US 20190076321A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2019/0076321 A1

Naygauz (43) Pub. Date: Mar. 14, 2019

(54) DEVICES AND SYSTEMS WITH AN EXTERNAL DISPLACEMENT MECHANISM FOR CONTAMINANT-FREE ENGAGEMENT OF PHARMACEUTICAL VESSELS AND PHARMACEUTICAL ADMINISTRATION DEVICES

(71) Applicant: **Mikael Naygauz**, Forrest Hills, NY (US)

(72) Inventor: **Mikael Naygauz**, Forrest Hills, NY (US)

(21) Appl. No.: **16/100,594**

(22) Filed: **Aug. 10, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/619,795, filed on Jan. 20, 2018, provisional application No. 62/619,920, filed on Jan. 22, 2018, provisional application No. 62/562,490, filed on Sep. 25, 2017, provisional application No. 62/564,933, filed on Sep. 28, 2017, provisional application No. 62/612,267, filed on Dec. 29, 2017, provisional application No. 62/566,414, filed on Sep. 30, 2017, provisional application No. 62/582,922, filed on Nov. 7, 2017, provisional application No. 62/560,195, filed on Sep. 19, 2017, provisional application No. 62/563,072, filed on Sep. 26, 2017, provisional application No. 62/558,502, filed on Sep. 14, 2017, provisional application No. 62/625,334, filed on Feb. 1, 2018, provisional application No. 62/644,185, filed on Mar. 16, 2018, provisional application No. 62/651,000, filed on Mar. 30, 2018, provisional application No. 62/653,356, filed on Apr. 5, 2018, provisional application No. 62/657,809, filed on Apr. 15, 2018, provisional application No. 62/662,743, filed on Apr. 25, 2018, provisional application No. 62/669,948, filed on May 10, 2018, provisional application No. 62/675,058, filed on May 22, 2018.

Publication Classification

(51) **Int. Cl.**

A61J 1/14 (2006.01)

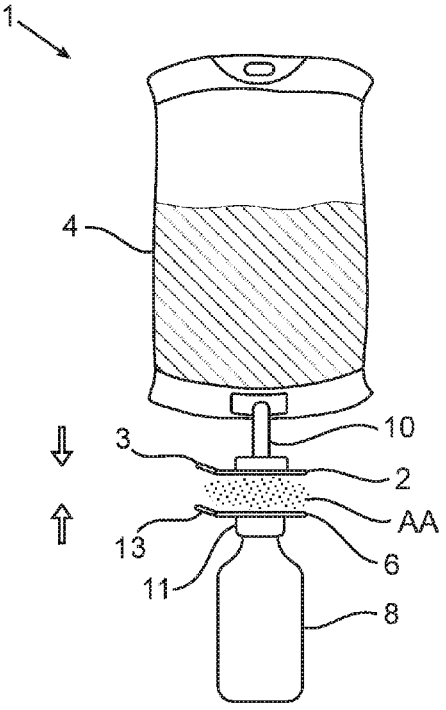
A61J 1/20 (2006.01)

(52) **U.S. Cl.**

CPC ***A61J 1/1443*** (2013.01); ***A61J 1/2013*** (2015.05); *A61J 1/2096* (2013.01); ***A61J 1/1418*** (2015.05); ***A61J 1/2089*** (2013.01)

(57) ABSTRACT

The present invention relates, in some embodiments thereof, to systems, devices and methods allowing for an engagement of two or more vessels or devices in a decontaminated manner. In some embodiments of the invention, the systems and devices of the invention include a first connection interface attached to a first vessel and a second connection interface attached to a second vessel, wherein the first connection interface and the second connection interface are configured to allow for an engagement between the first vessel and the second vessel, and wherein the first and second connection interfaces are further configured to externally displace from the engagement between the first vessel and the second vessel while a hermetically sealed connection is maintained between the first vessel and the second vessel.



