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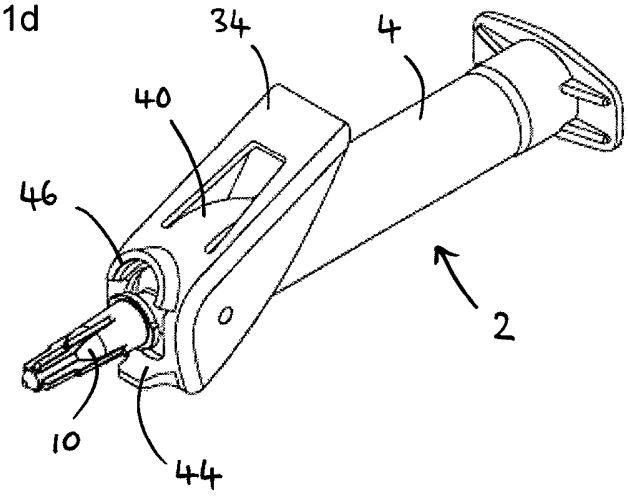
(54) **Title**: FLUID TRANSFER CONNECTIONS

Figure 1d



(57) **Abstract**: A fluid transfer device or connection (2) comprises a fluid transfer tip that has a tapered friction fitting for a corresponding hub (10). A lever member (34) is pivotally mounted to move relative to the fluid transfer tip. A latch (46) such as a screw thread is mounted on the lever member (34) to engage the hub (10) and provide a positive connection e.g. screw fit in addition to the friction fitting. The lever member (34) may optionally be resiliently biased by a spring (40). The hub (10) is disconnected from the tip by pivoting the lever member (34) to release the positive connection with the hub (10) and to subsequently release the hub (10) from the friction fitting.

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Fluid transfer connections

The present invention relates to the detachment of fluid-transferring devices and connections from a corresponding hub, and especially when transferring fluid in a medical setting. The invention may find particular use in detaching a fluid transfer device such as a syringe, or other fluid transfer connection, from a hub that is connected to a living subject to/from whom fluid is being transferred.

In a medical setting it may be necessary or desirable to transfer fluid to/from a subject for a variety of reasons. For example, a hub connected to a needle or other cannula may be used to draw blood from a vein or to infuse fluid substances i.e. intravenous (IV) therapy. A drip is one type of IV therapy. IV therapy may be used to correct electrolyte imbalances, to deliver medications or nutrition, for blood transfusion or as fluid replacement to correct dehydration. IV therapy can also be used for chemotherapy of cancer patients. Fluid-transferring devices such as syringes may also be attached to a hub that connects a cannula for the addition or removal of fluid to/from a variety of bodily cavities, organs or vessels. For instance, the hub may be part of an entity providing a catheter to drain urine from the bladder or kidney, to remove fluid from an abscess, to extract liquid from joints or cysts, or to administer breathing gases through a tracheal tube. A typical endotracheal tube includes a cuff inflation tube with a hub for attachment of a syringe to enable inflation to seal the trachea and bronchial tree against air leakage and aspiration of fluids. A tracheostomy tube or urinary tract catheter might also use a cuff system with a hub for connection of a syringe or other device to inject fluid to inflate a cup or balloon that holds it in place. However fluid injections using a syringe connected to a needle are one of the most common health care procedures in the world.

When transferring fluids to/from a subject, the hub with its needle, catheter or other cannula inserted in the patient is often left in-situ while the fluid-transferring device may be removed and replaced, e.g. to empty/re-fill a syringe or to change over the IV therapy. Where two medical devices that carry small fluid volumes must be connected, a standard Luer fitting is the most common means of achieving a leak-free junction. One type of Luer fitting, commonly called a "Luer lock/lok", uses an internally threaded collar surrounding a “Luer slip” friction fit (see below) tapered male tip of a syringe or the like. The projecting tip can be inserted into a corresponding female hub with an external thread and the collar screwed down to lock the connection. Such Luer lock fittings have the advantage of providing a secure connection that can not easily come loose, but two hands are needed to hold the hub while screwing the device in/out. A more rapid form of attachment may be preferred in some circumstances, for example in an emergency situation. Another type of Luer fitting, commonly called a "Luer slip", simply uses a friction fit between a female hub and corresponding tapered male tip of a device without a threaded collar. A standard friction fit is achieved by a 6% taper. A Luer slip attachment is

common for infusing less viscous fluids, such as vaccinations, and transferring fluids where high pressures are not involved, for example when drawing blood.

A problem observed with both Luer lock and Luer slip connections is the risk of injury when detaching the fluid-transferring device from a hub that is still connected to a patient. While a medical practitioner might take care to hold the hub and avoid injury when unscrewing a Luer lock connection, there is a temptation with a Luer slip connection to try to pull the device from the hub e.g. with one hand. However this can easily result in the hub being tugged away from the body and causing tissue damage. Often the device may not be pulled in a straight line with the cannula connected to the hub, but rotated, and this can twist the components. The tape used to hold the hub e.g. IV port in position is often loosened from the skin and its cannula e.g. needle may even be accidentally extracted. When emptying fluid from a body cavity, for example, keeping the needle hub still when detaching the syringe can be essential to avoid diffuse cutting inside the cavity or damage of the cavity wall. In addition there is a risk of unacknowledged contamination of both the hub and the Luer tip (not only the user) when holding the very small hub with the thumb and index fingers while pulling away the male tip, the tip sliding past the user's fingers as it is released.

Moreover tugging with a single hand does not usually apply enough force even to pull the device out of a friction fitting (such as a Luer slip) and, depending on the force used when connecting the Luer slip tip to the hub, the practitioner usually needs to hold or push the hub while also pulling the device so that it becomes detached. Typically the device will be rotated simultaneously while pulling away from the hub. This jerking can result in unwanted extraction of the needle or other component connected to the hub. The connection will often be pressurised by fluid. For example, a cuff connected to a tracheostomy tube, endotracheal tube or urinary catheter often has a tight connection of the male Luer tip with two-handed operation being required to loosen the connection while the sprung piston in the female Luer hub blocks the outflow of fluid (air or liquid) from the cuff.

Ease of disconnection can be a problem not only when detaching a device from a hub connected to a patient but also when it is desired to fill/empty a device such as a syringe via a fluid hub in a quick and convenient manner. For example, when filling a syringe using a needle inserted in a vial, each time that the syringe is removed it requires two hands to firmly grasp the needle hub and the syringe to separate them while the needle remains in the vial. As mentioned above, there is again a risk of contamination as the user grasps the hub and the tip comes into contact with the fingers holding the hub.

Another situation where a user might come into contact with a needle hub is when using a blood collection tube. The blood tubes are evacuated plastic or glass containers sealed with an elastomeric septum that is piercable by a double-ended needle to draw venous blood. Due to the piercing force and pressure differential, a secure connection to the needle assembly is required and therefore a threaded Luer lock connection is normally used rather than a Luer slip.

US 5,201,716 proposes an alternative blood specimen collection system that does not require the needle assembly to be grasped and twisted during disconnection. In this system a needle assembly is mounted with an interference fit rather than a threaded connection. A pivotally mounted lever assembly is spring-biased to hold the needle assembly in position, i.e. to provide an additional level of security over the friction fit. If the lever is actuated against its spring bias then there is only an interference fit holding the needle assembly in place. The lever can be pivoted to simultaneously release the spring bias and to apply a forward ejection force to the needle assembly.

In any situation where one hand is holding a needle hub while pulling a device away there is a risk of needlestick injury and contamination. Needle caps frequently being mislaid or forgotten can exacerbate this. This also applies when separating a needle or other contaminated component from a syringe or similar device for disposal purposes, with many needlestick injuries occurring when trying to remove sharps to throw into a bin. Usually the person handling a syringe will try to cover a contaminated needle with a cap after use, before grasping the hub to separate the needle from the syringe barrel for disposal. However, when mounting a needle cap onto the contaminated needle a person will use the large muscle groups in the arms and shoulders that work less precisely and, combined with poor depth of vision, this often results in a needlestick injury to the fingers holding the needle cap. It would be better if a needle hub could be safely released without needing to cap the needle or handle the connection.

There are various fluid transfer procedures in the medical setting that may require a very secure connection between a fluid transfer tip (e.g. provided by a syringe) and a corresponding hub. The hub may be connected to a needle or catheter inserted into an artery, vein, cavity or organ of a patient. In the field of cardiology, angiography and angioplasty procedures may inject fluids (liquid and/or air) into narrow channels at high pressure. Manual syringes and manifold sets are used for percutaneous coronary interventions and coronary diagnostic procedures such as angiography. A cardiac angiographic kit typically comprises a catheter hub for connection, a catheter body of chosen size, length and stiffness, and a tip with a single end-hole to eject fluids. The catheter body is inserted into the coronary vessels, ventricles and/or peripheral vasculature. A syringe may be connected to the catheter hub to inject contrast agents or saline at pressures ranging between 250 and 800 psi, and even up to 1000 or 1200 psi (84 bar). The catheter hub has an external thread to provide a standard Luer lock connection.

Luer lock connectors have become universal, not only for joining syringes to hubs, but also for connecting small-bore medical tubing and hoses for liquids and/or gases. Luer lock connections are commonly used for vascular IV lines but also find use in other medical treatment or diagnostic systems. Tubing and hoses may use a Luer lock connection for cuff

inflation systems, feeding tubes, catheters, and hoses for vascular, enteral, respiratory, neuraxial and urethral/urinary systems.

The screw connection of a Luer lock hub is often considered necessary to withstand high pressures. However a syringe, hose or other fluid transfer device must be rotated to connect, and disconnect, its Luer lock collar to/from the hub. This can take time and requires a two-handed operation. Furthermore, when a user grips the hub to unscrew the connection there is a risk of contamination, especially where the hub includes a needle that may carry blood on its shaft. It would improve the efficiency and workflow of medical procedures if a fluid transfer device could be disconnected from a Luer lock hub more easily.

The present invention seeks to address or mitigate the problems outlined above.

When viewed from a first aspect of the present invention there is provided a fluid transfer device comprising: a fluid transfer tip, the fluid transfer tip comprising a tapered friction fitting for a corresponding hub; a lever member pivotally mounted to move relative to the fluid transfer tip; and a screw thread mounted on the lever member to enable a hub to be connected to the tip by a screw fit in addition to the friction fitting; wherein the lever member is resiliently biased so that the screw thread is positioned to form a screw fit with the hub; and wherein the hub can be disconnected by pivoting the lever member against the resilient bias to release the screw fit with the hub and to subsequently release the hub from the friction fitting.

Such a device provides a novel mechanism for locking with a screw fit and automatic release using a lever. The screw thread mounted on the lever member enables a hub carrying a screw thread, such as a standard Luer lock hub, to be connected to the device. The hub may be connected by relative rotation, as is conventional, to ensure a tight screw connection. Such a Luer lock connection may be suited to high pressure fluid transfer procedures. A benefit of the operating the lever member to pivot away the screw thread and release the screw fit is that a hub can be disconnected from the device without an unscrewing action. The usual two-handed operation of unscrewed can be replaced by a simple one-handed operation of the lever member. Such a device may furthermore be connected to a hub carrying a flange, such as a standard Luer slip hub, with the screw thread engaging the flange to provide a positive connection in addition to the friction fitting. Other hub designs may also be positively engaged by the screw thread, as is explained further below.

The screw thread mounted on the lever member can be considered a kind of latch, as pivoting the lever member against the resilient bias releases the latch so that the screw thread is separated from a corresponding thread on an outer surface of the connected hub. This leaves the hub connected by the friction fitting alone. Simply releasing the screw fit is not enough to disconnect the hub from the fluid transfer tip; the hub can not fall away from the tip under gravity due to the friction fitting. The lever member has the additional function of also releasing the hub from the friction fitting. This can be achieved in a single smooth action by the lever member, for example a front surface thereof, moving relative to the fluid transfer tip to

push away the hub and release the friction fitting. In a preferred set of embodiments the a lever member is pivotally connected to the device with one end, such as a front surface, moveable between first and second positions relative to the fluid transfer tip.

The lever member is resiliently biased so that the screw thread is positioned to form a screw fit with the hub. This means that the default position of the lever member is one that maintains a Luer lock connection. This ensures safety and reliability. A user must actively overcome the resilient bias to release the screw fit with the hub.

As is mentioned above, a hub may be connected to the screw thread by rotating the hub as it is pushed onto the fluid transfer tip. The lever member may remain in its resiliently biased position while the hub is being connected in this way. For example, a standard Luer lock hub may be rotated by up to 270° to ensure connection of its outer screw thread with the screw thread mounted on the lever member. However, the Applicant has recognised that the time and/or manual dexterity required to rotate a hub to form the screw fit may not always be desirable. The resilient bias of the lever member means that is can be pushed aside to enable faster connection of a hub. This provides an improvement over standard Luer lock connections. For example, a hub may be pushed onto the fluid transfer tip without rotation, forcing the lever member to pivot against its resilient bias so that the screw thread is not engaged while the hub is connected onto the tapered friction fitting. A final, short rotation of the hub may then allow the screw thread to engage and the lever to return to its resiliently biased position. This may only require a turn through 90° (or less), rather than 180° or 270°, to complete the screw fit connection. The screw thread may only be partially threaded.

The screw thread mounted on the lever member may take the form of a standard helical thread. The cross-sectional shape of the thread (often called its form or thread form) may be square, rectangular, triangular (e.g. V-shaped), trapezoidal, or other shapes. A standard triangular thread form is based on an isosceles triangle and usually called V-threads. An equilateral triangle provides 60° V-threads. However it is envisaged that the screw thread may have a thread form that assists a hub in being pushed onto the tip without requiring full rotation. The screw thread may have a non-equilateral triangular thread form. For example, a triangular thread form may be angle downwardly, along a direction of decreasing taper of the fluid transfer tip, to assist in a hub pushing past the screw thread and then engaging the screw fit once the friction fitting has been formed. The thread form may even include downwardly extending teeth, or other gripping means, that prevent a hub from being forcibly disconnected without pivoting the lever member to release the screw fit. Various different thread forms may be considered, especially where the device is intended to be connected to a hub that does not carry a standard Luer lock threaded collar, e.g. a Luer slip hub carrying a flange, or any other kind of hub that can form a friction fitting with the tapered fluid transfer tip.

An advantage of using a lever member to disconnect the tip from a corresponding hub is that it can amplify an input force to provide a greater output force, i.e. providing leverage to

push a hub away from the tip. The mechanical advantage of a lever member can increase the force applied so that the device can be released without necessarily holding the hub, thereby enabling single-handed operation. Furthermore, a lever member can be ideally suited to engage the screw fit when pivoted under the resilient bias and to move the hub out of the screw fit as it pivots against the resilient bias, with further pivotal movement of the lever member also acting to release the hub from the friction fitting.

In a set of embodiments the screw thread is an internal thread carried by a partial hemispherical collar. As such a collar only extends around one side of the fluid transfer tip, e.g. up to 180° around the circumference of the fluid transfer tip, the screw fit may be released simply by pivoting the lever member to move the collar away from the fluid transfer tip and hub connected thereto.

More generally, it is preferable that the screw thread mounted on the lever member takes the form of an internally threaded collar. Such a collar may be mounted on the lever member to at least partially surround the fluid transfer tip. In order to ensure a secure Luer lock connection, the internally threaded collar may extend substantially 360° around the circumference of the fluid transfer tip. However a 360° collar can make it more difficult for the lever member to operate to release the screw fit, as the collar must be moved away from the fluid transfer tip on all sides. The Applicant has devised a solution wherein the internally threaded collar is separable into multiple segments that are arranged to be moved apart by pivoting the lever member against the resilient bias, thereby releasing the screw fit with the hub.

This is considered novel and inventive in its own right, regardless of whether the lever member is resiliently biased, and not only for fluid transfer devices (such as syringes) but any fluid transfer connection in general. Thus according to a second aspect of the present invention there is provided a fluid transfer connection comprising: a fluid transfer tip comprising a tapered friction fitting for a corresponding hub; a lever member pivotally mounted to move relative to the fluid transfer tip; and an internally threaded collar mounted on the lever member to at least partially surround the fluid transfer tip and enable a hub to be connected to the tip by a screw fit in addition to the friction fitting; wherein the internally threaded collar is separable into multiple segments; and wherein a hub is disconnected by pivoting the lever member to move the segments apart and thereby release the screw fit.

Such a fluid transfer connection benefits from the screw fit of a standard Luer lock connection, which is trusted to withstand pressurised fluid transfer procedures, but enables the Luer lock connection to be released by operating the lever member instead of unscrewing the tip from a corresponding hub. This can be a simple one-handed gesture rather than a two-handed twisting movement. The separable collar allows the lever-operated disconnection mechanism to cooperate with a standard Luer lock hub.

The internally threaded collar may be separable into multiple segments that are arranged around the circumference of the fluid transfer tip, for example partially hemispherical

segments. The multiple segments may move apart, for example by moving radially, in a direction that is in line with lever member or orthogonal to the lever member. Preferably at least some of the segments move radially outwardly relative to the fluid transfer tip. It will be appreciated that not all of the segments necessarily move radially outwardly relative to the fluid transfer tip. For example, one or more of the segments may stay still while one or more other segments move outwardly to result in the segments being spaced apart.

The internally threaded collar may surround the fluid transfer tip by up to 360°, in continuous or spaced segments. A secure Luer lock connection may be achieved by a collar that extends at least 180°, 190°, 200°, 210°, 220°, 230°, 240°, 250°, 260°, 270°, 280°, 290°, 300°, 310°, 320°, 330°, 340°, or 350° around the circumference of the fluid transfer tip. In preferred embodiments the internally threaded collar extends substantially 360° around the circumference of the fluid transfer tip. The movable segments of the collar enable a 360° screw fit to be achieved which is conveniently released by operating the lever member.

According to at least some embodiments of the second aspect of the invention the lever member may be freely pivotable, allowing a user to easily open and close the collar to connect and disconnect a hub as desired. However it may be preferable that the lever member has a default position that holds the collar closed to form the screw fit. In a preferred set of embodiments the lever member is resiliently biased so that the internally threaded collar surrounds the fluid transfer tip to form a screw fit with the hub. A user must therefore operate the lever member with sufficient force to overcome the resilient bias before the screw fit is released. This can prevent the Luer lock connection from being accidentally released. It is therefore preferable that the segments are only moved apart by pivoting the lever member against the resilient bias.

The lever member may act to separate the internally threaded collar into multiple segments that are already defined e.g. formed during manufacture. In one set of embodiments the internally threaded collar comprises pre-separated multiple segments. However the force applied by the lever member may instead be exploited to physically separate the collar into segments, for example breaking open frangible connections or areas of weakness formed in the collar. In another set of embodiments the internally threaded collar is arranged to be broken into multiple segments.

The fluid transfer tip may be connected and reconnected to a hub more than once. In a set of embodiments the internally threaded collar may be separable into hinged segments. Such hinged segments may be opened and closed by operation of the lever member. However, in at least some embodiments it is preferable that the fluid transfer tip can only be used once, e.g. to prevent cross-contamination. The collar may be designed to undergo permanent damage during disconnection of a hub so that the fluid transfer connection or device can not be re-used. In a set of embodiments there may be provided means for locking the multiple segments apart.

In embodiments of the second aspect of the invention, operation of the lever member may leave a hub connected to the tip by the friction fitting. Manual intervention may be required to fully disconnect the hub, for example a user may need to pull away the hub. However the friction fitting may not be easy to release manually, and a twisting action might be requires to loosen the hub. It is therefore preferable that pivoting the lever member subsequently releases the hub from the friction fitting. As is mentioned above, the lever member, for example a front surface thereof, can be arranged to move relative to the fluid transfer tip to push away the hub and release the friction fitting. In a set of embodiments the lever member comprises a front surface having a rim arranged to move forwards along the tip after the segments have been moved apart.

The Applicant has further recognised that a resilient bias may not be an essential feature to at least some further aspects of the invention. Thus when viewed from a third aspect of the present invention there is provided a fluid transfer device or connection comprising: a fluid transfer tip, the fluid transfer tip comprising a tapered friction fitting for a corresponding hub; a lever member pivotally mounted to move relative to the fluid transfer tip; and a screw thread mounted on the lever member to enable a hub to be connected to the tip by a screw fit in addition to the friction fitting; wherein the lever member is operable to move the screw thread between at least two different positions, wherein in a first position the screw thread engages the hub and thereby assists in holding the hub in a locked position and in a second position the screw thread does not engage the hub and the lever member acts to release the hub from the friction fitting.

It is preferable that the lever member is manually operable to pivot between the first and second positions. A resilient bias may optionally be used to assist manual operation. For example, the lever member may be resiliently biased to move the screw thread into the first position. This can ensure that the screw thread automatically engages the tip without manual intervention, i.e. the locking position is the default position. Manual operation of the lever member can then overcome the bias force to move the screw thread from the first position to the second position when it is desired to release the screw fit and then disconnect the friction fitting, e.g. by pushing away the hub. However, in some embodiments the presence of such a resilient bias, e.g. a spring member, may require a user to actively operate the lever member when it is desired to connect a hub to the fluid transfer tip, whereas without a resilient bias the lever member can be left in the second position (or a neutral third position) where the screw thread is moved out of the way.

In at least one set of embodiments, the lever member is preferably mounted so as to freely pivot between the first and second positions. This removes the need for a user to overcome a bias force and can make it easier to control the lever member. This may provide a user with manual dexterity in controlling movement of the lever member and selective connection/disconnection of a hub.

Even without a resilient bias, e.g. a spring member, the lever member may be arranged so as to hold the screw thread in the first position. Thus alternatively, or in addition to a resilient bias, the lever member may hold itself in the first position or the fluid transfer device/connection may act to hold the lever member in the first position. For example, the fluid transfer device may comprise a fluid chamber connected to the fluid transfer tip (e.g. a syringe) and the lever member may grip onto the fluid chamber when it moves to the first position. A user may need to apply a force to overcome the grip before the lever member can be moved away from the first position. Thus in a set of embodiments the fluid transfer device or connection further comprises gripping means arranged to hold the lever member in the first position. Such gripping means act in addition to the screw fit or other positive connection to the hub.

As mentioned above, in a set of embodiments the lever member may be operable to move the screw thread into a third position, between the first and second positions, where the screw thread no longer holds the hub in a locked position but allows the hub to remain connected to the fluid transfer tip by the friction fitting.

The lever member may comprise an actuator portion, e.g. provided by a front surface, that acts to release the hub from the friction fitting. The actuator portion is preferably arranged to move along the tip when the lever member is pivoted between the different positions. Such embodiments are described further below.

While the lever member may take many different forms, preferably the lever member comprises a front surface that is substantially transverse to the axis of the tip and the front surface is arranged to move along the tip when the lever member is pivoted against the resilient bias. In order for the lever member to transfer force efficiently, it is preferable for it to be relatively stiff. However it may also be desirable to mould the device, or at least the lever member, from plastics materials so as to provide a cheap, sterile and disposable product for single use in a medical setting. The lever member may be stiffened by forming it as a three-dimensional shell. Preferably the lever member comprises a front surface that is substantially transverse to the axis of the tip and one or more side surfaces that extend in a direction substantially parallel to the axis of the tip. Preferably the surfaces form a shroud extending back from the front surface and away from the fluid transfer tip. The three-dimensional extent of the member can help to ensure that it is stiff even if formed of a plastics material, as is preferred in various embodiments.

In a set of embodiments the lever member has an at least partially cylindrical form with the side surface(s) extending substantially parallel to the axis of the fluid transfer tip being cylindrical side surfaces. The side surface(s) do not need to fully surround the axis of the fluid transfer tip. But in at least one set of embodiments the front surface of the lever member is connected to one or more side surfaces that surround the fluid transfer tip. This can stiffen the lever member so that the front surface preferably does not flex when pushed against a hub but instead transmits its kinetic energy to move the hub away.

Alternatively, or in addition, the front and side surface(s) of the lever member are preferably integrally formed. For example, at least these parts of the lever member may be formed as a single plastics moulding. Alternatively, or in addition, it is preferable that the front surface at least partially surrounds the fluid transfer tip. The front surface may entirely surround the fluid transfer tip, for example with the tip protruding through an aperture in the front surface. This can make the lever member more compact and/or make the front surface more effective in pushing against a hub mounted on the fluid transfer tip with a friction fit.

A further advantage of using a lever member to disconnect the hub is that the shape, in particular the curvature, of the front surface can be designed to control the leverage that is achieved. In one set of embodiments the front surface is curved such that initial movement of the lever member (e.g. against a resilient bias) moves the front surface substantially transverse to the fluid transfer tip to release engagement of the screw fit and further movement of the lever member (e.g. against the resilient bias) moves the front surface along the fluid transfer tip to release the hub from the friction fitting. Accordingly the curvature of the front surface provides for two different movements that are matched to the different stages of disconnection.

A potential problem with pushing a hub away from a tip is that it may be forcibly disconnected. If the hub is carrying a needle or other sharp object then this could pose an injury risk. It is therefore preferable that the device further comprises a catch means arranged to catch the hub after it has been released from the friction fitting. Preferably further movement of the lever member (e.g. against a resilient bias) causes the catch means to catch the hub. In this way the hub may be caught as it becomes disconnected but then controllably separated from the device. The catch means be may be subsequently released by resiliently biased movement of the lever member, e.g. back to its resting state.

It may be desirable to disable the resilient bias (where provided) when the device is not in use, for example to make it compact for storage and/or transport. A generally applicable feature is for the device to comprise means to lock the lever member against the resilient bias.

