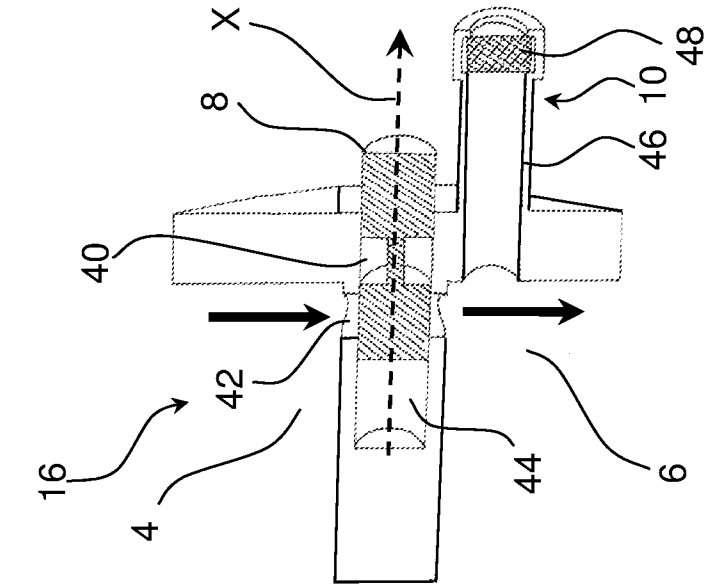


Fig. 2



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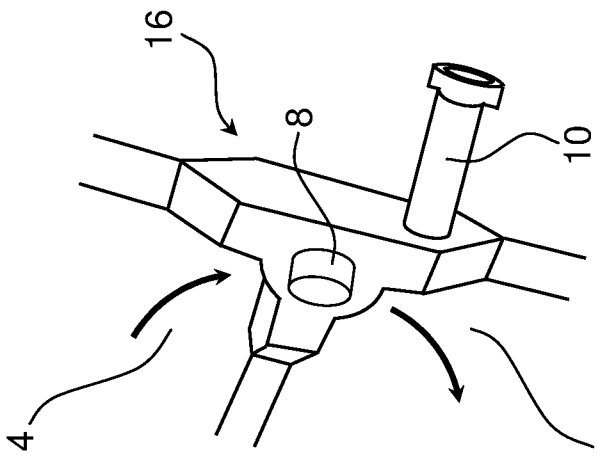
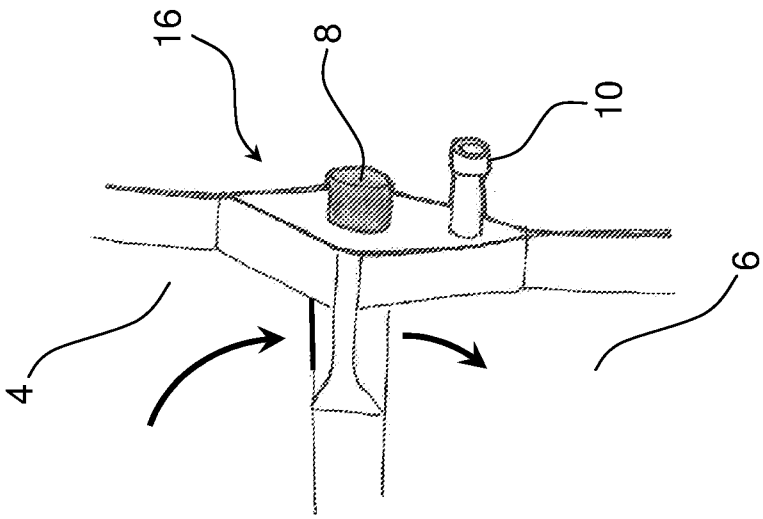
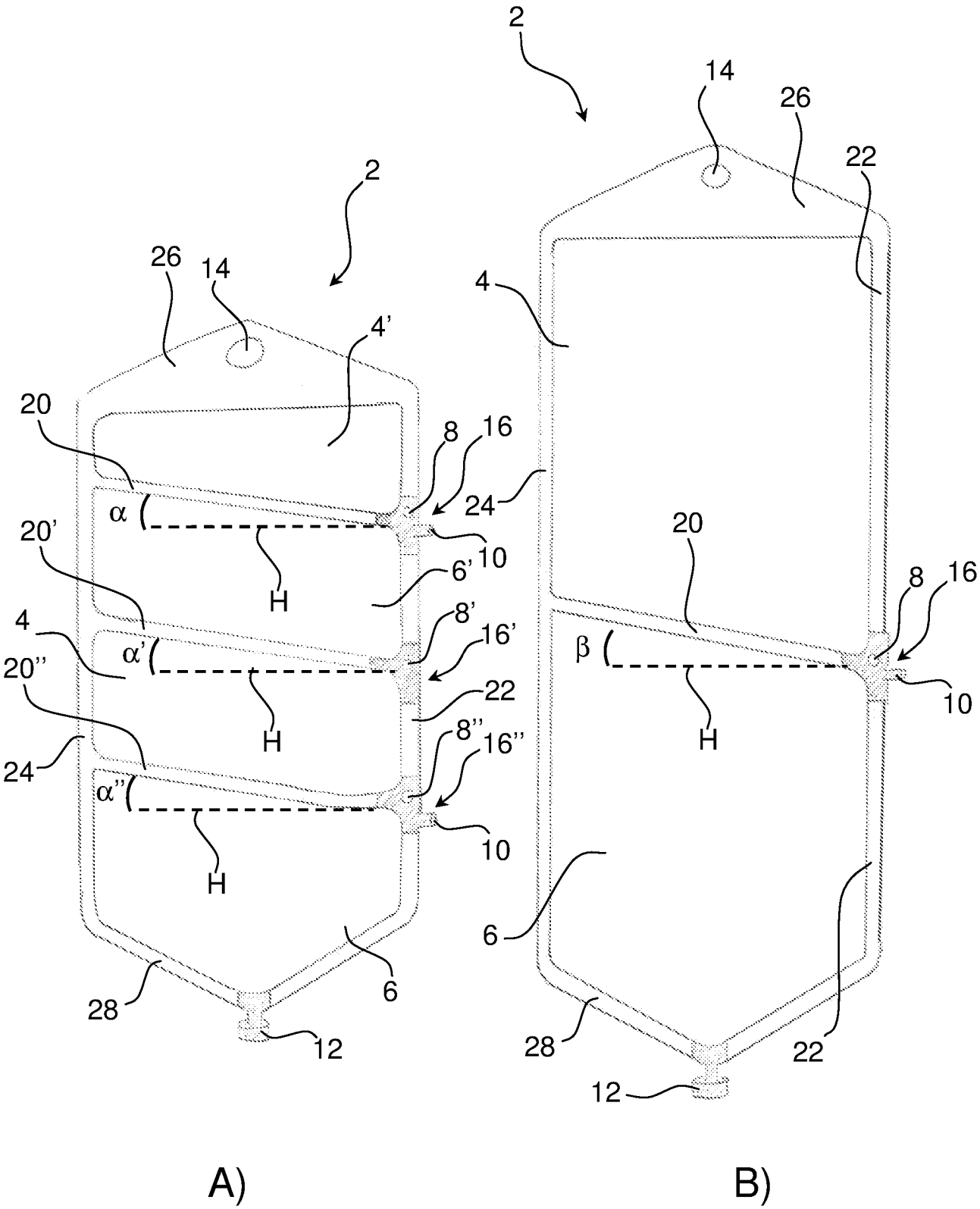


B)



A)

Fig. 3


2
26
14
4'
20
α
8
16
24
20'
H
10
6'
8'
4
α'
16'
20''
22
8''
16''
24
α''
10
H
H
6
28
12
2
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12
A)
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Fig. 4