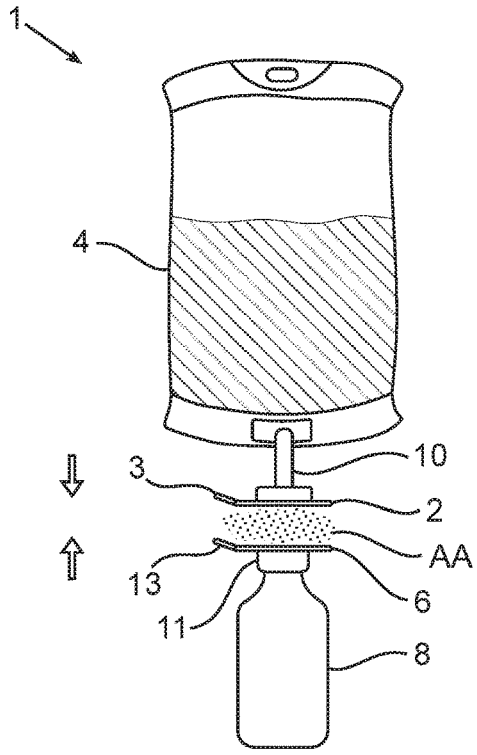


FIG. 1A

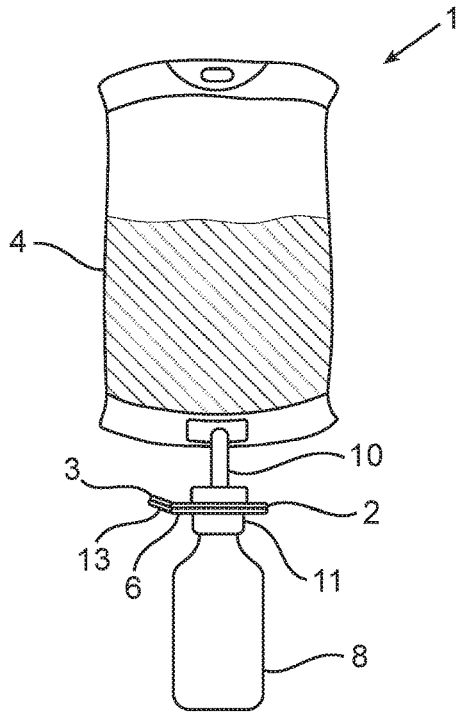


FIG. 1B

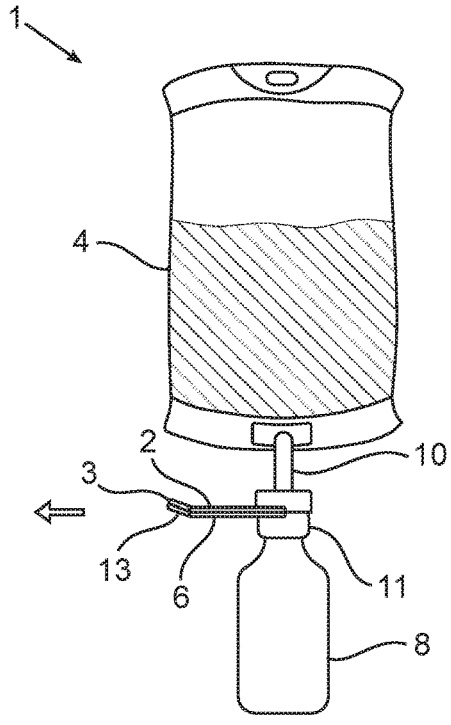


FIG. 1C

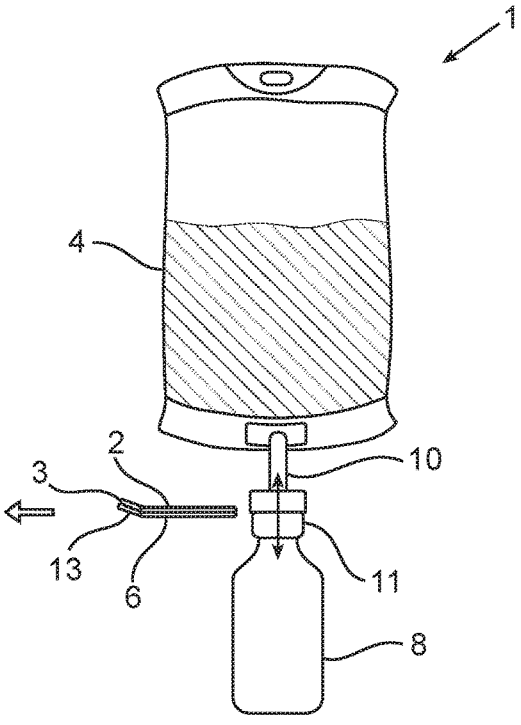


FIG. 1D

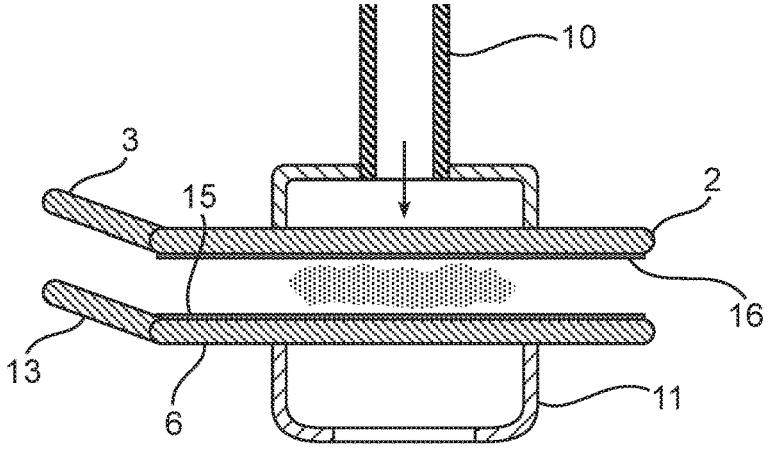


FIG. 2

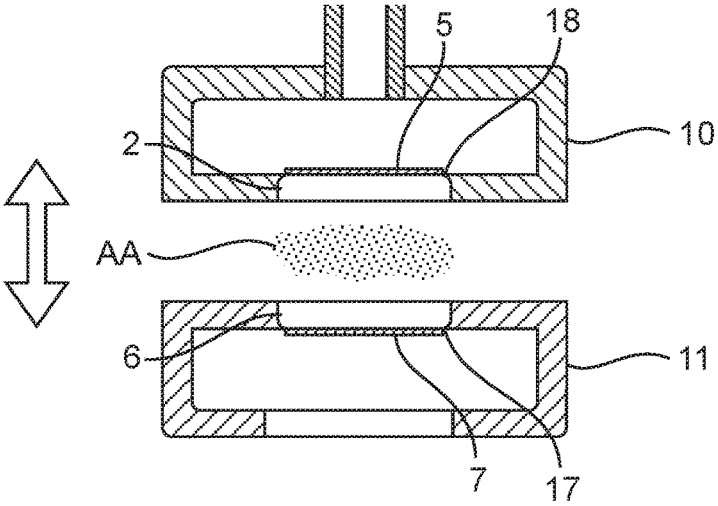


FIG. 3A

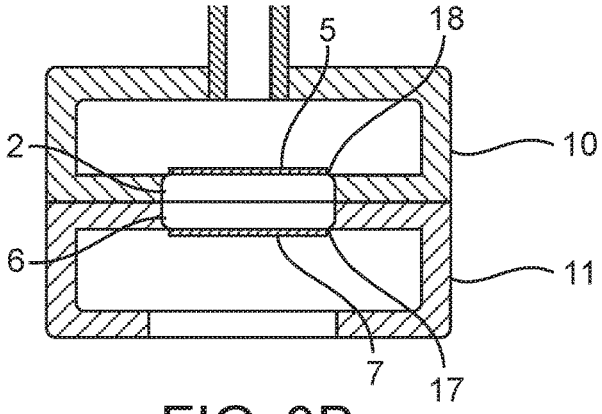


FIG. 3B

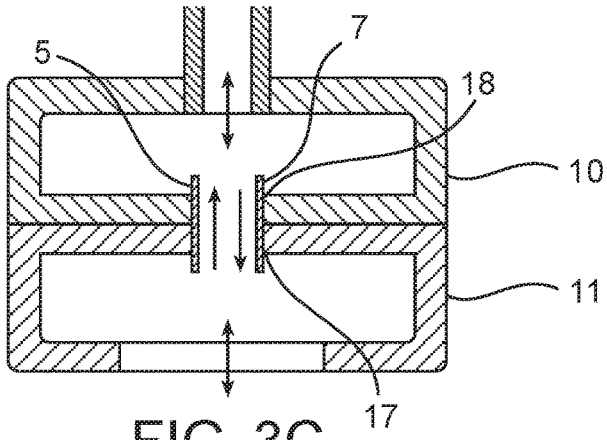


FIG. 3C

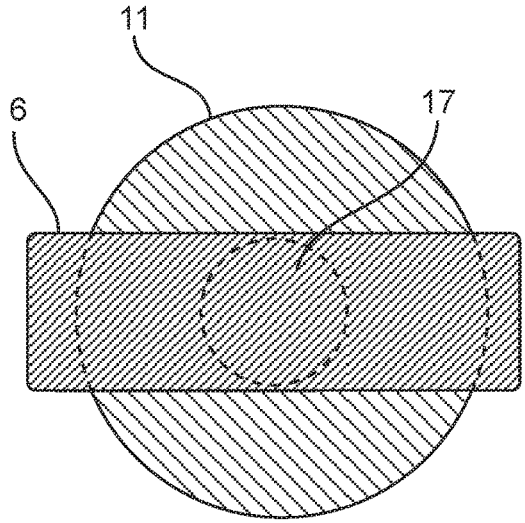


FIG. 4A

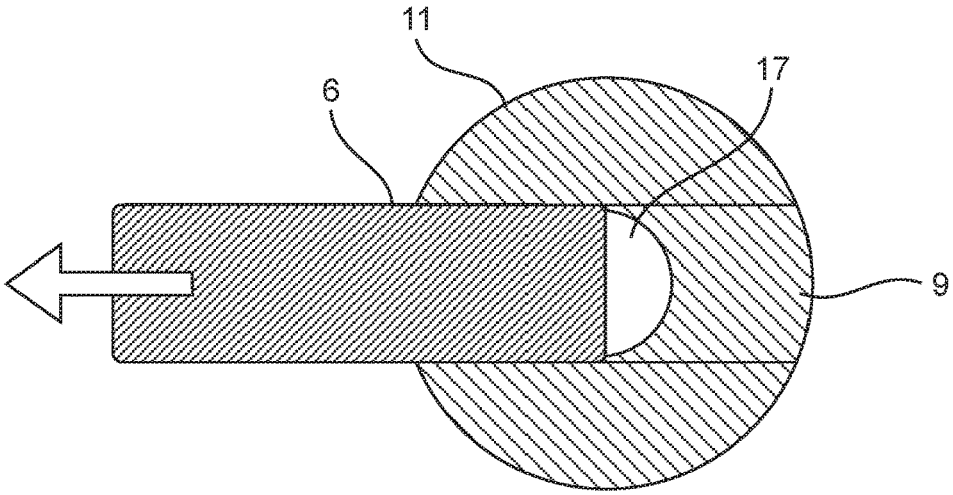


FIG. 4B

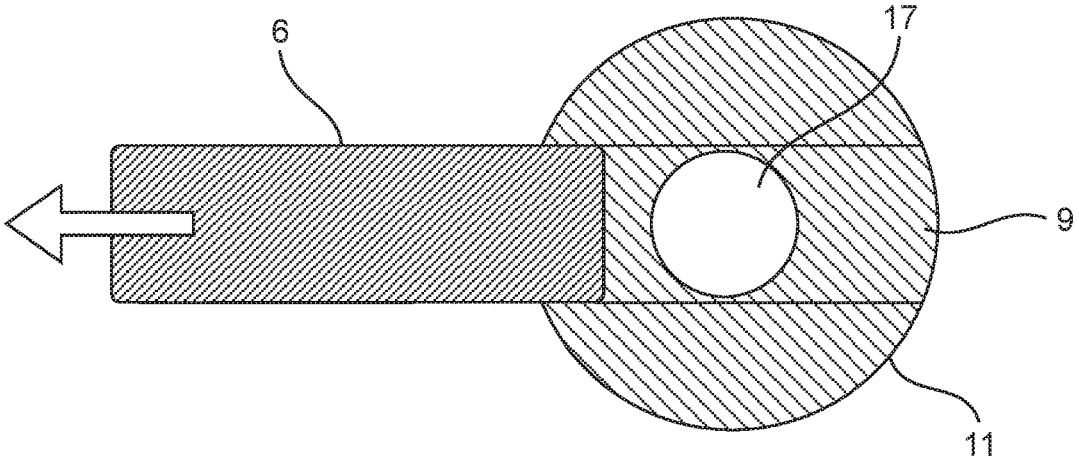


FIG. 4C

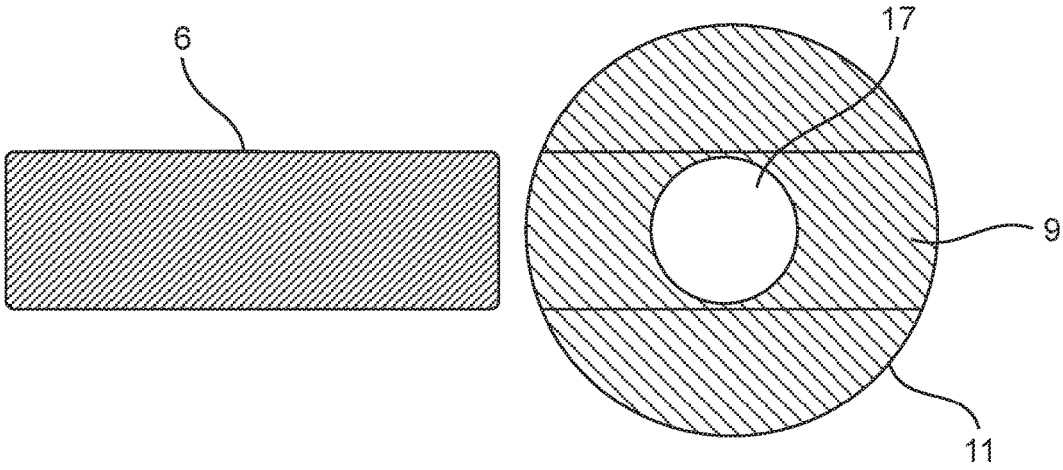


FIG. 4D

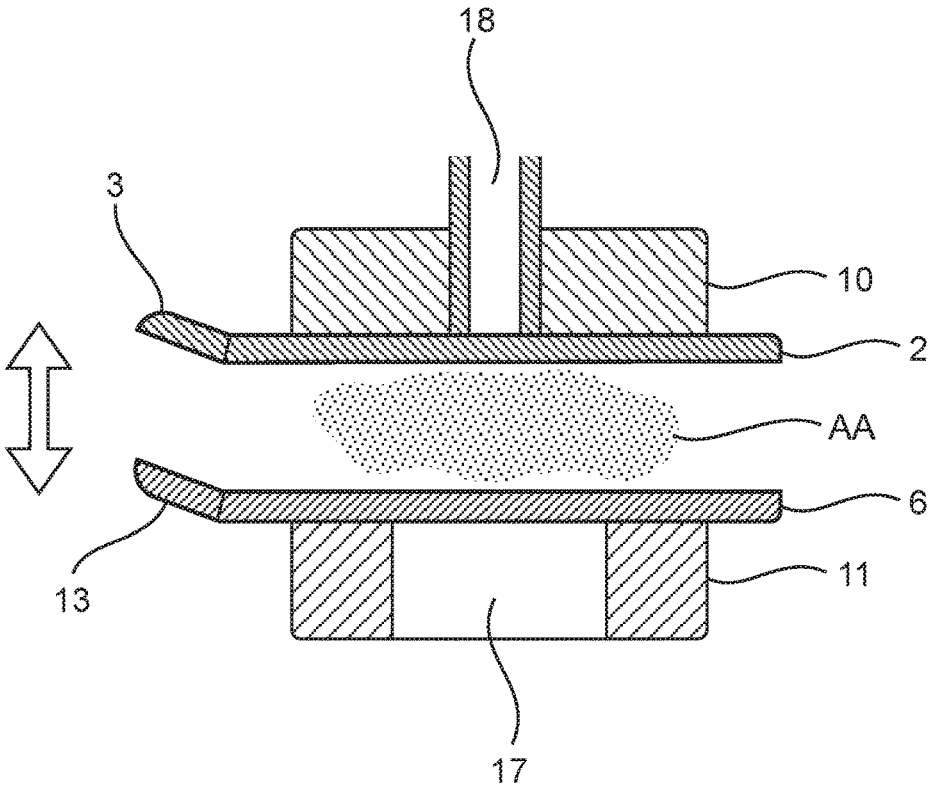


FIG. 5A

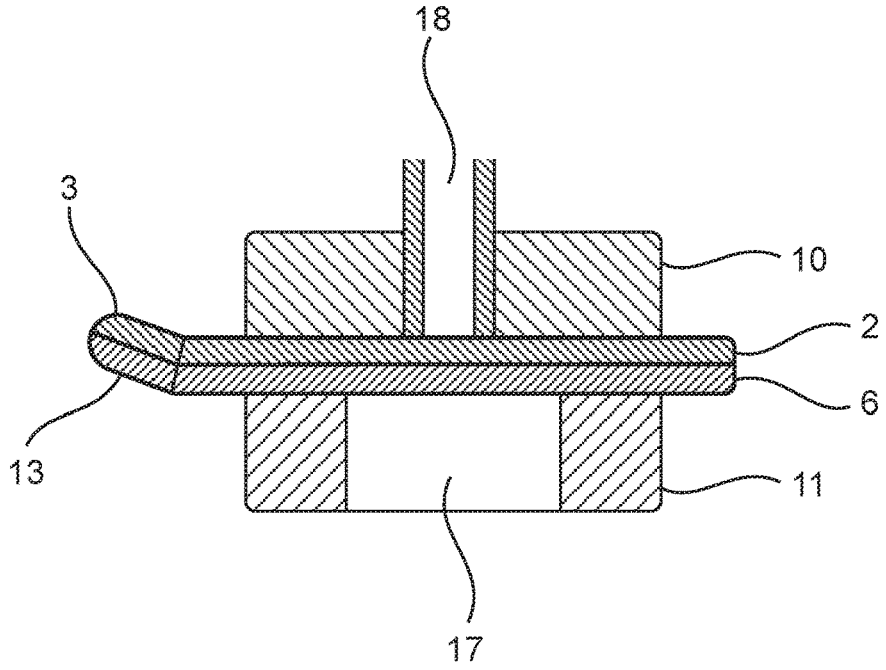


FIG. 5B

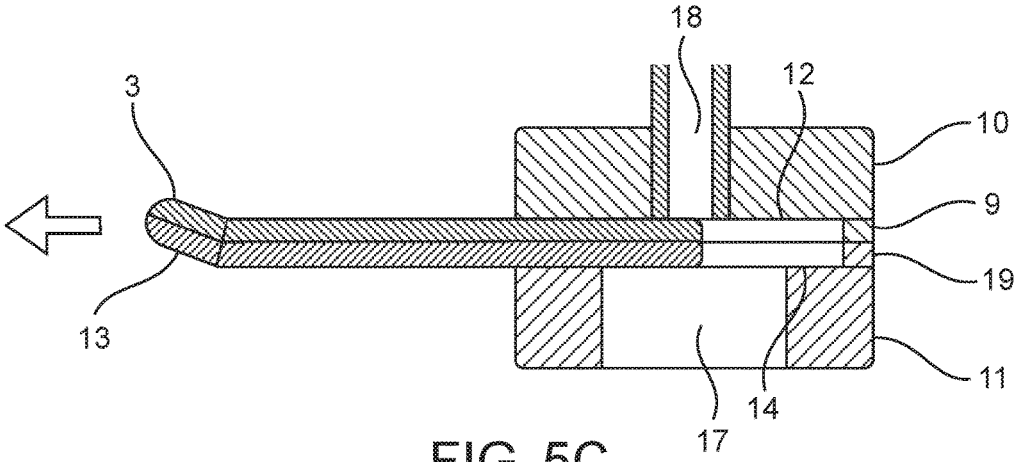


FIG. 5C

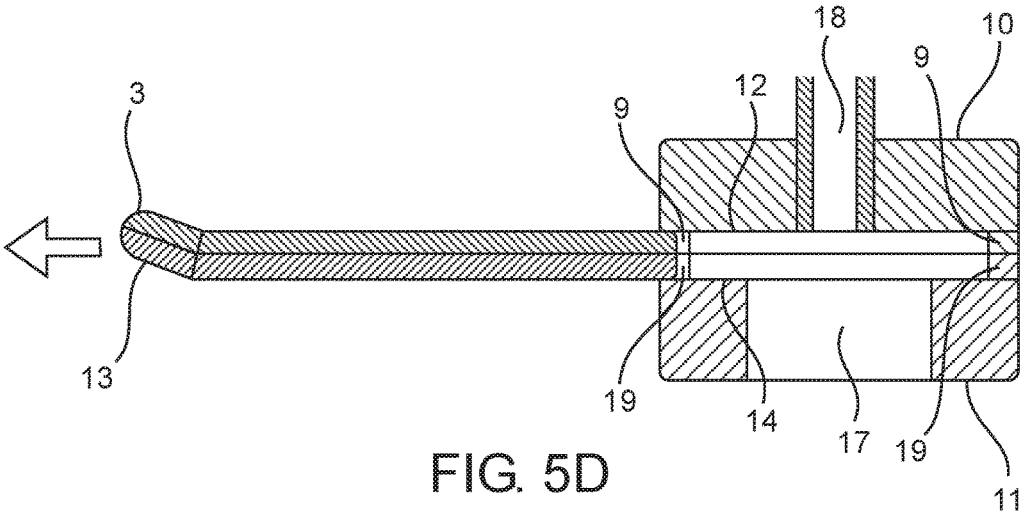


FIG. 5D

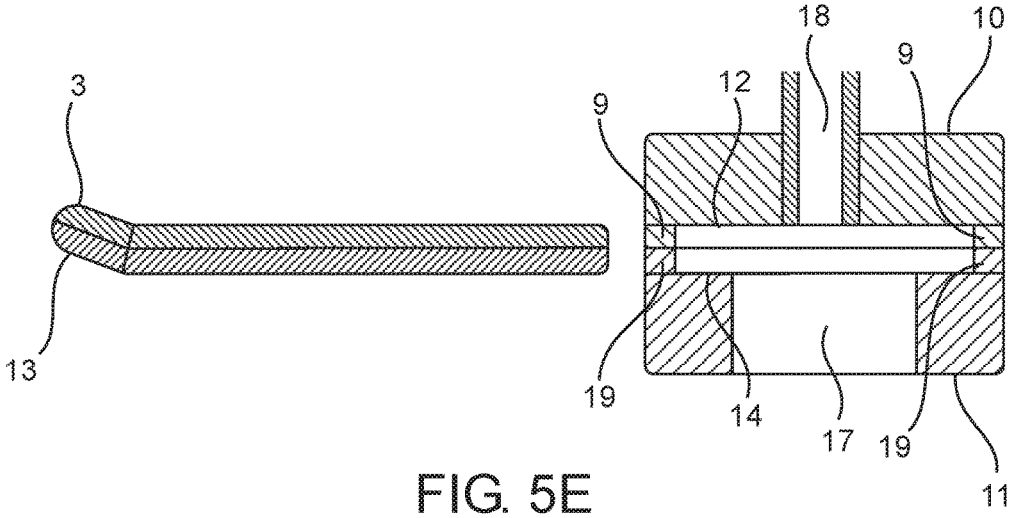


FIG. 5E

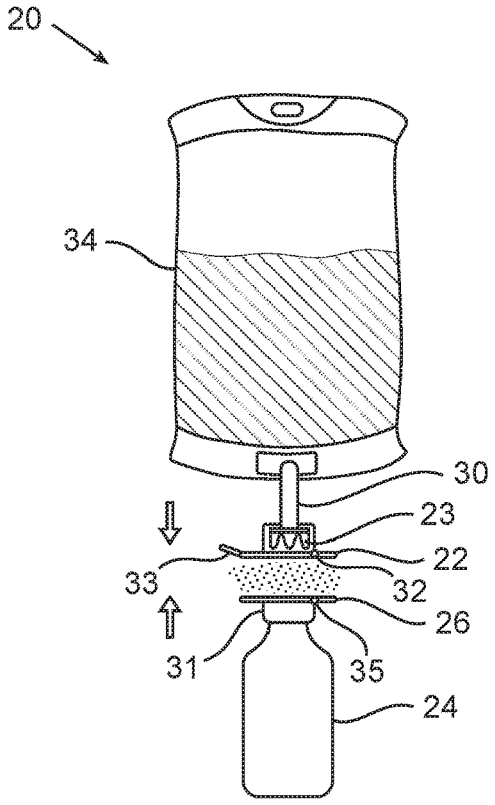