In any of the embodiments described above, the fluid transfer device or connection may include means for mounting the lever member. Where the lever member comprises one or more side surfaces that extend in a direction substantially parallel to the axis of the fluid transfer tip, for example in a cylindrical or rectangular form, the side surface(s) can conveniently extend along at least part of the device to engage with such mounting means. Accordingly the fluid transfer device or connection can be conveniently provided with the lever member mounted ready for assistance in disconnecting the tip from a hub during use. At least some embodiments of the present invention may therefore provide a new category of fluid transfer devices, such as syringes, or other fluid transfer connections, that are manufactured and/or sold with a lever member pre-mounted ready for use. While the lever member could potentially be packaged separately and mounted to a device (or connection) as required, it is advantageous

for the device (or connection) to be packaged and sold as a single unit comprising the lever member mounted thereto.

The lever member may be mounted to or around the fluid transfer tip, especially if retrofitted to a conventional fluid transfer device or connection, as will be discussed further below. However this may risk the lever member taking up space around the fluid transfer tip that would better used to form the friction fit with a corresponding hub, or otherwise interfere with connection. In at least some embodiments it is therefore preferred that the lever member is mounted to a fluid chamber of the fluid transfer device or connection. Where the lever member comprises one or more side surfaces that extend in a direction substantially parallel to the axis of the fluid transfer tip, for example in a cylindrical or rectangular form, the side surface(s) may extend parallel to the fluid chamber for mounting purposes. Preferably the side surface(s) form a shroud extending from the fluid transfer tip to at least partially surround the fluid chamber and engage with mounting means provided by the fluid chamber.

The means for mounting the lever member may be integral with or separate from the fluid transfer tip. In one set of embodiments the fluid transfer device or connection includes integral means for mounting the lever member. In embodiments where the mounting means are integral with the fluid transfer tip, they may be positioned behind the fluid transfer tip, for example carried by a fluid chamber that is integrated with the tip. In one set of embodiments the fluid transfer device comprises a fluid chamber in communication with the fluid transfer tip and the mounting means is integrated with the fluid chamber. For example, the mounting means may comprise an axle integrated with the fluid chamber. In such examples, the fluid transfer device may comprise a syringe and the syringe barrel may have an axle moulded on its outer surface to pivotally mount the lever member. The fluid chamber, such as the barrel of a syringe, may therefore be designed to mount a lever member so that the device can be supplied with the lever member pre-mounted ready for use. In another set of embodiments the lever member could even be integrated with the fluid transfer device or connection, for example with the lever member pivotally mounted by an integral hinge. The lever member and fluid transfer device (or connection) could, for example, be formed as a single plastics moulding, e.g. with the lever member pivotally mounted by a living hinge or the like.

However, in another set of embodiments it may be desirable to retrofit a lever member to an existing fluid transfer device or connection. For example, it may be desirable to mount a lever member to a standard syringe or other device/connection so as to enjoy various of the benefits outlined above but without changing the design of the device/connection. In such embodiments it is preferable that the lever member is mounted by a separate attachment. The lever member may be attached to a fluid transfer device or connection by any suitable means. So as to avoid interference with the fluid transfer tip, the lever member may be attached to the aft end of the tip, or behind the tip, by an attachment collar.

It will be understood that such a retrofitting mechanism may be attached around the fluid transfer tip or any other part of a fluid transfer connection or device, such as a syringe, in any situation where operation of the lever member may assist in locking and subsequently disconnecting a hub to/from the tip. The mechanism may be attached before or after inserting the tip into a hub. Such a mechanism could be optionally attached to a fluid transfer device or connection by a user when it is determined that the friction fitting is too tight to be easily disconnected by pulling the tip away from the hub, or at least not without risking damage or injury. The mechanism could also be optionally attached where the fluid transfer device (or connection) is connected to a hub carrying a needle and protection from needle spike is desired.

In one set of embodiments it is preferable that the lever member is removably mounted to the device or connection. This means that a user may remove and discard the lever member if it is not required or if it is preferable to operate the device (or connection) without any interference from the lever member. Preferably the lever member is mounted in a bi-stable position such that a force above a certain threshold and/or in a certain direction must be applied to release it from its mounted position. This can prevent the lever member from being accidentally released from the device (or connection).

The Applicant has recognised that even when the lever member is resiliently biased so that the collar is normally closed around the fluid transfer tip to form a screw fit, there is a risk of a user accidentally operating the lever member and disconnecting a hub unintentionally. During some fluid transfer procedures it may be paramount to ensure that the fluid connection is not released inadvertently. This may be particularly dangerous during high pressure fluid transfer. One way of avoiding this could be to disable the lever member. For example, the fluid transfer device or connection may include means for locking the lever member so that it can not be pivoted. A user may need to actively unlock the lever member before it can be moved. Another solution could be to remove the lever member i.e. reverting to a traditional Luer lock connection that has to be manually unscrewed.

A solution that ensures a high level of safety for the Luer lock connection, without changing the lever disconnection mechanism, is to provide the hub with means for locking the lever member. Thus in a set of embodiments the hub comprises a socket having a tapered internal surface to form the friction fitting, a screw thread around an outer surface of the socket to form the screw fit, and a flange circumscribing the screw thread so as to lock the screw fit.

This is considered novel and inventive in its own right, and thus when viewed from a further aspect the present invention provides a hub for directing fluid from a fluid transfer connection, the hub comprising a socket having a tapered internal surface to form a friction fit with a corresponding fluid transfer tip inserted therein, a screw thread around an outer surface of the socket to enable a screw connection in addition to the friction fit, and a flange

circumscribing the screw thread so as to lock the screw connection with a corresponding fluid transfer tip.

It will be appreciated that the extra flange circumscribing the screw thread of the hub can be arranged to engage against an outer surface of an internally threaded collar that forms a screw fit with the hub i.e. the Luer lock collar of a fluid transfer device or connection. Where the collar is mounted on a lever member, this engagement means that the lever member is immobilised so that it can not be operated to release the screw fit. The hub may be designed so that the flange circumscribes the screw thread at a distance that substantially matches the width of a standard Luer lock collar. This distance may be chosen to provide an interference fit between the flange and a Luer lock collar. Alternatively, or in addition, the flange may be provided with an internal gripping surface, e.g. made of a material and/or coated or treated to increase the coefficient of friction with the outer surface of a Luer lock collar.

Thus in embodiments of this aspect of the invention the hub may be connected to the fluid transfer tip of a fluid transfer device or connection, a friction fit being formed between the tip and the tapered internal surface of the socket, and a screw connection being formed between the screw thread and an internally threaded collar that at least partially surrounds the fluid transfer tip. Preferably the internally threaded collar is mounted on a lever member, the lever member being pivotally mounted to move relative to the fluid transfer tip to release the screw connection. The flange circumscribing the screw thread preferably engages an outer surface of the internally threaded collar so as to lock the screw connection against movement of the lever member. Thus the flange can prevent the internally threaded collar from moving or separating into multiple segments so that the screw connection can not be released.

In other embodiments the fluid transfer tip of a fluid transfer device or connection may be connected to a hub that does not include such a flange. The hub may therefore allow a lever member to operate to move or separate an internally threaded collar that forms a screw connection/fit with the hub. In a set of embodiments the hub may comprise a tapered internal surface and an outer rim at its base, for example a standard Luer slip hub. The outer rim may form an interference fit with the internally threaded collar that is akin to a screw fit. In another set of embodiments the hub may comprise a tapered internal surface and an outer thread at its base, for example a standard Luer lock hub. The outer thread of such a hub is of course intended to form a screw fit with the internally threaded collar of a corresponding Luer lock fitting.

Furthermore, although the various aspects of the invention described above relate to a screw thread or internally threaded collar being mounted on the lever member to form a screw fit with the hub, it will be appreciated that the invention may be extended to any latch or positive connection acting to lock the hub in addition to the normal friction fitting. For example, a suitable positive connection may be achieved by engaging a pair of male/female parts. Thus according to a further broad aspect of the present invention there is provided a fluid transfer

device or connection comprising: a fluid transfer tip, the fluid transfer tip comprising a tapered friction fitting for a corresponding hub; a lever member pivotally mounted to move relative to the fluid transfer tip; and a latch mounted on the lever member to engage a part mounted on the hub and provide a positive connection in addition to the friction fitting; wherein the hub is disconnected from the tip by pivoting the lever member to release the latch and to subsequently release the hub from the friction fitting. In some examples the latch may provide a positive connection on just one side of the fluid transfer tip, for example a latch extending up to 90° or up to 180° around the tip. In other examples the latch may provide a positive connection substantially all the way around the fluid transfer tip, for example a latch extending at least 180° or 270° and up to 360° around the tip. The latch may take the form of a screw thread or internally threaded collar. Any of the preferred features described above may equally be applied to this further aspect of the invention.

It is also envisaged that suitable hubs may deviate from standard Luer slip or Luer lock designs. The Applicant has recognised that when a hub is to be disconnected using a lever member it may be helpful to provide space below the outer rim or thread for the lever member to interact with the hub. Thus in a set of embodiments the hub comprises a tapered internal surface and an outer rim or thread spaced from its base by a skirt portion. The skirt portion can conveniently provide room for a lever member to rotate before it comes into contact with the rim or thread. As is described above, this may allow an internally threaded collar to open to release the screw fit before further movement of the lever member moves a front surface (e.g. having a rim) forwards along the fluid transfer tip, past the skirt portion, to release the hub from the friction fitting by pushing against the rim or thread. The skirt portion may be flexible.

In at least some embodiments, the hub may further comprise an additional means for gripping a fluid transfer tip when the hub is connected thereto. For example, the additional means for gripping a tip may comprise a flange or groove provided on the tapered internal surface. The flange or groove on the inner surface of the hub may engage over a corresponding groove or flange when it is connected to a tip. Accordingly, such a corresponding groove or flange may be provided on the fluid transfer tip. For example, the hub may comprise an annular groove on its tapered internal surface and the fluid transfer tip may be circumscribed by an annular gripping flange.

During use, the hub may be connected to a fluid transfer tip provided by a fluid transfer device or connection in the form of a syringe, blood collection tube, hose, tubing, IV line, stopper or closing cone. The hub may take the form of any female Luer lock connector, for example including a fluid connection to a catheter, cannula or hypodermic needle. The fluid transfer device or connection may be arranged to transfer liquids and/or gases.

The fluid transfer device may comprise any type of device used to transfer fluid - liquid and/or gas - either to or from a fluid receptacle. The fluid receptacle may be inanimate or it may be part of a living subject, for example a bodily cavity, organ or vessel, such as a vein or artery.

Although the present invention may find a wide range of uses, preferably the fluid transfer device is a medical device. The fluid transfer device may comprise one or more devices such as a syringe, pre-filled syringe, IV delivery device e.g. "drip", transfusion device, fluid pump, stopcock, aspirator, suction device, container for a blood collection tube or hose. The device may be made to meet the relevant medical standard(s), for example ISO 7886 for sterile hypodermic syringes.

Some embodiments of the present invention will now be described, by way of example only, and with reference to the accompanying drawings, in which:

Figures 1a to 1d show an embodiment of a disconnecting mechanism for a syringe connected to a needle hub;

Figures 2a and 2b provide a side and a cross-sectional view of a conventional Luer slip hub;

Figures 3a and 3b provide a side and a cross-sectional view of a conventional Luer lock hub;

Figures 4a to 4e show another embodiment of a disconnecting mechanism for a syringe connected to a needle hub;

Figures 5a and 5b provide plan views showing an alternative to Figures 4c and 4d;

Figures 6a and 6b show a first variant of the embodiment of Figure 4;

Figures 7a and 7b show a second variant of the embodiment of Figure 4;

Figures 8a to 8d provide plan and perspective views showing an alternative version of the embodiment of Figure 4;

Figures 9a to 9d illustrate some examples of a separable collar for use in the embodiments of Figures 4 to 7;

Figures 10a and 10b illustrate third and fourth variants of the embodiment of Figure 4;

Figures 11a and 1b illustrate fifth and sixth variants of the embodiment of Figure 4;

Figures 12a and 12b show another embodiment of a hub;

Figure 13 shows another variant of a hub;

Figures 14a and 14b provide a side and a cross-sectional view of a diffeent Luer lock hub;

Figures 15a and 15b provide perspective views of a hub connected to, and disconnected from, a syringe;

Figures 16a and 16b provide cross-sectional views of a first embodiment corresponding to Figures 15a and 15b;

Figures 17a and 17b provide cross-sectional views of a second embodiment corresponding to Figures 15a and 15b;

Figures 18a and 18b provide cross-sectional views of a third embodiment corresponding to Figures 15a and 15b; and

Figure 19 shows a disconnecting mechanism mounted to a fluid transfer tip at the end of a fluid transfer hose.

Figures 1a to 1d illustrate an embodiment of a disconnecting mechanism for a hub 10. The syringe 2 has a fluid transfer tip 6 that is tapered so as to form a Luer slip connection i.e. friction fitting with a corresponding hub 10. In addition the tip 6 may optionally be provided with an annular gripping flange 8 surrounding the tip 6 close to the barrel 4 of the syringe 2. The hub 10 may be a standard Luer slip hub 10 as seen in Figures 2a and 2b, or a hub 410 as seen in Figures 14a and 14b which includes an annular groove on its inner surface to grip onto the flange 8. The hub 10 may be similar to a standard Luer slip hub having an internal taper and an outer rim 12, except additionally provided with a skirt extending below the rim 12. Alternatively, the hub 10 may be a standard Luer lock hub 110 as seen in Figures 3a and 3b.

In this embodiment (see Fig. 1a) the syringe 2 has a pivotally mounted lever member 34 which carries a forwardly extending latch 46 in the form of a partial hemispherical collar carrying an internal thread. As is seen from Fig. 1b, the hub 10 may be connected to the tip 6 by pushing it onto the friction fitting at the same time as twisting the hub 10 to connect (e.g. the rim 12) with the threads of the latch 46. If the hub 10 is not rotated then it may still be pushed along the tip 6, forcing the lever member 34 to pivot against its resilient bias, and then finally rotated to form a screw fit. In its resiliently biased position, seen in Fig. 1c, the lever member 34 is pivoted to keep the threads positively engaged. Although a two-handed operation may be required to connect the hub 10 to the syringe 2, the lever member 34 can be used to disconnect the hub 10 in a continuous, single-handed movement. Fig. 1d shows the lever member 34 being pivoted down against the resilient bias of its leaf spring 40 so that the threaded latch 46 is moved away from the hub 10 so that it no longer assists in holding the hub in a locked position. Pivotal movement of the lever member 34 also pushes the hub 10 out of engagement with the gripping flange 8 on the tip 6 and releases the friction fitting. An optional catch member 44 is provided to prevent the hub 10 from flying away from the syringe 2.

In these embodiments the outer rim 12 of a standard Luer slip hub 10 is twisted to form a screw fit with an internal thread mounted on the latch 46 of the lever member 34. However a Luer slip hub is not usually intended to form a screw fit with a fluid transfer tip in the same way as a Luer lock connector. A Luer lock hub has an outer thread rather than a flat rim so as to ensure that a screw fit connection is made. Figures 2 and 3 compare conventional hubs. Figs. 2a and 2b show a standard Luer slip hub 10 having an outer rim 12. Figures 3a and 3b show a standard Luer lock hub 110 having an outer thread 112. Either of these hubs 10, 110 may be connected to the fluid transfer tip 6 of the syringe 2 seen in Figs. 1a-1d, the screw threads of the latch 46 engaging with either the rim 12 or outer thread 112 to provide a positive connection e.g. screw fit in addition to the friction fitting.

There will now be described some embodiments of a disconnecting mechanism for a standard Luer lock hub 110. In Figures 4a-4e there is seen a syringe 102 that has a pivotably

mounted lever member 134 resiliently biased by a leaf spring 140. The Luer lock hub 110 is connected to the tip 106 of the syringe 102 by a friction fitting between the tapered surfaces. The Luer lock hub 110 has an outer thread 112 at its base which enables the hub 110 to be connected by a screw fit in addition to the friction fitting. A conventional Luer lock syringe would provide an internally threaded collar that could be twisted onto the hub 110. However in these embodiments an internally threaded collar 146 is mounted on the lever member 134 and arranged to be split open when the lever member 134 is operated.

In order to connect or disconnect the hub 110 from the tip 106, the lever member 134 may be moved against the resilient bias of the spring 140 so as to open the collar 146, as is seen in Fig. 4b. It is no longer necessary to rotate the syringe 102 or the hub 110 when connecting or disconnecting. The screw connection is simply released when the lever member 134 is pressed down. When disconnecting the syringe 102 from the hub 110, it may not even be necessary to forcibly separate the friction fitting. As the lever member 134 is pivoted against the syringe 102 its front surface, or a rim on the front surface, may push forwards along the tip 106 so as to push away the hub 110 and automatically separate the connection in a single one-handed operation, as is seen in Fig. 4c. An optional catch member 144 may be arranged to prevent the hub 110 from flying off. Further details of such a lever mechanism may be found in the Applicant's published application WO 2013/164358, the contents of which are hereby incorporated by reference.

When the lever member 134 is released, it automatically pivots under the resilient bias of the spring 140 so that the threaded collar 146 closes around the outer thread 112 of the Luer lock hub 110. Unlike the hemispherical collar seen in Figure 1, the threaded collar 146 can extend substantially 360° around the circumference of the Luer lock hub 110. This ensures the integrity of the screw fit providing the Luer lock connection. The plan views of Figures 4d and 4e demonstrate how, in one example, the threaded collar 146 splits apart into two hemispherical segments when the lever member 134 is operated. Of course the threaded collar 146 may separate into multiple parts that move radially outwardly from one another when the collar is opened. These partly hemispherical segments may not be equal in circumference. An example of a threaded collar 246 that separates into three segments is shown in the plan views of Figs. 5a and 5b.

It will be appreciated that when the threaded collar 146 is closed around the hub 110, its segments may not exactly touch one another, for example as seen in Figures 6a and 6b. In one example, seen in Figures 7a and 7b, the threaded collar 146 forms a continuous 360 degree thread around the Luer lock hub 110.

When the lever member 134 is operated, the internally threaded collar 146 may separate into multiple segments that separate radially parallel to the lever member 134. In other embodiments, for example as shown in Figures 8a to 8c, a lever member 134 may carry an

internally threaded collar 146 that separates into multiple segments that spread apart radially in a direction transverse to the lever member 134.

In any of these embodiments, the internally threaded collar 146 may already be separated into separate segments, for example a cut collar as seen in Fig. 9a. Alternatively, the threaded collar 146 may be formed as an integral 360° circle around the tip 106, but with one or more areas of weakness or frangible lines that enable the collar to split apart into multiple segments when a force is applied to the lever member 134. Figures 9b to 9d illustrate some possible examples.

It will be appreciated that the lever member 134 may operate to split open the threaded collar 146 in any suitable way. In the illustrated example of Figure 10a, a feature on the tip 106 is arranged to push against one or more of the segments of the threaded collar 146 when the lever member 134 is operated. In the illustrative example of Figure 10b, a feature provided on the barrel 104 of the syringe 102 may act to push open the threaded collar 146 when the lever member 134 is operated.

In at least some of these embodiments it is envisaged that the lever member 134 may be operated multiple times so as to open and close the threaded collar 146 and allow multiple connection and disconnection events to take place. However, in a medical setting where fluid transfer devices such as syringes are typically intended to only be used once, it can be desirable for the disconnecting mechanism to render the device unusable after a single use. Figures 11a and 11b illustrate some possible ways of achieving this. In Fig. 11a it is seen that the segments of the threaded collar 146 become permanently deformed upon operation of the lever member, so that the collar cannot be used again. Figure 11b shows an alternative design where the segments of the collar 146 become locked in an open position once the lever member has operated.

It is an advantage of the embodiments described above that a standard Luer lock hub 110 can be connected and disconnected using the one-hand operation of a lever member. The resilient bias acting on the lever member ensures that its default position holds the threaded collar closed around the hub 110 and a user must purposely apply pressure to the lever member in order to unlock the connection. However, there may be some circumstances where a syringe or other fluid transfer device that carries such a lever member is to have a Luer lock connection with a hub, but without any risk of a user accidentally operating the lever member and opening the screw fit connection. In such situations, a standard Luer lock hub may be replaced with a novel locking hub 210 as seen in Figures 12a and 12b. In addition to the external thread 212, the hub 210 includes a circumferential flange 214 that circumscribes the screw thread 212. As is seen from Figure 12b, this hub 210 may be connected to the tip 106 of a syringe 102 by twisting the screw thread 212 into engagement with the internally threaded collar 146 so that the outer flange 214 surrounds the collar 146 and therefore locks a screw connection. Even if pressure is applied to the lever member 134, it is not able to pivot and open

the collar 146 due to the circumscribing flange 214 provided by the hub 210. The only way that a user can disconnect the hub 210 from the tip is by unscrewing it in the same way as a conventional Luer lock connection.

A similar type of locking flange may also be provided on a Luer slip hub. In another variant seen in Figure 13, the lever member 334 is provided with an outwardly facing latch member 366, such as a partial hemispherical collar, that can lock inside the flange 314 of the hub 310.

Another hub 410 is shown in Figures 14a and 14b. It may be seen that the hub 410 carries an external thread 412, which means that the hub 410 may be used with a standard Luer lock connection if desired. The thread 412 may be omitted or replaced by a plain rim, in other variants. However, as compared to a conventional Luer lock hub (seen in Figs. 3a and 3b), the hub 410 comprises a skirt 414 below the thread 412. The skirt 414 extends downwardly so as to pass through the slot in the front surface of the lever member. The skirt 414 therefore provides a surface that helps the lever member to engage the hub 410. It can further be seen from the cross-section shown in Fig. 14b that the skirt 414 has an annular groove 416 formed on its inner surface in addition to being tapered. The groove 416 provides an additional means for the hub 410 to be gripped when connected to a fluid transfer tip by a friction fitting, in particular a fluid transfer tip circumscribed by an annular gripping flange. Finally, it can also be seen from Figs. 14a and 14b that the hub 410 may optionally include an outer ring 418 which is an ergonomic feature making it easier for a user to push the hub 410 onto a tip. Such a hub 410 may be connected/disconnected to/from the fluid transfer tip 6, 106 of a syringe 2, 102 as described above in relation to Figs. 1-12.

Figures 15-18 illustrate some further embodiments of a locking and disconnecting mechanism for a hub 510, seen here as a standard Luer slip hub 510 carrying a flange 512. The hub 510 may be replaced by any of the other hubs described above. The hub 510 may carry a needle (not shown) or form part of a fluid transfer connection. The syringe 502 has a fluid transfer tip 506 that is tapered to form a Luer slip i.e. friction fitting with the hub 510. Behind the fluid transfer tip 506, a lever member 534 is pivotally mounted to the barrel 504 of the syringe 502. The lever member 534 carries a latch 546 in form of a screw thread or internally threaded collar. The lever member 534 can be manually operated to move the latch 546 between different positions.

As is seen in Fig. 15a, in a first position the lever member 534 is pivoted down so that the screw thread of the latch 546 engages the flange 512 of the hub 510 and thereby assists in holding the hub in a locked position. As is seen in Fig. 15b, in a second position the lever member 534 is pivoted up so that the screw thread does not engage the hub 510 and, furthermore, the lever member 534 acts to release the hub 510 from the friction fitting by pushing it forwards along the tip 506. Although a two-handed operation may be required to connect the hub 510 to the syringe 502, the lever member 534 can be used to disconnect the

hub 510 in a continuous, single-handed movement. As seen in the cross-sectional views of Figs. 16a and 16b, an optional catch member 544 may be provided on the lever member 534 to prevent the hub 510 from flying away from the syringe 502 when it is released by movement into the second position.

The lever member 534 may be freely pivotable between the first and second positions seen in Figs. 15a and 15b. The cross-sectional views of Figs. 17a and 17b show movement of the lever member 534 between the first (locking) position and the second (releasing and disconnecting) position. Alternatively, the lever member 534 may be resiliently biased into the first position e.g. by a leaf spring 540 (or other spring member), as seen in the cross-sectional views of Figs. 18a and 18b. In this example a user must pivot the lever member 534 against the resilient bias of the leaf spring 540 in order to move the latch 546 away from the hub 510 and push the hub 510 along the tip 506, thereby releasing the friction fitting.

Of course various embodiments of the present invention, such as those described above, are not limited to a fluid transfer device in the form of a syringe. It will be appreciated that the disconnecting mechanisms described herein are not limited to use with a syringe comprising a barrel as a fluid chamber, but may instead be mounted to a fluid transfer tip at the end of a hose, pipe, cannula, etc. Figure 19 shows a lever-actuated disconnection mechanism mounted to a fluid transfer tip at the end of a fluid transfer hose. Equally, such a hose or other fluid transfer device could replace the syringe shown in any of the other embodiments described above.

Claims

1. A fluid transfer device comprising:

a fluid transfer tip, the fluid transfer tip comprising a tapered friction fitting for a corresponding hub;

a lever member pivotally mounted to move relative to the fluid transfer tip; and

a screw thread mounted on the lever member to enable a hub to be connected to the tip by a screw fit in addition to the friction fitting;

wherein the lever member is resiliently biased so that the screw thread is positioned to form a screw fit with the hub;

and wherein the hub can be disconnected by pivoting the lever member against the resilient bias to release the screw fit with the hub and to subsequently release the hub from the friction fitting.

2. A fluid transfer device according to claim 1, wherein the screw thread is an internal thread carried by a partial hemispherical collar.

3. A fluid transfer device according to claim 1, wherein the screw thread mounted on the lever member takes the form of an internally threaded collar.

4. A fluid transfer device according to claim 3, wherein the internally threaded collar extends substantially 360° around the circumference of the fluid transfer tip.