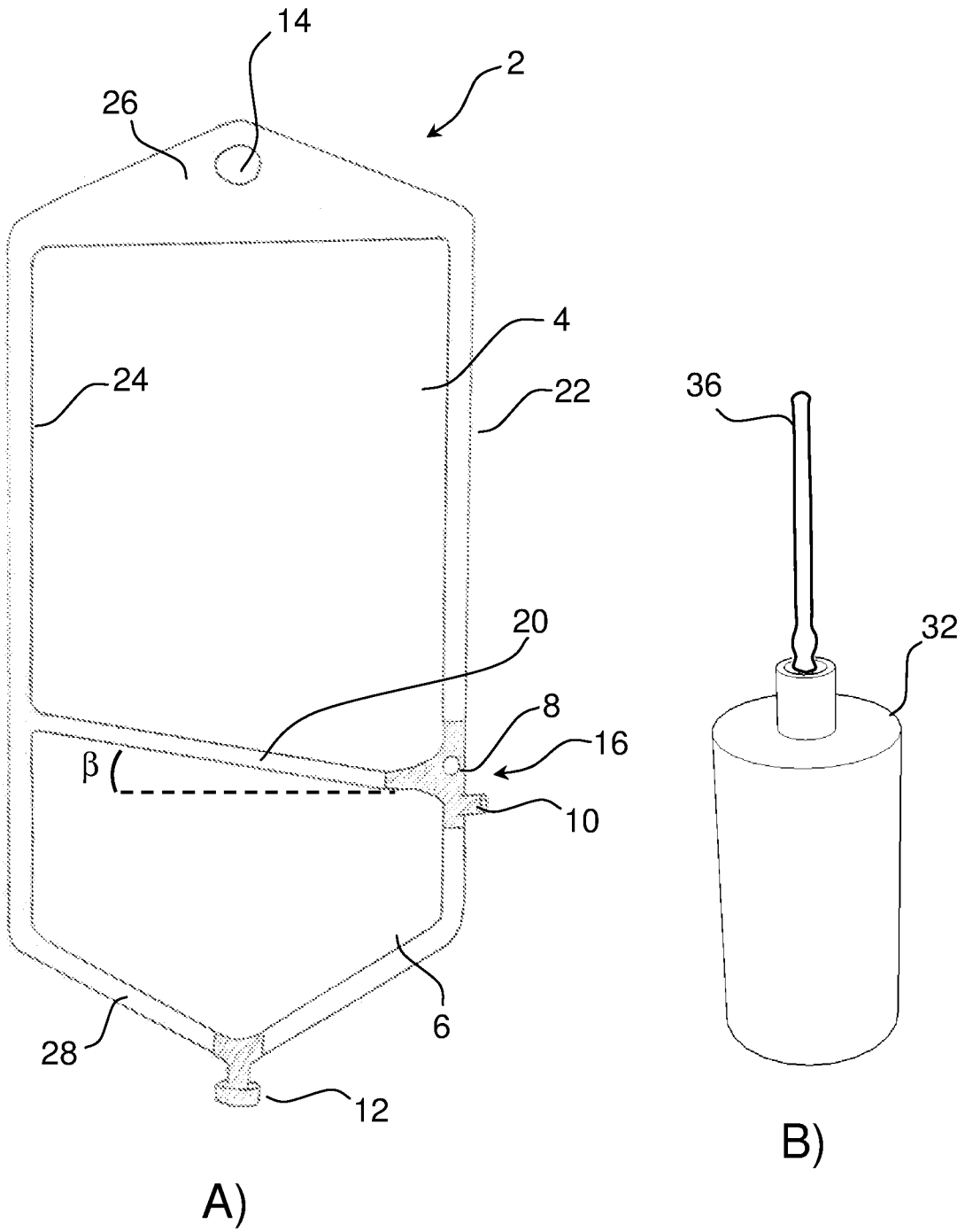

Fig. 5

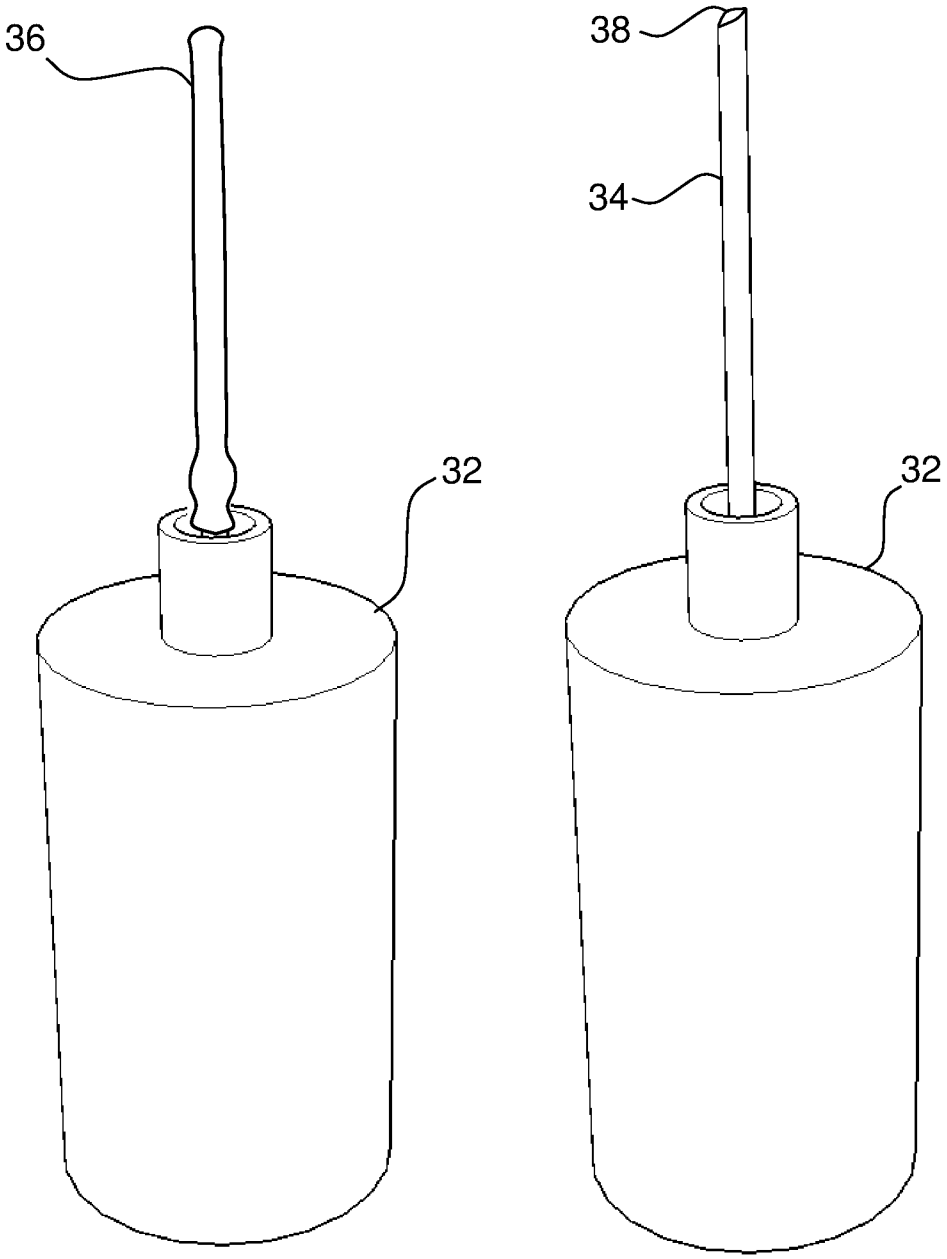

Fig. 6

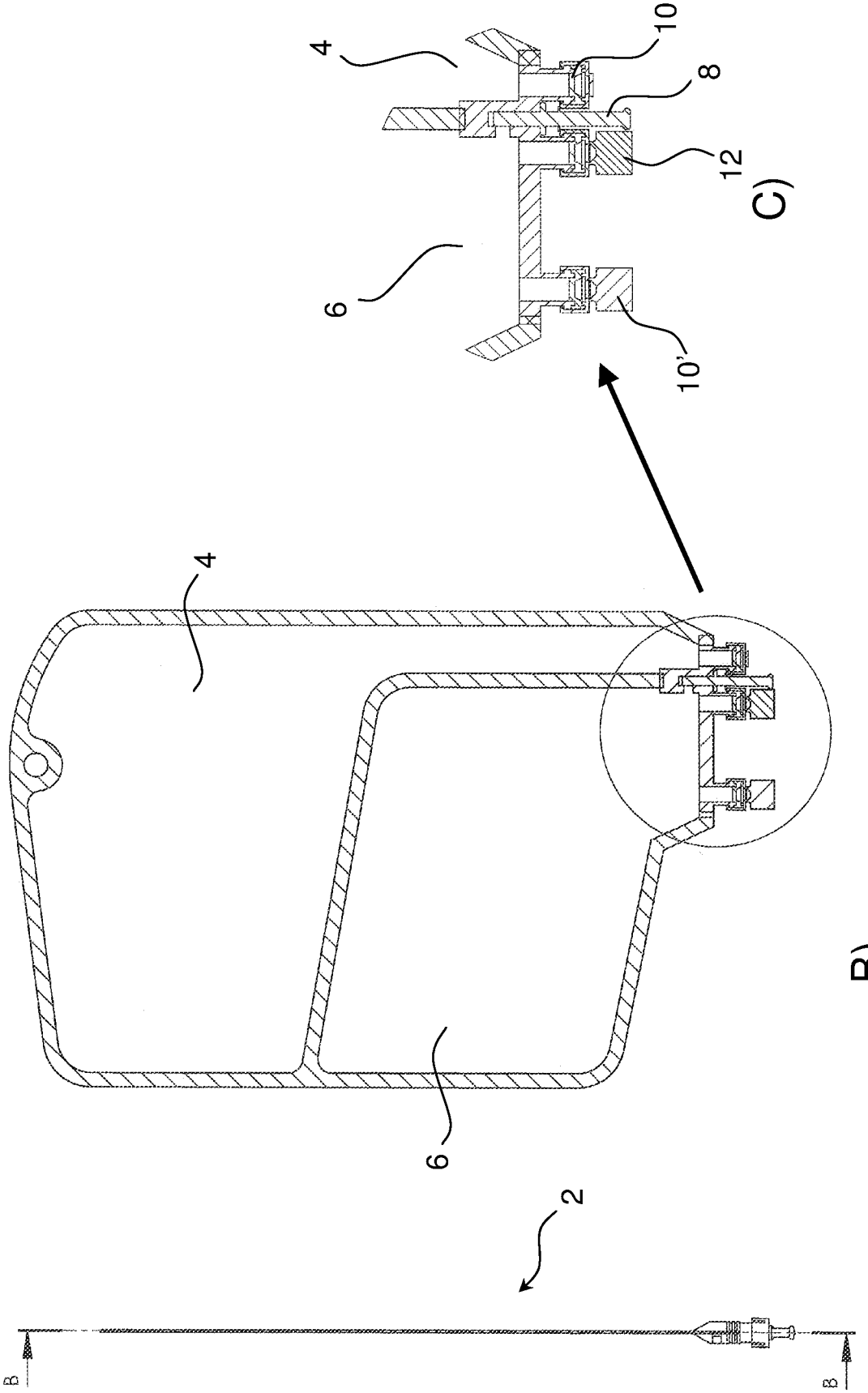

Fig. 7

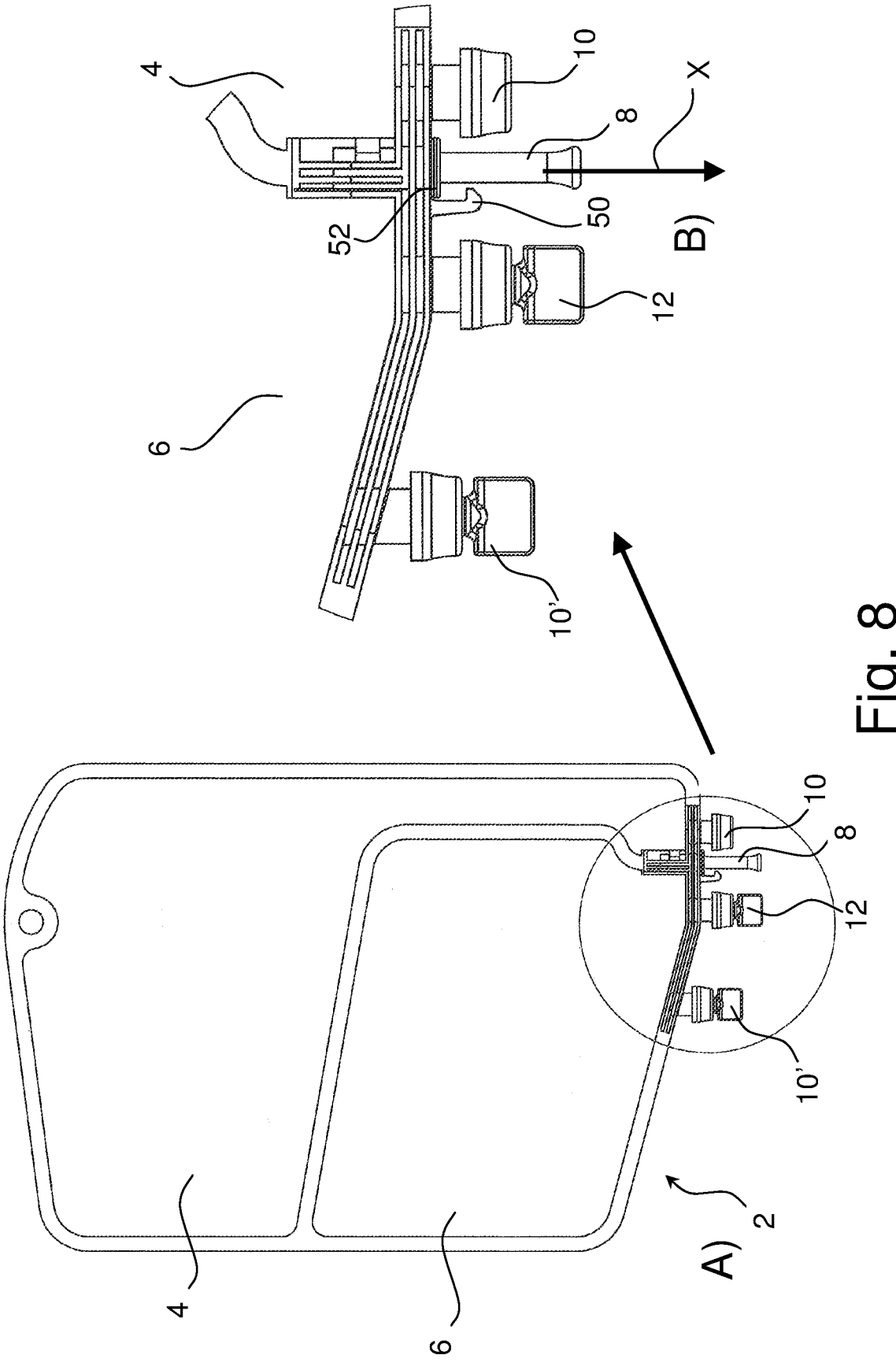

Fig. 8

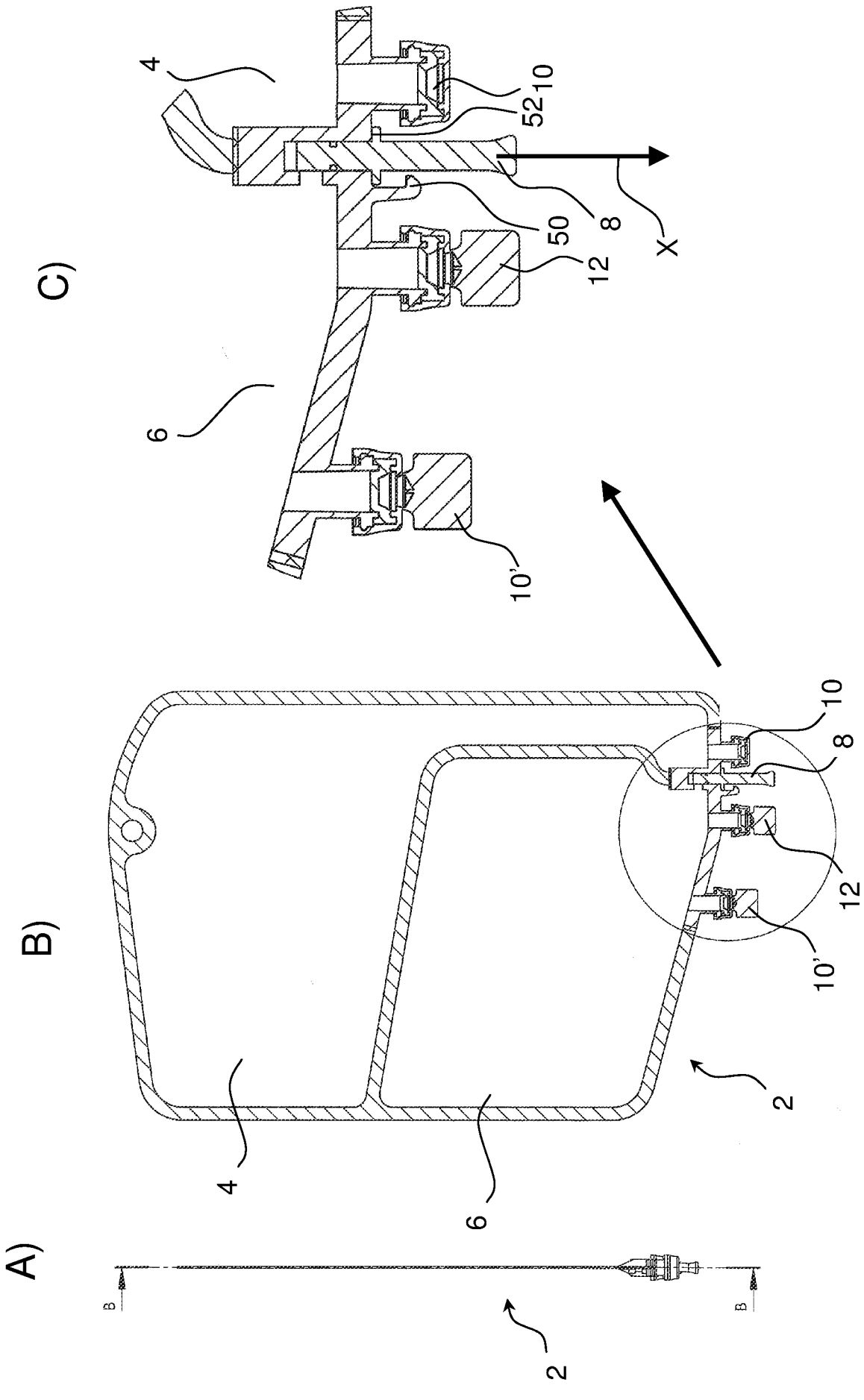

Fig. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/DK2016/050191

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61J1/10 A61J1/14 A61J1/20
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)
A61J

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	EP 0 442 406 A1 (SHINSOZAI SOGO KENKYUSHO KK [JP]) 21 August 1991 (1991-08-21) cited in the application column 6, line 56 - column 11, line 51; figures 1-14	1-13
X	US 5 853 388 A (SEMEL DAVID [US]) 29 December 1998 (1998-12-29) column 4, line 3 - line 46; figures 1-4	2
A	EP 0 974 331 A2 (HAEMOPHARM INDUSTRY AG [LI]) 26 January 2000 (2000-01-26) cited in the application figure 1	5

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

☒ See patent family 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 application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 August 2016	02/09/2016

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Sommer, Jean

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/DK2016/050191

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		DE 69917383 T2	30-06-2005
		EP 0974331 A2	26-01-2000
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		IT MI980509 U1	24-01-2000