FIG. 6A

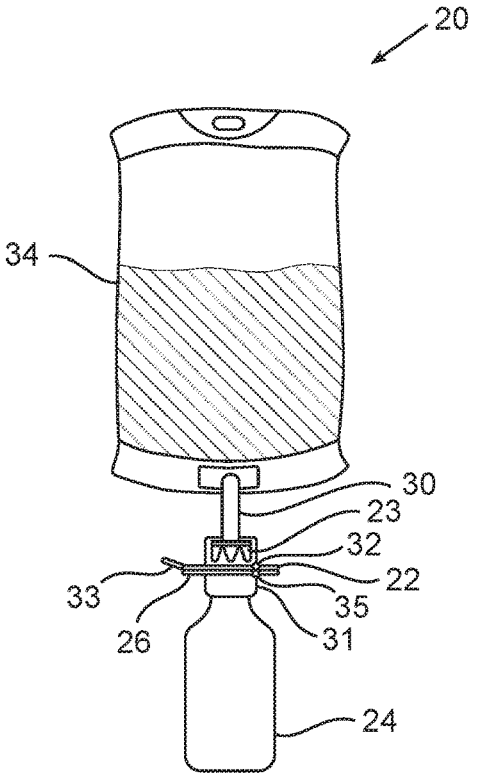


FIG. 6B

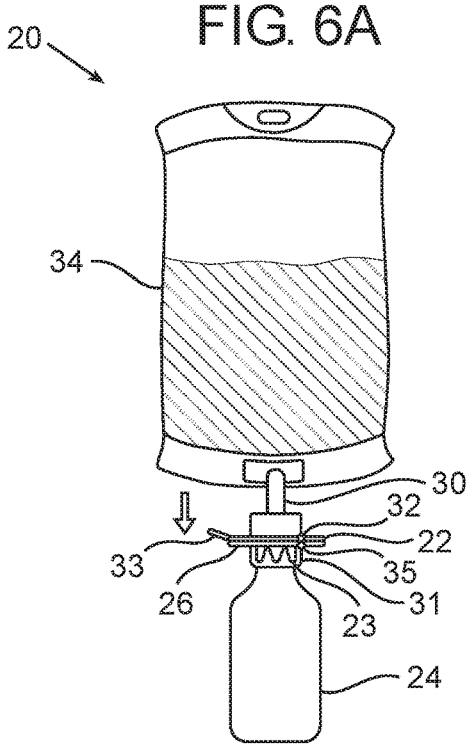


FIG. 6C

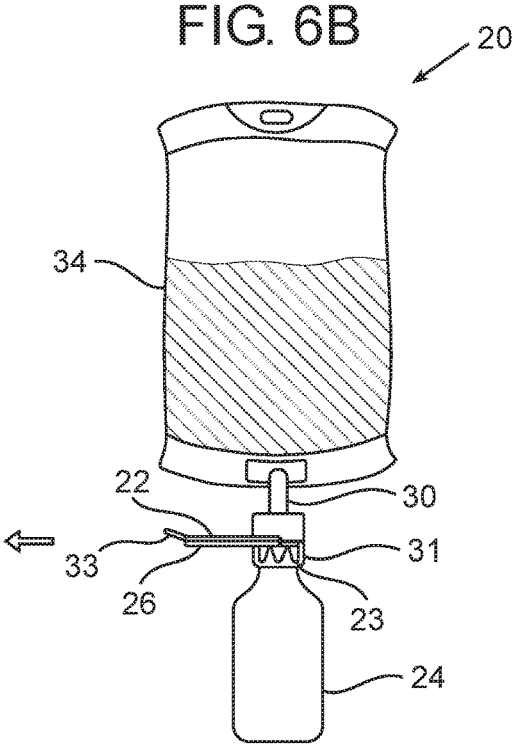


FIG. 6D

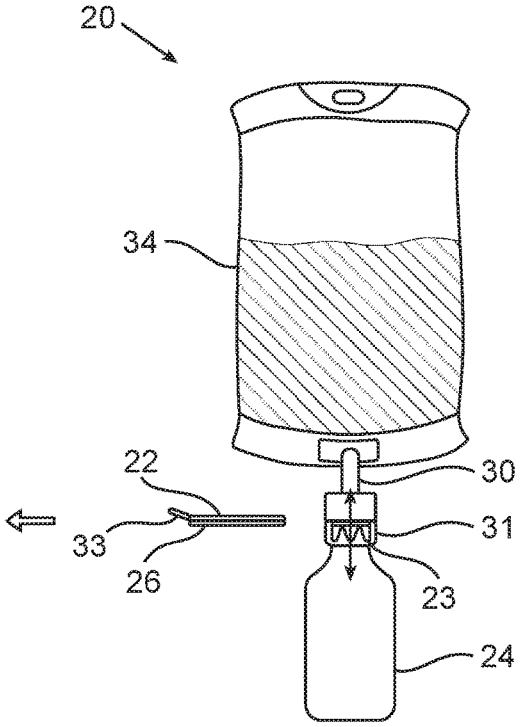


FIG. 6E

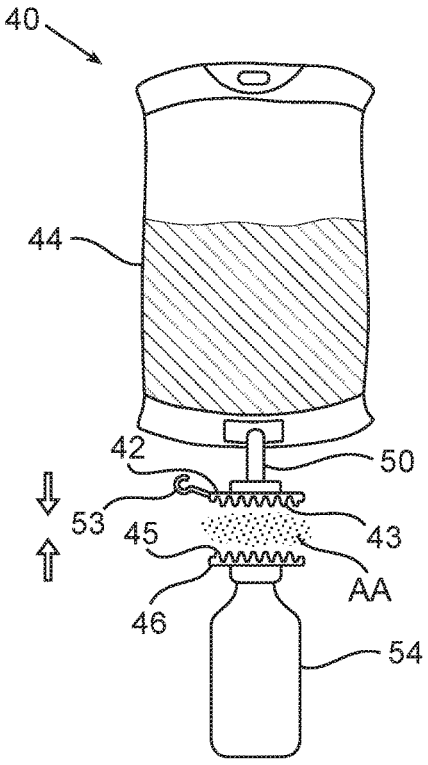


FIG. 7A

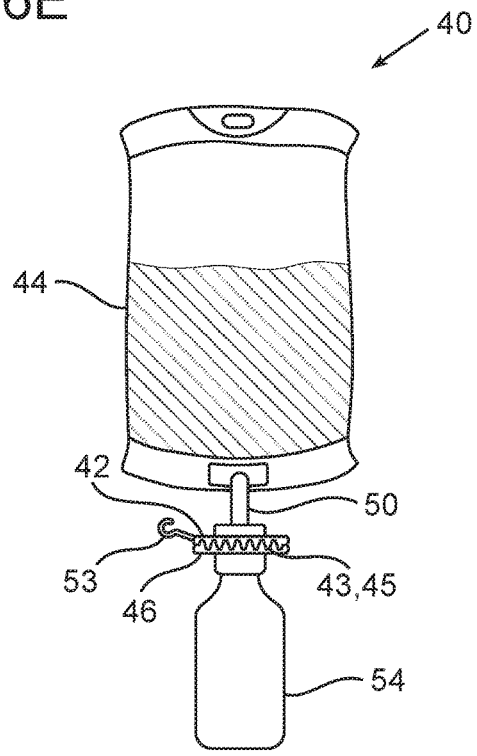


FIG. 7B

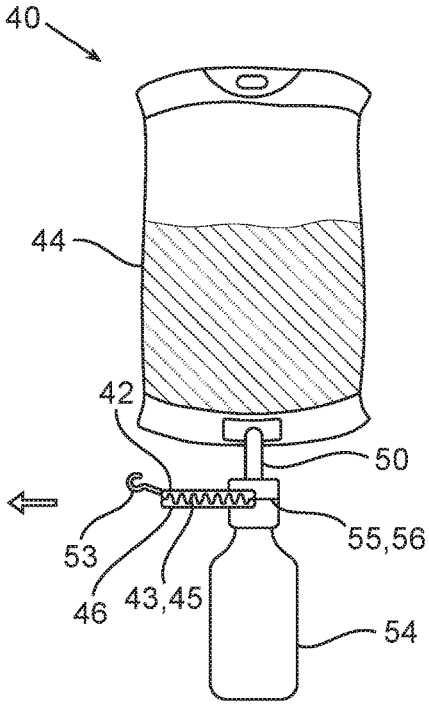


FIG. 7C

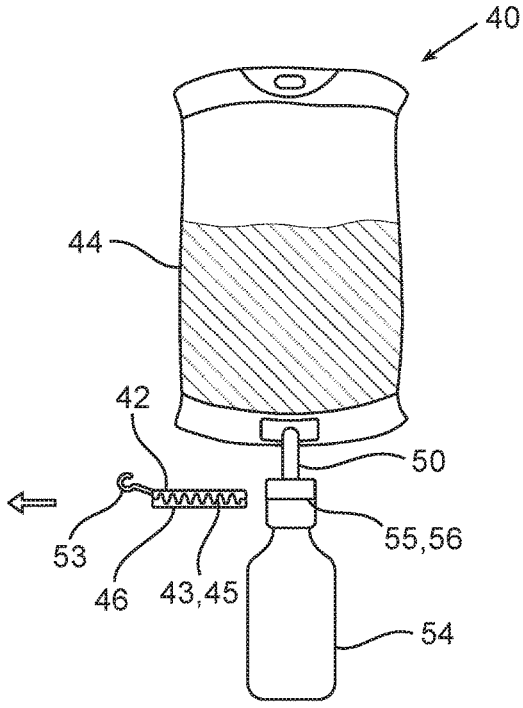


FIG. 7D

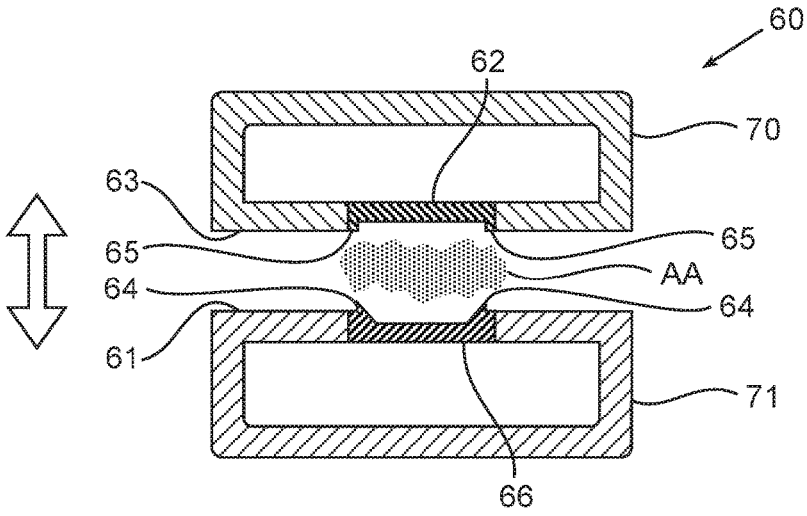


FIG. 8A

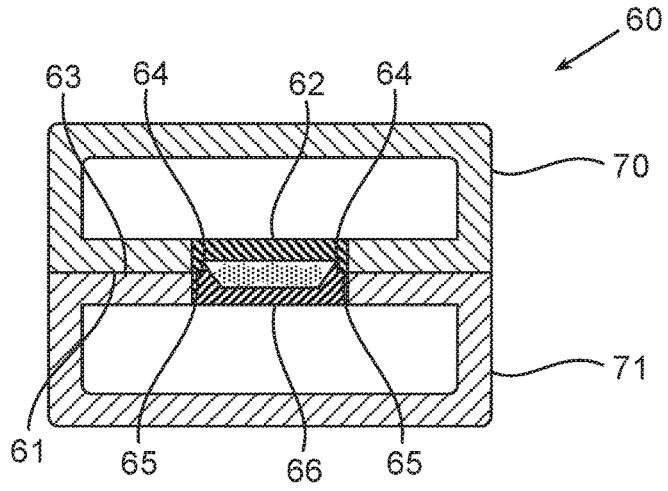


FIG. 8B

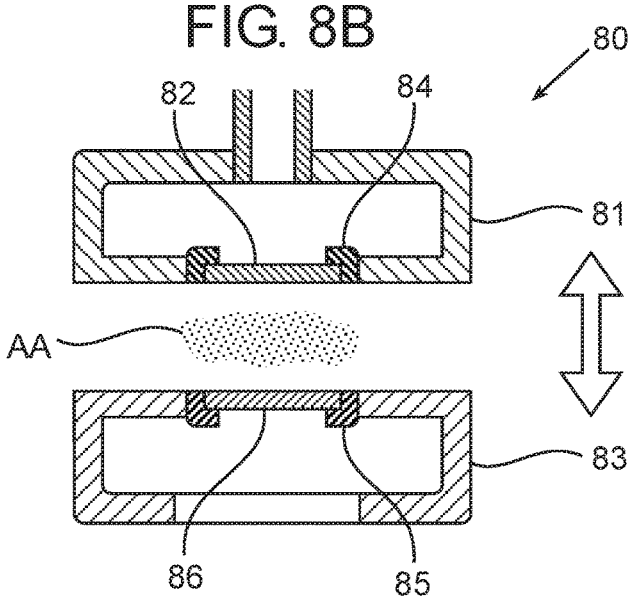


FIG. 9A

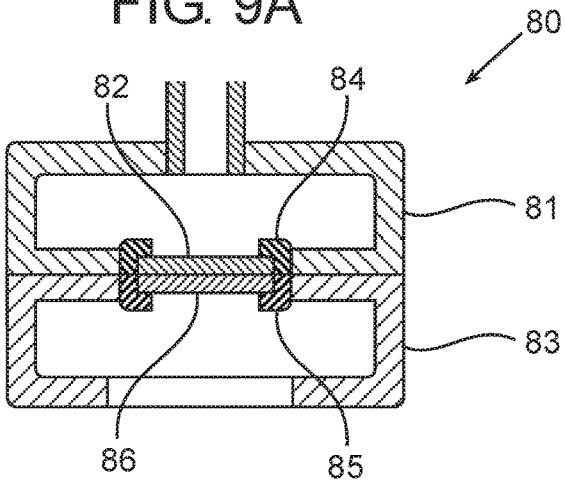


FIG. 9B

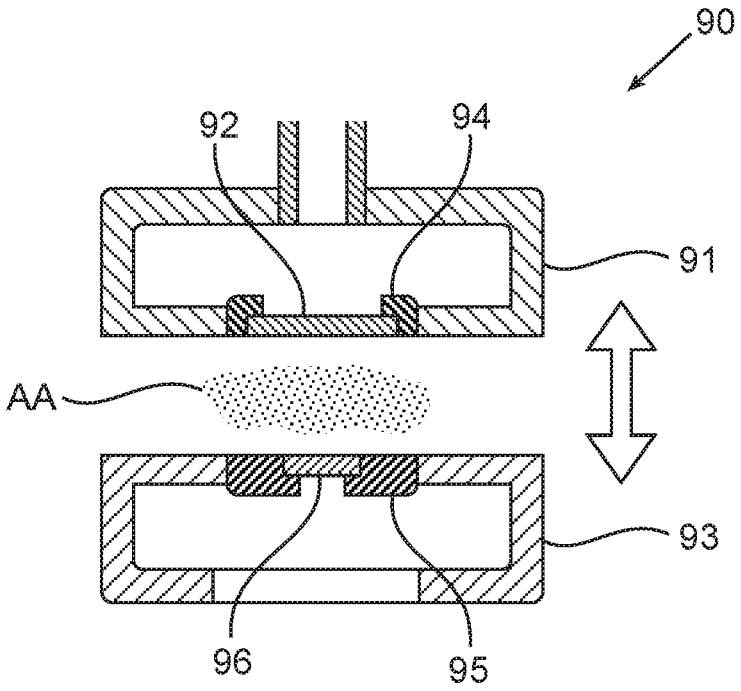


FIG. 10A

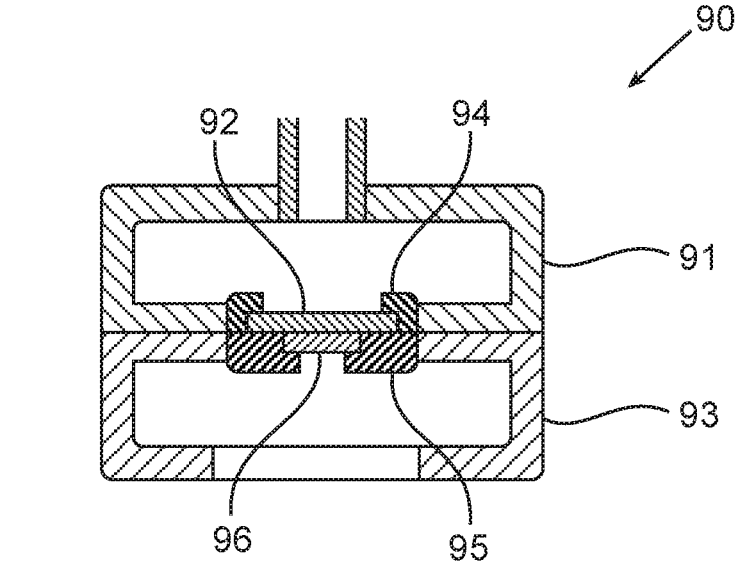


FIG. 10B

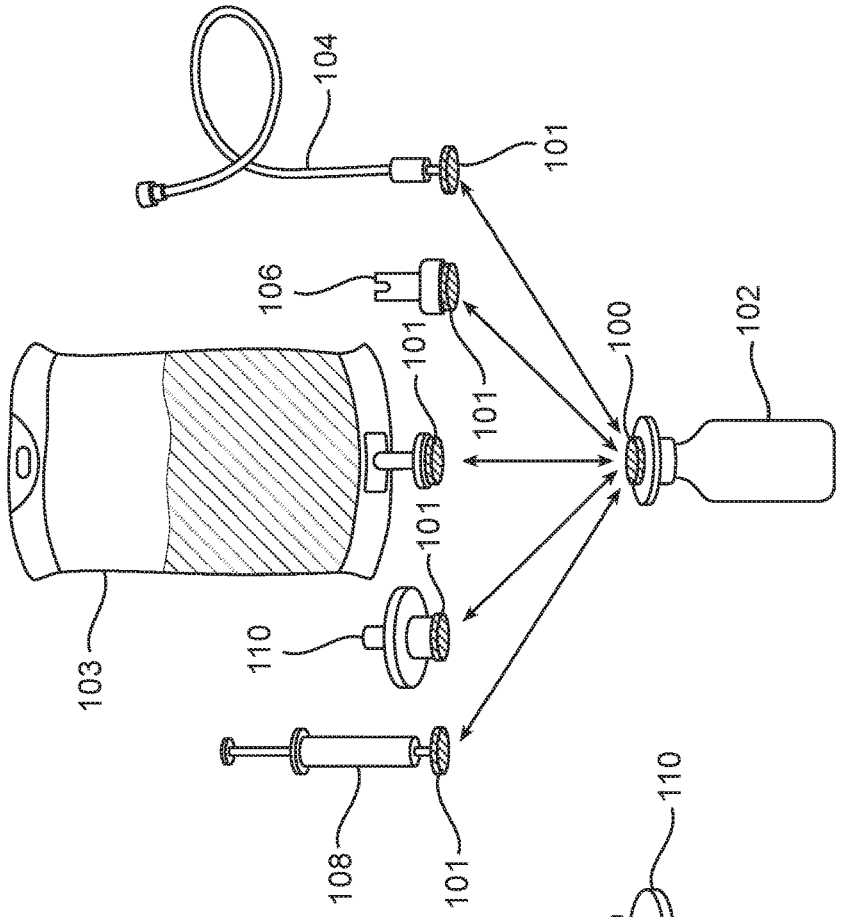


FIG. 11B

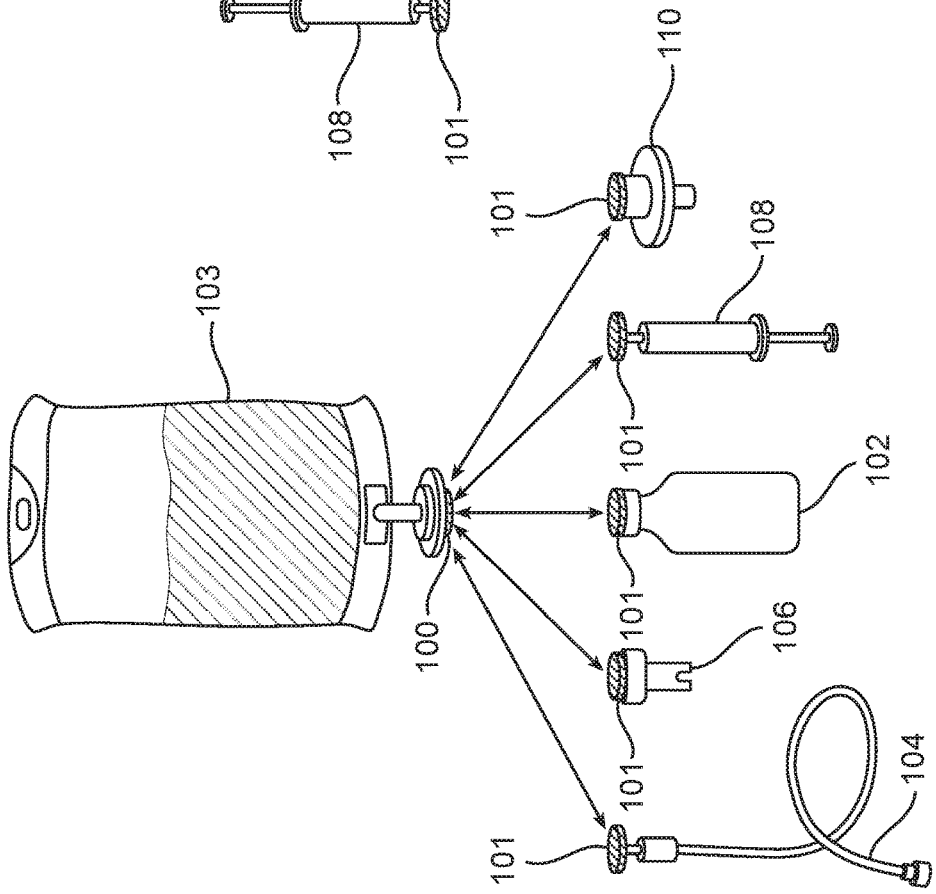


FIG. 11A

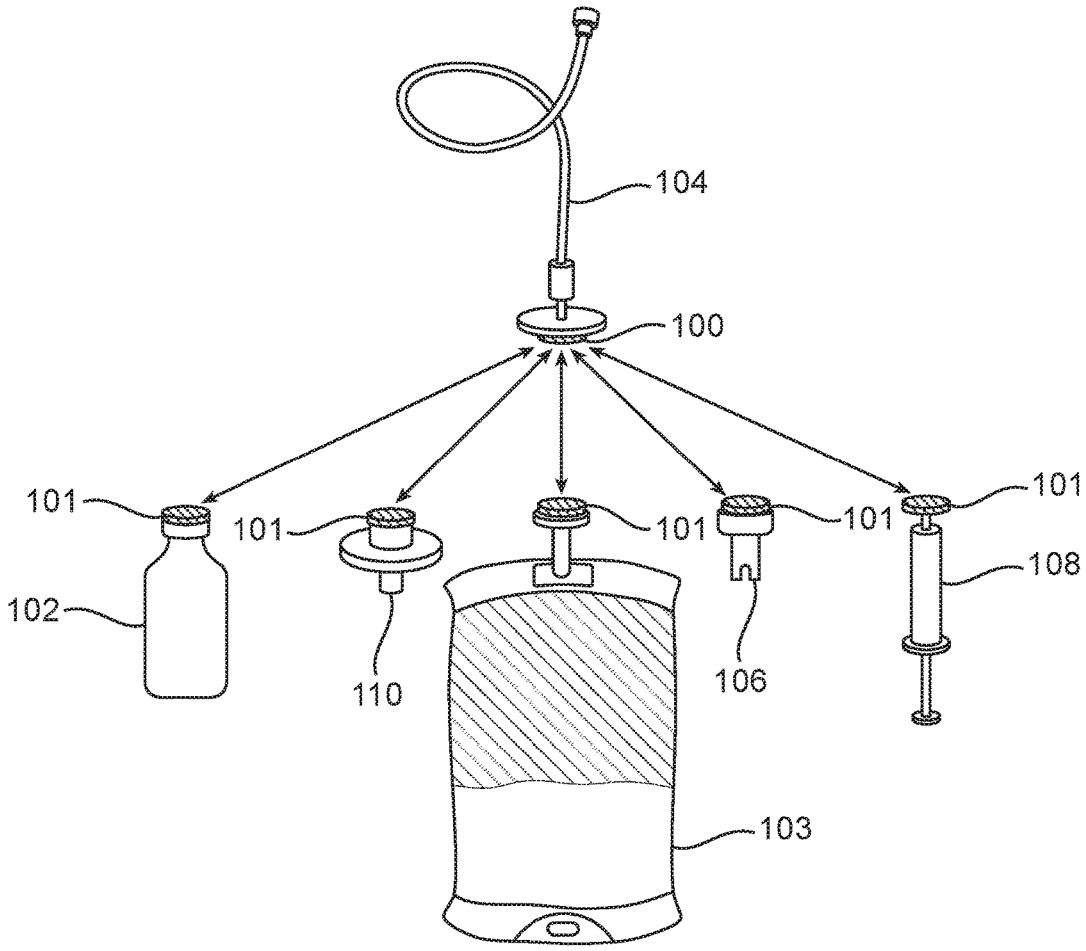


FIG. 11C