5. A fluid transfer device according to claim 3 or 4, wherein the internally threaded collar is separable into multiple segments that are arranged to be moved apart by pivoting the lever member against the resilient bias, thereby releasing the screw fit with the hub.

6. A fluid transfer connection comprising:

a fluid transfer tip comprising a tapered friction fitting for a corresponding hub;

a lever member pivotally mounted to move relative to the fluid transfer tip; and

an internally threaded collar mounted on the lever member to at least partially surround the fluid transfer tip and enable a hub to be connected to the tip by a screw fit in addition to the friction fitting;

wherein the internally threaded collar is separable into multiple segments; and

wherein a hub is disconnected by pivoting the lever member to move the multiple segments apart and thereby release the screw fit.

7. A fluid transfer connection according to claim 6, wherein the internally threaded collar extends substantially 360° around the circumference of the fluid transfer tip.

8. A fluid transfer connection according to claim 6 or 7, wherein the lever member is resiliently biased so that the internally threaded collar surrounds the fluid transfer tip to form the screw fit.

9. A fluid transfer connection according to claim 8, wherein the segments are moved apart by pivoting the lever member against the resilient bias.

10. A fluid transfer connection according to any of claims 6-9, wherein at least some of the segments move radially outwardly relative to the fluid transfer tip.

11. A fluid transfer connection or device according to any of claims 3-10, wherein the internally threaded collar comprises pre-separated multiple segments.

12. A fluid transfer connection or device according to any of claims 3-10, wherein the internally threaded collar is arranged to be broken into multiple segments.

13. A fluid transfer connection or device according to any of claims 3-12, wherein the internally threaded collar is separable into hinged segments.

14. A fluid transfer connection according to any of claims 6-13, further comprising means for locking the multiple segments apart.

15. A fluid transfer connection according to any of claims 6-14, wherein pivoting the lever member subsequently releases the hub from the friction fitting.

16. A fluid transfer device or connection comprising:

a fluid transfer tip, the fluid transfer tip comprising a tapered friction fitting for a corresponding hub;

a lever member pivotally mounted to move relative to the fluid transfer tip; and

a screw thread mounted on the lever member to enable a hub to be connected to the tip by a screw fit in addition to the friction fitting;

wherein the lever member is operable to move the screw thread between at least two different positions, wherein in a first position the screw thread engages the hub and thereby assists in holding the hub in a locked position and in a second position the screw thread does not engage the hub and the lever member acts to release the hub from the friction fitting.

17. A fluid transfer device or connection according to claim 16, wherein the lever member is manually operable to pivot between the first and second positions

18. A fluid transfer device or connection according to claim 16 or 17, further comprising gripping means arranged to hold the lever member in the first position.

19. A fluid transfer device or connection according to any of claims 16-18, wherein the lever member is resiliently biased to move the screw thread into the first position.

20. A fluid transfer device or connection according to any of claims 16-19, wherein the lever member is operable to move the screw thread into a third position, between the first and second positions, where the screw thread no longer holds the hub in a locked position but allows the hub to remain connected to the fluid transfer tip by the friction fitting.

21. A fluid transfer device or connection comprising:

a fluid transfer tip, the fluid transfer tip comprising a tapered friction fitting for a corresponding hub;

a lever member pivotally mounted to move relative to the fluid transfer tip; and

a latch mounted on the lever member to engage a part mounted on the hub and provide a positive connection in addition to the friction fitting;

wherein the hub is disconnected from the tip by pivoting the lever member to release the latch and to subsequently release the hub from the friction fitting.

22. A fluid transfer device or connection according to claim 21, wherein the lever member is resiliently biased so that the latch provides said positive connection.

23. A fluid transfer device or connection according to any preceding claim, wherein the lever member comprises a front surface that is substantially transverse to the axis of the tip and the front surface is arranged to move along the tip when the lever member is pivoted.

24. A fluid transfer device or connection according to claim 23, wherein the front surface is curved such that initial pivoting movement of the lever member moves the front surface substantially transverse to the fluid transfer tip to release the screw fit and further movement of the lever member moves the front surface along the fluid transfer tip to release the hub from the friction fitting.

25. A fluid transfer device or connection according to any preceding claim, wherein the lever member comprises a front surface having a rim arranged to move forwards along the tip after the segments have been moved apart.

26. A fluid transfer device or connection according to any preceding claim, wherein the lever member comprises a catch means arranged to catch the hub after it has been released from the friction fitting.

27. A fluid transfer device or connection according to claim 26, wherein the lever member is resiliently biased and pivoting the lever member against the resilient bias causes the catch means to catch the hub.

28. A fluid transfer device or connection according to claim 26 or 27, wherein the catch means is arranged to be released by resiliently biased movement of the lever member.

29. A fluid transfer device or connection according to any preceding claim, further comprising means for mounting the lever member.

30. A fluid transfer device or connection according to claim 29, wherein the means for mounting the lever member are integral with or separate from the fluid transfer tip.

31. A fluid transfer device or connection according to claim 30, wherein the lever member is mounted by a separate attachment.

32. A fluid transfer device or connection according to any preceding claim, wherein the lever member is removably mounted.

33. A fluid transfer device or connection according to any preceding claim, wherein the fluid transfer tip comprises a male connector tip that is tapered to form the friction fitting when inserted into a corresponding female hub.

34. A fluid transfer device or connection according to any preceding claim, wherein a hub is connected to the fluid transfer tip.

35. A fluid transfer device or connection according to claim 34, wherein the hub comprises a tapered internal surface and an outer rim at its base.

36. A fluid transfer device or connection according to claim 34, wherein the hub comprises a tapered internal surface and an outer thread at its base.

37. A fluid transfer device or connection according to claim 34, wherein the hub comprises a tapered internal surface and an outer rim or thread spaced from its base by a skirt portion.

38. A fluid transfer device or connection according to claim 37, wherein the skirt portion is flexible.

39. A fluid transfer device or connection according to any of claims 35-38, wherein the hub further comprises a groove or flange provided on the tapered internal surface for gripping a corresponding flange or groove on the fluid transfer tip.

40. A fluid transfer device or connection according to any of claims 34-39, wherein the hub provides a fluid connection to a catheter, cannula or hypodermic needle.

41. A fluid transfer device or connection according to any preceding claim, wherein the fluid transfer tip is part of a syringe.

42. A fluid transfer device or connection according to claim 34, wherein the hub comprises a socket having a tapered internal surface to form the friction fitting, a screw thread around an outer surface of the socket to form the screw fit, and a flange circumscribing the screw thread so as to lock the screw fit.

43. A hub for directing fluid from a fluid transfer connection, the hub comprising a socket having a tapered internal surface to form a friction fit with a corresponding fluid transfer tip inserted therein, a screw thread around an outer surface of the socket to enable a screw connection in addition to the friction fit, and a flange circumscribing the screw thread so as to lock the screw connection with a corresponding fluid transfer tip.

44. A hub according to claim 43, including a fluid connection to a catheter, cannula or hypodermic needle.

45. A hub according to claim 43 or 44, wherein the screw thread is spaced from a base of the hub by a skirt portion.

46. A hub according to claim 45, wherein the skirt portion is flexible.

47. A hub according to any of claims 43-46, further comprising an additional means for gripping a fluid transfer tip when the hub is connected thereto.

48. A hub according to claim 47, wherein the additional means for gripping a tip comprises a flange or groove provided on the tapered internal surface.

49. A hub according to any of claims 43-48, connected to a fluid transfer tip provided by a fluid transfer device or connection in the form of a syringe, blood collection tube, hose, tubing, IV line, stopper or closing cone.

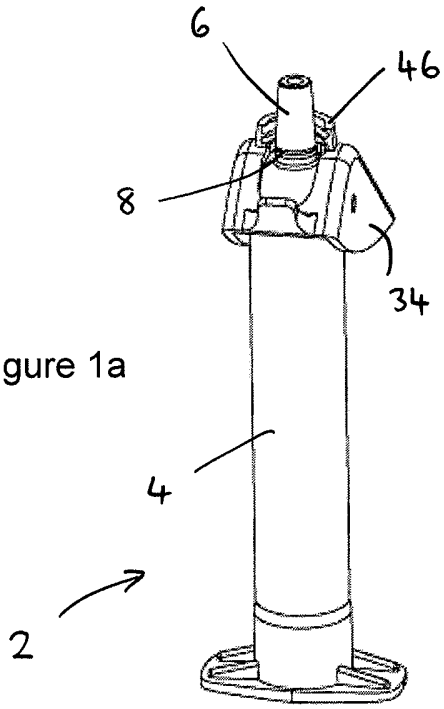


Figure 1a

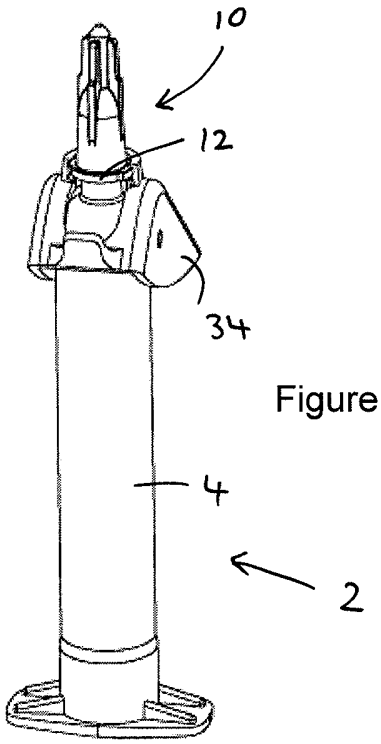


Figure 1b

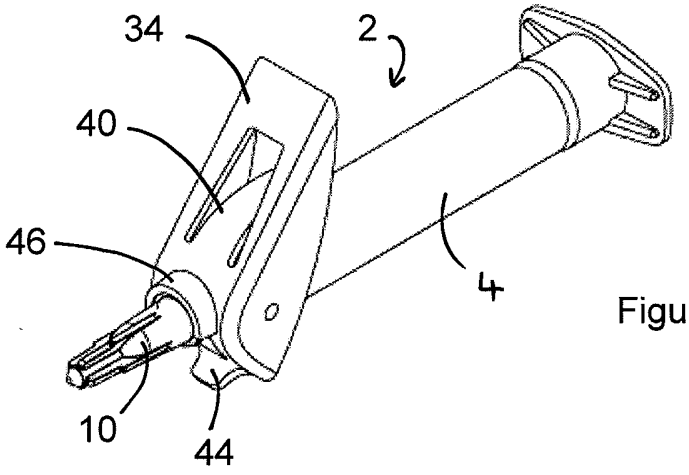
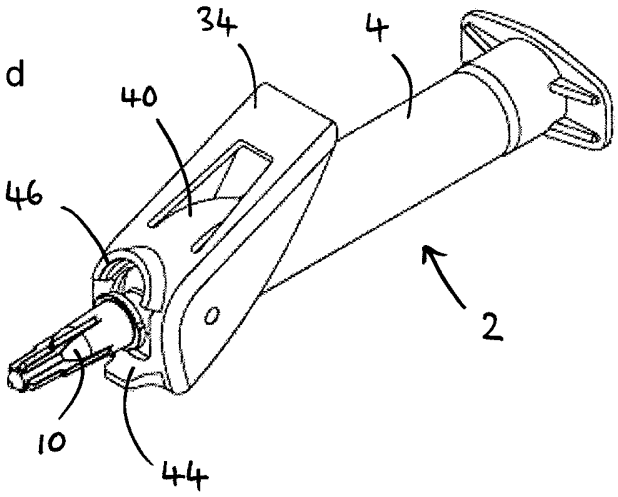


Figure 1c

Figure 1d



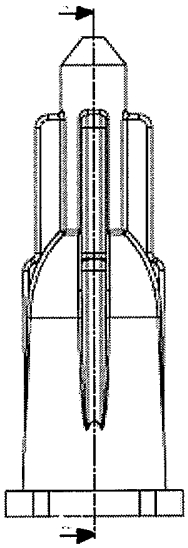


Fig. 2a

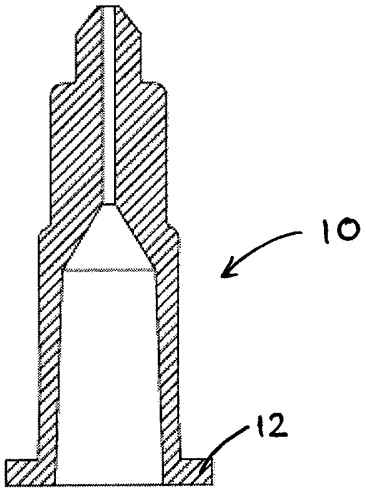


Fig. 2b

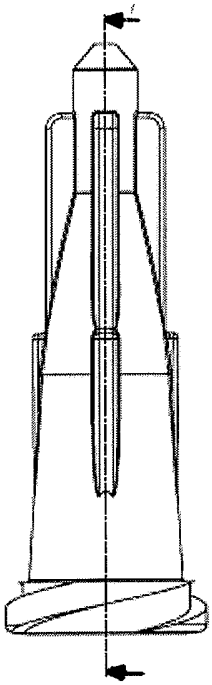


Fig. 3a

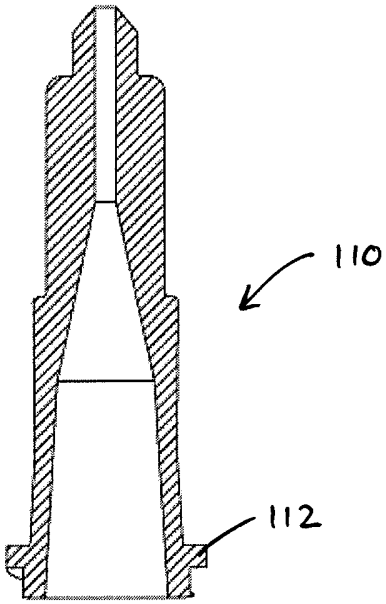


Fig. 3b

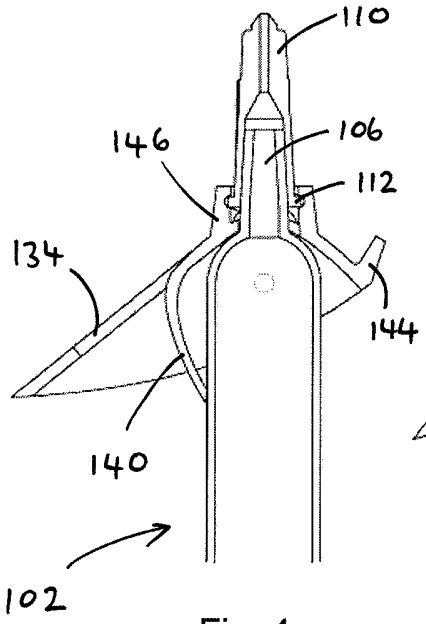


Fig. 4a

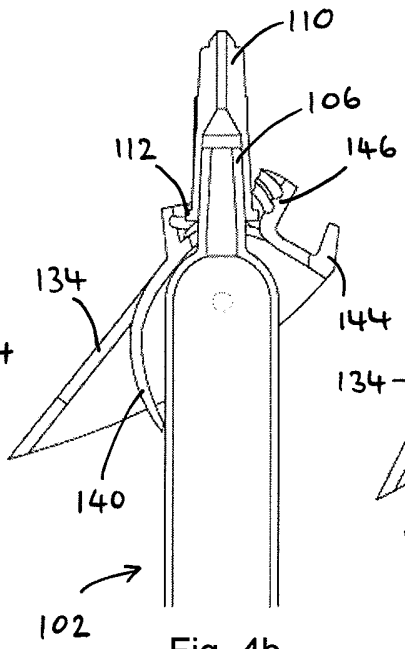


Fig. 4b

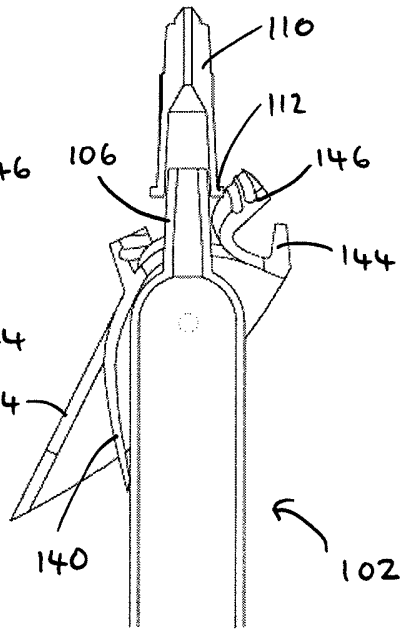


Fig. 4c

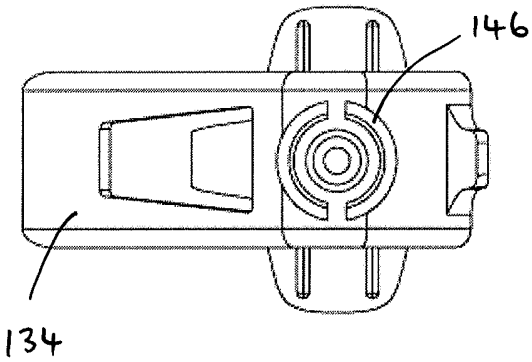


Fig. 4d

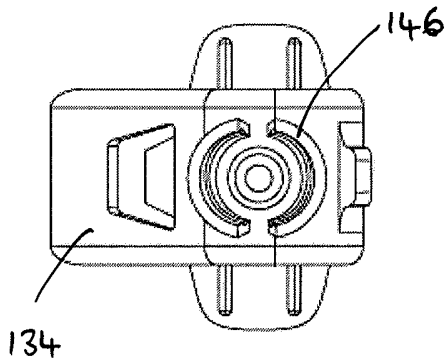


Fig. 4e

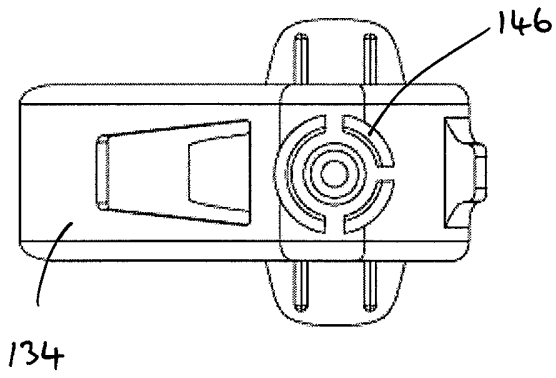


Fig. 5a

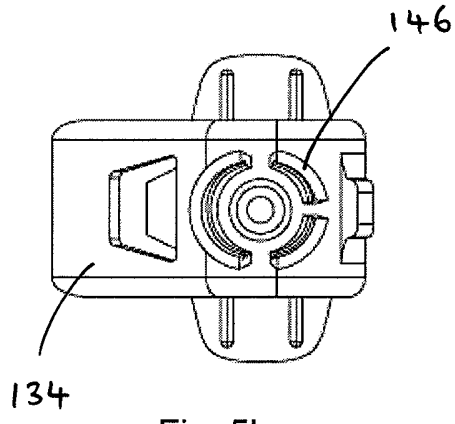


Fig. 5b

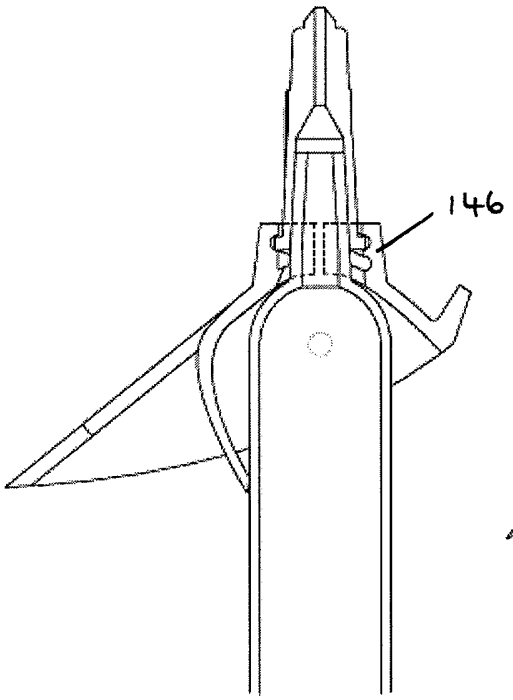


Fig. 6a

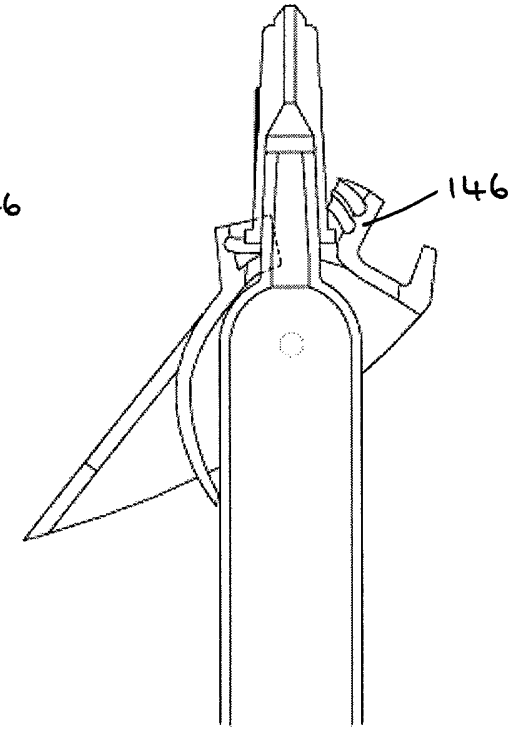


Fig. 6b

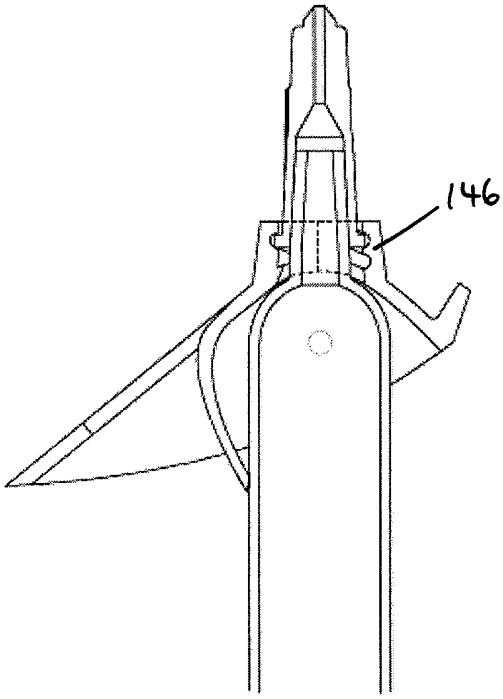


Fig. 7a

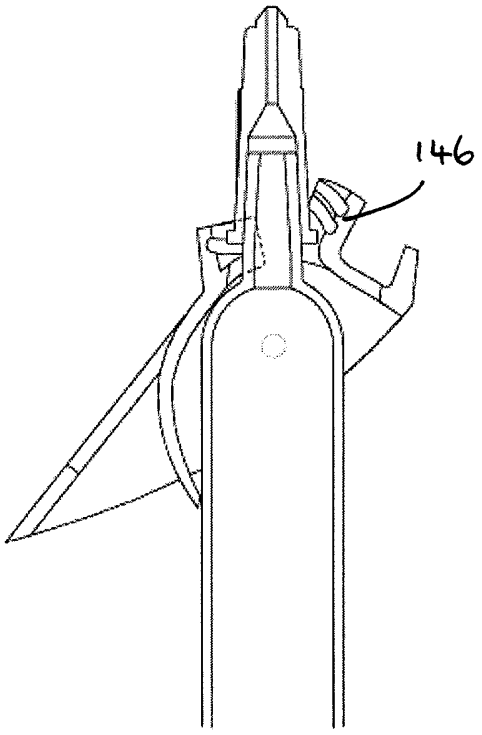


Fig. 7b

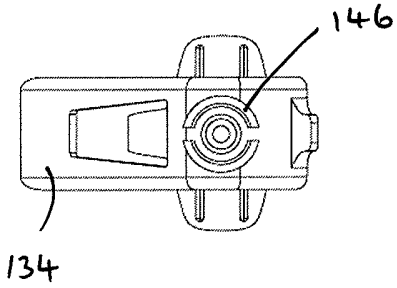


Fig. 8a

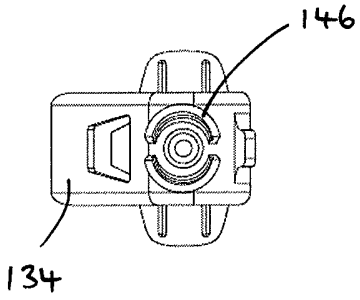


Fig. 8b

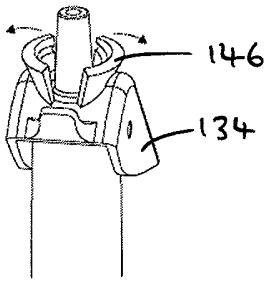


Fig. 8c

Fig. 9a

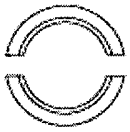
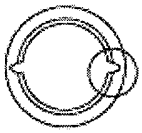


Fig. 9b



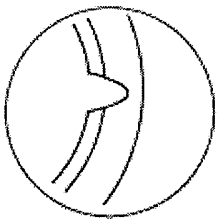
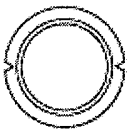