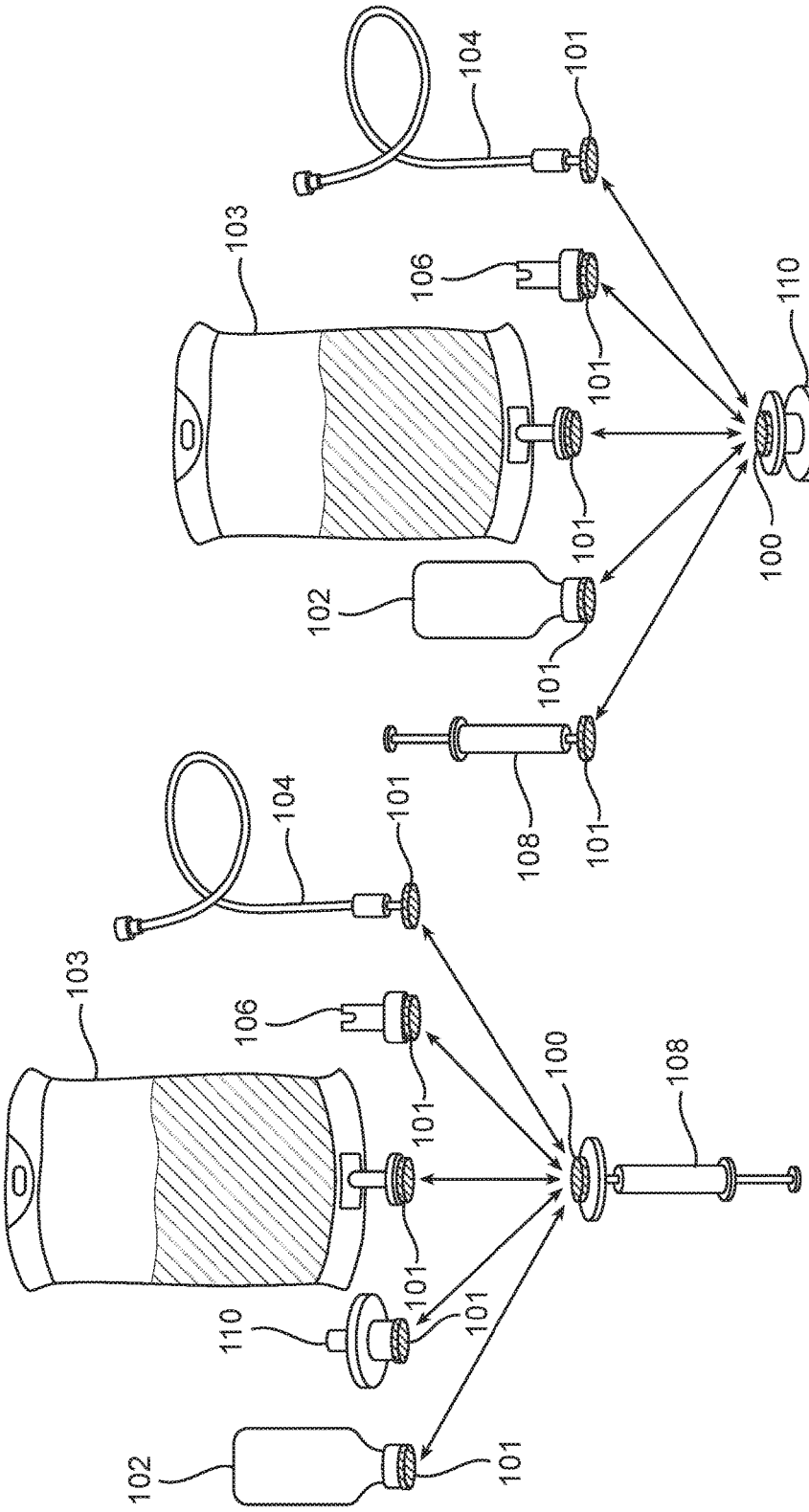


FIG. 11E

FIG. 11D

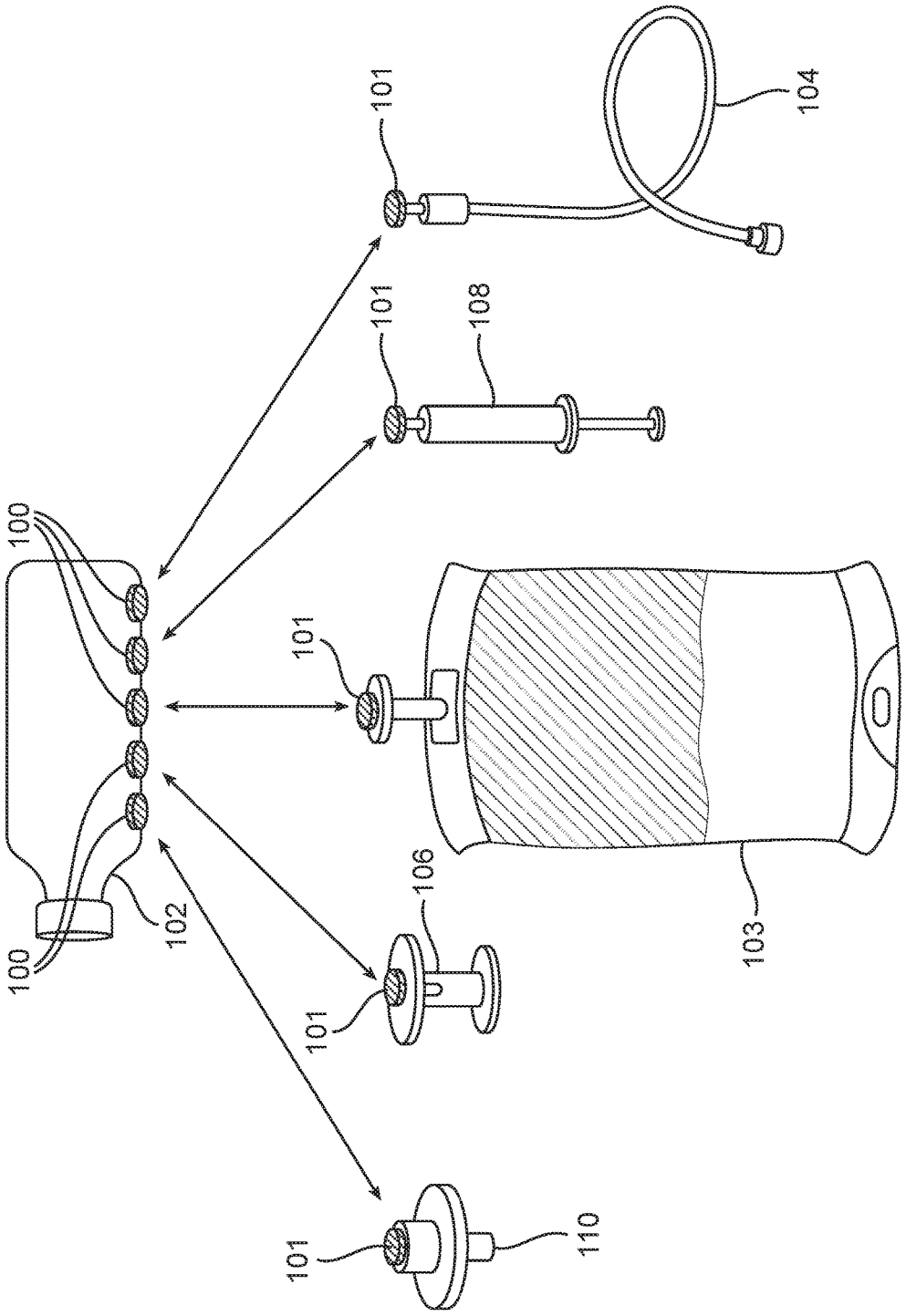


FIG. 12

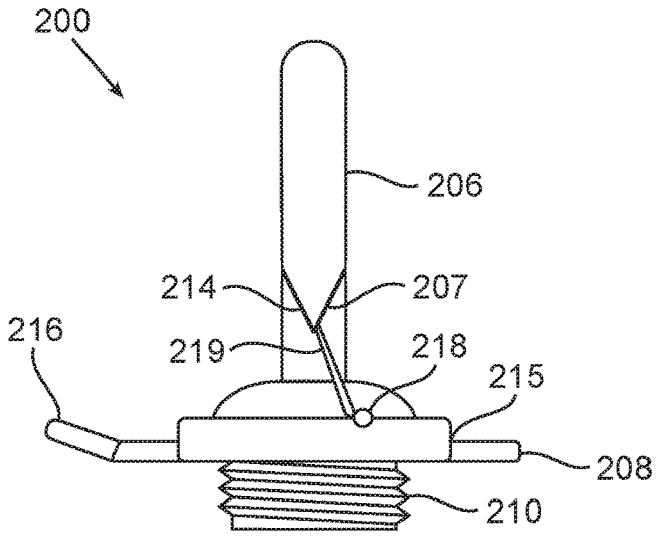


FIG. 13A

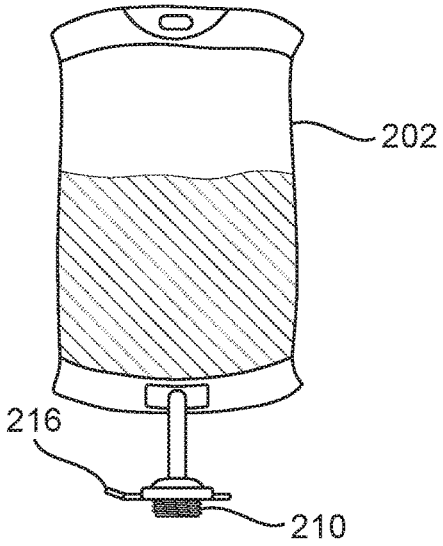


FIG. 13B

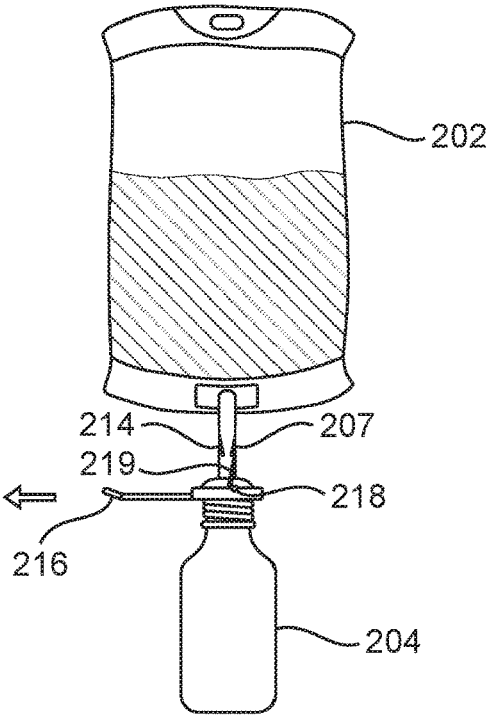


FIG. 13C

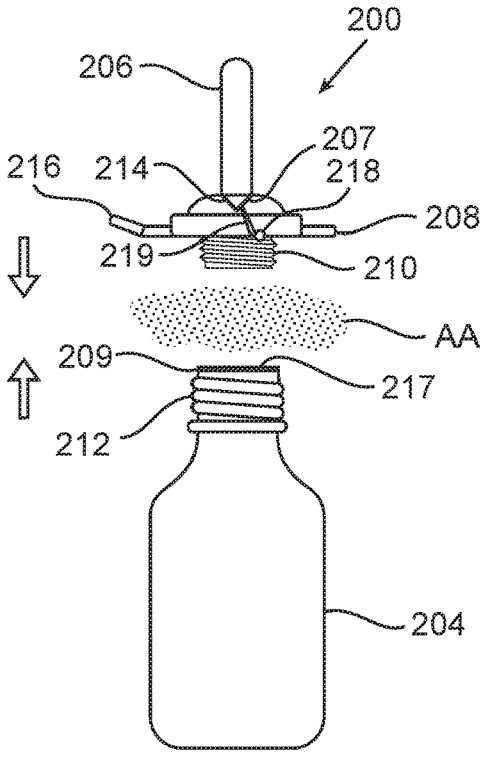


FIG. 14A

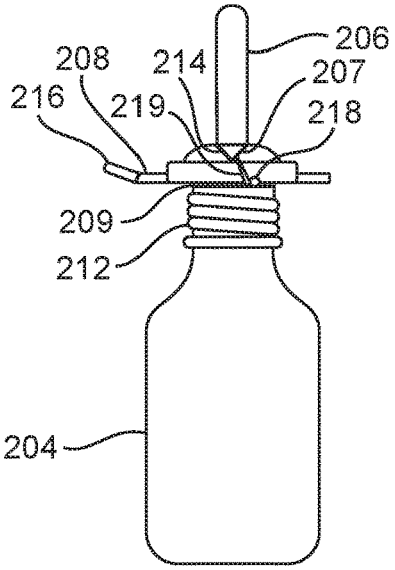


FIG. 14B

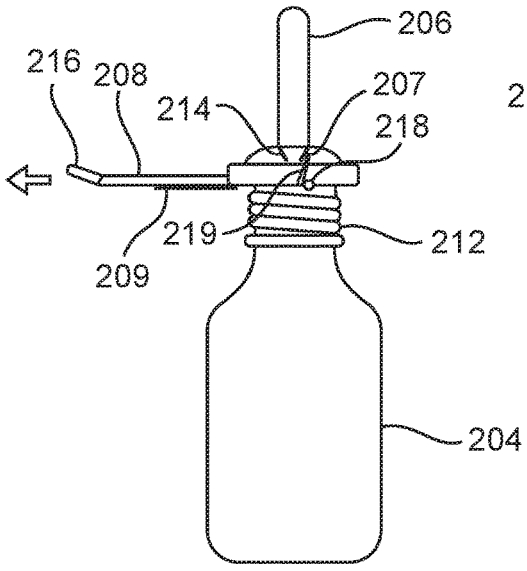


FIG. 14C

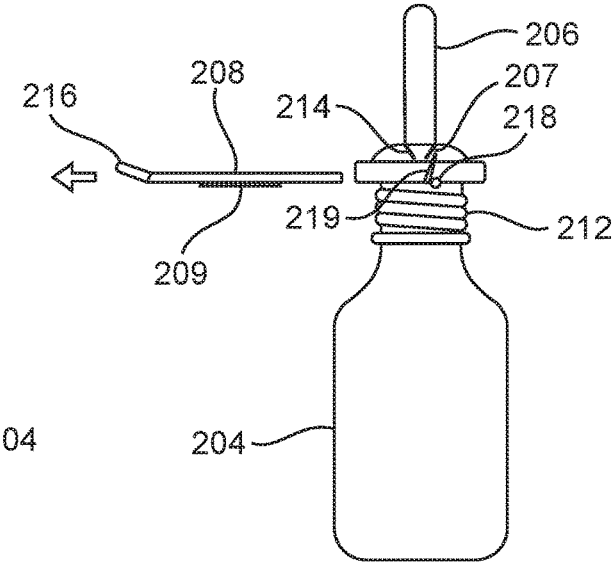


FIG. 14D

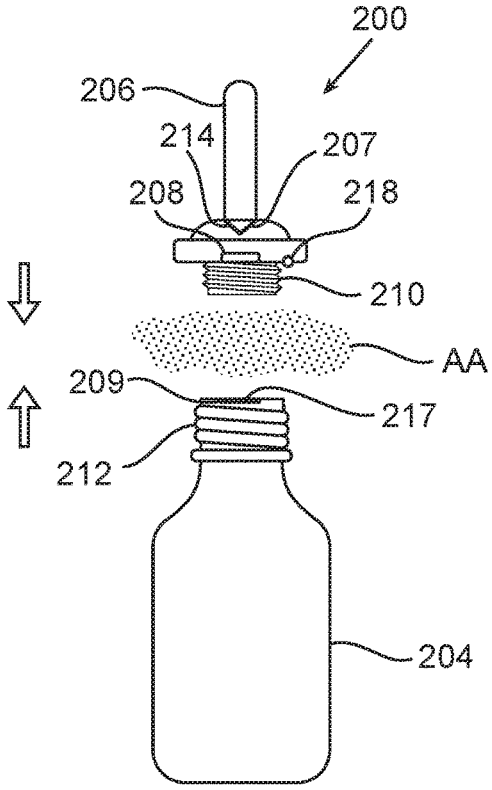


FIG. 15A

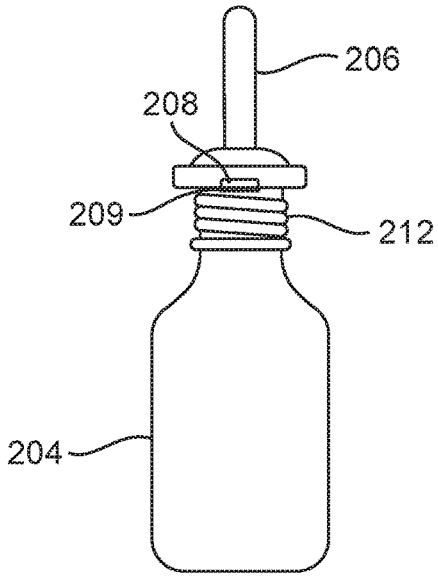


FIG. 15B

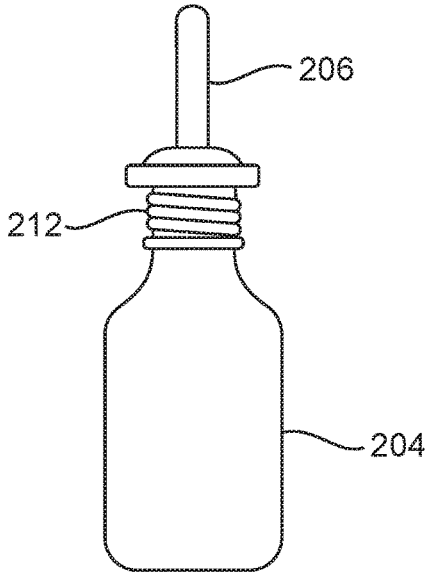


FIG. 15C

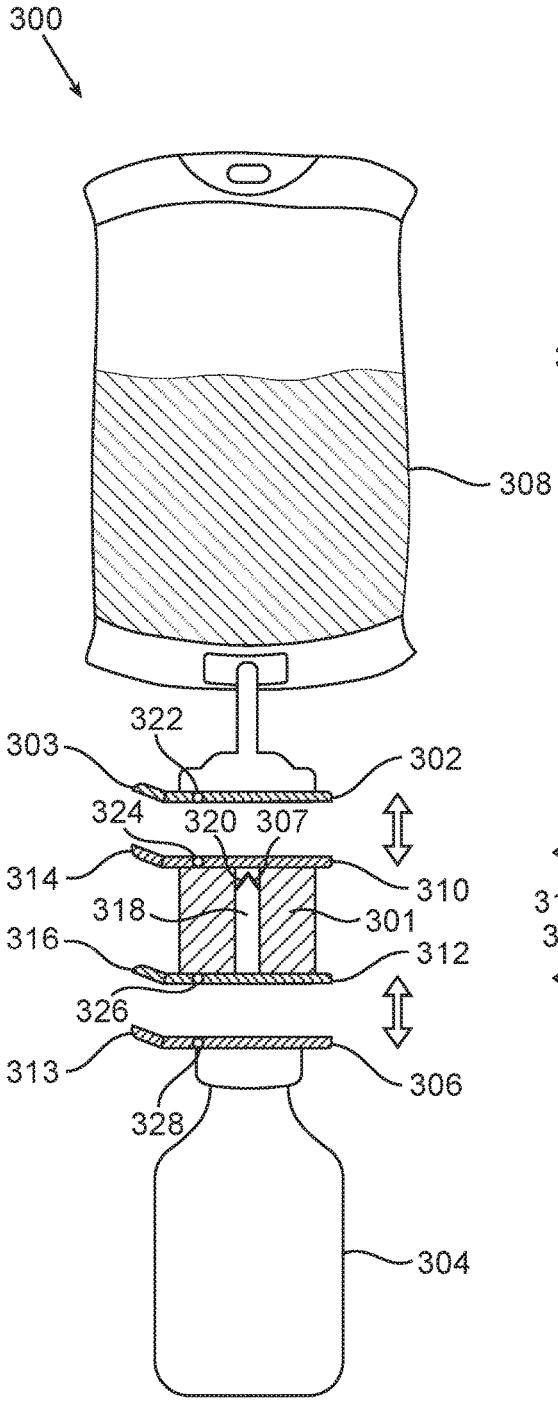


FIG. 16A

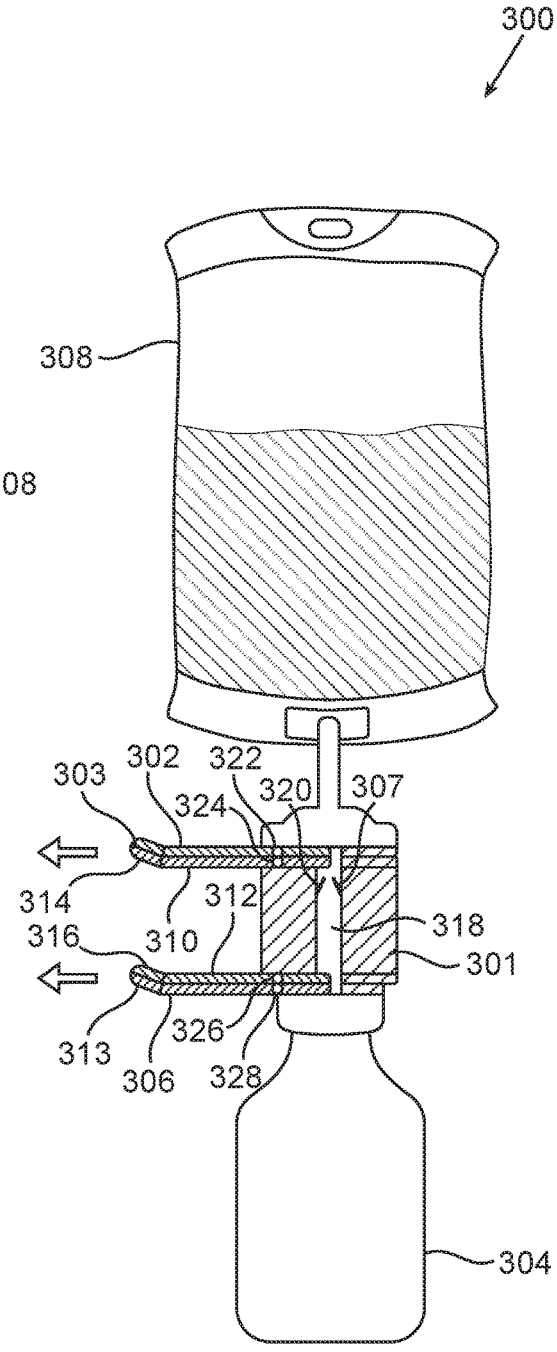


FIG. 16B

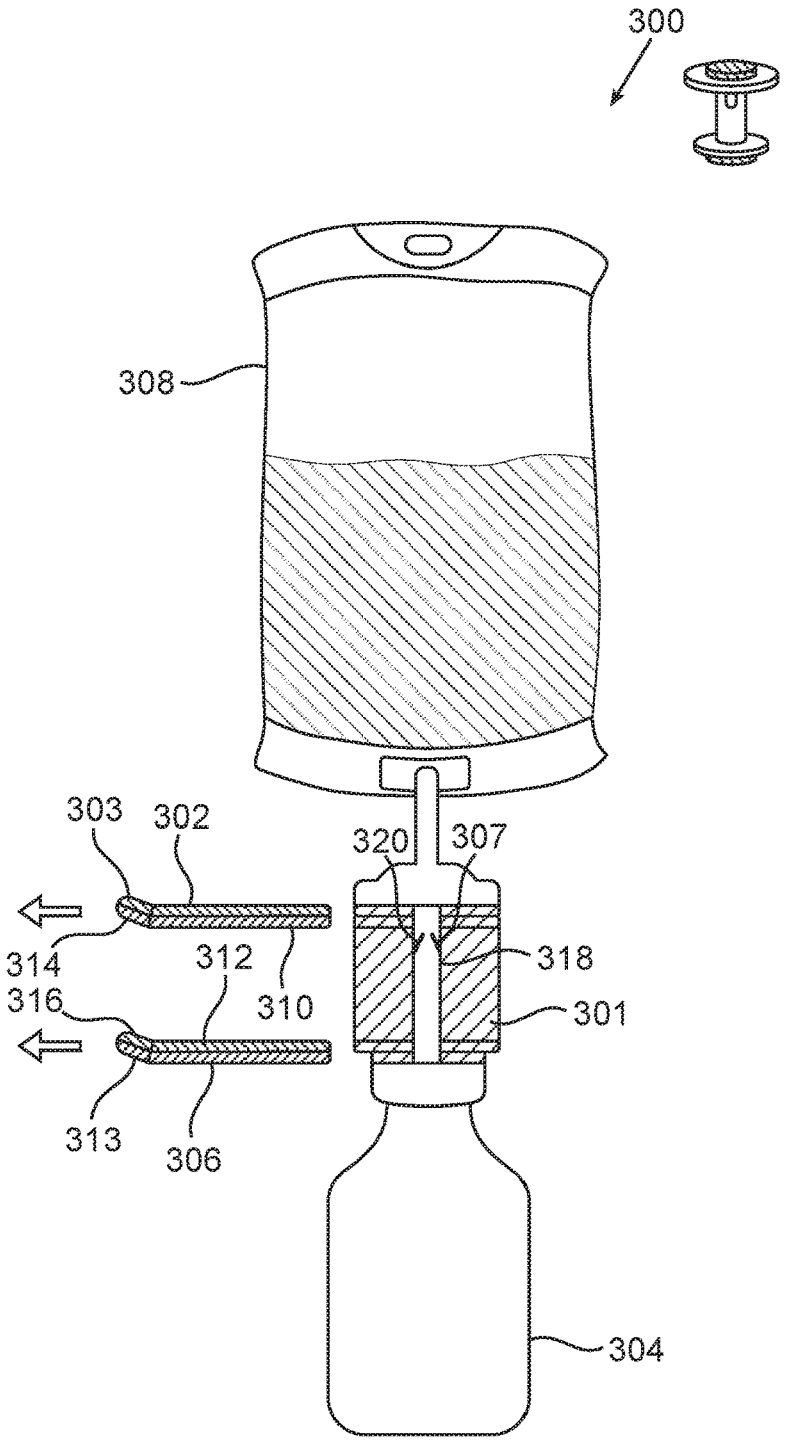


FIG. 16C

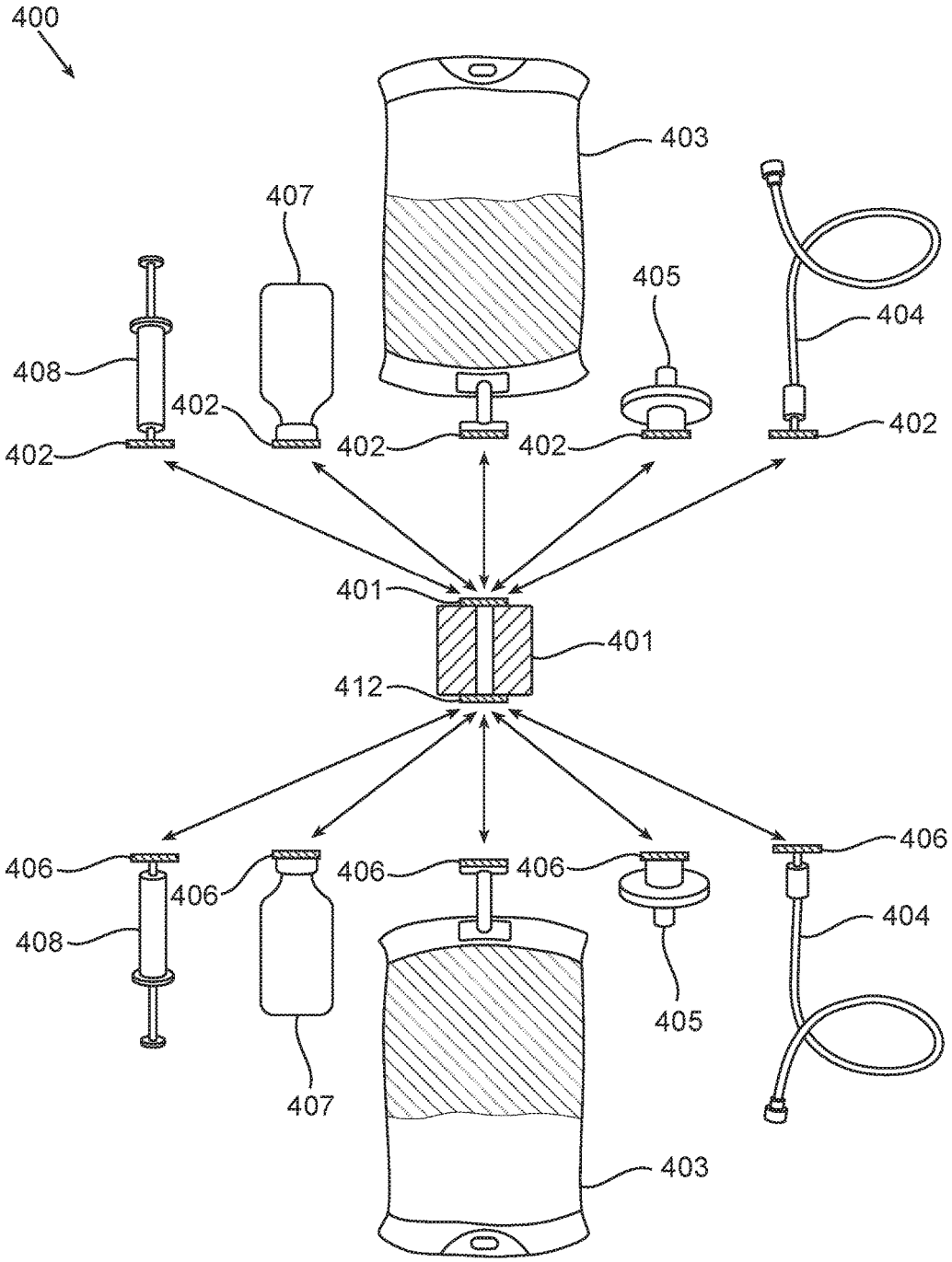

400
403
407
405
404
408
402
402
402
402
402
401
401
412
406
406
406
406
406
408
404
405
407
403