Fig. 9c

Fig. 9d



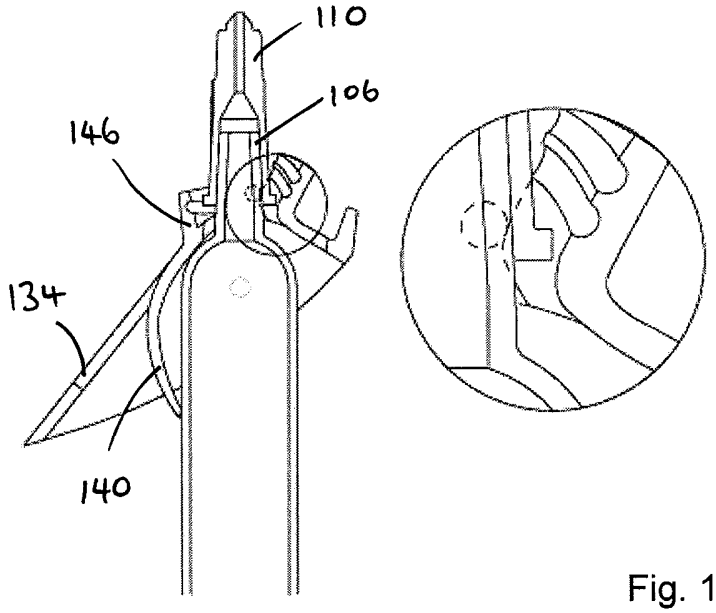


Fig. 10a

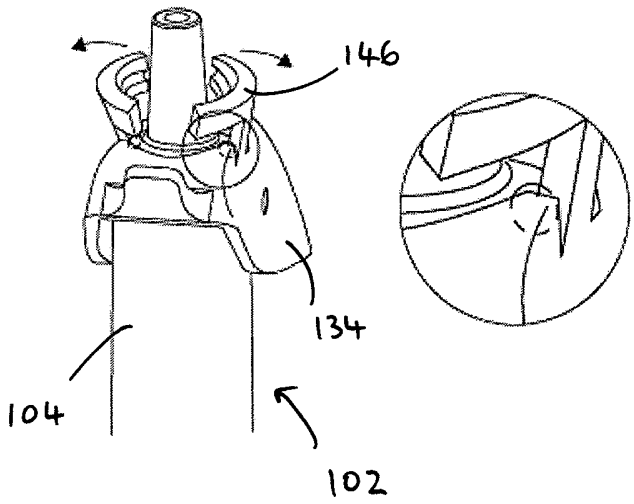


Fig. 10b

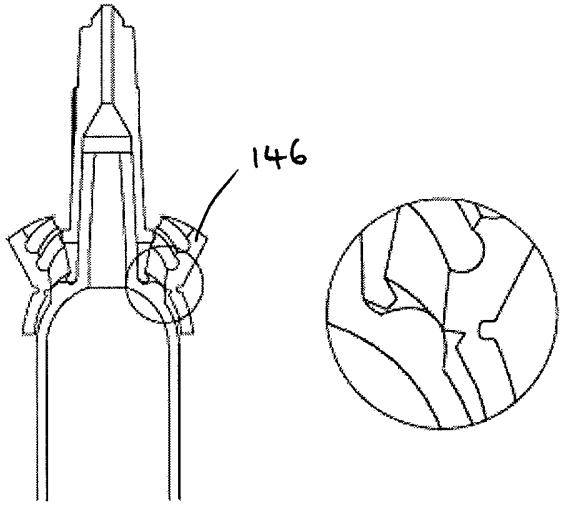


Fig. 11a

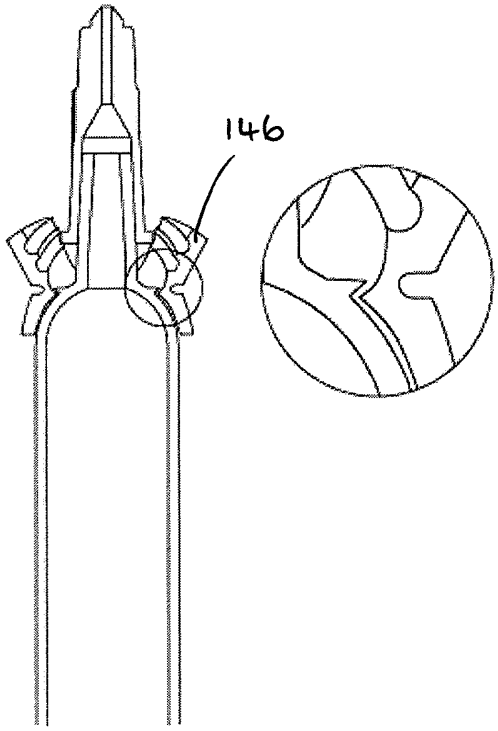


Fig. 11b

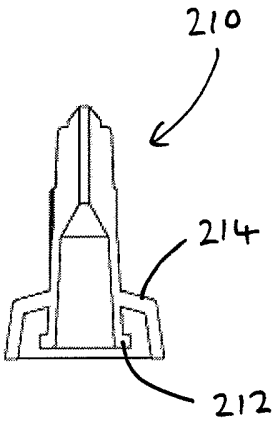


Fig. 12a

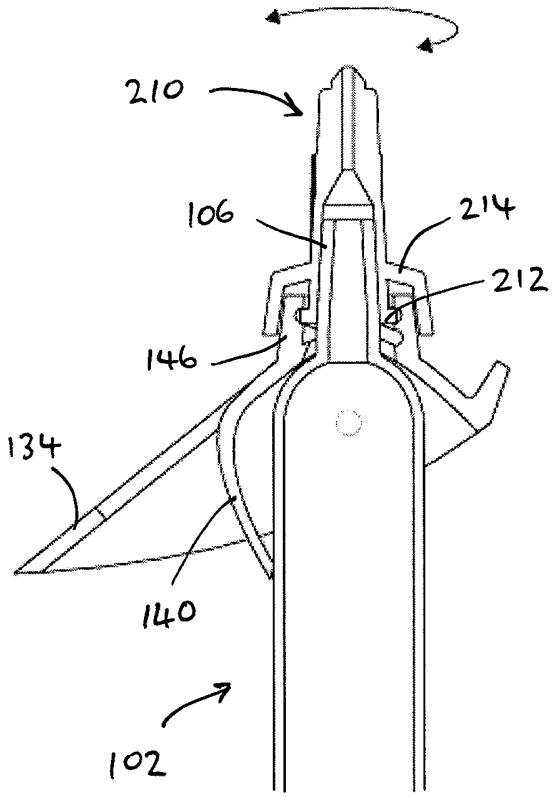


Fig. 12b

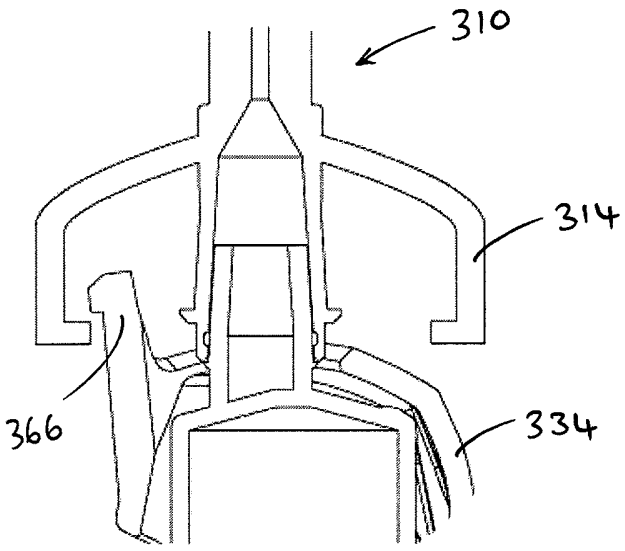


Fig. 13

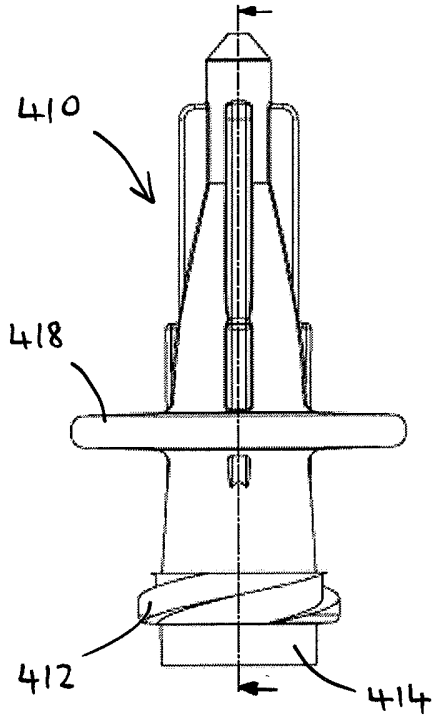


Fig. 14a

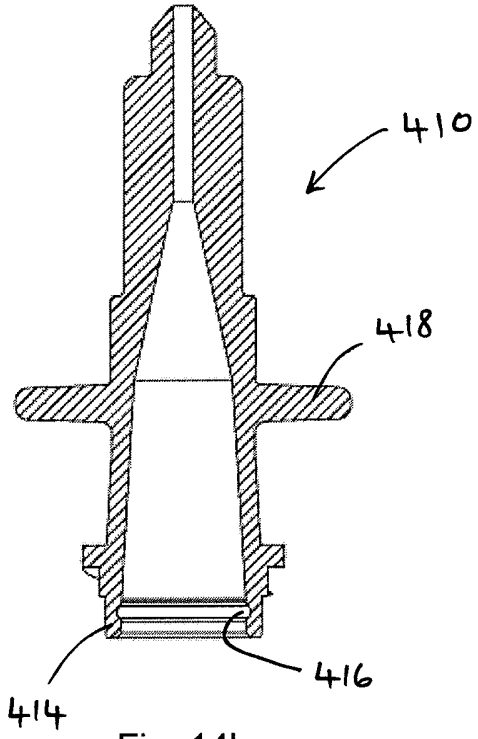


Fig. 14b

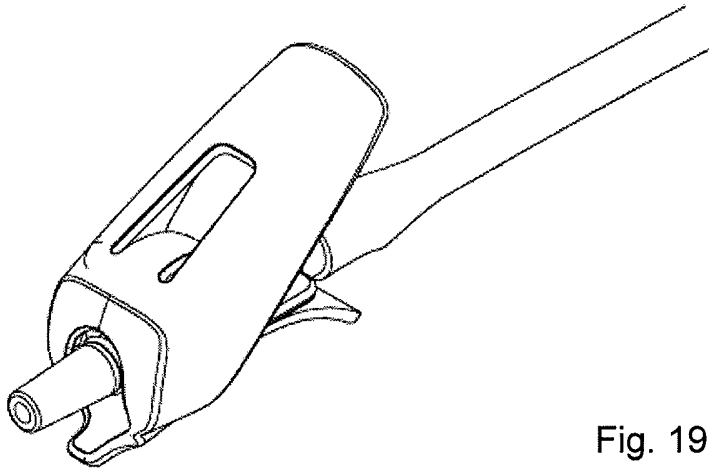


Fig. 19

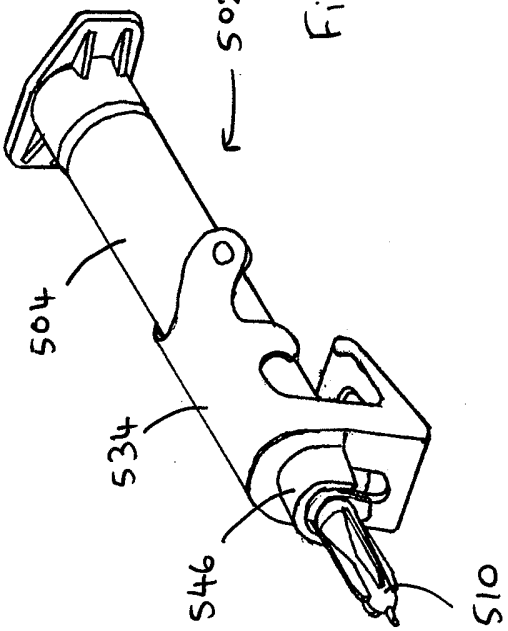


Fig. 15a

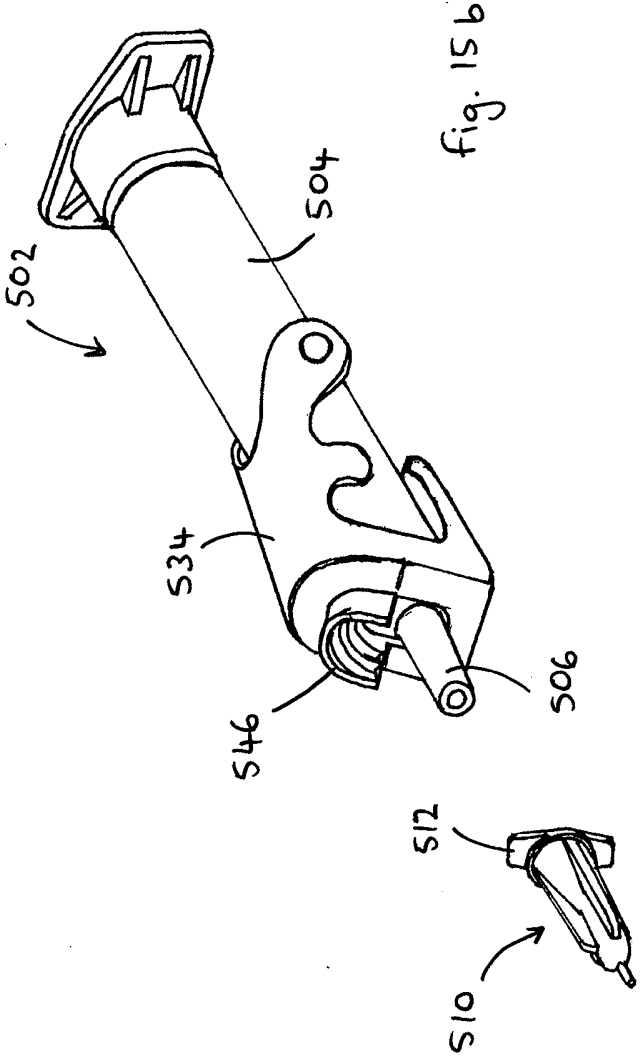


Fig. 15b

Fig. 16b

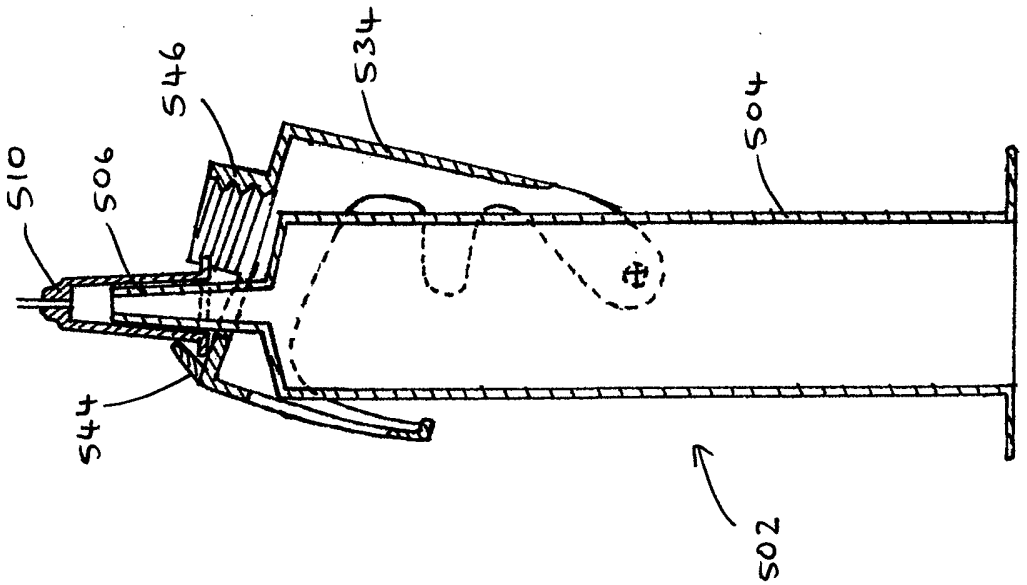


Fig. 16a

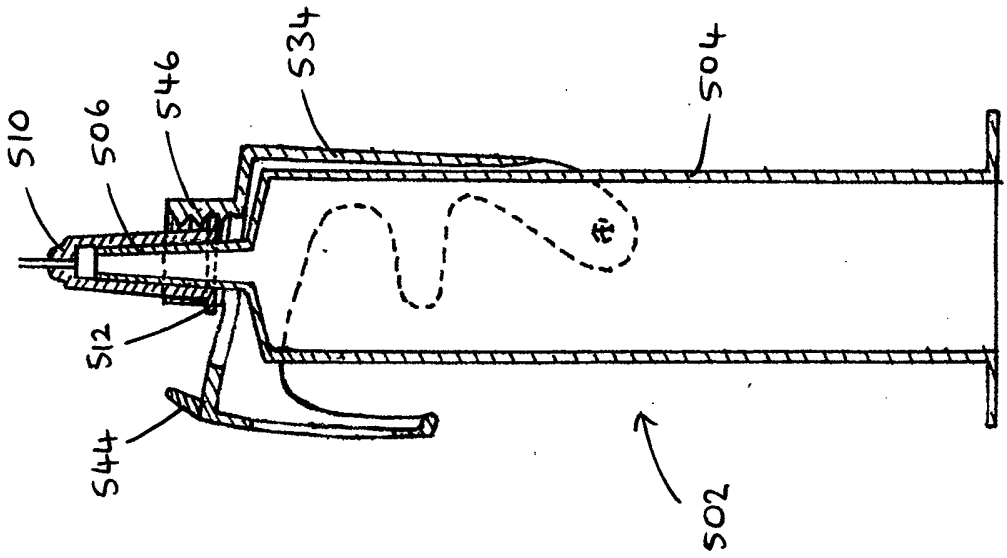


Fig. 17b

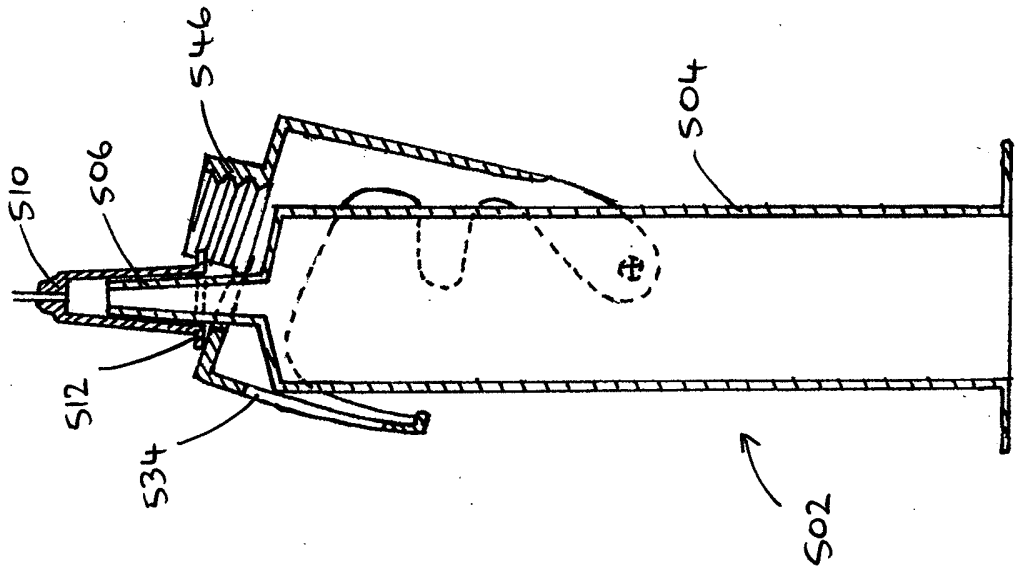


Fig. 17a

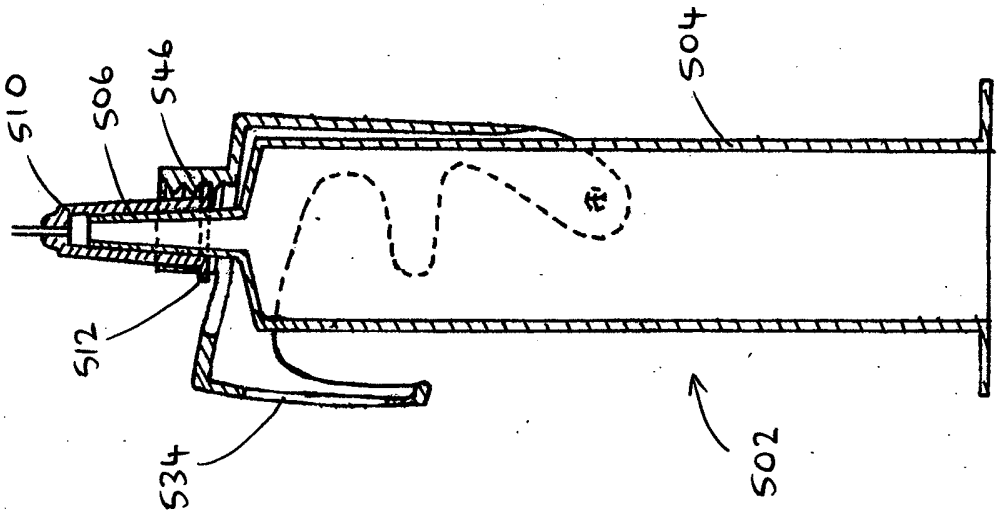


Fig. 18b

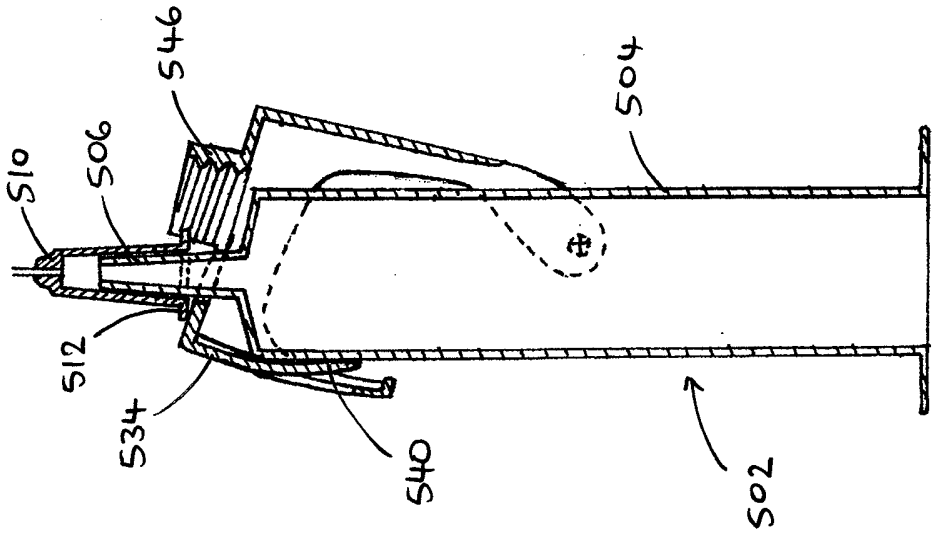
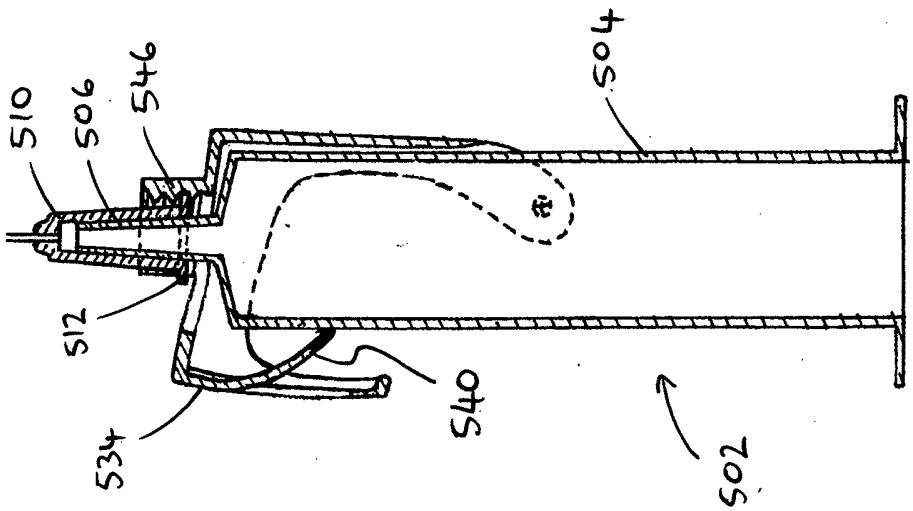


Fig. 18a



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/066436

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61M5/32 A61M5/34 A61M5/31 A61M5/50
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 Y	WO 90/00881 A1 (SPENCER TREESA A [US]) 8 February 1990 (1990-02-08) figures 20-23	1,6,16, 21,43 2-5, 7-15, 17-20, 22-42, 44-49

Y	US 4 490 142 A (SILVERN RUBIN D [US]) 25 December 1984 (1984-12-25) figure 2	1-49

Y	WO 90/11789 A1 (ANTHOGYR SOC [FR]) 18 October 1990 (1990-10-18) figure 6	1-49

	-/--	

[X] Further documents are listed in the continuation of Box C.

[X] 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
12 September 2014	22/09/2014

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	Ehrsam, Fernand

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/066436

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	WO 2013/164358 A1 (CONCEPTOMED AS [NO]) 7 November 2013 (2013-11-07) figures	1-49

X,P	WO 2014/020090 A1 (CONCEPTOMED AS [NO]) 6 February 2014 (2014-02-06) figures 18, 22d-22d	1-49

Y	US 5 755 673 A (KINSEY PHILLIP SPENCER [US]) 26 May 1998 (1998-05-26) figure 3	1-49

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2014/066436

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

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

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

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

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-49

A fluid transfer device

1.1. claims: 43-49

A hub for directing fluid from a fluid transfer device

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2014/066436

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9000881 A1	08-02-1990	AT 124226 T	15-07-1995
		AU 615400 B2	26-09-1991
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		DE 68923284 T2	08-02-1996
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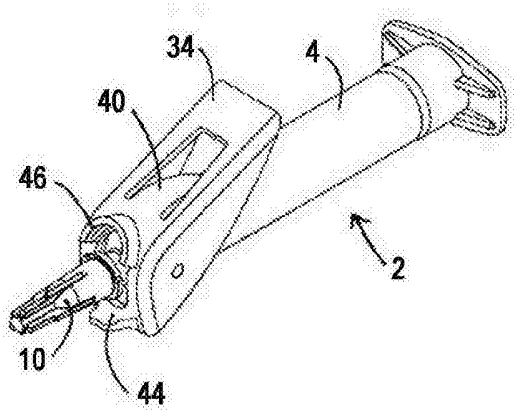
流体输送连接件

(57)摘要

流体输送装置或流体输送连接件(2)包括流体输送顶端，该流体输送顶端具有用于对应接头(10)的锥形摩擦配合部。杆构件(34)枢转地安装成相对于流体输送顶端移动。例如为螺纹件的闩锁(46)安装在杆构件(34)上，以接合接头(10)并且除了提供摩擦配合部以外还提供正连接，例如螺纹配合部。杆构件(34)可选地被弹簧(40)弹性偏压。接头(10)通过使杆构件(34)枢转而与顶端分离，从而释放与接头(10)的正连接，然后释放接头(10)的摩擦配合。



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1. 一种流体输送装置，所述流体输送装置包括：

流体输送顶端，所述流体输送顶端包括用于对应接头的锥形摩擦配合部；

杆构件，所述杆构件枢转地安装成相对于所述流体输送顶端移动；以及

螺纹，所述螺纹形成在所述杆构件上，以使得所述接头除了通过所述摩擦配合部以外还能够通过螺纹配合部与所述流体输送顶端连接；

其中，所述杆构件被弹性偏压，使得所述螺纹被定位为与所述接头形成螺纹配合部；

并且其中，能通过对抗所述弹性偏压枢转所述杆构件来使所述接头分离，以释放与所述接头的螺纹配合部，然后将所述接头从所述摩擦配合部释放。

2. 根据权利要求 1 所述的流体输送装置，其中，所述螺纹是由部分半球形的轴环承载的内螺纹。

3. 根据权利要求 1 所述的流体输送装置，其中，安装在所述杆构件上的所述螺纹采用内螺纹轴环的形式。

4. 根据权利要求 3 所述的流体输送装置，其中，所述内螺纹轴环围绕所述流体输送顶端的周界延伸大致 360°。

5. 根据权利要求 3 或 4 所述的流体输送装置，其中，所述内螺纹轴环能被分成多个区段，所述多个区段被布置为通过对抗所述弹性偏压枢转所述杆构件而移开，从而释放与所述接头的螺纹配合部。

6. 一种流体输送连接件，所述流体输送连接件包括：

流体输送顶端，所述流体输送顶端包括用于对应接头的锥形摩擦配合部；

杆构件，所述杆构件枢转地安装成相对于所述流体输送顶端移动；以及

内螺纹轴环，所述内螺纹轴环安装在所述杆构件上，以至少部分地包围所述流体输送顶端，并使得所述接头除了通过所述摩擦配合部以外还能够通过螺纹配合部与所述流体输送顶端连接；

其中，所述内螺纹轴环能被分成多个区段；并且

其中，通过枢转所述杆构件以使所述多个区段分开而释放所述螺纹配合部，从而使所述接头分离。

7. 根据权利要求 6 所述的流体输送连接件，其中，所述内螺纹轴环围绕所述流体输送顶端的周界延伸大致 360°。

8. 根据权利要求 6 或 7 所述的流体输送连接件，其中，所述杆构件被弹性偏压，使得所述内螺纹轴环包围所述流体输送顶端以形成所述螺纹配合部。

9. 根据权利要求 8 所述的流体输送连接件，其中，通过对抗所述弹性偏压枢转所述杆构件而使所述多个区段移开。

10. 根据权利要求 6 至 9 中任一项所述的流体输送连接件，其中，所述多个区段中的至少一些区段相对于所述流体输送顶端径向地向外移动。

11. 根据权利要求 3 至 10 中任一项所述的流体输送连接件或流体输送装置，其中，所述内螺纹轴环包括预先隔开的多个区段。

12. 根据权利要求 3 至 10 中任一项所述的流体输送连接件或流体输送装置，其中，所述内螺纹轴环被布置为分成多个区段。

13. 根据权利要求 3 至 12 中任一项所述的流体输送连接件或流体输送装置，其中，所述

内螺纹轴环能分成铰接区段。

14. 根据权利要求 6 至 13 中任一项所述的流体输送连接件，所述流体输送连接件包括用于锁定所述多个区段的装置。

15. 根据权利要求 6 至 14 中任一项所述的流体输送连接件，其中，枢转所述杆构件使得随后从所述摩擦配合部释放所述接头。

16. 一种流体输送装置或流体输送连接件，包括 ：

流体输送顶端，所述流体输送顶端包括用于对应接头的锥形摩擦配合部 ；

杆构件，所述杆构件枢转地安装成相对于所述流体输送顶端移动 ；以及

螺纹，所述螺纹形成在所述杆构件上，以使得所述接头除了通过所述摩擦配合部以外还能够通过螺纹配合部与所述流体输送顶端连接 ；

其中，所述杆构件能操作成使所述螺纹在至少两个不同位置之间移动，其中，在第一位置中，所述螺纹接合所述接头，从而有助于将所述接头保持在锁定位置，在第二位置中，所述螺纹不接合所述接头，并且所述杆构件用于从所述摩擦配合部释放所述接头。

17. 根据权利要求 16 所述的流体输送装置或流体输送连接件，其中，所述杆构件能手动操作成在所述第一位置与所述第二位置之间枢转。

18. 根据权利要求 16 或 17 所述的流体输送装置或流体输送连接件，还包括抓持装置，所述抓持装置被布置为将所述杆构件保持在所述第一位置。

19. 根据权利要求 16 至 18 中任一项所述的流体输送装置或流体输送连接件，其中，所述杆构件被弹性偏压，以使所述螺纹进入所述第一位置。

20. 根据权利要求 16 至 19 中任一项所述的流体输送装置或流体输送连接件，其中，所述杆构件能操作成使所述螺纹进入所述第一位置与所述第二位置之间的第三位置，在所述第三位置处，所述螺纹不再将所述接头保持在锁定位置，而是允许所述接头保持通过所述摩擦配合部连接至所述流体输送顶端。

21. 一种流体输送装置或流体输送连接件，包括 ：

流体输送顶端，所述流体输送顶端包括用于对应接头的锥形摩擦配合部 ；

杆构件，所述杆构件枢转地安装成相对于所述流体输送顶端移动 ；以及

闩锁，所述闩锁安装在所述杆构件上，以与安装在所述接头上的部件接合且除了提供所述摩擦配合部以外还提供正连接 ；

其中，通过枢转所述杆构件以释放所述闩锁且然后从所述摩擦配合部释放所述接头，从而使所述接头与所述流体输送顶端分离。

22. 根据权利要求 21 所述的流体输送装置或流体输送连接件，其中，所述杆构件被弹性偏压，使得所述闩锁提供所述正连接。

23. 根据任一前述权利要求所述的流体输送装置或流体输送连接件，其中，所述杆构件包括前表面，所述前表面大致横向于所述流体输送顶端的轴线，所述前表面布置为当所述杆构件枢转时沿着所述流体输送顶端移动。

24. 根据权利要求 23 所述的流体输送装置或流体输送连接件，其中，使所述前表面是弯曲的，使得所述杆构件的初始枢转运动使大致横向于所述流体输送顶端的所述前表面移动，以释放螺纹配合部，所述杆构件的进一步运动使所述前表面沿着所述流体输送顶端移动，以从所述摩擦配合部释放所述接头。

25. 根据任一前述权利要求所述的流体输送装置或流体输送连接件，其中，所述杆构件包括具有边缘的前表面，所述边缘布置为在多个区段移开之后沿着所述流体输送顶端向前移动。

26. 根据任一前述权利要求所述的流体输送装置或流体输送连接件，其中，所述杆构件包括捕获装置，所述捕获装置布置为在从所述摩擦配合部释放所述接头之后捕获所述接头。

27. 根据权利要求 26 所述的流体输送装置或流体输送连接件，其中，所述杆构件被弹性偏压，并且对抗所述弹性偏压地枢转所述杆构件将导致所述捕获装置捕获所述接头。

28. 根据权利要求 26 或 27 所述的流体输送装置或流体输送连接件，其中，所述捕获装置布置为通过所述杆构件的弹性偏压运动而释放。

29. 根据任一前述权利要求所述的流体输送装置或流体输送连接件，还包括用于安装所述杆构件的装置。

30. 根据权利要求 29 所述的流体输送装置或流体输送连接件，其中，所述用于安装所述杆构件的装置与所述流体输送顶端成一体或分离。

31. 根据权利要求 30 所述的流体输送装置或流体输送连接件，其中，通过单独附接件来安装所述杆构件。

32. 根据任一前述权利要求所述的流体输送装置或流体输送连接件，其中，所述杆构件被能移除地安装。

33. 根据任一前述权利要求所述的流体输送装置或流体输送连接件，其中，所述流体输送顶端包括锥形的凸连接器顶端，以在插入对应的凹的所述接头时形成所述摩擦配合部。

34. 根据任一前述权利要求所述的流体输送装置或流体输送连接件，其中，所述接头连接至所述流体输送顶端。

35. 根据权利要求 34 所述的流体输送装置或流体输送连接件，其中，所述接头包括锥形内表面并在所述接头的底部包括外边缘。

36. 根据权利要求 34 所述的流体输送装置或流体输送连接件，其中，所述接头包括锥形内表面并在所述接头的底部包括外螺纹。

37. 根据权利要求 34 所述的流体输送装置或流体输送连接件，其中，所述接头包括锥形内表面以及通过裙部而与所述接头的底部间隔开的外边缘或外螺纹。

38. 根据权利要求 37 所述的流体输送装置或流体输送连接件，其中，所述裙部是柔性的。

39. 根据权利要求 35 至 38 中任一项所述的流体输送装置或流体输送连接件，其中，所述接头还包括凹槽或凸缘，所述凹槽或凸缘设置在所述锥形内表面上以用于抓持在所述流体输送顶端上的对应的凸缘或凹槽。

40. 根据权利要求 34 至 39 中任一项所述的流体输送装置或流体输送连接件，其中，所述接头提供与导管、套管或皮下注射器针头的流体连接。

41. 根据任一前述权利要求所述的流体输送装置或流体输送连接件，其中，所述流体输送顶端是注射器的一部分。

42. 根据权利要求 34 所述的流体输送装置或流体输送连接件，其中，所述接头包括具有锥形内表面以形成所述摩擦配合部的插口、位于所述插口的外表面周围以形成螺纹配合

部的螺纹，以及限定所述螺纹从而锁定所述螺纹配合部的凸缘。

43. 一种用于从流体输送连接件引导流体的接头，所述接头包括：插口，所述插口具有锥形内表面以与插入所述插口中的对应的流体输送顶端形成摩擦配合部；螺纹，所述螺纹位于所述插口的外表面周围以使得除了形成摩擦配合部以外还能够形成螺纹连接；以及凸缘，所述凸缘限定所述螺纹，从而锁定与对应的所述流体输送顶端的所述螺纹连接。

44. 根据权利要求 43 所述的接头，所述接头包括与导管、套管或皮下注射器针头流体连接的流体连接件。

45. 根据权利要求 43 或 44 所述的接头，其中，所述螺纹通过裙部而与所述接头的底部间隔开。

46. 根据权利要求 45 所述的接头，其中，所述裙部是柔性的。

47. 根据权利要求 43 至 46 中任一项所述的接头，还包括用于在所述接头连接至所述流体输送顶端时抓持所述流体输送顶端的额外装置。

48. 根据权利要求 47 所述的接头，其中，用于抓持所述流体输送顶端的所述额外装置包括设置在所述锥形内表面上的凸缘或凹槽。

49. 根据权利要求 43 至 48 中任一项所述的接头，所述接头连接至由注射器、采血管、软管、管道、IV 管线、挡块或封闭锥状物的形式的流体输送装置或流体输送连接件提供的流体输送顶端。

流体输送连接件

[0001] 本发明涉及流体输送装置与对应接头的分离和连接，并且特别是当在医疗设备中输送流体时。本发明在使流体输送装置（例如注射器或其他流体输送连接件件）与接头（该接头与将流体输送至其/从其输送流体的活体连接）分离时特别有用。

[0002] 在医疗设备中，可能由于多种原因而必须或期望将流体输送至活体/从活体输送流体。例如，与针或其他套管连接的接头可用于从静脉抽血或输入流体物质，即，静脉注射(IV)疗法。静脉滴注是一种类型的IV疗法。IV疗法可用来校正电解质失衡，以输送药物或营养，用于输血或作为补液以校正脱水。IV疗法也可用于癌症患者的化疗。流体输送装置（例如注射器）也可附接至与套管连接的接头，以用于对多种体腔、器官或血管增加或去除流体/从多种体腔、器官或血管增加或去除流体。例如，接头可以是提供导管以从膀胱或肾脏排尿、从脓肿中去除流体、从关节或囊肿中提取液体，或通过气管套管进行呼气的实体的一部分。典型的气管导管包括封套充气管(cuff inflation tube)，该封套充气管具有用于连接注射器以使得能够充气的接头，以使气管和支气管树密封，从而防止漏气和吸入流体。气管造口管或尿路导管也可使用封套系统，该封套系统具有用于连接注射器或其他装置以注入流体的接头，以使将其保持在位的杯或气球充气。然而，使用连接到针头的注射器的流体注入是世界上最常用的卫生保健程序之一。

[0003] 当将流体输送至对象/从对象输送流体时，用针头、导管或其他套管插入患者体内的接头通常留在原位，同时可去除和更换流体输送装置，例如以清空/重填注射器或改变IV疗法。在必须连接携带少量流体体积的两个医疗装置的位置处，标准鲁尔装置是最常见的实现无泄漏连接的装置。一种类型的鲁尔装置（通常叫做“鲁尔锁”）使用内螺纹轴环，其包围注射器等的“鲁尔滑动”摩擦配合部（见下文）锥形凸顶端。伸出的顶端可被插入对应的凹接头中，该对应的凹接头具有外螺纹和向下拧以锁定连接的轴环。这种鲁尔锁装置具有提供无法轻易变松的牢固连接的优点，但需要在将装置拧入/拧出的同时用两只手来握持接头。在一些情况中，例如在紧急情况中，更快速的连接形式可能是优选的。另一种类型的鲁尔装置（通常叫做“鲁尔滑动”）简单地使用凹接头与没有螺纹轴环的装置的对应的锥形凸顶端之间的摩擦配合部。用6%锥度来实现标准摩擦配合部。鲁尔滑动连接通常用于注入低粘性的流体，例如接种疫苗，并用于在不涉及高压的位置（例如当抽血时）输送流体。

[0004] 在使用鲁尔锁和鲁尔滑动连接的情况下所观察到的问题是，当使流体输送装置从仍连接到患者的接头分离时，存在受伤的风险。虽然执业医师可能小心地握持接头且在拧开鲁尔锁连接件时避免受伤，但会总想用鲁尔滑动连接来试图例如用一只手将装置从接头中拉出。然而，这容易导致接头从身体抽出并导致组织损伤。通常，用连接到接头的套管可能无法将装置直线拉出而是使其旋转，这会使部件扭转。用来将接头（例如IV端口）保持在位的带通常从皮肤松开，甚至可能意外地抽出其套管（例如针头）。当从体腔中清空流体时，例如当使注射器分离时仍对针头进行保持，这对于避免体腔内的发散切割或腔壁损伤而言是必不可少的。另外，当用拇指和食指在拉出凸顶端的同时握持非常小的接头时，存在接头和鲁尔顶端（不仅是用户）的未确认的组合的风险，当释放顶端时，其滑过用户的手

指。

[0005] 此外，用一只手进行拉动通常甚至不会施加足够的力将装置从摩擦配合部（例如鲁尔滑动）中拉出，取决于当将鲁尔滑动顶端与接头连接时使用的力，执业医生通常需要抓持或推动接头同时也拉动装置，使其分离。通常，该装置将在从接头拉出的同时旋转。这种急拉会导致针头或连接到接头的其他部件的不期望的抽出。该连接通常将被流体加压。例如，通过在凹鲁尔接头中的弹簧活塞阻止流体（空气或液体）从封套流出的同时松开连接所需的双手操作，连接到气管造口管、气管导管或导尿管的封套通常与凸鲁尔顶端紧密连接。

[0006] 不仅当使装置与连接到患者的接头分离时，而且当期望经由流体接头以快速且方便的方式填充/清空装置（例如注射器）时，易于分离会是一个问题。例如，当用插入药瓶中的针头填充注射器时，每当去除注射器时，都需要用两只手来牢固地抓持针头接头和注射器，以当针头留在药瓶中时使其分离。如上所述，当用户抓持接头且顶端与握持接头的手指接触时，又存在污染的风险。

[0007] 用户可能接触针头接头的另一种情况是当使用采血管时。采血管是用弹性隔膜密封的真空塑料或玻璃容器，可用双头针头刺穿该隔膜以抽出静脉血。由于刺穿力和压力差的原因，所以需要与针头组件的牢固连接，从而通常使用螺纹鲁尔锁连接件，而不是鲁尔滑动。US 5,201,716 提出了一种替代的血液标本采集系统，其不需要在分离的过程中抓持并扭转针头组件。在这个系统中，通过过盈配合而不是螺纹连接来安装针头组件。枢转地安装的杆组件被弹簧偏压，以将针头组件保持在位，即，在摩擦配合部上提供额外等级的安全性。如果对抗弹簧偏压而对杆进行致动，那么仅存在将针头组件保持在位的过盈配合。杆可枢转，以同时释放弹簧偏压并对针头组件施加向前的弹射力。

[0008] 在用一只手握持针头接头同时拉出装置的任何情况中，存在针杆损坏和污染的风险。频繁放错或忘记的针帽会使此恶化。当使针头或其他受污染的部件与注射器或用于一次性目的的类似装置分开时，这也适用，当尝试去除尖头以扔入垃圾箱时会出现许多针杆损坏。通常，在抓持接头以使针头与注射器筒分离从而丢掉之前，握持注射器的人将试图在使用后用针帽覆盖受污染的针头。然而，当将针帽安装在受污染的针头上时，人将使用手臂和肩膀中的不太精确地作用的大肌肉群，与较差的视觉深度相结合，这通常对握持针帽的手指产生针杆损坏。如果可不需要盖住针头或操作连接而安全地释放针头接头，那么将是更好的。

[0009] 在流体输送顶端（例如由注射器提供与对应接头之间需要非常牢固连接的医疗设备中具有多种流体输送过程。接头可连接至插入患者的动脉、静脉、体腔或器官的针头或导管。在心脏病学、血管造影术和血管成形术的领域中，可能在高压下向窄道中注入流体（液体和/或空气）。手动注射器和歧管组用于经皮冠状动脉介入治疗冠状动脉诊断程序，例如血管造影术。心血管造影套件典型地包括导管接头，以用于连接选定尺寸、长度和硬度的导管主体以及具有喷射流体的单端孔的顶端。导管主体被插入冠状血管、心室和/或外周脉管系统。注射器可连接至导管接头，以在范围在 250psi 和 800psi 之间（甚至高达 1000psi 或 1200psi(84 巴)）的压力下注入造影剂或盐水。导管接头具有外螺纹，以提供标准鲁尔锁连接件。

[0010] 鲁尔锁连接件器已经变得通用，不仅用于使注射器与接头连接，而且用于使小孔

医疗管道与用于液体和/或气体的软管连接。鲁尔锁连接件通常用于脉管IV管线，而且适用于其他医疗或诊断系统。管道和软管可使用用于封套充气系统的鲁尔锁连接件、供给管、导管以及用于脉管系统、肠内系统、呼吸系统、神经系统和尿道/泌尿系统的软管。

[0011] 鲁尔锁接头的螺纹连接通常认为是承受高压所必需的。然而，必须使注射器、软管或其他流体输送装置旋转，以使其鲁尔锁轴环与接头连接和分离。这会花费时间并需要双手操作。此外，当用户抓持接头来拧开连接时，存在污染的风险，特别是在接头包括可能在其轴上携带血液的针头的位置。如果流体输送装置可更容易地与鲁尔锁接头分离，那么将改进医疗过程的效率和工作流。

[0012] 本发明设法解决或减轻上述问题。

[0013] 当从本发明的第一方面来看时，提供了一种流体输送装置，其包括：流体输送顶端，该流体输送顶端包括用于对应接头的锥形摩擦配合部；杆构件，该杆构件枢转地安装成相对于流体输送顶端移动；以及螺纹，该螺纹形成在杆构件上，以使得接头除了通过摩擦配合部以外还能够通过螺纹配合部而连接至流体输送顶端；其中，杆构件被弹性偏压，使得螺纹被定位为形成与接头的螺纹配合部；并且其中，可通过对抗弹性偏压枢转杆构件来分离接头，以释放与接头的螺纹配合部，然后将接头从摩擦配合部释放。

[0014] 这种装置提供了一种用于通过螺纹配合部锁定并使用杆自动释放的新颖的机构。安装在杆构件上的螺纹使得接头（例如标准鲁尔锁接头）能够承载螺纹，以与装置连接。接头可通过相对旋转连接，和传统的一样，以确保紧密的螺纹连接。这种鲁尔锁连接件可能适合于高压流体输送过程。操作杆构件以枢转走螺纹并释放螺纹配合部的好处是，不用拧开作用便可使接头与装置分离。可用杆构件的简单的单手操作来代替常用的双手拧开操作。这种装置可进一步与承载凸缘的接头连接，例如标准鲁尔滑动接头，螺纹与凸缘接合，以除了摩擦配合部以外还提供正连接（positive connection，积极连接，有效连接）。其他接头设计也可通过螺纹正接合，如下面进一步说明的。

[0015] 安装在杆构件上的螺纹可被认为是一种类型的闩锁，这是因为对抗弹性偏压枢转杆构件可释放闩锁，使得螺纹与所连接的接头的外表面上的对应螺纹分离。这不会干涉通过摩擦配合部连接的接头。简单地释放螺纹配合部并不足以使接头与流体输送顶端分离；接头由于摩擦配合部而不会在重力的作用下从顶端下落。杆构件具有也使接头从摩擦配合部释放的额外功能。这可通过杆构件（例如其前表面）相对于流体输送顶端移动以推开接头并释放摩擦配合部，而在单个平滑作用中实现。在一组优选的实施例中，杆构件的一端枢转地连接至装置，例如可相对于流体输送顶端在第一位置与第二位置之间移动的前表面。

[0016] 杆构件被弹性偏压，使得将螺纹被定位为与接头形成螺纹配合部。这意味着，杆构件的默认位置是保持鲁尔锁连接件的位置。这确保安全性和可靠性。用户必须主动地克服弹性偏压来释放与接头的螺纹配合部。

[0017] 如上所述，通过对接头进行旋转将其推动到流体输送顶端上，接头可连接至螺纹。在接头以这种方式连接的同时，杆构件可保持在其弹性偏压的位置中。例如，可使标准鲁尔锁接头旋转高达270°，以确保其外螺纹与安装在杆构件上的螺纹的连接。然而，申请人已经认识到，使接头旋转以形成螺纹配合部所需的时间和/或手动灵巧度可能不总是令人满意的。杆构件的弹性偏压意味着可将其推向一旁，以使得接头能够更快地连接。这对标准鲁尔锁连接件提供了改进。例如，不用旋转便可将接头推动到流体输送顶端上，迫使杆构件

对抗其弹性偏压而枢转，使得在接头连接到锥形摩擦配合部上的同时螺纹不接合。于是，接头的最终的短时旋转可允许螺纹接合并允许杆返回至其弹性偏压的位置。这可能仅需要转过 90°（或更小），而不是 180° 或 270°，以完成螺纹配合部连接。该螺纹可能仅是局部有螺纹的。

[0018] 安装在杆构件上的螺纹可采用标准螺旋形螺纹的形式。螺纹的截面形状（通常叫做其形式螺纹形式）可以是正方形形状、矩形形状、三角形（例如 V 形）形状、梯形形状或其他形状。标准三角形螺纹形式以等腰三角形为基础，通常叫做 V 形螺纹。等边三角形提供 60° V 形螺纹。然而，想象到螺纹可具有不需要完全旋转便可帮助将接头推到顶端上的螺纹形状。该螺纹可具有非等边三角形螺纹形状。例如，三角形螺纹形式可以是沿着流体输送顶端的递减锥度的方向向下的角度，以帮助接头推过螺纹，然后，一旦形成摩擦配合部，便与螺纹配合部接合。螺纹形状甚至可包括向下延伸的齿或其他抓持装置，其防止接头在不用使杆构件枢转以释放螺纹配合部的情况下强制分离。可考虑各种不同的螺纹形状，特别是在装置旨在与不承载标准鲁尔锁螺纹轴环的接头（例如，承载凸缘的鲁尔滑动接头，或可与锥形流体输送顶端形成摩擦配合部的任何其他类型的接头）连接的位置。