FIG. 17

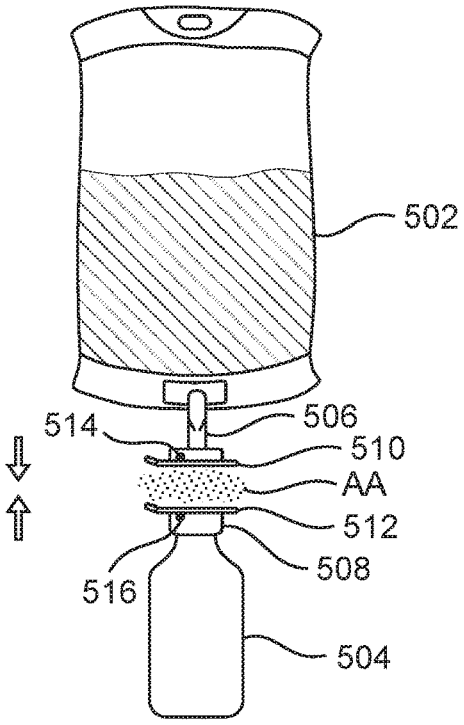


FIG. 18A

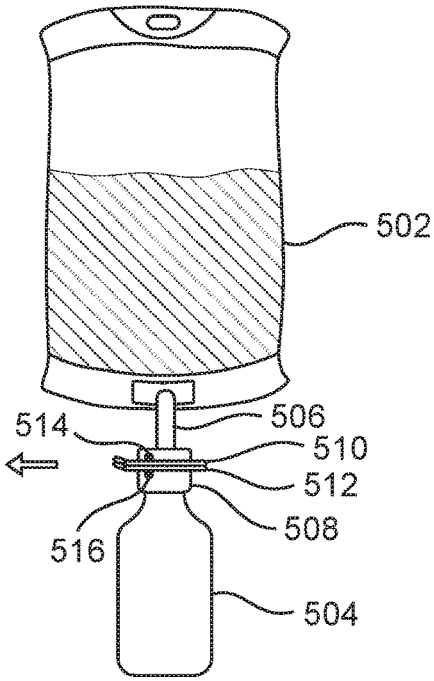


FIG. 18B

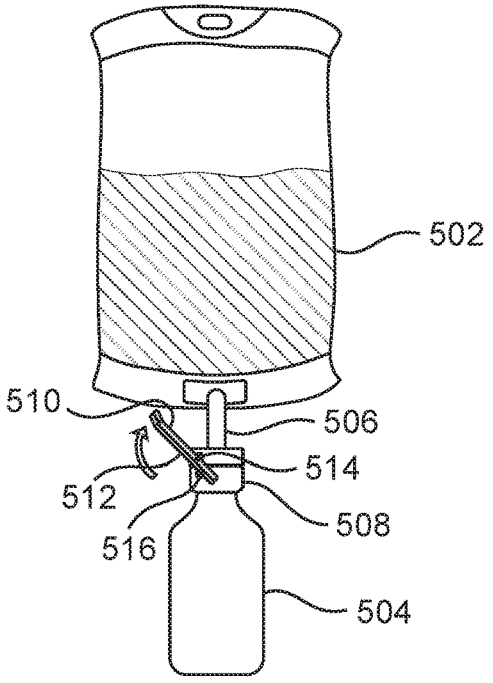


FIG. 18C

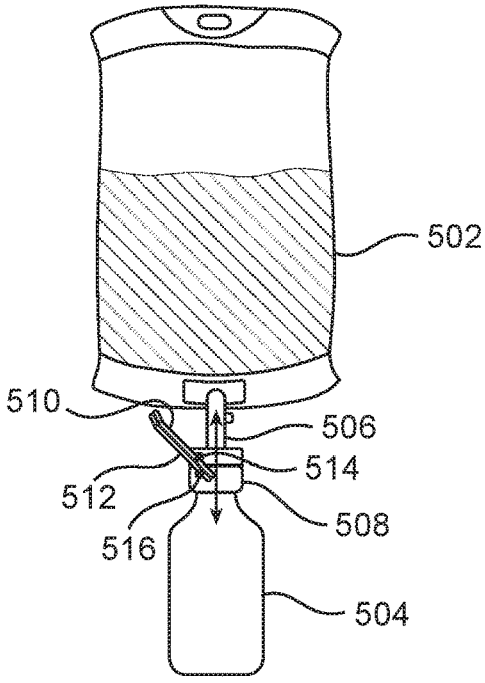


FIG. 18D

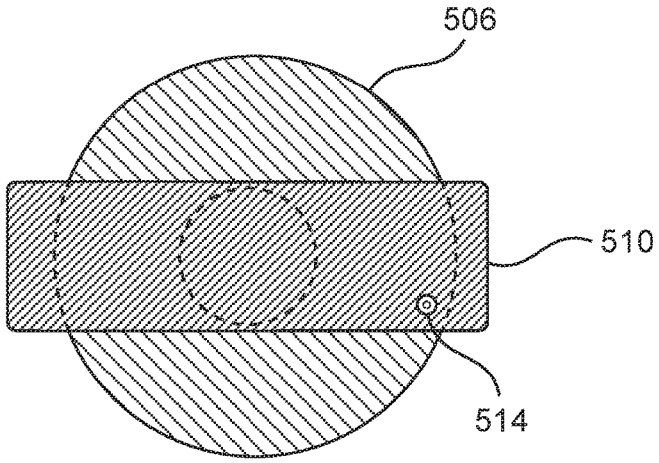


FIG. 19A

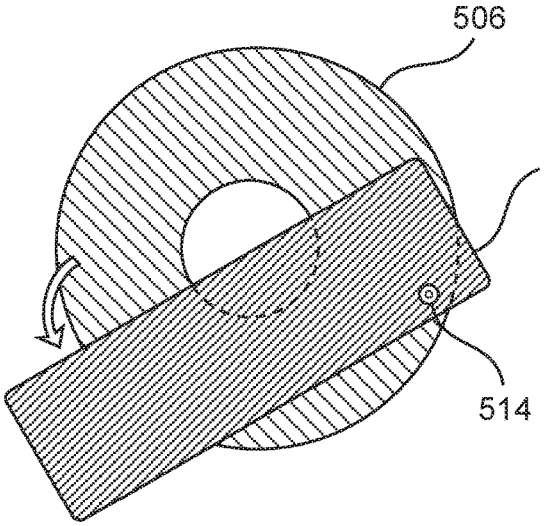


FIG. 19B

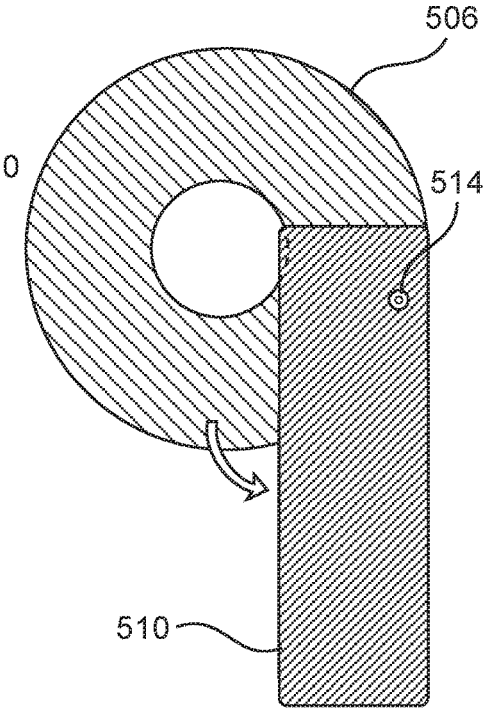


FIG. 19C

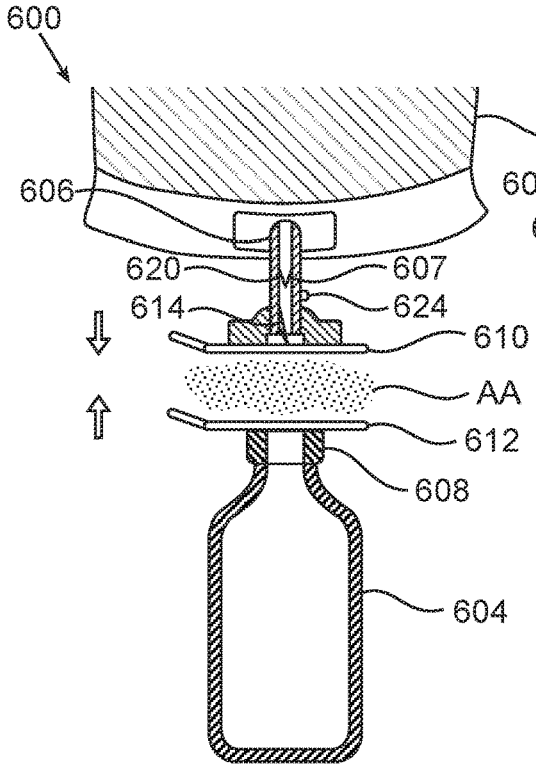


FIG. 20A

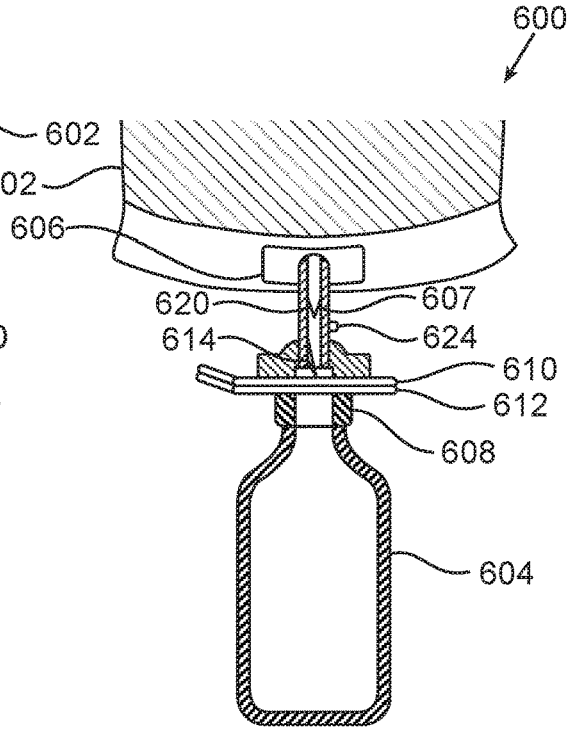


FIG. 20B

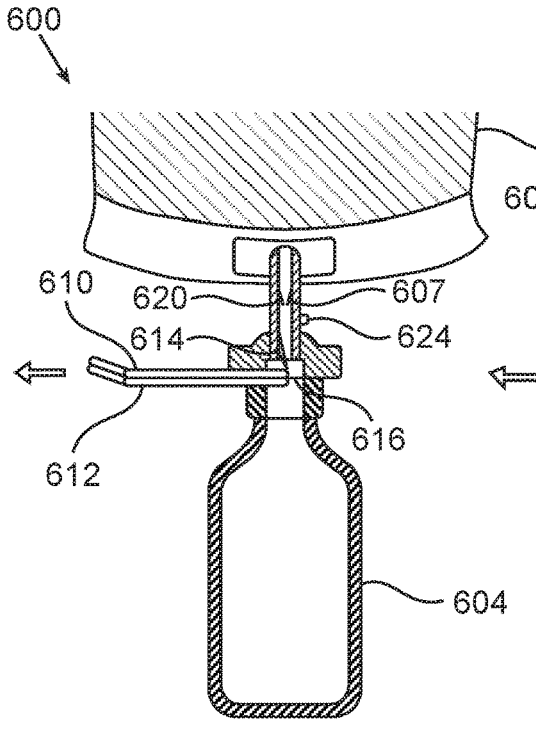


FIG. 20C

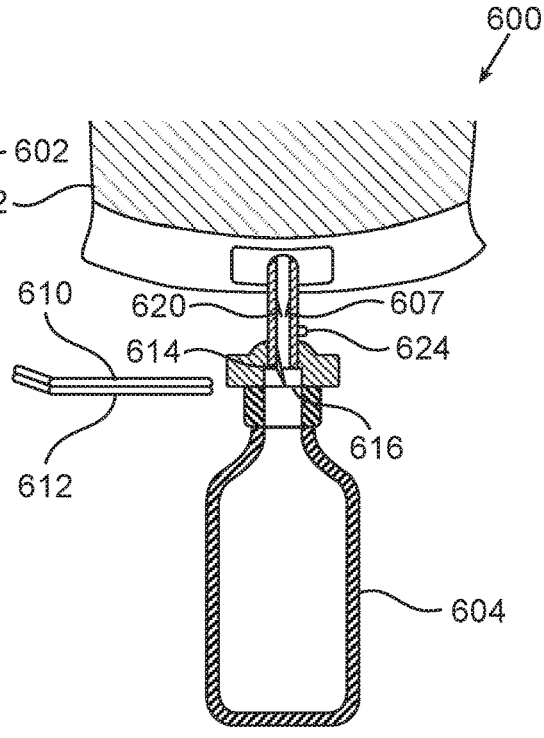


FIG. 20D

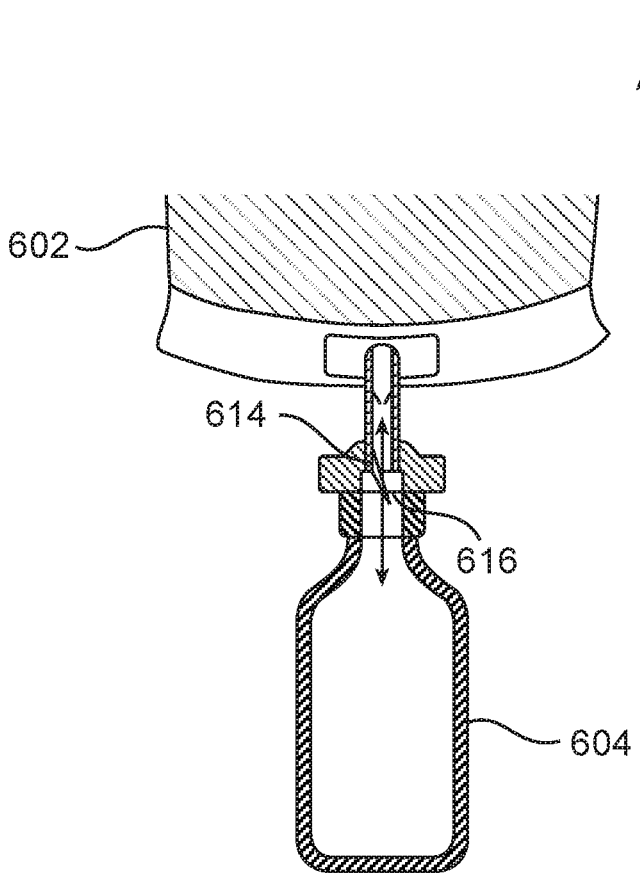


FIG. 20E

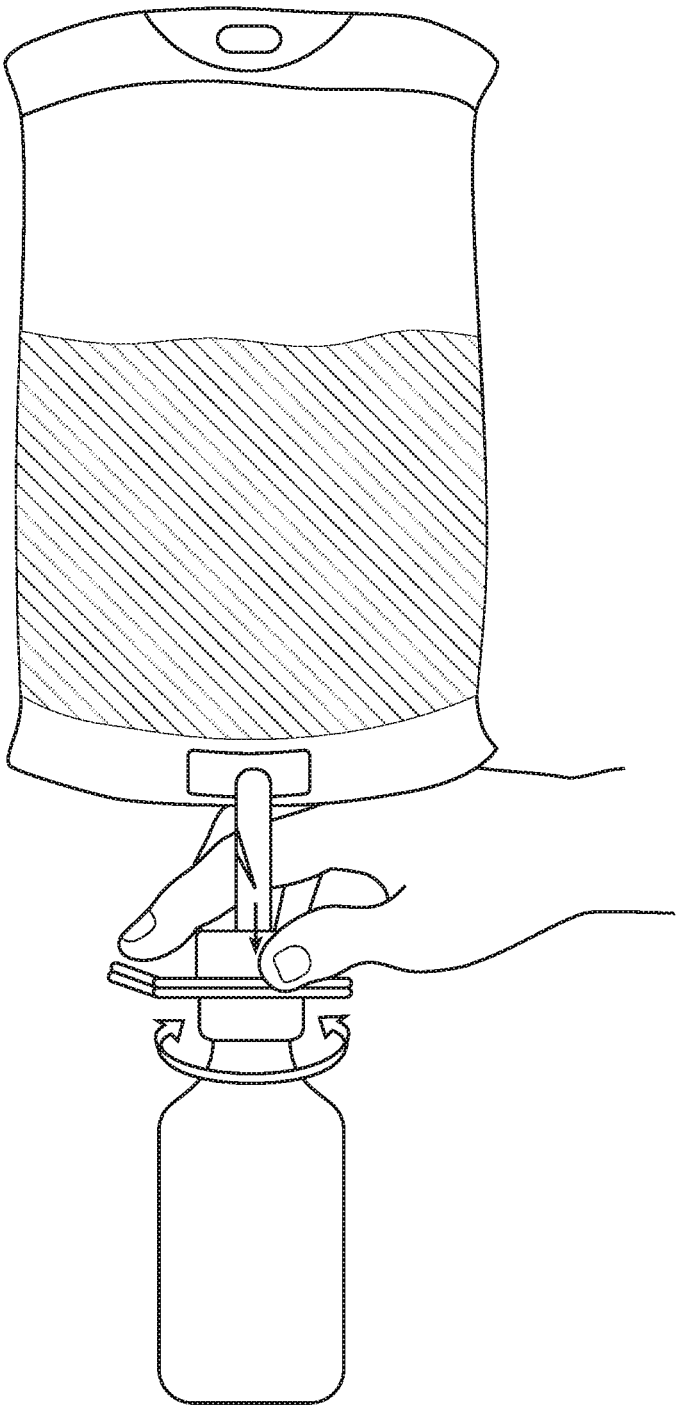


FIG. 21

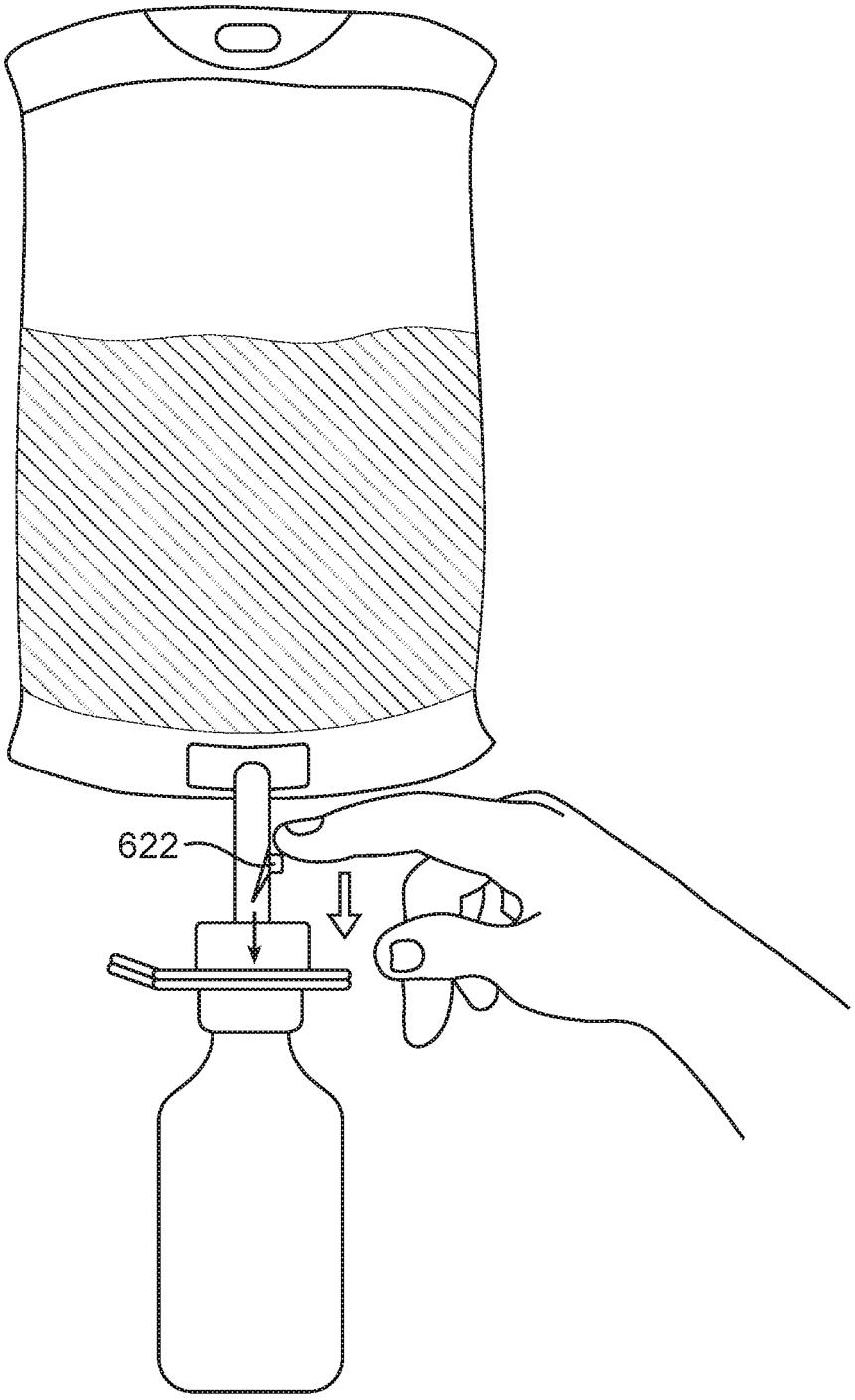


FIG. 22

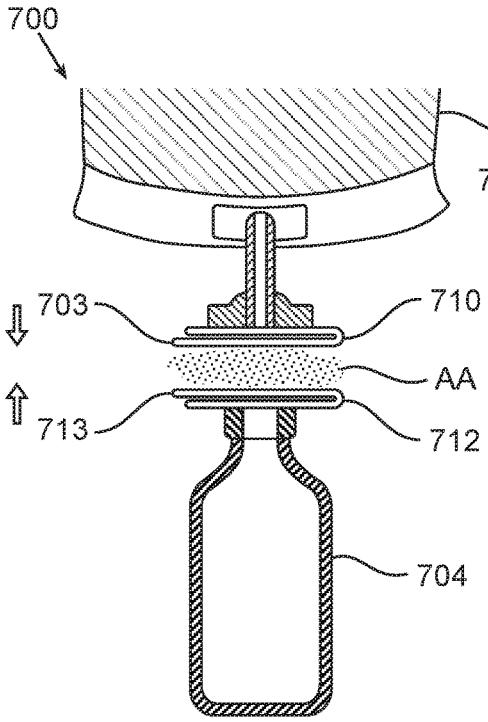


FIG. 23A

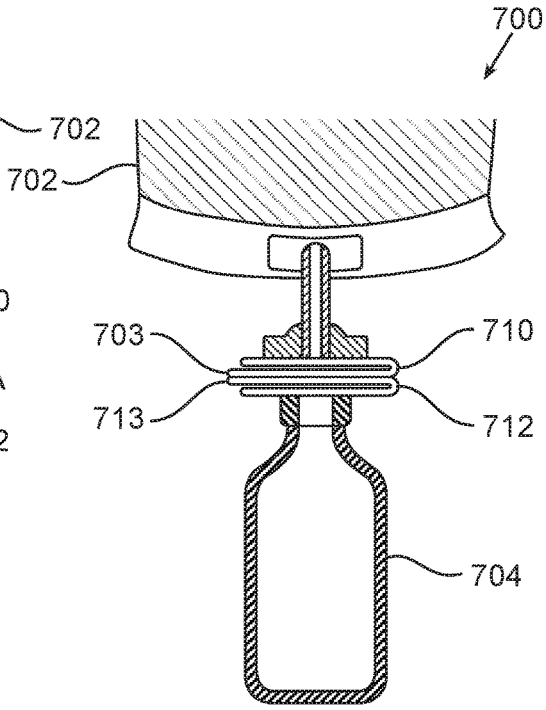


FIG. 23B

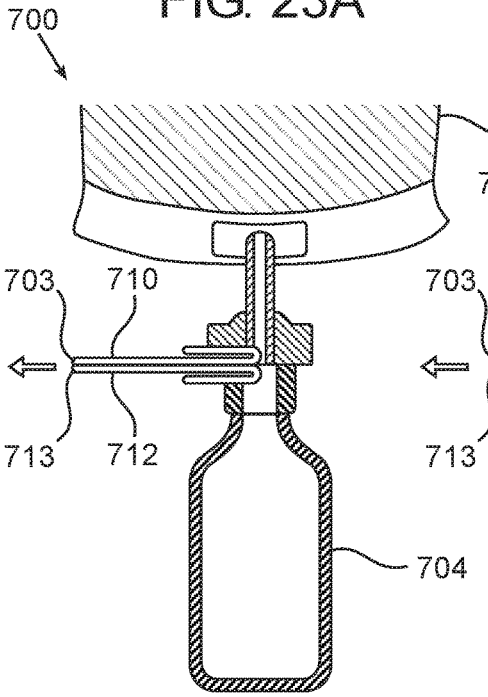


FIG. 23C

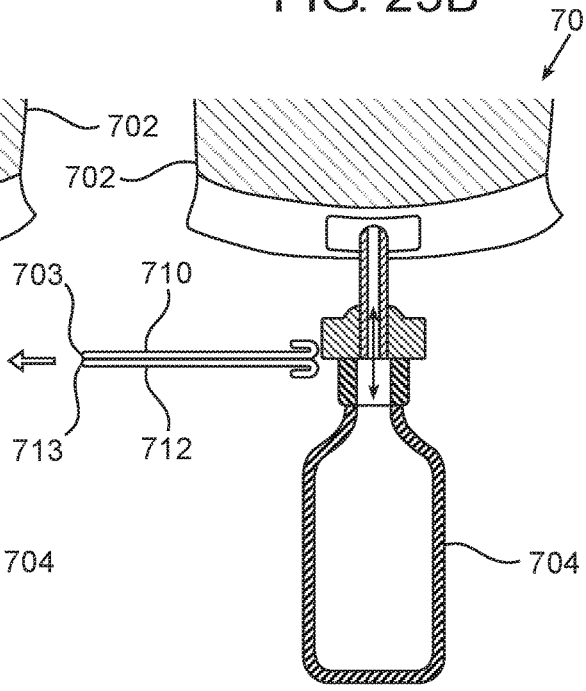


FIG. 23D

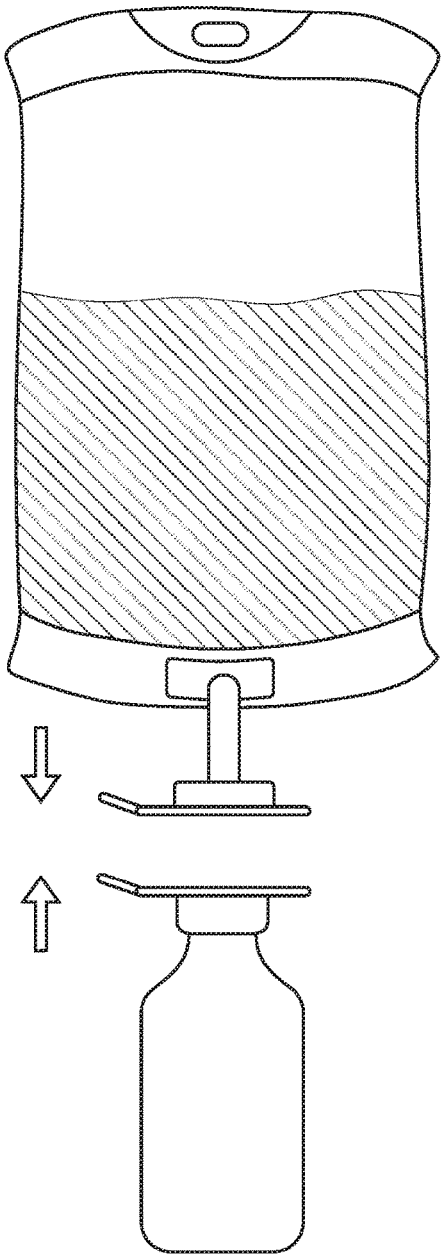


FIG. 24A

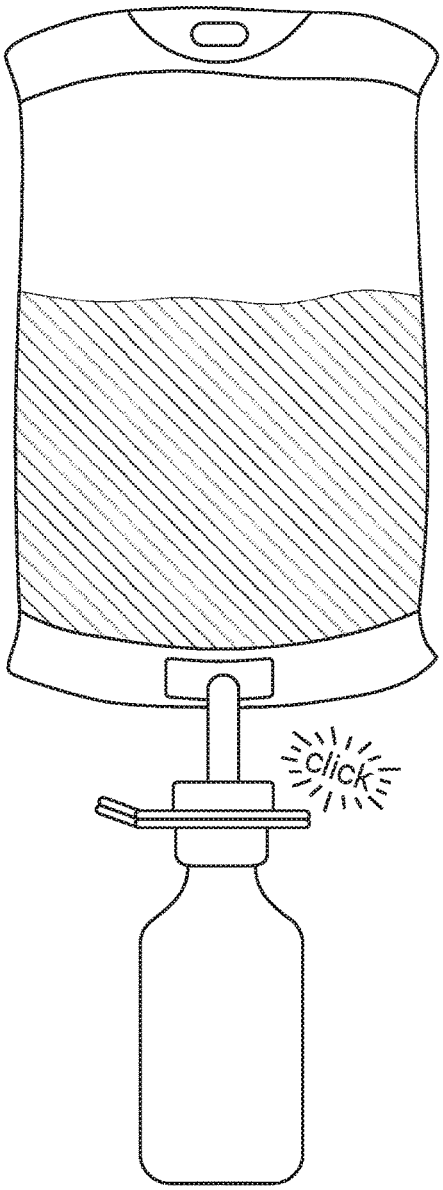


FIG. 24B

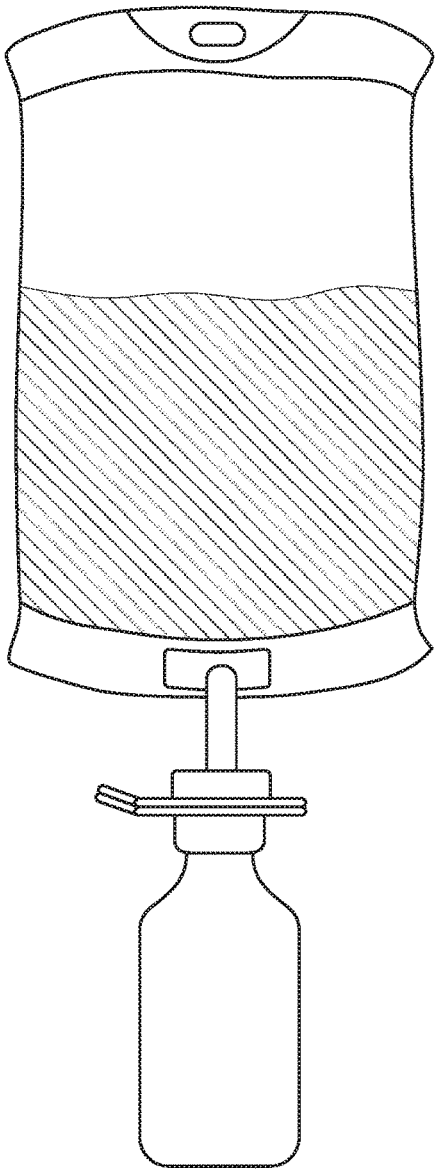


FIG. 25A

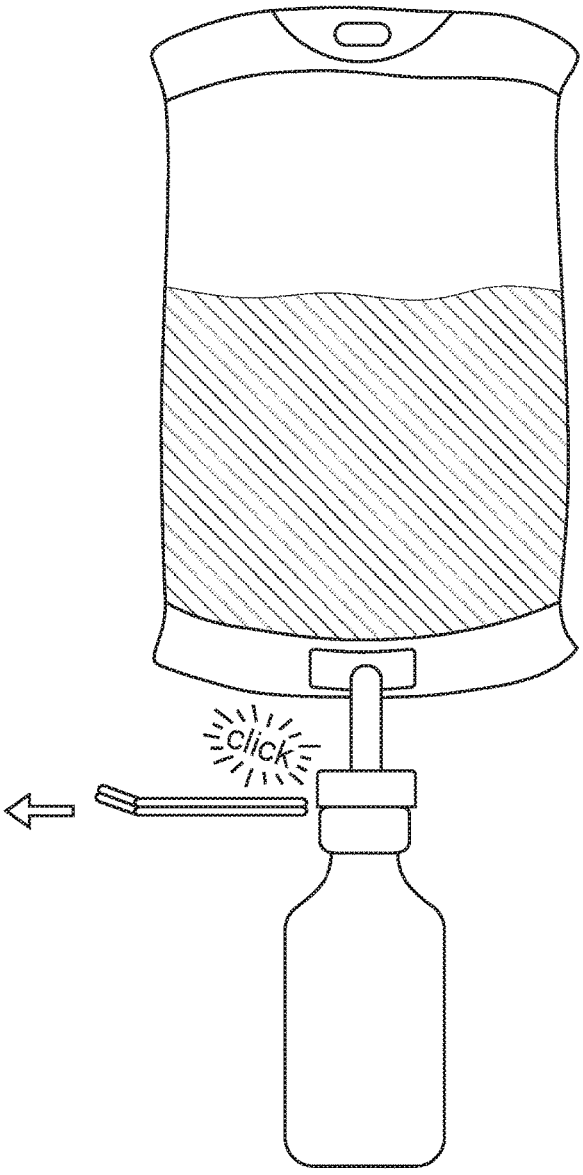


FIG. 25B

DEVICES AND SYSTEMS WITH AN EXTERNAL DISPLACEMENT MECHANISM FOR CONTAMINANT-FREE ENGAGEMENT OF PHARMACEUTICAL VESSELS AND PHARMACEUTICAL ADMINISTRATION DEVICES

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Patent Application Nos. 62/545,152 filed on Aug. 14, 2017; 62/558,502 filed on Sep. 14, 2017; 62/560,195 filed on Sep. 19, 2017; 62/562,490 filed on Sep. 25, 2017; 62/563,072 filed on Sep. 26, 2017; 62/564,933 filed on Sep. 28, 2017; 62/566,414 filed on Sep. 30, 2017; 62/582,922 filed on Nov. 7, 2017; 62/612,267 filed on Dec. 29, 2017; 62/619,795 filed Jan. 20, 2018; 62/619,920 filed Jan. 22, 2018; 62/625,334 filed on Feb. 1, 2018; 62/626,686 filed on Feb. 6, 2018; 62/631,729 filed on Feb. 17, 2018; 62/644,185 filed on Mar. 16, 2018; 62/649,483 filed on Mar. 28, 2018; 62/651,000 filed on Mar. 30, 2018; 62/651,149 filed on Mar. 31, 2018; 62/653,356 filed on Apr. 5, 2018; 62/657,806 filed on Apr. 14, 2018; 62/657,808 filed on Apr. 15, 2018; 62/657,809 filed on Apr. 15, 2018; 62/660,885 filed on Apr. 20, 2018; 62/662,721 filed on Apr. 25, 2018; 62/662,743 filed on Apr. 25, 2018; 62/664,933 filed on Apr. 30, 2018; 62/666,866 filed on May 4, 2018; 62/667,593 filed on May 6, 2018; 62/669,948 filed on May 10, 2018; 62/670,833 filed on May 13, 2018; 62/675,058 filed on May 22, 2018; 62/676,822 filed on May 25, 2018; 62/679,817 filed on Jun. 3, 2018; 62/680,576 filed on Jun. 4, 2018; 62/680,974 filed on Jun. 5, 2018; 62/681,884 filed on Jun. 7, 2018; 62/686,602 filed on Jun. 18, 2018; 62/686,612 filed on Jun. 18, 2018; and 62/690,260 filed on Jun. 26, 2018. The contents of the above applications are all incorporated by reference as if fully set forth herein in their entirety.

FIELD OF THE INVENTION

[0002] The present invention relates, in some embodiments thereof, to systems, devices, and methods allowing for an engagement of two or more pharmaceutical vessels or pharmaceutical administration devices in a decontaminated manner. In some embodiments of the invention, the systems, devices and methods of the invention include a first connection interface attached to a first vessel (or administration device); and a second connection interface attached to a second vessel (or administration device), wherein the first connection interface and the second connection interface are configured to allow for an engagement between the first vessel and the second vessel, and wherein the first and second connection interfaces are further configured to externally displace from the engagement between the first vessel and the second vessel while a hermetically sealed connection is maintained between the first vessel and the second vessel.

BACKGROUND OF THE INVENTION

[0003] The medicinal practice routinely involves administration of medical substances, such as, medicaments, fluids, nutritional substances and the alike, to patients or animals. The preparation and/or administration of such medicinal substances typically involves one or more transfers of those substances between pharmaceutical vessels or administration devices (such as, vials, syringes, infusion lines, connectors, etc.). Each such act of transferring substances between vessels or devices exposes the connection interfaces of the vessels and accordingly the medical substances themselves to contaminants present in ambient air or ambient air particles (e.g., bacteria, viruses, funguses, spores, pyrogens, dirt). In addition, connection interfaces are further prone to contaminations due to physical contact of the interfaces, for example, with nonsterile gloves, or devices.

[0004] Such contaminations are a major problem in the healthcare setting since contaminants, once invading within medicinal substances, may pose substantial danger if administered intracorporeally to patients.

[0005] Typical connection interfaces of pharmaceutical vessels or pharmaceutical administration devices include rubber bungs and/or stoppers covered by a cap and/or seal that can be flicked off and/or are removed prior to usage thereof. These rubber bungs/stoppers are used to allow penetration by a needle attached to a syringe or by other medical connectors. When the cap and/or seal is flicked off and/or removed, the rubber bung and/or stopper is exposed to ambient air and to contaminants present therein. Accordingly, exposure of connection interfaces to ambient air may involve contamination of the interfaces and consequently contamination of a beneficial substance to be provided to a patient.

[0006] Existing systems include U.S. D 720,067; U.S. D 717,947; U.S. D 703,812; U.S. D 690,418; U.S. D 639,939; U.S. D 637,713; U.S. D 9,790,011; U.S. D 9,775,777; U.S. Pat. No. 9,561,326; U.S. Pat. No. 9,493,281; U.S. Pat. No. 9,492,353; U.S. Pat. No. 9,309,020; U.S. Pat. No. 9,173,816; U.S. Pat. No. 9,168,203; U.S. Pat. No. 9,162,803; U.S. Pat. No. 9,039,672; U.S. Pat. No. 8,926,583; U.S. Pat. No. 8,827,978; U.S. Pat. No. 8,790,330; U.S. Pat. No. 8,662,985; U.S. Pat. No. 8,657,803; U.S. Pat. No. 8,622,985; U.S. Pat. No. 8,562,583; U.S. Pat. No. 8,545,475; U.S. Pat. No. 8,523,838; U.S. Pat. No. 8,491,563; U.S. Pat. No. 8,480,646; U.S. Pat. No. 8,449,521; U.S. Pat. No. 8,381,776; U.S. Pat. No. 8,336,587; U.S. Pat. No. 8,328,772; U.S. Pat. No. 8,287,513; U.S. Pat. No. 8,225,826; U.S. Pat. No. 8,075,550; U.S. Pat. No. 8,029,747; U.S. Pat. No. 7,998,134; U.S. Pat. No. 7,975,733; U.S. Pat. No. 7,942.860; U.S. Pat. No. 7,867,215; U.S. Pat. No. 7,744,581; U.S. Pat. No. 7,731,678; U.S. Pat. No. 7,387,216; U.S. Pat. No. 7,306,584; U.S. Pat. No. 6,875,203; U.S. Pat. No. 6,729,370; U.S. Pat. No. 6,715,520; U.S. Pat. No. 6,602,239; U.S. Pat. No. 6,409,708; U.S. Pat. No. 6,343,629; U.S. Pat. No. 6,162,199; U.S. Pat. No. 6,113,583; U.S. Pat. No. 6,063,068; U.S. Pat. No. 5,893,397; U.S. Pat. No. 5,876,380; U.S. Pat. No. 5,832,971; U.S. Pat. No. 5,807,374; U.S. Pat. No. 5,746,733; U.S. Pat. No. 5,569,235; U.S. Pat. No. 5,462,535; U.S. Pat. No. 5,405,326; U.S. Pat. No. 5,292,318; U.S. Pat. No. 5,279,582; U.S. Pat. No. 4,944,723; U.S. Pat. No. 4,932,947; U.S. Pat. No. 4,932,937; U.S. Pat. No. 4,919,657; U.S. Pat. No. 4,915,701; U.S. Pat. No. 4,826,489; U.S. Pat. No. 4,673,404; U.S. Pat. No. 4,564,054; U.S. Pat. No. 3,610,241; U.S. Pat. No. 3,605,743; U.S. Pat. No. 3,587,575; U.S. Pat. No. 3,583,399; U.S. Pat. No. 3,578,037; U.S. Pat. No. 3,556,099; U.S. Pat. No. 3,552,387; U.S. Pat. No. 3,406,686; U.S. Pat. No. 3,380,450; U.S. Pat. No. 3,375,825; U.S. Pat. No. 3,342,180; U.S. Pat. No. 3,330,282; U.S. Pat. No. 3,330,281; U.S. Pat. No. 3,306,290; U.S. Pat. No. 3,255,752; U.S. Pat. No. 3,253,592; U.S. Pat. No. 3,076,456; U.S. Pat. No.