[0019] 使用杆构件使顶端与对应接头分离的优点在于可增大输入力以提供更大的输出力，即，提供杆作用将接头推离顶端。杆构件的机械优点可增加所施加的力，使得不用必须握持接头便可释放装置，从而使得能够进行单手操作。此外，当在弹性偏压下枢转时，杆构件理想地可适于接合螺纹配合部，并且适于使接头随着其对抗弹性偏压枢转而从螺纹配合部移出，杆构件的进一步枢转运动也用来从摩擦配合部释放接头。

[0020] 在一组实施例中，螺纹是由部分半圆形轴环承载的内螺纹。因为这种轴环仅围绕流体输送顶端的一侧延伸，例如围绕流体输送顶端的周界延伸 180°，所以可通过枢转杆构件以使轴环移动远离流体输送顶端和与其连接的接头而简单地释放螺纹配合部。

[0021] 更一般地，安装在杆构件上的螺纹优选地采用内螺纹轴环的形式。这种轴环可安装在杆构件上，以至少部分地包围流体输送顶端。为了确保牢固的鲁尔锁连接件，内螺纹轴环可围绕流体输送顶端的周界基本上延伸 360°。然而，360° 轴环会使得杆构件更难以操作释放螺纹配合部，因为轴环必须在所有边上远离流体输送顶端。申请人已经设计了一种解决方案，其中，内螺纹轴环可分成多区段，这些区段布置为通过对抗弹性偏压枢转杆构件而移开，从而释放与接头的螺纹配合部。

[0022] 不仅是对于流体输送装置（例如注射器）而言还是是对于任何一般的流体输送连接件而言，认为其本身是新颖且创新的，不考虑杆构件是否被弹性偏压。因此，根据本发明的第二方面，提供了一种流体输送连接件，其包括：流体输送顶端，包括用于对应接头的锥形摩擦配合部；杆构件，枢转地安装成相对于流体输送顶端移动；以及内螺纹轴环，安装在杆构件上，以至少部分地包围流体输送顶端，并使得接头除了通过摩擦配合部以外还能够通过螺纹配合部与流体输送顶端连接；其中，内螺纹轴环可被分成多个区段；并且其中，可通过枢转该杆构件以使这些区段分开而释放螺纹配合部，从而使接头分离。

[0023] 这种流体输送连接件获益于标准鲁尔锁连接件的螺纹配合部，其被认为可承受加压流体输送过程，但使得能够通过操作杆构件而不是将顶端从对应接头拧开来释放鲁尔锁连接件。这可以是简单的单手姿势，而不是双手扭转运动。可分开的轴环允许杆操作的分离机构与标准鲁尔锁接头配合。

[0024] 内螺纹轴环可被分成多个区段，这些区段布置在流体输送顶端的周界周围，例如部分半圆形的区段。该多个区段例如可通过在与杆构件一致或与杆构件正交的方向上径向地移动而移开。优选地，至少一些区段相对于流体输送顶端径向地向外移动。将理解，并不是所有的区段都必须相对于流体输送顶端径向地向外移动。例如，在一个或多个其他区段向外移动以导致这些区段间隔开的同时，一个或多个区段可保持不动。

[0025] 内螺纹轴环可在连续或隔开的区段中包围流体输送顶端高达 360°。可通过围绕流体输送顶端的周界延伸至少 180°、190°、200°、210°、220°、230°、240°、250°、260°、270°、280°、290°、300°、310°、320°、330°、340° 或 350° 的轴环来实现牢固的鲁尔锁连接件。在优选实施例中，内螺纹轴环围绕流体输送顶端的周界延伸基本上 360°。轴环的可移动区段使得能够获得 360° 的螺纹配合部，其通过操作杆构件来方便地释放。

[0026] 根据本发明的第二方面的至少一些实施例，杆构件可自由枢转，允许用户简单地打开和关闭轴环以根据需要连接和分离接头。然而，可能优选地，杆构件具有保持轴环关闭以形成螺纹配合部的默认位置。在一组优选实施例中，杆构件被弹性偏压，使得内螺纹轴环包围流体输送顶端，以与接头形成螺纹配合部。因此，用户必须用足够的力操作杆构件，以在释放螺纹配合部之前克服弹性偏压。这可防止意外地释放鲁尔锁连接件。因此，优选地，仅通过对抗弹性偏压枢转杆构件来使这些区段移动。

[0027] 杆构件可用于使内螺纹轴环分成多个区段，这些区段已经在制造过程中被限定（例如形成）。在一组实施例中，内螺纹轴环包括预先隔开的多个区段。然而，利用杆构件所施加的力替代地来使轴环物理地分成多个区段，例如打开在轴环中形成的易碎连接或弱化区域。在另一组实施例中，内螺纹轴环布置为分成多个区段。

[0028] 流体输送顶端可不止一次地与接头连接和重新连接。在一组实施例中，内螺纹轴环可分成铰接区段。这种铰接区段可通过杆构件的操作来打开和关闭。然而，在至少一些实施例中，优选地，流体输送顶端可仅使用一次，例如以防止交叉污染。轴环可设计为在接头的分离过程中经历永久损坏，使得无法重新使用流体输送连接件或装置。在一组实施例中，可提供用于锁定多个区段分离的装置。

[0029] 在本发明的第二方面的实施例中，杆构件的操作可通过摩擦配合部而使接头连接至顶端。可能需要手动介入来完全分离接头，例如用户可能需要拉开接头。然而，摩擦配合部可能不容易手动释放，并且可能需要扭转作用来松开接头。因此，优选地，使杆构件枢转随后从摩擦配合部释放接头。如上所述，杆构件（例如其前表面）可布置为相对于流体输送顶端移动，以推开接头并释放摩擦配合部。在一组实施例中，杆构件包括前表面，该前表面具有布置为在移开这些区段之前沿着顶端向前移动的边缘。

[0030] 申请人还认识到，弹性偏压可能不是对于本发明的至少一些其他方面而言必不可少的特征。因此，当从本发明的第三方面看时，提供了一种流体输送装置或流体输送连接件，包括：流体输送顶端，该流体输送顶端包括用于对应接头的锥形摩擦配合部；杆构件，枢转地安装成相对于流体输送顶端移动；以及螺纹，形成在杆构件上，以使得接头除了通过摩擦配合部以外还能够通过螺纹配合部与流体输送顶端连接；其中，杆构件能操作成使螺纹在至少两个不同位置之间移动，其中，在第一位置中，螺纹接合接头，从而有助于将接头保持在锁定位置，在第二位置中，螺纹不接合接头，并且杆构件用来从摩擦配合部释放接

头。

[0031] 优选地，杆构件可手动地操作成在第一位置与第二位置之间枢转。弹性偏压可选地用于帮助手动操作。例如，杆构件可被弹性偏压，以使螺纹进入第一位置。这可确保螺纹不用手动介入而与顶端自动地接合，即，锁定位置是默认位置。于是，杆构件的手动操作可克服偏压力，以当期望释放螺纹配合部然后例如通过推开接头而使摩擦配合部分离时，使螺纹从第一位置移动至第二位置。然而，在一些实施例中，当期望将接头连接至流体输送顶端时，这种弹性偏压（例如弹簧件）的存在可能需要用户主动地操作杆构件，而在不具有弹性偏压的情况下杆构件留在第二位置（或中立的第三位置），在该位置可移走螺纹。

[0032] 在至少一组实施例中，杆构件优选地安装为在第一位置与第二位置之间自由地枢转。这使得用户不需要克服偏压力，并使得更容易控制杆构件。这可对用户在控制杆构件的运动和接头的选择性连接/分离方面提供手动灵巧度。

[0033] 即使没有弹性偏压（例如没有弹簧构件），杆构件也可布置为将螺纹保持在第一位置。因此可替换地或者除了弹性偏压以外，杆构件可将其自身保持在第一位置，或者流体输送装置/连接可用于将杆构件保持在第一位置。例如，流体输送装置可包括与流体输送顶端连接的流体腔室（例如注射器），当其移动至第一位置时，杆构件可抓持在流体腔室上。用户可能需要在杆构件移动离开第一位置之前施加力来克服抓持。因此，在一组实施例中，流体输送装置或流体输送连接件还包括布置为将杆构件保持在第一位置的抓持装置。这种抓持装置另外用于螺纹配合部或其他与接头的正连接。

[0034] 如上所述，在一组实施例中，杆构件可操作成使螺纹进入在第一和第二位置之间第三位置，在第三位置处，螺纹不再将接头保持在锁定位置，而是允许接头保持通过摩擦配合部而连接至流体输送顶端。

[0035] 杆构件可包括致动器部分，例如由前表面提供，其用来从摩擦配合部释放接头。致动器部分优选地布置为，当杆构件在不同位置之间枢转时沿着顶端移动。下面进一步描述了这些实施例。

[0036] 虽然杆构件可采用许多不同的形式，但优选地，杆构件包括基本上横向于顶端的轴线的前表面，并且该前表面布置为当杆构件对抗弹性偏压而枢转时沿着顶端移动。为了使杆构件有效地输送力，优选地其相对较硬。然而，还可能期望用塑料材料模制该装置，或至少模制杆构件，以提供在医疗设备中单次使用的便宜的、无菌的且一次性的产品。可通过使杆构件形成为三维壳体来使杆构件变硬。优选地，杆构件包括基本上横向于顶端的轴线的前表面，以及在与顶端的轴线基本上平行的方向上延伸的一个或多个侧表面。优选地，这些表面形成从前表面向后延伸且远离流体输送顶端的罩子。构件的三维程度可帮助确保即使其由塑料材料形成也较硬，如在各种实施例中优选的。

[0037] 在一组实施例中，杆构件具有至少部分柱形的形状，与流体输送顶端的轴线基本上平行地延伸的侧表面（多个侧表面）是柱形的侧表面。侧表面（多个侧表面）不需要完全包围流体输送顶端的轴线。但在至少一组实施例中，杆构件的前表面连接至包围流体输送顶端的一个或多个侧表面。这可使杆构件变硬，使得当压靠接头时，前表面优选地不会弯曲，而是传递其动能以使接头移开。

[0038] 替代地或另外地，杆构件的前表面和侧表面优选地是一体成形的。例如，杆构件的至少这些部分可形成为单次塑料成型。可替换地或另外地，前表面优选地至少部分地包围

流体输送顶端。前表面可完全包围流体输送顶端，例如通过顶端穿过前表面中的孔。这会使杆构件更紧凑和/或使前表面在通过摩擦配合部压靠安装在流体输送顶端上的接头时更有效。

[0039] 使用杆构件来分离接头的另一优点在于，前表面的形状（特别是曲率）可被设计为控制所获得的杆作用。在一组实施例中，前表面弯曲，这样使得杆构件（例如对抗弹性偏压）的初始运动使前表面基本上横向于流体输送顶端移动，以释放螺纹配合部的接合，并且杆构件（例如对抗弹性偏压）的进一步运动使前表面沿着流体输送顶端移动，以从摩擦配合部释放接头。因此，前表面的曲率提供了与不同的分离阶区段匹配的两个不同的运动。

[0040] 将接头推离顶端的可能的问题在于其可能被迫分离。如果接头承载针头或其他尖锐物体，那么这会造成受伤风险。因此优选地，该装置进一步包括捕获装置(catch device，截持装置)，该捕获装置布置为在从摩擦配合部释放接头之后捕获该接头。优选地，杆构件（例如对抗弹性偏压的）的进一步运动导致捕获装置捕获接头。这样，接头可以随着其分离但然后与装置可控地分离而被捕获。随后，可通过杆构件的弹性偏压的运动（例如回到其静止状态的运动）来释放捕获装置。

[0041] 当装置不使用时，可能期望禁止弹性偏压（在提供的位置），例如以使其紧凑以便于储存和/或运输。对于该装置而言一般适用的特征在于，包括对抗弹性偏压锁定杆构件的装置。

[0042] 在任何上述实施例中，流体输送装置或连接可包括用于安装杆构件的装置。在杆构件（例如为柱形或矩形的形式）包括在与流体输送顶端的轴线基本上平行的方向上延伸的一个或多个侧表面的位置，侧表面（多个侧表面）可方便地沿着该装置的至少一部分延伸，以与这种安装装置接合。因此，流体输送装置或流体输送连接件可方便地设置有杆构件，该杆构件安装成有助于使顶端在使用过程中与接头分离。因此，本发明的至少一些实施例可提供一种新的类型的流体输送装置，例如注射器，或所制造和/或销售的具有预安装的备用杆构件的其他流体输送连接件。虽然杆构件可能单独包装并根据需要安装至装置（或连接），但有利地，该装置（或连接件）可作为安装有杆构件的单个单元来包装和销售。

[0043] 杆构件可安装至流体输送顶端或安装在流体输送顶端周围，特别是如果对传统的流体输送装置或连接进行改造，如下面将进一步讨论的。然而，这将更好地用于与对应接头形成摩擦配合部，或以其他方式干扰连接。因此，在至少一些实施例中优选地，将杆构件安装至流体输送装置或流体输送连接件的流体腔室。在杆构件（例如为柱形或矩形的形式）包括在与流体输送顶端的轴线基本上平行的方向上延伸的一个或多个侧表面的情况下，侧表面（多个侧表面）可为了安装的目的而与流体腔室平行地延伸。优选地，侧表面（多个侧表面）形成从流体输送顶端延伸的罩子，以至少部分地包围流体腔室并与由流体腔室提供的安装装置接合。

[0044] 用于安装杆构件的装置可与流体输送顶端成一体或分离。在一组实施例中，流体输送装置或流体输送连接件包括用于安装杆构件的一体式装置。在安装装置与流体输送顶端成一体的实施例中，安装装置可被定位在流体输送顶端的后面，例如由与顶端成一体的流体腔室承载。在一组实施例中，流体输送装置包括与流体输送顶端连通的流体腔室，并且安装装置与流体腔室成一体。例如，安装装置可包括与流体腔室成一体的轴。在这些实例中，流体输送装置可包括注射器，并且注射器筒可具有模制在其外表面上的轴，以枢转地安

装杆构件。因此，流体腔室（例如注射器的筒）可被设计为安装杆构件，使得可对该装置提供预安装的备用的杆构件。在另一组实施例中，杆构件甚至可与流体输送装置或流体输送连接件成一体，例如与通过一体式铰接件枢转地安装的杆构件成一体。例如，杆构件和流体输送装置（或连接件）可形成为例如与由活动铰接件等枢转地安装的杆构件一起的单次塑料成型。

[0045] 然而，在另一组实施例中，可能期望将杆构件改造为现有的流体输送装置或流体输送连接件。例如，可能期望将杆构件安装至标准注射器或其他装置 / 连接件，以享有上述各种好处而不改变该装置 / 连接件的设计。在这些实施例中优选地，通过单独附接件来安装杆构件。杆构件可通过任何适当的方式附接至流体输送装置或连接件。为了避免干扰流体输送顶端，杆构件可通过附接轴环附接至顶端的后端或附接在顶端的后面。

[0046] 将理解，在杆构件的操作可帮助使接头锁定至顶端并然后使接头与顶端分离的任何情况中，这种改造机构可附接在流体输送顶端或者流体输送连接件或装置的任何其他部分（例如注射器）周围。可在将顶端插入接头之前或之后附接该机构。当确定摩擦配合部过紧以至于无法通过将顶端拉离接头而轻易分离或至少没有损坏或受伤风险时，这种机构可选地可由用户附接至流体输送装置或流体输送连接件。该机构可选地也可附接在流体输送装置（或连接件）与承载针头的接头连接且期望防止针头刺伤的位置处。

[0047] 在一组实施例中优选地，杆构件可移除地安装至该装置或连接件。这意味着，如果不需要或如果优选地在不干扰杆构件的情况下操作该装置（或连接件），用户可移除并丢弃杆构件。优选地，杆构件安装在双稳态位置，这样使得必须施加超过某一阈值和 / 或在某一方向上的力，以将杆构件从其安装位置释放。这可防止杆构件意外地从该装置（或连接件）释放。

[0048] 申请人已经认识到，甚至当杆构件被弹性偏压使得轴环围绕流体输送顶端正常封闭以形成螺纹配合部时，也存在用户意外地操作杆构件且非故意地分离接头的风险。在一些流体输送过程中，可能最重要的是确保不会不小心释放流体连接。在高压流体输送过程中，这可能特别危险。避免此现象的一种方式可以是禁用杆构件。例如，流体输送装置或连接件可包括用于锁定杆构件的装置，使得其无法枢转。用户可能需要在杆构件移动之前主动地解锁杆构件。另一种解决方案可以是移除杆构件，即，回到传统的必须手动拧开的鲁尔锁连接件。

[0049] 在不改变杆分离机构的情况下确保鲁尔锁连接件的高安全等级的解决方案是，对接头提供用于锁定杆构件的装置。因此，在一组实施例中，接头包括 ：插口，具有锥形内表面以形成摩擦配合部 ；螺纹，位于插口的外表面周围以形成螺纹配合部 ；以及凸缘，限定螺纹以锁定螺纹配合部。

[0050] 其本身被认为是新颖且创新的，并因此当从另一方面看时，本发明提供了一种用于从流体输送连接件引导流体的接头，该接头包括 ：插口，具有锥形内表面以与插入其中的对应流体输送顶端形成摩擦配合部 ；螺纹，位于插口的外表面周围以使得除了能够形成摩擦配合部以外还能够形成螺纹连接部 ；以及凸缘，限定螺纹以使螺纹连接部与对应的流体输送顶端锁定。

[0051] 将理解，对接头的螺纹进行限定的额外凸缘被布置为接合抵靠内螺纹轴环（即，流体输送装置或连接件的鲁尔锁轴环）的与接头形成螺纹配合部的外表面。在将轴环安装

在杆构件上的情况下，这种接合意味着使杆构件不动，使得其无法操作以释放螺纹配合部。接头可被设计为使得凸缘在与标准鲁尔锁轴环的宽度基本上匹配的距离处限定螺纹。这种距离可被选择为在凸缘与鲁尔锁轴环之间提供过盈配合。替代地或另外地，凸缘可设置有内抓持面，例如由材料制成和 / 或进行涂覆或处理，以增加与鲁尔锁轴环的外表面的摩擦系数。

[0052] 因此，在本发明的这方面的实施例中，接头可连接至流体输送装置或连接件的流体输送顶端，在顶端与插口的锥形内表面之间形成摩擦配合部，并且在螺纹与至少部分地包围流体输送顶端的内螺纹轴环之间形成螺纹连接部。优选地，内螺纹轴环安装在杆构件上，杆构件枢转地安装成相对于流体输送顶端移动，以释放螺纹连接部。对螺纹进行限定的凸缘优选地接合内螺纹轴环的外表面，以锁定螺纹连接部对杆构件的运动。因此，凸缘可防止内螺纹轴环移动或分成多个区段，使得无法释放螺纹连接部。

[0053] 在其他实施例中，流体输送装置或连接件的流体输送顶端可连接至不包括这种凸缘的接头。因此，接头可允许杆构件操作成使与接头形成螺纹连接 / 配合的内螺纹轴环移动或分离。在一组实施例中，接头可包括锥形内表面，并在其底部包括外边缘，例如标准鲁尔滑动接头。外边缘可与内螺纹轴环形成过盈配合，类似于螺纹配合部。在另一组实施例中，接头可包括锥形内表面，并在其底部包括外螺纹，例如标准鲁尔锁接头。这种接头的外螺纹旨在与对应鲁尔锁配合件的内螺纹轴环形成螺纹配合部。

[0054] 此外，虽然上述发明的各个方面涉及一种安装在杆构件上以与接头形成螺纹配合部的螺纹或内螺纹轴环，但将理解，本发明可延伸至任何除了正常摩擦配合部以外的用来锁定接头的闩锁或正连接。例如，可通过接合一对凸 / 凹部件来实现合适的正连接。因此，根据本发明的另一宽泛方面，提供了一种流体输送装置或连接，其包括 ：流体输送顶端，该流体输送顶端包括用于对应接头的锥形摩擦配合部 ；杆构件，该杆构件枢转地安装成相对于流体输送顶端移动 ；以及闩锁，该闩锁安装在杆构件上，以与接合安装在接头上的部件并且除了提供摩擦配合部以外还提供正连接 ；其中，通过使杆构件枢转以释放闩锁且然后从摩擦配合部释放接头，从而使接头与顶端分离。在一些实例中，闩锁可仅在流体输送顶端的一侧上提供正连接，例如，闩锁围绕顶端延伸高达 90° 或高达 180° 。在其他实例中，闩锁可基本上围绕整个流体输送顶端提供正连接，例如，闩锁围绕顶端延伸至少 180° 或 270° 且高达 360° 。闩锁可采用螺纹或内螺纹轴环的形式。任何上述优选特征可同样地应用于本发明的此另一方面。

[0055] 还想到，合适的接头可与标准鲁尔滑动或鲁尔锁设计不同。申请人已经认识到，当用杆构件使接头分离时，对杆构件在外边缘或外螺纹下方提供空间以与接头相互作用可能是有帮助的。因此，在一组实施例中，接头包括锥形内表面以及通过裙部与其底部隔开的外边缘或外螺纹。裙部可方便地对杆构件提供空间以在其与边缘或螺纹接触之前旋转。如上所述，这可允许内螺纹轴环打开，以在杆构件的进一步运动使（例如具有边缘的）前表面沿着流体输送顶端向前移动，经过裙部，通过压靠边缘或螺纹而从摩擦配合部释放接头之前释放螺纹配合部。裙部可以是柔性的。

[0056] 在至少一些实施例中，接头还可包括当接头与其连接时用于抓持流体输送顶端的额外装置。例如，该用于抓持顶端的额外装置可包括设置在锥形内表面上的凸缘或凹槽。当接头与顶端连接时，接头的内表面上的凸缘或凹槽可接合在对应凹槽或凸缘上方。因此，这

种对应的凹槽或凸缘可设置在流体输送顶端上。例如，接头可在其锥形内表面上包括环形凹槽，并且流体输送顶端可由环形抓持凸缘限定。

[0057] 在使用过程中，接头可连接至由注射器、采血管、软管、管道、IV 管线、挡块或封闭锥状物的形式的流体输送装置或流体输送连接件提供的流体输送顶端。接头可采用任何凹鲁尔锁连接件的形式，例如包括与导管、套管或皮下注射器针头流体连接的流体连接件。流体输送装置或流体输送连接件可布置为输送液体和 / 或气体。

[0058] 流体输送装置可包括用来将流体 - 液体和 / 或气体输送至流体容器或从流体容器输送流体 - 液体和 / 或气体的任何类型的装置。流体容器可以是无生命的，或者其可以是活体的一部分，例如体腔、器官或血管，诸如静脉或动脉。虽然本发明可找到广泛的使用范围，但优选地，流体输送装置是医疗装置。流体输送装置可包括一种或多种装置，例如注射器、预充式注射器、IV 输送装置，例如“静脉滴注”，输液装置、流体泵、活塞、抽吸器、吸入装置、用于采血管或软管的容器。该装置符合相关医疗标准，例如用于无菌皮下注射器的 ISO 7886。

[0059] 现在将参考附图仅通过实例来描述本发明的一些实施例，其中：

[0060] 图 1a 至图 1d 示出了用于与针头接头连接的注射器的分离机构的一个实施例；

[0061] 图 2a 和图 2b 提供了传统的鲁尔滑动接头的侧视图和截面图；

[0062] 图 3a 和图 3b 提供了传统的鲁尔锁接头的侧视图和截面图；

[0063] 图 4a 至图 4e 示出了用于与针头接头连接的注射器的分离机构的另一实施例；

[0064] 图 5a 和图 5b 提供了示出图 4c 和图 4d 的替代方式的平面图；

[0065] 图 6a 和图 6b 示出了图 4 的实施例的第一变型；

[0066] 图 7a 和图 7b 示出了图 4 的实施例的第二变型；

[0067] 图 8a 至图 8d 提供了示出图 4 的实施例的替代方式的平面图和立体图；

[0068] 图 9a 至图 9d 示出了在图 4 至图 7 的实施例中使用的可分离轴环的一些实例；

[0069] 图 10a 和图 10b 示出了图 4 的实施例的第三变型和第四变型；

[0070] 图 11a 和图 11b 示出了图 4 的实施例的第五变型和第六变型；

[0071] 图 12a 和图 12b 示出了接头的另一实施例；

[0072] 图 13 示出了接头的另一变型；

[0073] 图 14a 和图 14b 提供了不同的鲁尔锁接头的侧视图和截面图；

[0074] 图 15a 和图 15b 提供了与注射器连接和分离的接头的立体图；

[0075] 图 16a 和图 16b 提供了对应于图 15a 和图 15b 的第一实施例的截面图；

[0076] 图 17a 和图 17b 提供了对应于图 15a 和图 15b 的第二实施例的截面图；

[0077] 图 18a 和图 18b 提供了对应于图 15a 和图 15b 的第三实施例的截面图；

[0078] 图 19 示出了在流体输送软管的端部安装至流体输送顶端的分离机构。

[0079] 图 1a 至图 1d 示出了用于接头 10 的分离机构的一个实施例。注射器 2 具有锥形的流体输送顶端 6，以与对应的接头 10 形成鲁尔滑动连接部，即摩擦配合部。另外，顶端 6 可选地可设置有环形夹持凸缘 8，该环形夹持凸缘包围顶端 6 且靠近注射器 2 的筒 4。接头 10 可以是如图 2a 和图 2b 所示的标准鲁尔滑动接头 10，或是如图 14a 和图 14b 所示的接头 410，该接头在其内表面上包括环形凹槽，以夹持在凸缘 8 上。接头 10 可与具有内锥面和外边缘 12 的标准鲁尔滑动接头类似，除了另外设置有在边缘 12 下方延伸的裙部以外。可替