2,972,991; U.S. Pat. No. 2,922,419; US20160262982; US20160038373; US20150209568; US20140183196; US20140016570; US20140007973; US20140000754; US20130184672; US20130006200; US20120209238; US20120209218; US20120203194; US20110284561; US20110186177; US20110125128; US20110108158; US20110098647; US20100249745; US20100198182; US20100152669; US20100147402; US20100036319; US20100004602; US20090057258; US20080312634; US20080223484; US20080171981;

[0007] US20060276759; US20050215976; US20030199847; US20030187420; US20020130100; US20020115981; US20020099354; ES2577377T3; EP2852367B1; EP2666513; EP2155141B1.

[0008] In order to overcome this obstacle, the current medical practice involves swabbing the surface of a connection interface with a disinfecting agent, such as 70% isopropyl alcohol, prior to accessing the connection interface. Other methods include i.v. (intravenous) rooms which are used for the sterile preparation of i.v. medications. Such rooms, to keep medicinal preparations as sterile as possible, are equipped with special instruments including, hoods with air filtration systems (e.g., HEPA filters), ventilation systems and air pressure systems. Additionally, those rooms necessitate that the medical staff working in these rooms are properly garmented, are properly trained, and require aseptic techniques, and employ quality control and validation processes. These systems require regular upkeep by certified personnel and require regular cleaning. These systems are therefore expensive, labor intensive, and require regular maintenance and testing to assure that they are operating effectively. The above described systems and methods are either cumbersome and expensive or inefficient in addressing the problem of reducing/eliminating contaminants on connection interfaces.

[0009] Thus, there is a long felt and unmet need for pharmaceutical vessels, devices, systems and/or methods that afford transfer of medical substances in a sterile manner. There is a need for reliable, user friendly and cost-effective solutions allowing contaminant-free engagement of vessels and devices for drug preparation and administration processes.

SUMMARY OF THE INVENTION

[0010] Objects of the invention are achieved by providing systems, devices, vessels and methods for engaging medical devices, such as vessels, in a decontaminated manner.

[0011] Objects of the invention are achieved by providing systems, devices, vessels and methods which are directed to transferring medical substances in an efficient, user-friendly and sterile manner.

[0012] The present invention is based on two or more connection interfaces, each of which is attached to a vessel. The connection interfaces are configured to connect between two or more medical vessels and while doing so, isolate and entrap therebetween ambient air particles. Such devices and systems allow for a hermetic and sterile connection between the vessels.

[0013] In an aspect of the invention, the present invention provides a decontamination system for the engagement of vessels, the system comprising: a first connection interface attached to a first vessel; and a second connection interface attached to a second vessel, wherein the first connection interface and the second connection interface are configured to allow for an engagement between the first vessel and the second vessel, and wherein the first connection interface and the second connection interface are further configured to externally displace from the engagement between the first vessel and the second vessel while a hermetically sealed connection is maintained between the first vessel and the second vessel.

[0014] In one or more embodiments, at least one of the first connection interface and the second connection interface is a film. In one or more embodiments, the film is a plastic or a metal alloy.

[0015] In one or more embodiments, upon the engagement between the first vessel and the second vessel, the first connection interface and the second connection interface are configured to slide with respect to the first vessel and the second vessel, thereby removing contaminants between the first vessel and the second vessel.

[0016] In one or more embodiments, the first connection interface is configured to seal and/or cover a port of the first vessel and/or a port of the second vessel.

[0017] In one or more embodiments, the first connection interface and the second connection interface are configured to seal and/or cover an aperture of the first vessel and an aperture of the second vessel, respectively.

[0018] In one or more embodiments, the decontamination system results in air particle-free engagement of the first vessel and the second vessel, wherein air particles that contact the first and second interfaces are entrapped by the first connection interface and the second connection interface.

[0019] In one or more embodiments, the system further comprises an engagement mechanism configured to provide a secure engagement between the first vessel and the second vessel. In one or more embodiments, the engagement mechanism is located on the first vessel and/or on the second vessel. In one or more embodiments, the engagement mechanism is selected from a thread, a luer, an adhesive, and a ratchet teeth mechanism. Optionally, a twisting, turning, and/or snapping motion is associated with the engagement. In an exemplary embodiment, a twisting motion is associated with a thread-luer mechanism. In an exemplary embodiment, a snapping motion is associated with a ratchet teeth mechanism. In one or more embodiments, when the first vessel and the second vessel engage via the engagement mechanism, an airtight seal is formed between the first vessel and the second vessel. In one or more embodiments, when the first vessel and the second vessel engage via the engagement mechanism a sealed aperture is formed between the first vessel and the second vessel.

[0020] In one or more embodiments, the sealed aperture formed between the first vessel and the second vessel allows for the displacement of at least one of the connection interfaces of the first vessel and the second vessel. In one or more embodiments, the sealed aperture is configured to displace at least one connection interface through the sealed aperture while maintaining the hermetic seal between the first vessel and the second vessel. In one or more embodiments, the system further comprises an engagement mechanism configured to provide a secure engagement between the first connection interface and the second connection interface. In one or more embodiments, the engagement mechanism is located on the first connection interface and/or on the second connection interface. In one or more embodiments, the engagement mechanism is selected from a thread,

a luer, an adhesive, and a ratchet teeth mechanism. In one or more embodiments, the engagement mechanism includes a mechanical object that connects the first connection interface with the second connection interface providing for a simultaneous external displacement of the first and second connection interfaces. In one or more embodiments, the mechanical object is a protrusion, a dent, or a hook. In one or more embodiments, the engagement mechanism that secures the first connection interface to the second connection interface is an adhesive. In one or more embodiments, the engagement mechanism secures the first connection interface to the second connection interface forming an airtight seal between the first connection interface and the second connection interface. In one or more embodiments, the engagement mechanism is a thread on the first vessel configured to engage a complementary thread on the second vessel. In one or more embodiments, the engagement mechanism is a thread on the first connection interface configured to engage a complementary thread on the second connection interface. In one or more embodiments, the thread of at least one of the thread and complementary thread is a luer.

[0021] In one or more embodiments, the system further comprises a first rail mechanism on the first vessel configured to provide external displacement of the first connection interface. In one or more embodiments, the system further comprises a second rail mechanism on the second vessel configured to provide external displacement of the second connection interface.

[0022] In one or more embodiments, the system further comprises a first rail mechanism on the first vessel configured to provide external displacement of the first connection interface and configured to provide external displacement of the second connection interface.

[0023] In one or more embodiments, the system further comprises a first slit mechanism on the first vessel configured to allow external displacement of the first connection interface and configured to provide external displacement of the second connection interface. In one or more embodiments, the first slit mechanism is an aperture. In one or more embodiments, the first slit mechanism is a sealed aperture. In one or more embodiments, the seal of the sealed aperture is a frangible seal. In one ore more embodiments, the frangible seal is opened via a force of a user's hand.

[0024] In one or more embodiments, the system comprises a seal or a cover disposed between a vessel and a connection interface. In one or more embodiments, the seal or cover is frangible. In one or more embodiments, the seal or cover is pierceable.

[0025] In one or more embodiments, the system comprises a first seal or a first cover disposed between a first vessel and a first connection interface and a second seal or a second cover disposed between a second vessel and a second connection interface. In one or more embodiments, the first seal or first cover and a second seal or a second cover is frangible. In one or more embodiments, the first seal or first cover and a second seal or a second cover is frangible.

[0026] In one or more embodiments, the system further comprises a first hinge mechanism on a first vessel configured to provide external displacement of a first connection interface and comprising a second hinge mechanism on a second vessel configured to provide external displacement of a second connection interface.

[0027] In one or more embodiments, the system further comprises a piercing member on the first and/or second vessel configured to pierce a sealed opening of the first and/or second vessel, thereby allowing fluid to pass between the vessels. In one or more embodiments, the piercing member is a needle.

[0028] In one or more embodiments, the first and second connection interfaces are externally displaced via a sliding or a pulling motion.

[0029] In one or more embodiments, when the first connection interface and the second connection interface are displaced, the connection between the first vessel and the second vessel is decontaminated. In one or more embodiments, when the first and/or second connection interface slides off the first and/or second rail mechanism, the hermetic connection between the first vessel and the second vessel is maintained. In one or more embodiments, when the first and second connection interface slides off the first rail mechanism, the hermetic connection between the first vessel and the second vessel is maintained.

[0030] In one or more embodiments, the first connection interface and the second connection interface externally displace from the engagement between the first vessel and the second vessel through a slit or an aperture sealed by the force of the engagement between the first vessel and the second vessel.

[0031] In one or more embodiments, the first connection interface and the second connection interface externally displace from the engagement between the first vessel and the second vessel at or about the same time.

[0032] In one or more embodiments, the first vessel and/or the second vessel are selected from a vial, a bag, a bottle, a syringe, an infusion line, a connector, a filter, a manifold, a container port, a bag port, a bottle port, a vial port, and combinations thereof. In one or more embodiments, the interior of the container port may have a pressure less than the pressure of ambient air.

[0033] In one or more embodiments, circumferential ends of at least one of or both of the first and second connection interface ends are concealed within the hermetically sealed connection between the first vessel and the second vessel.

[0034] In one or more embodiments, the system further comprises a tab on at least one of the first connection interface and the second connection interface, the tab configured to allow for external displacement of the first connection interface and the second connection interface with respect to the first vessel and the second vessel. In one or more embodiments, the tab is configured to be pulled axially by a user, the axial pulling of the tab configured to displace the first connection interface and the second connection interface from the first vessel and the second vessel, while maintaining a hermetic seal between the first vessel and the second vessel.

[0035] In one or more embodiments, the first vessel and the second vessel are in fluid communication with one another after external displacement of the first connection interface and the second connection interface from the first vessel and the second vessel.

[0036] In one or more embodiments, the first connection interface is coupled to the first vessel and wherein the second connection interface is coupled to the second vessel.

[0037] In one or more embodiments, the first connection interface has edges configured to isolate an entire surface of the first connection interface that is exposed to contaminants

from contacting an internal compartment of the first vessel and/or said second vessel when the first connection interface is engaged with the second connection interface.

[0038] In one or more embodiments, the first connection interface has edges configured to isolate a portion of the surface of the first connection interface that is exposed to contaminants from contacting an internal compartment of the first vessel and/or the second vessel when the first connection interface is engaged with the second connection interface.

[0039] In one or more embodiments, the edges are circumferential edges. In one or more embodiments, the circumferential edges define the outer portion of the first connection interface and the second connection interface. In one or more embodiments, the edges are further configured so the sides of the edges are not exposed to contaminants. In one or more embodiments, the sides of the edges that are exposed to an internal compartment of the first vessel and/or the second vessel are not exposed to contaminants.

[0040] In one or more embodiments, the outer portion of the edges of the first connection interface are not exposed to contaminants. In one or more embodiments, the edges of the first connection interface are configured to fully entrap the contaminants between the first and second connection interfaces upon engagement of the first and second connection interfaces. In one or more embodiments, the edges of the first connection interface are flat.

[0041] In one or more embodiments, the edges of the first connection interface are configured to snuggly fit the edges of the second connection interface. In one or more embodiments, the edge is an exterior portion of the connection interface that comes in contact with an interior compartment of the decontamination device and/or vessel.

[0042] In a further aspect, the present invention provides a method of decontaminating a connection between two vessels, the method comprising the steps of: providing a first connection interface attached to a first vessel; providing a second connection interface attached to a second vessel, engaging the first vessel to the second vessel; and externally displacing the first and second connection interfaces from the engagement between the first vessel and the second vessel, while a hermetically sealed connection between the first and second vessels is maintained.

[0043] In one or more embodiments, the step of externally displacing the first connection interface and the second connection interface occurs via a sliding motion.

[0044] In one or more embodiments, the step of externally displacing the first connection interface and the second connection interface occurs via sliding the first connection interface and the second connection interface axially with respect to the first vessel and the second vessel, thereby removing contaminants located between the first connection interface and second connection interface.

[0045] In one or more embodiments, an airtight seal is formed between the first connection interface and the second connection interface prior to the external displacement of the first connection interface and the second connection interface.

[0046] In one or more embodiments, the displacement of the first connection interface and the second connection interface is via a rail mechanism, such that the airtight sealed compartment between the first connection interface and the second connection interface slides off the rail.

[0047] In one or more embodiments, when the airtight seal between the first connection interface and the second connection interface is displaced, the connection between the first vessel and the second vessel is decontaminated.

[0048] In one or more embodiments, the airtight seal between the first connection interface and the second connection interfaces slides off the rail while maintaining the hermetically sealed connection between the first and second vessels.

[0049] In one or more embodiments, the step of externally displacing the first connection interface and the second connection interface occurs via peeling.

[0050] In one or more embodiments, the step of externally displacing the first connection interface and the second connection interface occurs at about the same time.

[0051] In one or more embodiments, circumferential ends of at least one of or both of the first and second connection interfaces ends are concealed within the airtight seal, allowing for sterile external displacement.

[0052] In one or more embodiments, the method further comprises connecting the first connection interface to the second connection interface via an engagement mechanism.

[0053] In one or more embodiments, connecting of the first connection interface to the second connection interface occurs prior to externally displacing the first and second connection interfaces from the engagement between the first vessel and the second vessel.

[0054] In one or more embodiments, the connecting of the first connection interface to the second connection interface is selected from a twisting of a thread onto a complementary thread, attaching ratchet teeth to a complementary retention member, and adhering a first connection interface to the second connection interface via an adhesive.

[0055] In one or more embodiments, the sealed aperture is a valve. In one or more embodiments, the valve is a one-way valve.

[0056] In a further aspect, the present invention provides a container housing a substance intended for intracorporal administration to a patient, the container comprising: a rail mechanism, and an externally displaceable connection interface, wherein the rail mechanism is configured to provide for the external displacement of the connection interface.

[0057] In one or more embodiments, the container further comprises an engagement mechanism. In one or more embodiments, the engagement mechanism is selected from a group consisting of a thread, a ratchet teeth mechanism, a snap-on mechanism and combinations thereof. In one or more embodiments, the connection interface is disposed on the rail mechanism. In one or more embodiments, the connection interface is disposed between rails of the rail mechanism. In one or more embodiments, the connection interface is attached to the rail mechanism via a frangible seal, wherein the frangible seal is configured to break/rupture by a force of a user's hand upon displacement of the connection interface from the rail. In one or more embodiments, the connection interface is attached to the container via a frangible seal, wherein the frangible seal is configured to break/rupture by a force of the user's hand upon displacement of the connection interface from the rail. In one or more embodiments, the connection interface may displace externally between the teeth of a ratchet teeth engagement mechanism. In one or more embodiments, the connection interface may displace externally between the threads of a thread/luer engagement mechanism.

[0058] In one or more embodiments, the container has a flexible wall. In one or more embodiments, the container has a rigid wall.

[0059] In one or more embodiments, the container is a bag. In one or more embodiments, the container is a bottle. In one or more embodiments, the container is a vial. In one or more embodiments, the container is a syringe.

[0060] In one or more embodiments, the connection interface displaces between teeth of a ratchet teeth engagement mechanism. In one or more embodiments, the connection interface displaces between threads of a thread engagement mechanism. In one or more embodiments, the connection interface has an adhesive on a surface of the connection interface.

[0061] In one or more embodiments, the connection interface has at least one of a disinfecting agent and a sterilizing agent disposed on the surface of the connection interface.

[0062] In yet a further aspect, the present invention provides a decontamination connector for decontaminating a connection between vessels, comprising: a port; a connection interface configured to cover the port, wherein the connection interface is configured to displace externally from the port; an engagement mechanism, wherein the engagement mechanism is configured to provide coupling between the port and a vessel; and wherein following the coupling, the decontamination connector and the vessel form a hermetically coupled connection, while the connection interface is externally displaced from the port while maintaining the hermetically coupled connection between the decontamination connector and the vessel.

[0063] In one or more embodiments, the connection interface is selected from the group consisting of a film, a plastic, a polymer, or a metal alloy.

[0064] In one or more embodiments, the connection interface is configured to seal the port of a first vessel.

[0065] In one or more embodiments, an engagement mechanism provides a secure engagement between the decontamination connector and the second vessel. In one or more embodiments, the engagement mechanism is selected from a thread, a luer, an adhesive, and a ratchet teeth mechanism. In one or more embodiments, the engagement mechanism is configured to form an airtight connection between the first vessel and the second vessel.

[0066] In one or more embodiments, the connection forms a sealed aperture. In one or more embodiments, the sealed aperture provides for the displacement of the connection interface through the sealed aperture while maintaining the hermetically coupled connection between the decontamination connector and the vessel.

[0067] In one or more embodiments, the connector further comprises an engagement mechanism configured to provide an engagement between the connection interface and a second connection interface on a second vessel.

[0068] In one or more embodiments, the engagement mechanism is selected from a thread, a luer, an adhesive, and a ratchet teeth mechanism. In one or more embodiments, the engagement mechanism includes a mechanical object that connects the first connection interface and a second connection interface on a second vessel providing for a simultaneous external displacement of the first and second connection interfaces. In one or more embodiments, the mechanical object is a protrusion, a dent or a hook.

[0069] In one or more embodiments, the connector further comprises a rail mechanism configured to provide for the external displacement of the connection interface. In one or more embodiments, the rail mechanism is configured to provide for the external displacement of the connection interface via a sliding motion.

[0070] In one or more embodiments, the connection interface displaces externally from the port via a hinge mechanism. In one or more embodiments, the connection interface displaces externally from the port via peeling.

[0071] In one or more embodiments, when the connection interface externally displaces from the port, the hermetic connection between the decontamination connector and the vessel is maintained.

[0072] In one or more embodiments, the decontamination connector is attached to or integrally attached to a vessel, to a container or to an administration device. In one or more embodiments, the container is selected from a vial, a bag, and a bottle. In one or more embodiments, the vessel is selected from a syringe, an infusion line, a connector, a filter, and a manifold.

[0073] In one or more embodiments, the port is selected from the group consisting of a container port, a syringe port, an infusion line port, a connector port, a manifold port, and a vessel port.

[0074] In one or more embodiments, the circumferential end of the connection interface end is concealed within the hermetically coupled connection between the decontamination connector and the vessel.

[0075] In one or more embodiments, the decontamination connector further comprises a tab, the tab configured to allow for the external displacement of the connection interface with respect to the port of the decontamination connector.

[0076] In one or more embodiments, the tab is configured to be pulled axially by a user, the axial pulling of the tab configured to displace the connection interface from the port of the decontamination connector while maintaining a hermetic seal between the decontamination connector and the vessel.

[0077] In one or more embodiments, the port is in fluid communication with the vessel after external displacement of the connection interface from the port.

[0078] In one or more embodiments, the connection interface is coupled to the port of the decontamination connector.

[0079] In one or more embodiments, the decontamination connector further comprises a piercing member configured to pierce a seal or cover of a vessel or a container.

[0080] In one or more embodiments, the decontamination connector further comprises a valve. In one or more embodiments, the valve is a one-way valve.

[0081] In yet a further aspect, the present invention provides a decontamination connector for the decontamination of a connection between vessels, comprising: a port; a connection interface configured to cover the port, wherein the connection interface is configured to displace externally from the port; a rail mechanism configured to provide for the external displacement of the connection interface; and an engagement mechanism, wherein the engagement mechanism is configured to provide coupling between the port and a vessel, wherein following the coupling, the decontamination connector and the vessel form a hermetically coupled connection, while the connection interface is externally displaced from the port via the rail mechanism while maintaining the hermetically coupled connection between the decontamination connector and the vessel.

[0082] In yet a further aspect, the present invention provides a decontamination connector for the decontamination of a connection between vessels, comprising: a port; a connection interface configured to cover the port, wherein the connection interface is configured to displace externally from the port; a sealed aperture configured to provide for the external displacement of the connection interface; and an engagement mechanism, wherein the engagement mechanism is configured to provide coupling between the port and a vessel, wherein following coupling, the decontamination connector and the vessel form a hermetically coupled connection, while the connection interface is externally displaced from the port through the sealed aperture while the hermetically coupled connection between the decontamination connector and the vessel is maintained.

[0083] In one or more embodiments, the sealed aperture reseals at about the time of external displacement of at least one of the connection interfaces of the decontamination connector and the vessel. In one or more embodiments, the sealed aperture reseals prior to detachment of at least one of the connection interfaces of the decontamination connector and the vessel from the decontamination connector and the vessel.

[0084] In yet a further aspect, the present invention provides a method of decontaminating a connection between two vessels, the method comprising the steps of: providing a first connection interface attached to a first vessel; providing a second vessel; engaging the first vessel to the second vessel; and externally displacing the first connection interface from the engagement between the first vessel and the second vessel, while a hermetically sealed connection between the first and second vessel is maintained.

[0085] In one or more embodiments, the step of externally displacing the connection interface occurs via a sliding motion. In one or more embodiments, the step of externally displacing the connection interface occurs via sliding axially with respect to the first vessel and the second vessel, thereby removing contaminants located on the first connection interface.

[0086] In one or more embodiments, displacement of the connection interface is via a rail mechanism. In one or more embodiments, when the connection interface is displaced, the connection between the first vessel and the second vessel is decontaminated. In one or more embodiments, the connection interface slides on the rail while maintaining the hermetically sealed connection between the first and second vessels.

[0087] In one or more embodiments, the step of externally displacing the connection interface occurs via peeling.

[0088] In one or more embodiments, the method further comprises connecting the first vessel to the second vessel via an engagement mechanism. In one or more embodiments, connecting of the first vessel to the second vessel occurs prior to externally displacing the connection interface from the engagement between the first vessel and the second vessel.

[0089] In one or more embodiments, connecting of the first vessel to the second vessel is selected from a twisting of a thread onto a complementary thread, attaching ratchet teeth to a complementary retention member, and adhering the first vessel to the second vessel via an adhesive.

[0090] In yet a further aspect, the present invention provides a vessel with a rail mechanism.

[0091] In one or more embodiments, the vessel is a container. In one or more embodiments, the vessel has a flexible wall. In one or more embodiments, the vessel has a rigid wall. In one or more embodiments, the vessel is a bag or a bottle. In one or more embodiments, the vessel is a vial. In one or more embodiments, the vessel is a syringe. In one or more embodiments, the rail mechanism is attached to the vessel. In one or more embodiments, the rail mechanism is integrally attached to the vessel. In one or more embodiments, the rail mechanism forms a unitary structure with the vessel.

[0092] In yet a further aspect, the present invention provides a vessel having a rail mechanism and a vessel surface disposed on the rail mechanism. In one or more embodiments, the vessel surface is disposed between the rails of the rail mechanism. In one or more embodiments, the rail mechanism is configured to provide for the sliding of the vessel surface along the rail mechanism.

[0093] Unless otherwise defined, all technical or/and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the invention pertains. Although methods and materials similar or equivalent to those described herein can be used in the practice or testing of embodiments of the invention, exemplary methods or/and materials are described below. In case of conflict, the patent specification, including definitions, will control. In addition, the materials, methods, and examples are illustrative only and are not intended to be necessarily limiting.

BRIEF DESCRIPTION OF THE DRAWINGS

[0094] Some embodiments of the invention are herein described, by way of example only, with reference to the accompanying drawings. With specific reference now to the drawings in detail, it is stressed that the particulars shown are by way of example and for purposes of illustrative discussion of embodiments of the invention. In this regard, the description taken with the drawings makes apparent to those skilled in the art how embodiments of the invention may be practiced.

[0095] In the drawings:

[0096] FIGS. **1**A-**1**D are schematic illustrations presenting an exemplary decontamination system which comprise a first connection interface and a second connection interface configured to engage with each other and to allow a hermetic and decontaminated communication between a first vessel and a second vessel, according to some embodiments of the invention.

[0097] FIG. **2** is a magnified cut view of the first connection interface and second connection interface shown in FIGS. **1**A-**1**D, the connection interfaces configured to seal an opening of a first vessel and a second vessel, respectively, according to some embodiments of the invention.

[0098] FIGS. **3**A-**3**C are schematic back cut views of a first connection interface and a second connection interface, each of the connection interfaces configured to seal an opening within a corresponding vessel, according to some embodiments of the invention.

[0099] FIGS. **4**A-**4**D are schematic top cut views of a vessel having an opening for allowing fluid flow therethrough and an aperture to accommodate a connection interface, wherein prior to externally displacing from the vessel, the connection interface is configured to seal the opening and aperture (FIG. **4**A), wherein when the connec-

tion interface externally displaces from the opening and aperture (FIGS. **4**B-**4**C) and following the external displacement (FIG. **4**D), the opening allows the fluid to flow therethrough and the aperture reseals allowing a hermetic engagement between vessels, according to some embodiments of the invention.

[0100] FIGS. **5**A-**5**E are schematic side cut views of a first connection interface and a second connection interface attached to medical vessels via ports, the connection interfaces configured to engage with each other and externally displace from the vessel via a rail mechanism, according to some embodiments of the invention.

[0101] FIGS. **6**A-**6**E are schematic illustrations presenting a further exemplary decontamination system with an engagement mechanism configured to provide a secure engagement between two vessels, according to some embodiments of the invention.

[0102] FIGS. **7**A-**7**D are schematic illustrations presenting a further exemplary decontamination system with an engagement mechanism configured to provide a secure engagement between connection interfaces, according to some embodiments of the invention.

[0103] FIGS. **8**A-**8**B are schematic back cut views showing a first connection interface and a second connection interface, wherein circumferential ends of at least one of the connection interfaces are concealed within the airtight seal formed following engagement of the connection interfaces, according to some embodiments of the invention.

[0104] FIGS. **9**A-**9**B are schematic back cut views of a first connection interface and a second connection interface attached to a first vessel and a second vessel, respectively, the connection interfaces may externally displace from the first and second vessels, via a rail mechanism, according to some embodiments of the invention.

[0105] FIG. **10**A-**10**B are schematic back cut views of a first and a second connection interfaces attached to a first and a second vessel, respectively, the connection interfaces are different in their exterior surface area and are configured to externally displace from the first vessel and the second vessel, via a rail mechanism, according to some embodiments of the invention.

[0106] FIGS. **11**A-**11**E are schematic illustrations presenting connection interfaces configured to be coupled to and allow an engagement between various types of medical vessels and devices, according to some embodiments of the invention.

[0107] FIG. **12** is a schematic illustration presenting a first vessel attached to a plurality of connection interfaces wherein each connection interface is configured to engage with a complementary connection interface present on a medical vessel or device, according to some embodiments, of the invention.

[0108] FIGS. **13**A-**13**C are schematic illustrations presenting a further exemplary decontamination connector which includes a connection interface configured to cover a port, the connection interface is further configured to displace externally from the port, according to some embodiments of the invention.

[0109] FIGS. **14**A-**14**D are schematic illustrations presenting a decontamination connector which allows sterile engagement of vessels, according to some embodiments of the invention.

[0110] FIGS. **15**A-**15**C are schematic back view illustrations presenting a decontamination connector which allows sterile engagement of vessels, according to some embodiments of the invention.

[0111] FIGS. **16**A-**16**C are schematic illustrations presenting a first and a second medical vessel attached to connection interfaces, wherein a decontamination connector mediates the engagement and fluid passageway between the vessels, according to some embodiments of the invention.

[0112] FIG. **17** is a schematic illustration presenting a system wherein various types of medical vessels or devices may be attached to connection interfaces, and wherein a decontamination connector mediates the engagement and fluid passageway between the vessels, according to some embodiments of the invention.

[0113] FIGS. **18**A-**18**D are schematic illustrations presenting yet another exemplary decontamination system which comprises a first connection interface and a second connection interface configured to engage with each other and to allow a hermetic and decontaminated communication between a first vessel and a second vessel, wherein the connection interfaces externally displace by a hinge mechanism, according to some embodiments of the invention.