换地，接头 10 可以是如图 3a 和图 3b 所示的标准鲁尔锁接头 110。

[0080] 在这个实施例中（见图 1a），注射器 2 具有枢转地安装的杆构件 34，该杆构件承载向前延伸的闩锁 46，该闩锁是带有内螺纹的部分半球形轴环的形式。如图 1b 所示，接头 10 可通过在将接头 10 扭转以与闩锁 46 的螺纹（例如边缘 12）连接的同时将其推到摩擦配合部上而与顶端 6 连接。如果不旋转接头 10，那么仍可沿着顶端 6 推动该接头，迫使杆构件 34 对抗其弹性偏压而枢转，然后最终旋转为形成螺纹配合部。在其弹性偏压位置中，如图 1c 所示，使杆构件 34 枢转以保持螺纹正接合。虽然可能需要双手操作来将接头 10 与注射器 2 连接，但是可用杆构件 34 来在连续的单手运动中使接头 10 分离。图 1d 示出，杆构件 34 对抗其板簧 40 的弹性偏压而向下枢转，使得螺纹闩锁 46 远离接头 10，从而使得其不再有助于将接头保持在锁定位置。杆构件 34 的枢转运动还将接头 10 推出与顶端 6 上的夹持凸缘 8 的接合并释放摩擦配合部。可选的捕获件 44 被设置成防止接头 10 飞离注射器 2。

[0081] 在这些实施例中，标准鲁尔滑动接头 10 的外边缘 12 被扭转，以形成与安装在杆构件 34 的闩锁 46 上的内螺纹形成螺纹配合部。然而，鲁尔滑动接头通常并非旨在以与鲁尔锁连接件器相同的方式与流体输送顶端形成螺纹配合部。鲁尔锁接头具有外螺纹，而不是平边缘，从而确保形成螺纹配合部连接。图 2 和图 3 比较了传统的接头。图 2a 和图 2b 示出了具有外边缘 12 的标准鲁尔滑动接头 10。图 3a 和图 3b 示出了具有外螺纹 112 的标准鲁尔锁接头 110。这些接头 10、110 都可连接至如图 1a 至图 1d 所示的注射器 2 的流体输送顶端 6，闩锁 46 的螺纹与外边缘 12 或外螺纹 112 接合，以除了提供摩擦配合部以外还提供正连接，例如螺纹配合部。

[0082] 现将描述用于标准鲁尔锁接头 110 的分离机构的一些实施例。在图 4a 至图 4e 中，可看到注射器 102，该注射器具有可枢转安装的杆构件 134，该杆构件由板簧 140 弹性偏压。鲁尔锁接头 110 通过锥形面之间的摩擦配合部而连接至注射器 102 的顶端 106。鲁尔锁接头 110 在其底部具有外螺纹 112，该外螺纹使得接头 110 除了摩擦配合部以外还能够通过螺纹配合部连接。传统的鲁尔锁注射器将提供可扭转到接头 110 上的内螺纹轴环。然而在这些实施例中，内螺纹轴环 146 安装在杆构件 134 上且布置为当操作杆构件 134 时裂开。

[0083] 为了使接头 110 与顶端 106 连接或分离，可对抗弹簧 140 的弹性偏压移动杆构件 134，从而打开轴环 146，如图 4b 所示。当连接或分离时，不再必须旋转注射器 102 或接头 110。当压下杆构件 134 时，简单地释放螺纹连接。当使注射器 102 与接头 110 分离时，甚至可能不必须强制分离摩擦配合部。当使杆构件 134 抵靠注射器 102 而枢转时，其前表面或前表面上的边缘可沿着顶端 106 向前推动，从而推开接头 110 并在单次单手操作下使该连接自动地分离，如图 4c 所示。可选的捕获件 144 可布置为防止接头 110 飞走。在申请人的公开申请 WO 2013/164358 中可找到这种杆机构的进一步细节，该专利的内容通过引证结合于此。

[0084] 当释放杆构件 134 时，该杆构件在弹簧 140 的弹性偏压下自动地枢转，使得螺纹轴环 146 围绕鲁尔锁接头 110 的外螺纹 112 封闭。与图 1 所示的半球形轴环不同，螺纹轴环 146 可围绕鲁尔锁接头 110 的周界延伸基本上 360°。这确保了提供鲁尔锁连接件的螺纹配合部的完整性。图 4d 和图 4e 的平面图在一个实例中说明了当操作杆构件 134 时螺纹轴环 146 如何分成两个半球形区段。当然，螺纹轴环 146 可分成多个部件，当打开轴环时，这些部件彼此向外径向地移动。这些部分半球形的区段的周长可能并不相等。在图 5a 和图

5b 的平面图中示出了分成三区段的螺纹轴环 246 的一个实例。

[0085] 将理解，当螺纹轴环 146 围绕接头 110 封闭时，其区段可能不会彼此精确地接触，例如，如图 6a 和图 6b 所示。在一个实例中，如图 7a 和图 7b 所示，螺纹轴环 146 形成围绕鲁尔锁接头 110 的连续 360 度螺纹。

[0086] 当操作杆构件 134 时，内螺纹轴环 146 可分成多个区段，这些区段与杆构件 134 径向地平行地隔开。在其他实施例中，例如如图 8a 至图 8c 所示，杆构件 134 可承载内螺纹轴环 146，该内螺纹轴环分成多区段，这些区段在横向于杆构件 134 的方向上径向地展开。

[0087] 在任何这些实施例中，内螺纹轴环 146 可能已经被分成多个区段，例如，如图 9a 所示的切割轴环。可替换地，螺纹轴环 146 可形成为围绕顶端 106 的整个 360° 的圆，但具有一个或多个弱化区域或易碎线 (frangible line)，其使得当对杆构件 134 施加力时，轴环能够分成多个区段。图 9b 至图 9d 示出了一些可能的实例。

[0088] 将理解，杆构件 134 可操作成以任何适当的方式劈开螺纹轴环 146。在图 10a 的所示实例中，顶端 106 上的特征布置为，当操作杆构件 134 时，推靠螺纹轴环 146 的一个或多个区段。在图 10b 的说明性实例中，设置在注射器 102 的筒 104 上的特征可用于在操作杆构件 134 时推动打开螺纹轴环 146。

[0089] 在这些实施例中的至少一些中设想到，可多次操作杆构件 134，以打开和关闭螺纹轴环 146 并允许发生多次连接和分离。然而，在流体输送装置（例如注射器）通常旨在仅使用一次的医疗设备中，期望分离机构使得该装置在使用一次之后不可使用。图 11a 和图 11b 示出了可能的实现这种情况的一些方式。在图 11a 中可看到，螺纹轴环 146 的这些区段在操作杆构件时发生永久变形，使得无法再次使用轴环。图 11b 示出了一种替代设计，其中，一旦操作杆构件，轴环 146 的这些区段就锁定在打开位置中。

[0090] 上述实施例的一个优点是，可使用单手操作杆构件来连接和分离标准鲁尔锁接头 110。作用在杆构件上的弹性偏压确保其默认位置保持螺纹轴环围绕接头 110 封闭，并且用户必须有目的地对杆构件施加压力以使连接解锁。然而，可能存在一些这样的情况 :注射器或承载这种杆构件的其他流体输送装置将与具有接头的鲁尔锁连接件，而不存在用户意外地操作杆构件并打开螺纹配合部连接的任何风险。在这种情况中，可用如图 12a 和图 12b 所示的新颖的锁定接头 210 替换标准鲁尔锁接头。除了外螺纹 212 以外，接头 210 包括对螺纹 212 进行界定的周界凸缘 214。如图 12b 所示，这种接头 210 可通过将螺纹 212 扭转成与内螺纹轴环 146 接合而连接至注射器 102 的顶端 106，使得外凸缘 214 包围轴环 146，并由此锁定螺纹连接。即使对杆构件 134 施加压力，也由于由接头 210 提供的限定凸缘 214 的原因而无法枢转并打开轴环 146。用户可使接头 210 与顶端分离的唯一方式是，通过以与传统的鲁尔锁连接件相同的方式将其拧开来实现。

[0091] 还可在鲁尔滑动接头上设置类似类型的锁定凸缘。在图 13 所示的另一变型中，杆构件 334 设置有面向外的闩锁构件 366，例如部分半球形的轴环，其可锁定在接头 310 的凸缘 314 内。

[0092] 在图 14a 和图 14b 中示出了另一接头 410。可以看到，接头 410 承载外螺纹 412，这意味着，如果需要的话，接头 410 可与标准鲁尔锁连接件一起使用。在其他变型中，可省略螺纹 412 或将其用平边缘代替。然而，与传统的鲁尔锁接头（见图 3a 和图 3b）相比，接头 410 在螺纹 412 下方包括裙部 414。裙部 414 向下延伸，以通过杆构件的前表面中的槽。

因此，裙部 414 提供了帮助杆构件接合接头 410 的表面。从图 14b 所示的截面中还可看到，裙部 414 除了是锥形的以外，还可在其内表面上形成有环形槽 416。槽 416 提供了额外的装置以用于在通过摩擦配合部与流体输送顶端（特别是，由环形夹持凸缘限定的流体输送顶端）连接时对接头 410 进行夹持。最后，从图 14a 和图 14b 中还可看到，接头 410 可选地可包括外环 418，该外环是使得用户更容易将接头 410 推到顶端上的人体工程学特征。这种接头 410 可与如以上相对于图 1 至图 12 描述的注射器 2、102 的流体输送顶端 6、106 连接 / 分离。

[0093] 图 15 至图 18 示出了用于接头 510 的锁定和分离机构的一些其他实施例，这里可以看到承载凸缘 512 的标准鲁尔滑动接头 510。可用任何其他上述接头代替接头 510。接头 510 可承载针头（未示出）或形成流体输送连接件件的一部分。注射器 502 具有锥形的流体输送顶端 506，以与接头 510 形成鲁尔滑动部，即摩擦配合部。在流体输送顶端 506 的后面，杆构件 534 枢转地安装至注射器 502 的筒 504。杆构件 534 承载螺纹或内螺纹形式的闩锁 546。可手动地操作杆构件 534，以使闩锁 546 在不同位置之间移动。

[0094] 如图 15a 所示，在第一位置中，杆构件 534 向下枢转，使得闩锁 546 的螺纹与接头 510 的凸缘 512 接合，从而有助于将接头保持在锁定位置。如图 15b 所示，在第二位置中，杆构件 534 向上枢转，使得螺纹与接头 510 不接合，此外，杆构件 534 用于通过使接头 510 沿着顶端 506 向前推动而从摩擦配合部释放接头 510。虽然可能需要双手操作来将接头 510 与注射器 502 连接，但杆构件 534 可用于使接头 510 在连续的单手运动中分离。如图 16a 和图 16b 的截面所示，可在杆构件 534 上设置可选的捕获件 544，以当通过进入第二位置的运动释放接头 510 时，防止该接头从注射器 502 飞走。

[0095] 杆构件 534 可在图 15a 和图 15b 所示的第一位置与第二位置之间自由枢转。图 17a 和图 17b 的截面图示出了杆构件 534 在第一（锁定）位置与第二（释放和分离）位置之间的运动。可替换地，例如可通过板簧 540（或其他弹簧件）将杆构件 534 弹性偏压至第一位置中，如图 18a 和图 18b 的截面图所示。在这个实例中，用户必须使杆构件 534 对抗板簧 540 的弹性偏压而枢转，以便使闩锁 546 远离接头 510 并沿着顶端 506 推动接头 510，从而释放摩擦配合部。

[0096] 当然，本发明的各种实施例（例如以上描述的那些）不限于注射器形式的流体输送装置。将理解，本文描述的分离机构不限于与包括作为流体腔室的筒的注射器一起使用，而是可在软管、管道、套管等的端部安装至流体输送顶端。图 19 示出了在流体输送软管的端部安装至流体输送顶端的杆驱动的分离机构。同样地，这种软管或其他流体输送装置可代替在任何其他上述实施例中示出的注射器。

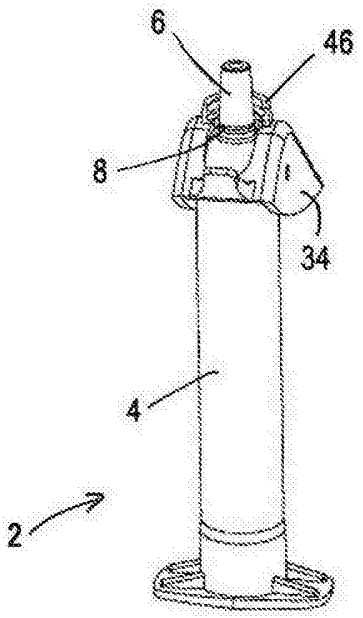


图 1a

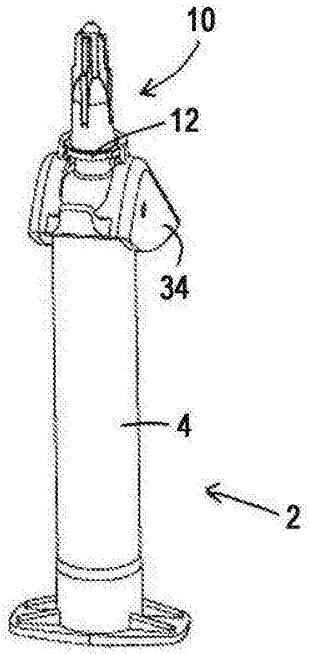


图 1b

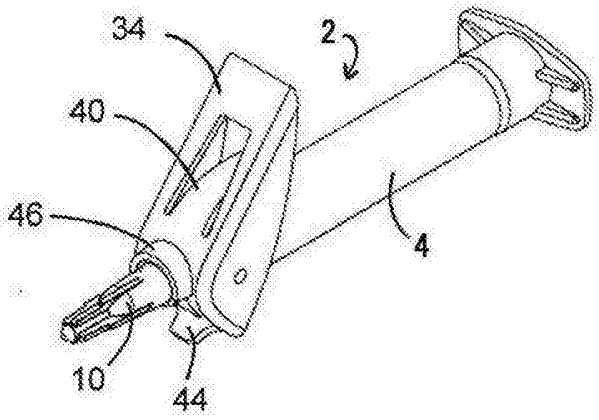


图 1c

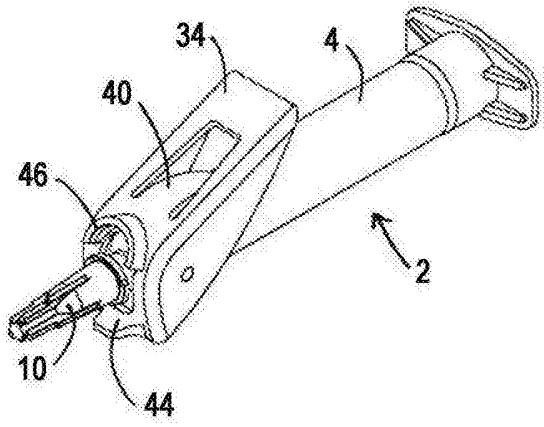


图 1d

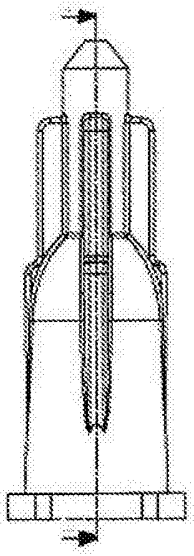


图 2a

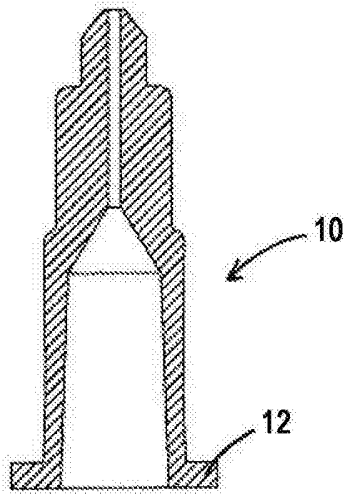


图 2b

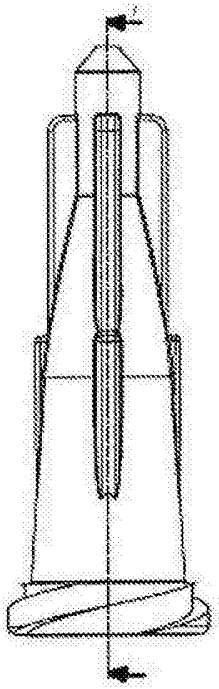


图 3a

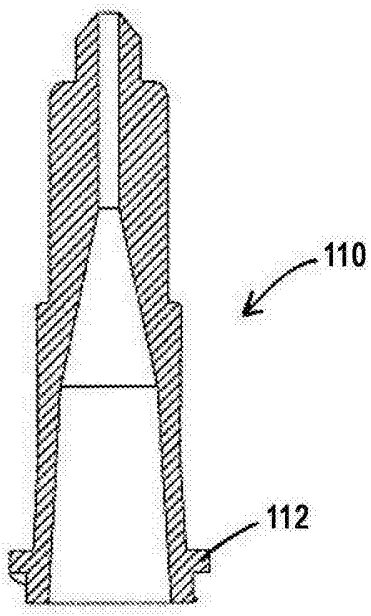


图 3b

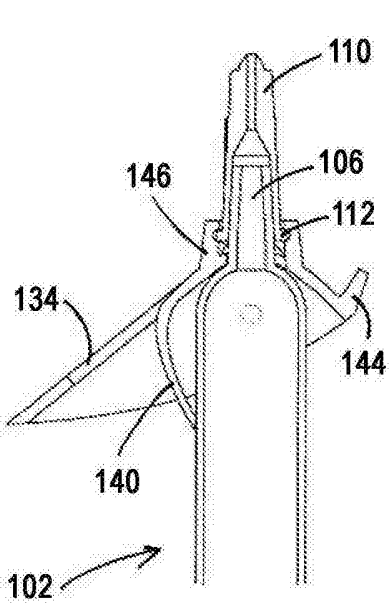


图4a

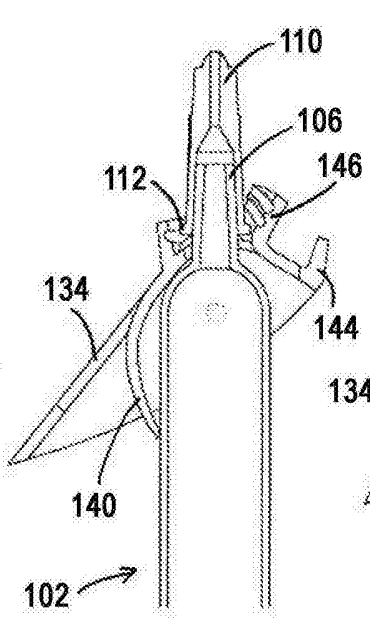


图4b

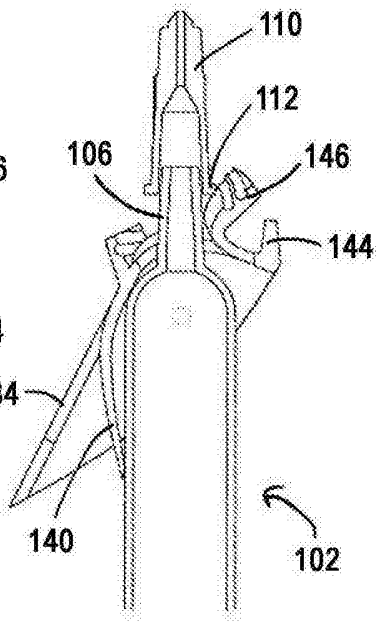


图4c

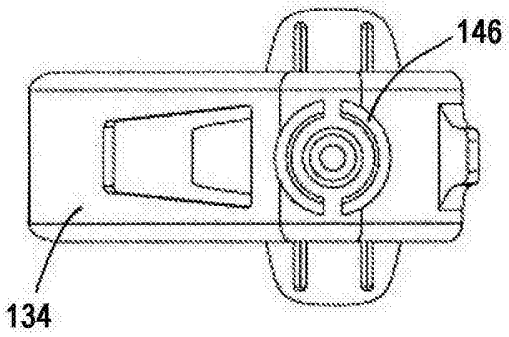


图 4d

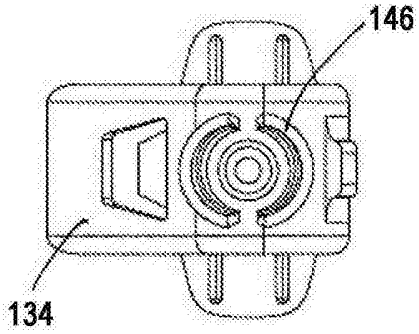


图 4e

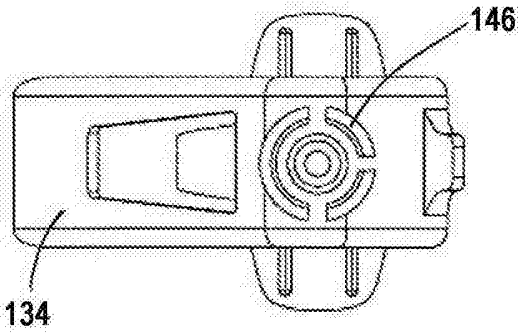


图 5a

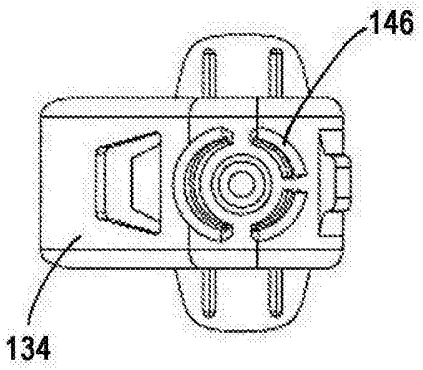


图 5b

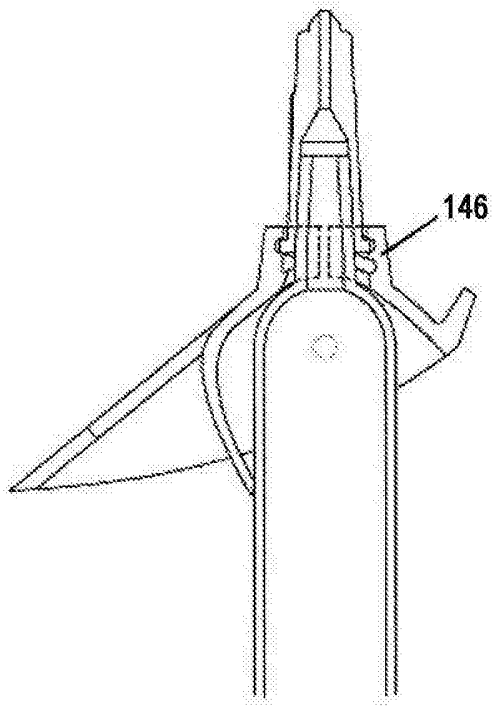


图 6a

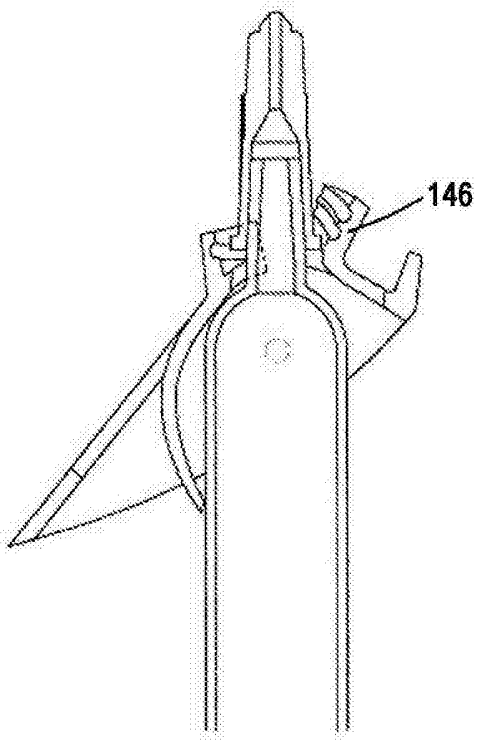


图 6b

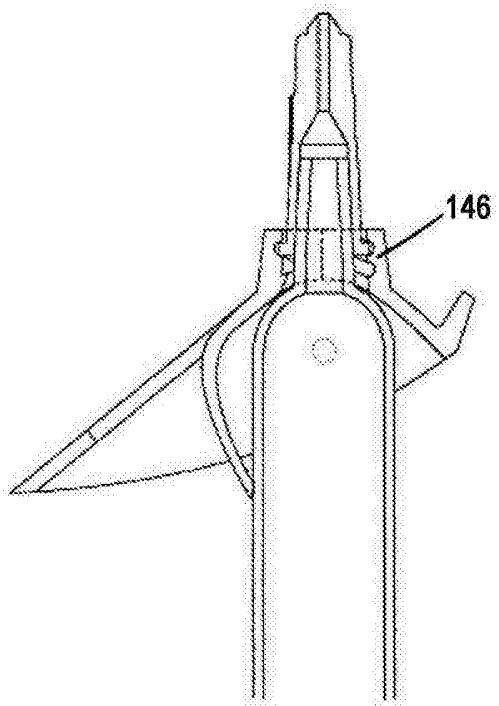


图 7a

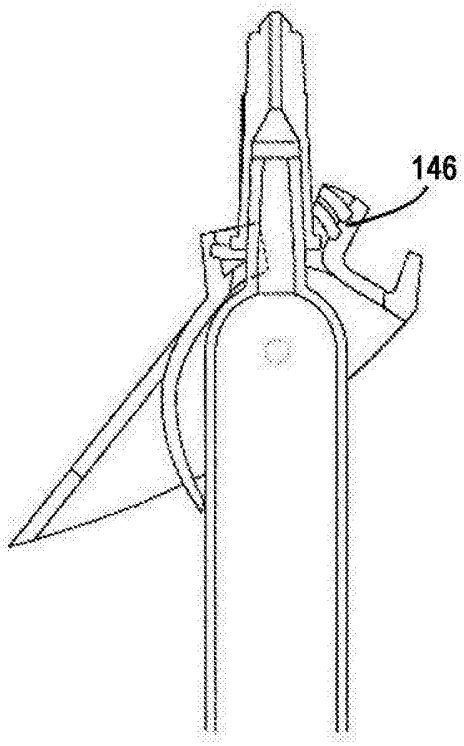


图 7b

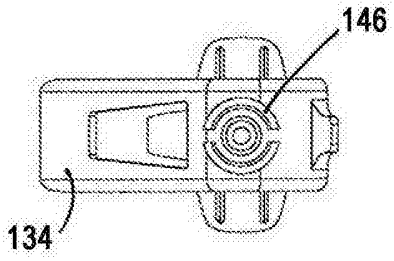


图 8a

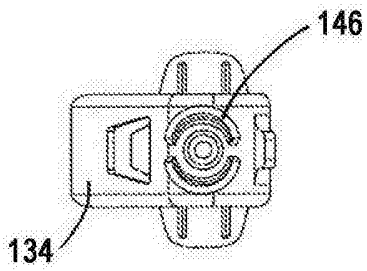


图 8b

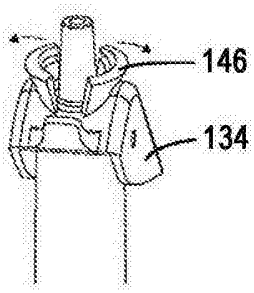


图 8c

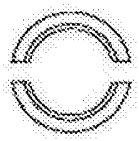
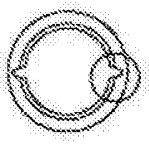


图 9a



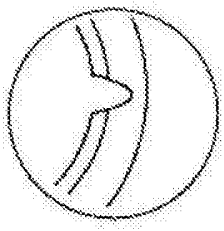


图 9b

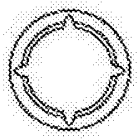


图 9c

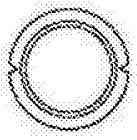


图 9d

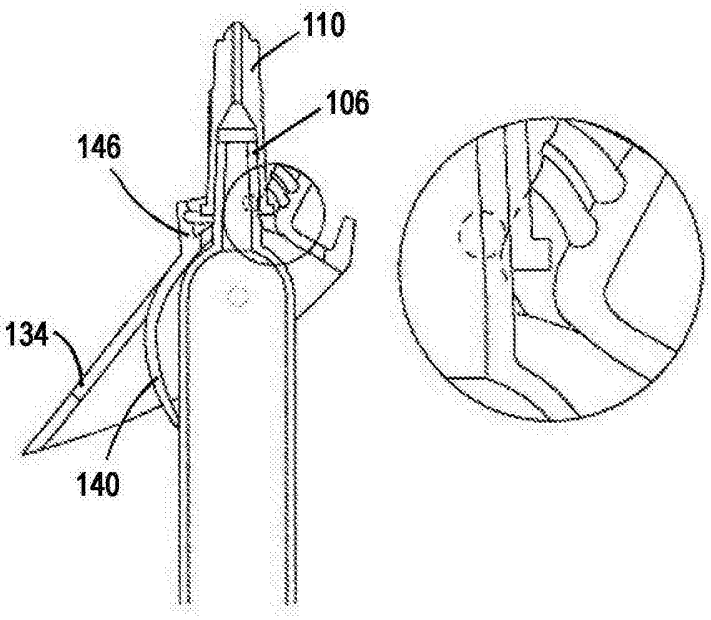


图 10a

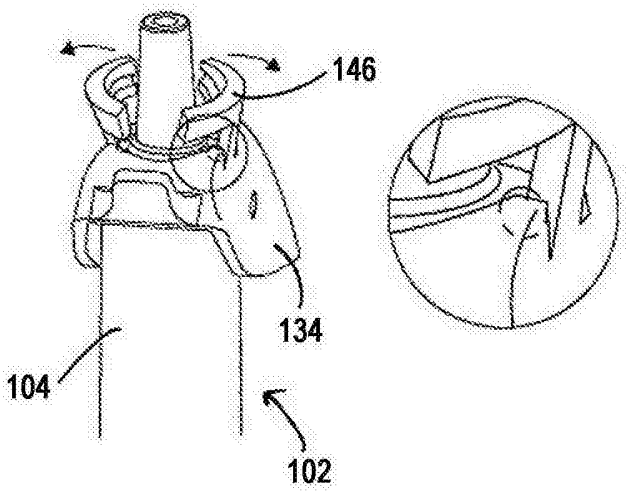


图 10b

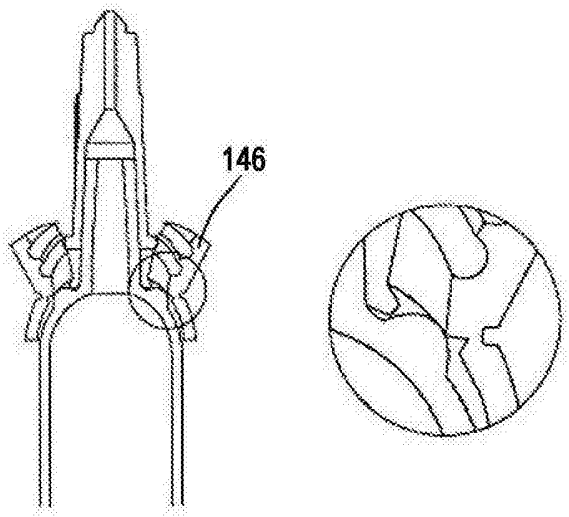


图 11a

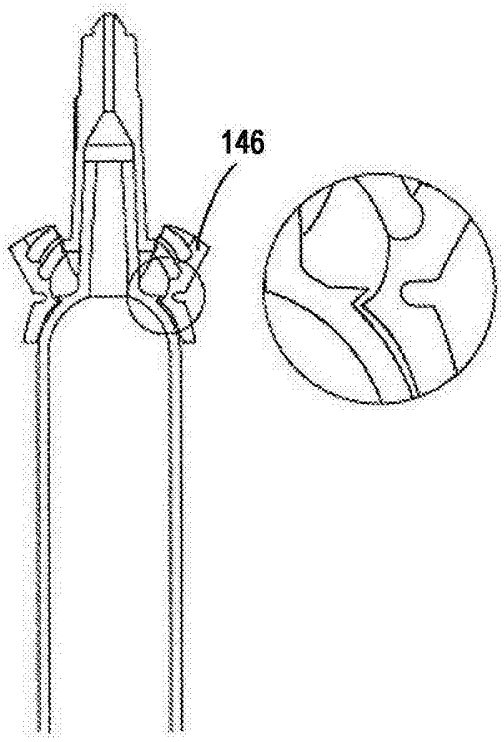


图 11b

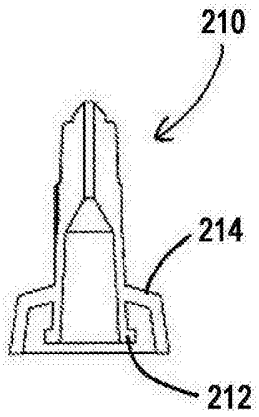


图 12a

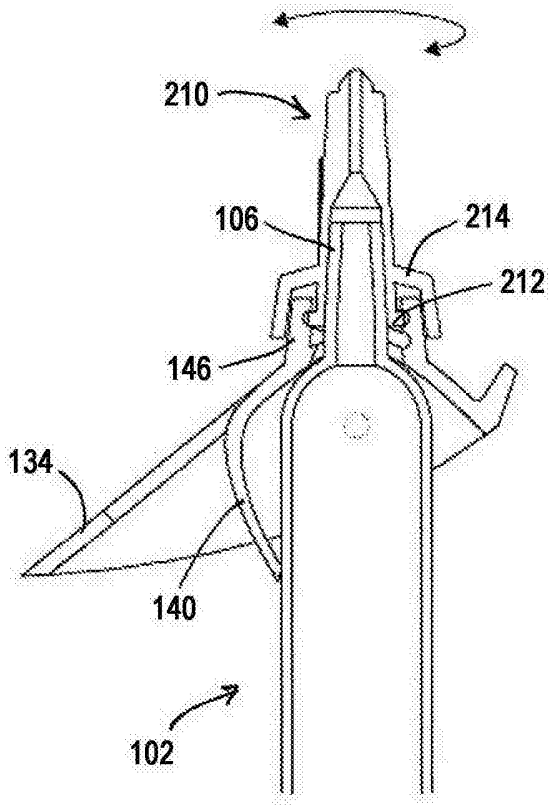


图 12b

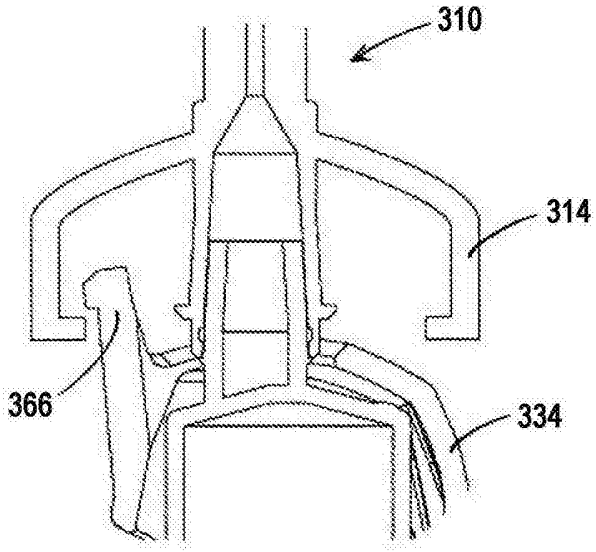


图 13

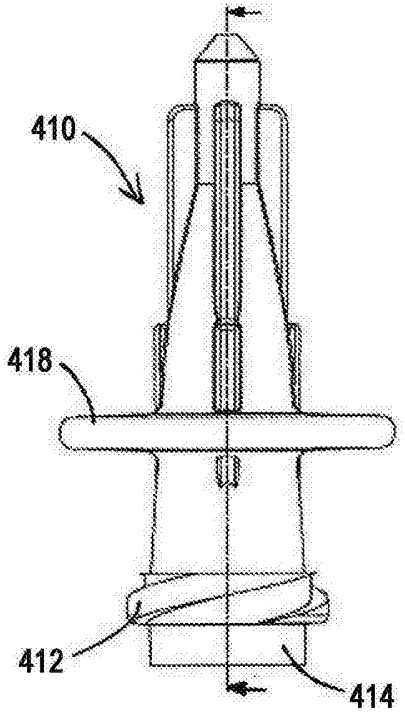


图 14a

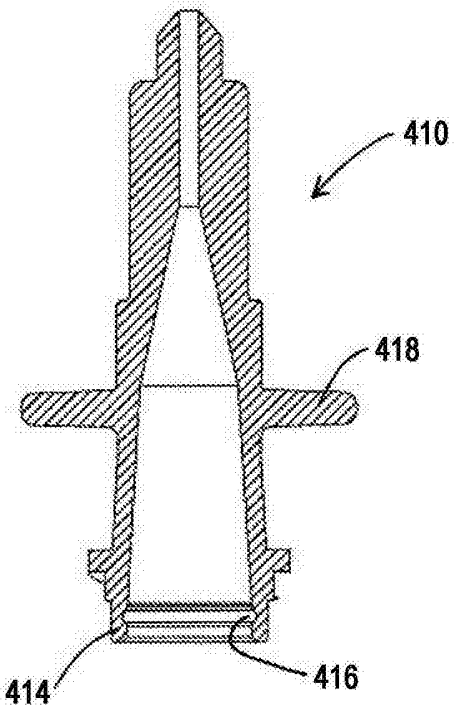


图 14b

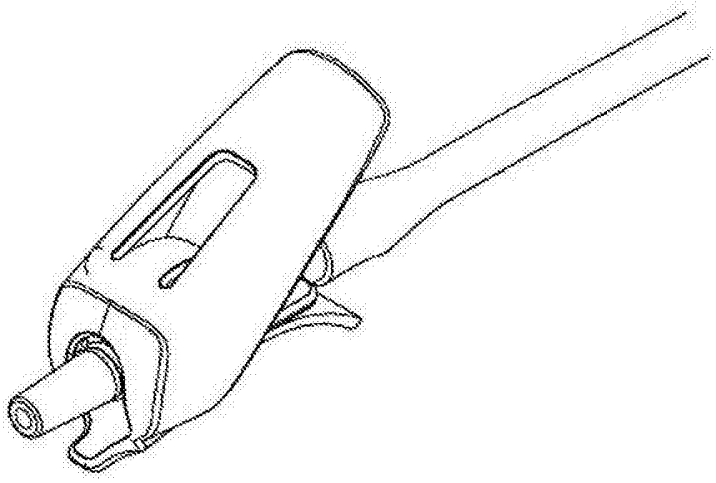
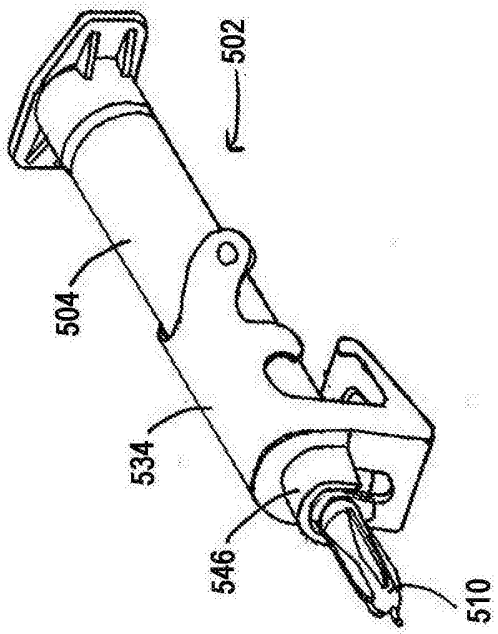


图 19



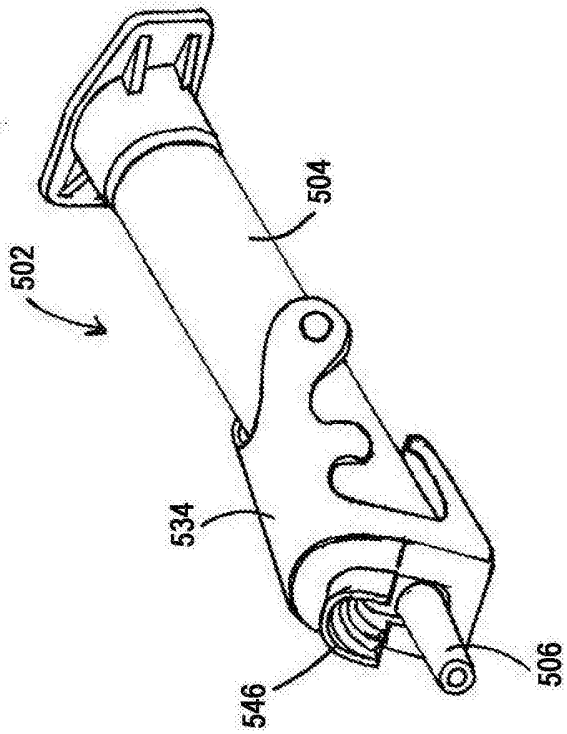


图 15a

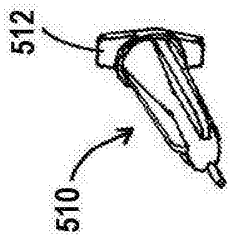


图 15b

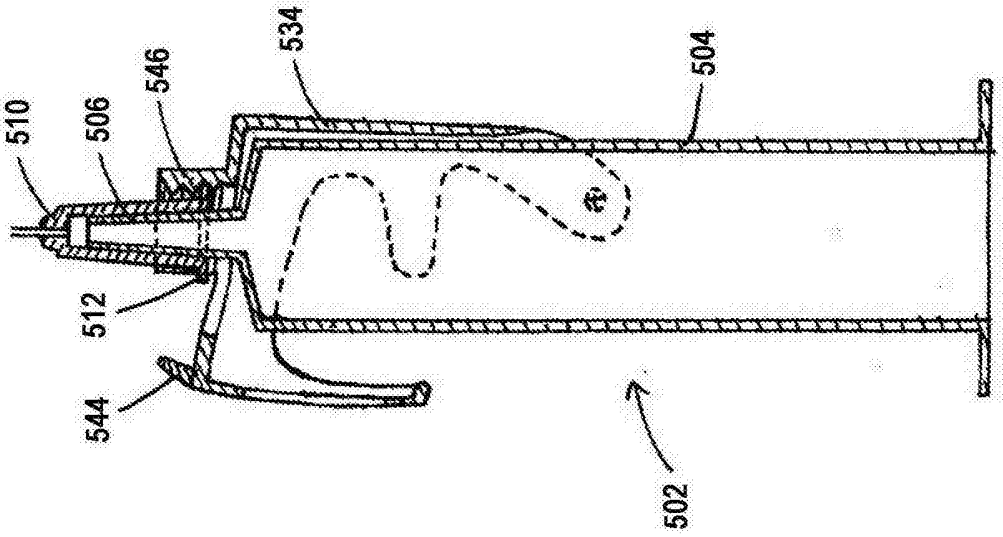


图 16a

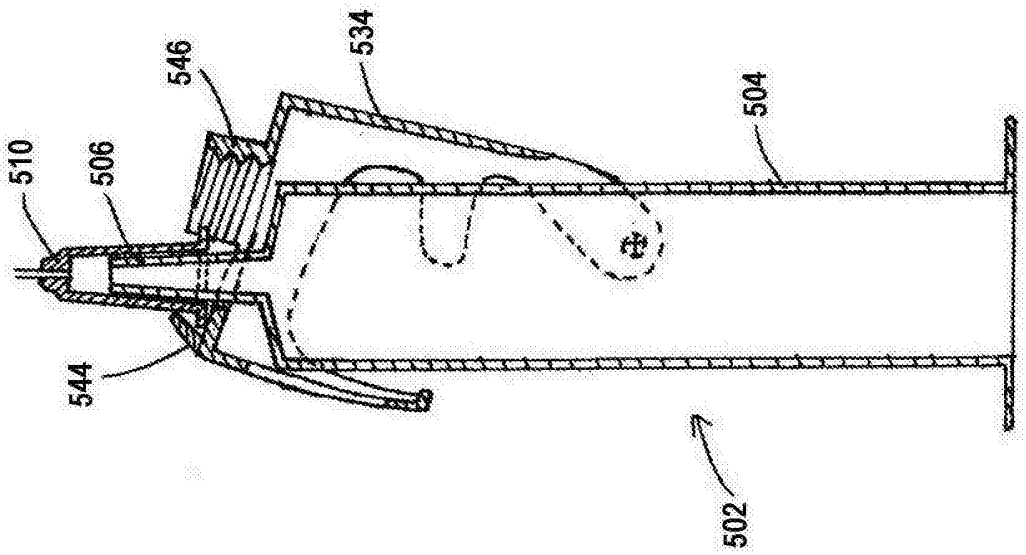


图 16b

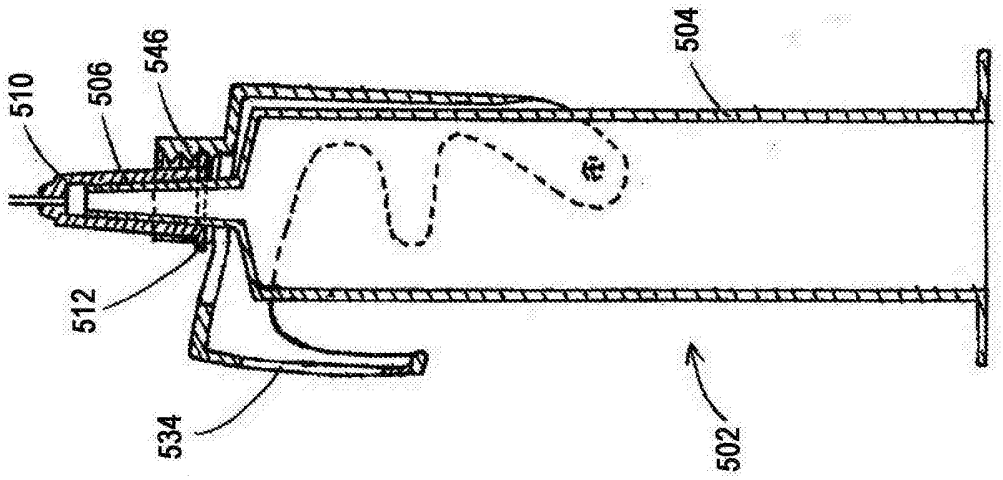


图 17a

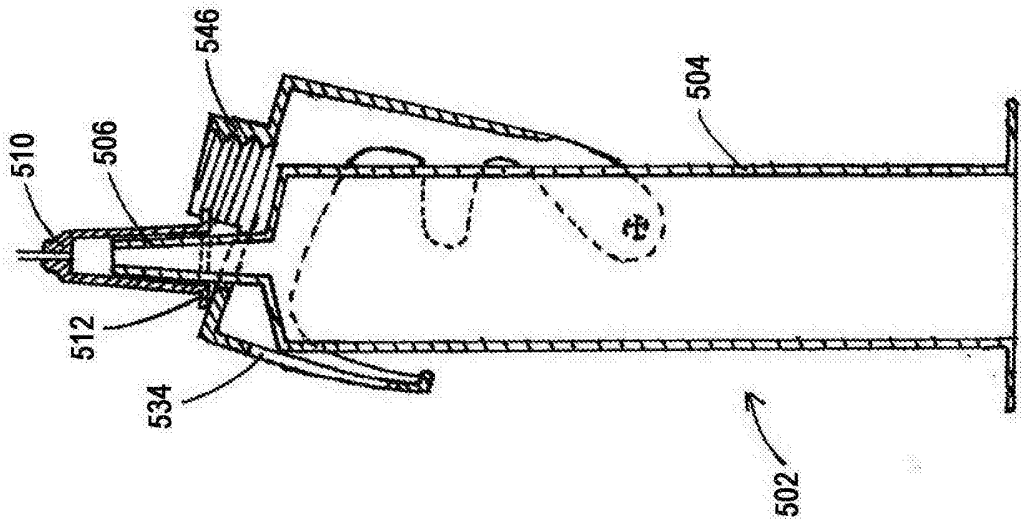


图 17b

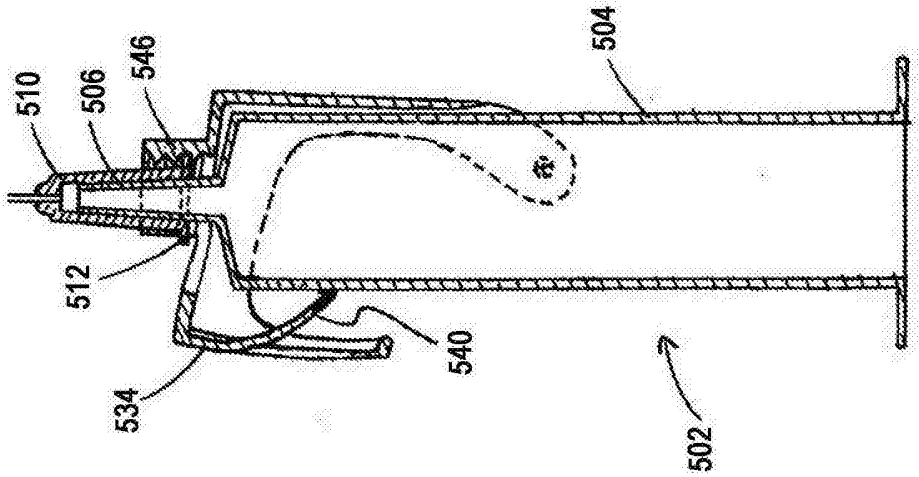


图 18a

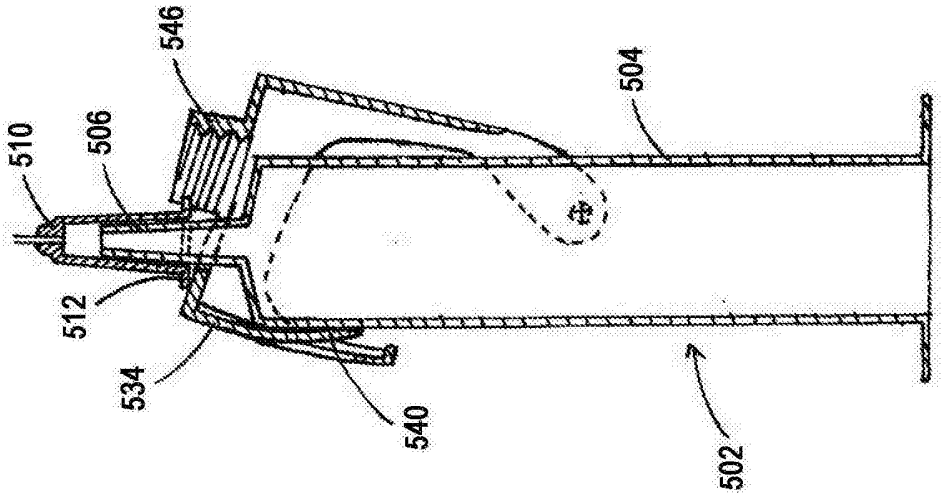


图 18b