[0114] FIGS. **19**A-**19**C are schematic top cut views of a vessel's port having a connection interface which can externally displace by a hinge mechanism, according to some embodiments of the invention.

[0115] FIGS. **20**A-**20**E are schematic side cut views presenting yet another exemplary decontamination system which comprises a first connection interface and a second connection interface and a piercing member and a valve disposed within at least the port of first medical vessel, according to some embodiments of the invention.

[0116] FIG. **21** is a schematic illustration presenting yet another exemplary decontamination system which comprises a first connection interface and a second connection interface and a piercing member disposed within at least the port of first medical vessel, the piercing member is actuated by a twist motion, according to some embodiments of the invention.

[0117] FIG. **22** is a schematic illustration presenting yet another exemplary decontamination system which comprises a first and a second connection interfaces and a piercing member disposed within at least the port of first medical vessel, the piercing member is actuated by a downward pushing motion, according to some embodiments of the invention.

[0118] FIGS. **23**A-**23**D are schematic side cut views presenting yet another exemplary decontamination system which comprises a first connection interface and a second connection interface which are in a folded position and peeled off while externally displacing from the openings of a first vessel and a second vessel, according to some embodiments of the invention.

[0119] FIGS. **24**A-**24**B are schematic illustrations presenting yet another exemplary decontamination system comprising a first connection interface and a second connection interface configured to engage with each other and to allow a hermetic and decontaminated communication between vessels, wherein a click sound is heard at about the time of engagement of the vessels, according to some embodiments of the invention.

[0120] FIGS. **25**A-**25**B are schematic illustrations presenting yet another exemplary decontamination system compris-

ing a first connection interface and a second configured to engage with each other and to allow a hermetic and decontaminated communication between vessels, wherein a click sound is heard at about the time of external displacement of the vessels, according to some embodiments of the invention.

[0121] It should be appreciated that for simplicity and clarity of illustration, elements shown in the figures have not necessarily been drawn to scale. For example, the dimensions of some of the elements are exaggerated relative to each other for clarity. Further, where considered appropriate, reference numerals have been repeated among the figures to indicate corresponding elements.

DETAILED DESCRIPTION OF THE INVENTION

[0122] It is understood that the invention is not limited to the particular methodology, devices, items or products etc., described herein, as these may vary as the skilled artisan will recognize. It is also to be understood that the terminology used herein is used for the purpose of describing particular embodiments only and is not intended to limit the scope of the invention. The following exemplary embodiments may be described in the context of exemplary bedding articles for ease of description and understanding. However, the invention is not limited to the specifically described products and methods and may be adapted to various applications without departing from the overall scope of the invention. All ranges disclosed herein include the endpoints. The use of the term "or" shall be construed to mean "and/or" unless the specific context indicates otherwise.

[0123] The present invention relates to devices, methods and systems allowing an engagement of medical containers or devices in a sterile manner. In one embodiment, the present invention provides connection interfaces, that may be coupled to, or integrally formed with, vessels or containers, such as vials, syringes, etc. The invention provides a solution to an unmet and long felt need in the medical setting and allows connecting in a sterile manner, two or more vessels. The herein disclosed devices and systems are user friendly, cost effective and abolish the need for complicated and expensive known methods for transferring medical substances. In an embodiment of the invention, the herein disclosed devices and systems are disposable. In an embodiment of the invention, the herein disclosed devices and systems are non-disposable. In an embodiment of the invention, the herein disclosed vessels and devices are intended for one-time use. In an embodiment of the invention, the herein disclosed vessels and devices are intended to be reused.

[0124] In an aspect of the invention, the devices and systems include a first connection interface attached to a first vessel and a second connection interface attached to a second vessel. The first and second connection interfaces are configured to allow an engagement therebetween the connection interfaces. When the connection interfaces engage each other, ambient air particles present at the vicinity thereof are entrapped within/between the engagement formed by the connection interfaces. The engagement between the connection interfaces further establishes an airtight engagement of the vessels. The connection interfaces are further configured to externally displace from the vessels, thereby allowing fluid flow between the vessels and contaminants-free connection of the vessels.

[0125] Accordingly, the herein disclosed invention allows transferring medical substances in a contaminants-free, or in a substantially contaminants-free manner. In one or more embodiments, the herein disclosed invention allows connecting vessels in a contaminants-free, or in a substantially contaminants-free manner.

[0126] In one or more embodiments, the herein disclosed invention provides a fluidic passageway or communication between medical containers in a contaminants-free, or in a substantially contaminants-free manner.

[0127] In one or more embodiments, the herein disclosed invention affords to isolate and/or entrap ambient air particles present between two, or more, vessels. In one or more embodiments, the herein disclosed invention, allows to substantially decrease the chances to introduce a contamination within a medical substance, when preparing or administering medical substances.

[0128] As used herein, the term "substances" refers to various types of materials that should be kept sterile. The substances may be liquid, solid, semi-solid, or gas. In one or more embodiments, the substances are "medical substances". As used herein the term "medical substances" refers to and encompasses any of the various medical drugs, fluids, nutritional products, solid powders, suspensions, liquids solutions and the like.

[0129] As used herein, the term "contaminant-free" is interchangeable with the term "sterile", "disinfected", and "decontaminated". The term refers to substances that are free or substantially free of ambient air particles and/or pathogens, including but not limited to dirt, bacteria, viruses, funguses, spores, and/or pyrogens. Typically, when less or no air is introduced within medical substances, the chances of contamination by pathogens, such as, bacteria, viruses, funguses, spores, pyrogens or the alike is completely abolished or significantly reduced.

[0130] As used herein, "substantially contaminants-free" means significantly less ambient air present when transferring medical substances with the herein disclosed vessels and systems, as compared to comparable conditions for transferring medical substances without the herein disclosed vessels and systems.

[0131] As used herein, the term "ambient air particles" is interchangeable with the term "environmental air particles" and refers to air particles present in a non-filtered or filtered environment. For example, air can be purified by filters, such as a High Efficiency Particulate Air (HEPA) filter.

[0132] As used herein, the term "connection interface" encompasses any surface, layer plane or the alike that can be attached to a vessel. The term may encompass a structure that can be coupled to a vessel and that can engage with a complementary connection interface. In an embodiment of the invention, the connection interface may seal or cover an aperture of a vessel. In an embodiment of the invention, the connection interface may seal or cover an opening for fluid passageway of a vessel. In an embodiment of the invention, the connection interface may be a surface of a container. In an embodiment of the invention, the connection interface may be a surface of a device. In an embodiment of the invention, the connection interface may be a surface of a vessel. In an embodiment of the invention, the connection interface abuts a container. In an embodiment of the invention, the connection interface is surface mounted to a container. In an embodiment of the invention, the connection

interface is surface mounted to a wall of the container. In an embodiment of the invention the connection interface is flush mounted to a container.

[0133] In an embodiment of the invention, the connection interface abuts a device. In an embodiment of the invention, the connection interface is surface mounted to a device. In an embodiment of the invention, the connection interface is surface mounted to a wall of a device. In an embodiment of the invention the connection interface is flush mounted to a device.

[0134] In an embodiment of the invention, the connection interface abuts a vessel. In an embodiment of the invention, the connection interface is surface mounted to a vessel. In an embodiment of the invention, the connection interface is surface mounted to a wall of a vessel. In an embodiment of the invention the connection interface is flush mounted to a vessel. In an embodiment of the invention, the connection interface is flush mounted to a wall of a vessel. In one or more embodiments, a plurality of connection interfaces abuts a vessel and/or device. In an embodiment of the invention, a plurality of connection interfaces is surface mounted to a vessel. In an embodiment of the invention, a plurality of connection interfaces is surface mounted to a at least one wall of a vessel. In an embodiment of the invention, a plurality of connection interfaces is surface mounted to a vessel. In an embodiment of the invention, a plurality of connection interfaces is flush mounted to a vessel. In an embodiment of the invention, a plurality of connection interface is flush mounted to at least one wall of a vessel. In one or more embodiments, a plurality of connection interfaces is attached to a vessel, a container, and/or a device.

[0135] In an embodiment of the invention, the present invention discloses a first connection interface and a second connection interface. The first connection interface and the second connection interface may be similar or may be different in size and/or shape. In one or more embodiments, the exterior surface area facing ambient air, of the connection interfaces may be equal. In one or more embodiments, the exterior surface area facing ambient air, of the connection interfaces may be non-equal. In one or more embodiments, the difference in surface area between the exterior surface area of a plurality of connection interfaces is less than 0.3 inches squared. For example, less than 0.2 inches squared, or less than 0.1 inches squared.

[0136] In an embodiment of the invention, the first connection interface and the second connection interface when engaged with each other entrap ambient air particles therebetween. In an embodiment of the invention, the first connection interface and the second connection interface when engaged with each other externally displace from a vessel(s), and/or from the connection interface(s).

[0137] In one or more embodiments, the connection interface has a thin film layer. In an exemplary embodiment, the connection interface may present a thickness of about 1 mm or below. Alternatively, the connection interface may present a thickness of above 1 mm. The connection interface may be manufactured from various materials, including, an elastic polymer. The connection interface may be made from a plastic material. The connection interface may be a rubber or a polymer. The connection interface may be formed of a metal material (e.g., a metal alloy). In yet a further exemplary embodiment, the connection interface may preset the form of a thin film made of an aluminum foil, cling wrap, or the alike. The metal alloy may include, for example, aluminum. In yet a further exemplary embodiment, the connection interface may preset the form of a thin film made of an aluminum foil, or the alike. In one or more embodiments, the connection interface is attached to, or is integrally formed with a vessel, or port thereof. In one or more embodiments, the connection interface is peelable from the vessels. In one or more embodiments, the peelable connection interface is attached to a vessel via an adhesive. In one or more embodiments, the peelable connection interface may be detached from a vessel surface by the force of a user's hand. In one or more embodiments, the connection interface is movable or slidable along a rail located along a length of the aperture of a vessel. In one or more embodiments, the first and second connection interfaces may be attached to or engage each other via various mechanisms. For example, the connection interfaces may be engaged via an engagement mechanism, such as a thread, a luer, an adhesive, a mechanical object, a dent and a ratchet teeth mechanism. In one or more embodiments, the connection interface may be covered by a cover (not shown). In one or more embodiments, the cover may be a peelable cover. In one or more embodiments, a sterilizing or disinfecting substance may be located between the connection interface and the cover. In one or more embodiments, the sterilizing or disinfecting substance may be an alcohol. In one or more embodiments, the alcohol may be 70% isopropyl alcohol.

[0138] The connection interfaces may be coupled within any portion of the vessel. For example, the connection interfaces may be connected onto the vessels' body or aperture, the vessels' wall or port thereof

[0139] In one or more embodiments, the first connection interface and the second connection interface are configured to prevent contaminants from entering the fluid passageway between a first vessel and a second vessel. In one or more embodiments, the first connection interface and the second connection interface are configured to prevent contaminants from entering the interior of the vessel's body. In one or more embodiments, the first connection interface and the second connection interface are configured to prevent contaminants from entering a fluid housed inside the vessel's body.

[0140] In one or more embodiments, a first connection interface and a second connection interface are configured to prevent contaminants from contacting an internal compartment of the first vessel and/or the second vessel.

[0141] As used herein the term "external displacement" refers to a displacement (i.e., dislocation) of the herein disclosed first and/or second, and/or any additional connection interfaces. In an embodiment of the invention, the displacement is external, namely, outside the vessels being connected by the herein disclosed system. In an embodiment of the invention, the displacement is external to the fluid communication established following engagement of the vessels being connected by the herein disclosed system, methods and devices. In an embodiment of the invention, the displacement maintains a hermetic seal of the connection interfaces and/or the vessels. The displacement may occur via a sliding motion, or by a pulling out motion, or by peeling the connection interfaces. In an embodiment of the invention, the displacement occurs for both the first connection interface and the second connection interface. The external displacement may optionally occur simultaneously for both connection interfaces or may occur consecutively. In an embodiment of the invention, the external displace-

ment established a fluid passageway between two or more vessels. In one or more embodiments, the connection interface is configured to hermetically seal an aperture present in a vessel. In one or more embodiments, at about the time of external displacement of the connection interfaces, the aperture through which the connection interfaces pass through reseals, allowing a hermetic airtight connection between two or more vessels. In one or more embodiments, after external displacment of the connection interfaces, the aperture through which the connection interfaces pass through reseals, allowing a hermetic airtight connection between two or more vessels. In one or more embodiments, the aperture through which the connection interfaces pass through reseals prior to detachment of the connection interfaces from the vessels.

[0142] As used herein the term "vessel" refers to any device utilized for containing, housing or transferring substances as herein disclosed. In one or more embodiments, the vessel may be used for containing medical substances. In an embodiment of the invention, the vessel is a medical vessel. In an embodiment of the invention, the vessel is a medical device. In an embodiment of the invention, the vessels are used for, and adapted to allow connection to another vessel(s). In an embodiment of the invention, the vessel may be a medical container utilized for accommodating medical substances. Various types of medical containers are contemplated. The medical container may be selected, without limitation, from a vial, a bag, a chamber, a housing, a bottle, and the alike. In an embodiment of the invention, the term vessel further encompasses elements that can be used to connect between vessels. In accordance with this embodiment, the vessel may be selected, without limitation, from a connector, a port, a syringe, an infusion line, a tubing, a syringe, a filter, a spike, a port and a manifold. In an embodiment of the invention, one or more connection interfaces (for example, two or more, three or more, etc.) may be coupled to a first vessel and each of those connection interfaces may be coupled and engage with a one or more connection interfaces present on a one or more vessels. In one or more embodiments, the vessel may be a container, a bag, a bottle, a connector, an infusion line or a syringe having a plurality of externally displaceable connection interfaces. In one or more embodiments, the vessels to be engaged may have similar surface area or similar contact surface area (i.e., surface onto which the connection interface is coupled to). For example, a first vessel and a second vessel may have similar surface area or similar contact surface area. In one or more embodiments, the vessels to be engaged may have different surface area or different contact surface area. For example, a first connection interface may have a greater surface area or contact surface area than a second vessel. As used herein the term "fluid communication" refers to two vessels in which substances may pass therethrough either directly or indirectly. The fluid communication may occur via a fluid passageway that allows for the flow/transfer of a medical substance.

[0143] The herein systems and connectors may include one or more valves that restrict fluid flow or passageway. For example, one or more valves may be located at the opening of one or more vessels. In a further exemplary embodiment one or more valves may be disposed at the aperture(s) of the vessels or at a location within a port or vessel body of the vessels. The valves are generally provided to seal and prevent fluid flow prior to any engagement of vessels and/or external displacement of connection interfaces. In an exemplary embodiment, when valves are provided to seal an aperture that provides for the external displacement of connection interfaces , the valves may establish resealing of the apertures at about the time or following the external displacement of the connection interfaces, preventing any leakage of fluids from the engagement between the vessels. In certain embodiments, the resealing occurs at about the time or prior to the external displacement. In certain embodiments, the valves that provide for the passage and external displacement of the connection interfaces may be made of a rubber material, an elastomeric material, a plastic material, and combinations thereof. In an embodiment of the invention, the valve or aperture providing for the passage and external displacement of at least one or two connection interfaces maintains a hermetic seal between at least two vessels or at least two devices by a force of the engagement between at least two vessels or devices. In some embodiments the force of engagement that maintains the hermetic seal between two vessels or devices during the external displacement of the connection interfaces is provided by an engagement mechanism selected from a thread, a luer, a ratchet teeth mechanism, a snap-on mechanism, and combinations thereof. In certain embodiments, the aperture, sealed aperture, or valve providing for the passage and external displacement of at least one or at least two connection interfaces reseals prior to the connection interfaces fully displacing from the first and/or second vessel or device. In some embodiments, the displacement of the connection interfaces occurs in the space between two ratchet teeth. In certain embodiments, the displacement of the connection interfaces occurs between threads of a thread/luer engagement mechanism. In certain embodiments, the valves may prevent backflow of fluids. In some embodiments, the valves may be one-way valves.

[0144] In an embodiment of the invention, the herein disclosed devices, systems and methods allow fluid communication in contaminant- free, or substantially contaminant-free manner. For example, between three or more, four or more, five or more or six or more vessels. In an embodiment of the invention, the herein disclosed devices, systems and methods allow fluid communication between three, four, five, six, or seven vessels. For example, the devices, systems, and methods of the invention allow fluid communication between two containers, between two bags, between a syringe and a bag, between a connector and a bag, between a vial and a bag, between a vial and a bottle, between a syringe and a vial or between a syringe and a connector.

[0145] A further purpose of this invention is to provide a connection interface that reduces the presence of non-purified air and/or air particles. This invention focuses on connection interfaces that are substantially reduced of contaminants and ambient air particles and/or entirely contaminant free and entirely free of ambient air particles.

[0146] Referring now to the drawings, FIGS. **1**A-**1**D illustrate an exemplary decontamination system **1** for the engagement of one or more vessels. Decontamination system **1** includes a first connection interface **2** attached to a first vessel **4**. Decontamination system **1** further includes a second connection interface **6** attached to a second vessel **8**. First connection interface **2** may be provided when coupled to first vessel **4**, and second connection interface **6** may be provided when coupled to second vessel **8**. Optionally, the connection interface **2** may be integrally manufactured with

vessel **4** and/or connection interface **6** may be integrally manufactured with vessel **8**. Further optionally, the connection interfaces may be manufactured or assembled separately from the vessels and coupled thereto at a later stage in a sterile manner. First connection interface **2** and second connection interface **6** may be similar or may be different in size and/or shape. First connection interface **2** and/or second connection interface **6** may be in the form of a film. The film may be manufactured from, for example, an elastic polymer (e.g., a rubber) or from a metal film (e.g., a metal alloy) or polymer and may be of a thickness of less than about 5 millimeters. As presented in FIGS. **1**A-**1**D, first vessel **4** is a bag, such as, an infusion bag, and second vessel **8** is a bottle. It is to be noted that other forms of vessels or containers are herein contemplated. For example, the vessel may be a medical container chosen from a vial, a bag, a bottle, and the alike. The vessel may also be chosen from a syringe, an infusion line, a connector, a filter, a manifold, a bag port, a bottle port, a vial port, or any of the alike. First vessel **4** includes port **10** which is attached to first connection interface **2**. Vessel **8** also includes port **11** which is attached to second connection interface **6**. In accordance with this embodiment, first connection interface **2** can be used to seal and/or cover port **10** of first vessel **4**. Second connection interface **6** can be used to seal and/or cover port **11** of second vessel **8**. Optionally, first connection interface **2** may be directly attached to first vessel **4** without a port (not shown) and/or second connection interface **6** may be directly attached to second vessel **8** without a port (not shown). In accordance with this embodiment, first connection interface **2** may abut, may be flush mounted or may be surface mounted to first vessel **4** and/or second connection interface **6** may abut, may be flush mounted or surface mounted to second vessel **8**.

[0147] First connection interface **2** and second connection interface **6** are configured to allow for an engagement between first vessel **4** and second vessel **8**.

[0148] FIG. **1**A shows decontamination system **1** of the invention prior to engagement of the connection interfaces **2** and **6**, wherein ambient air AA particles surround the connection interfaces **2** and **6**. FIG. **1**B shows decontamination system **1** of the invention following an engagement between first and second connection interfaces **2** and **6**, respectively. An engagement between first connection interface **2** and second connection interface **6** involves an entrapment of ambient air AA particles present therebetween the connection interfaces **2** and **6**. FIG. **1**C shows decontamination system **1** during external displacement of first and second connection interfaces **2** and **6**, respectively.

[0149] Decontamination system **1** may further comprise a tab **3** positioned on a longitudinal end of first connection interface **2**, and a tab **13** positioned on a longitudinal end of second connection interface **6**. Tabs **3** and **13** are configured to allow for an external displacement of first connection interface **2** and second connection interface **6** with respect to first vessel **4** and second vessel **8**, respectively. The tabs **3** and **13** are configured to be pulled out axially by a user, the axial pulling of the tabs **3** and **13** is configured to allow for a displacement of first connection interface **2** and second connection interface **6** from the first vessel **4** and second vessel **8**, respectively. FIG. **1**D shows decontamination system **1** following external displacement of first and second connection interfaces **2** and **6**, respectively. The herein disclosed decontamination system **1** establishes a hermetically sealed connection of the two vessels which is maintained during the external displacement of the connection interfaces and as long as the vessels remain in contact. In an embodiment of the invention, the engagement between the first and second vessel **4**, and **8**, respectively, results in an ambient air AA particles-free engagement between the vessels. Ambient air AA interfacing the first and second interfaces is entrapped by the engaged first connection interface **2** and the second connection interface **6**. In an embodiment of the invention, the first and second vessels **4** and **8**, respectively are in fluid communication with one another at about the time or after the external displacement of the first and second connection interfaces **2** and **6**, respectively.

[0150] FIG. **2** is a magnified side cut view of the connection interfaces **2** and **6**, and of ports **10** and **11** of vessels **4** and **8**, respectively. The one or both connection interfaces **2** and **6** may include an engagement mechanism in the form of adhesive tapes **15** and **16**, respectively. The adhesive tapes **15** and **16** may be a thin layer of an adhesive film/tape which may be covered, prior to use thereof, by a cover tape (not shown). The herein disclosed system may include, in an alternative embodiment, an adhesive tape, **16** or **15** which may be present merely on one of the interfaces **2** or **6**, respectively. The adhesive film/tape, **15** or **16**, and/or cover tape (not shown) may have a sterilizing or disinfecting substance on the film/tape or on the cover tape.

[0151] Reference is now made to FIGS. **3**A- **3**C which show back cut views of the connection interfaces **2** and **6** attached to ports **10** and **11**, respectively. Connection interfaces **2** and **6** are configured such that, while present, they seal openings **18** and **17** of vessels **4** and **8**, respectively. Openings **18** and **17** may be covered by valve **5** and valve **7**, respectively. Valves **5** and **7** are closed while the interfaces seal the openings **18** and **17** and are opened upon external displacement of the interfaces **2** and **6**, respectively. FIG. **3**A presents ports **10** and **11**, wherein openings **18** and **17** are sealed by the connection interfaces **2** and **6**, respectively. Following engagement of the interfaces (shown in FIG. **3**B), the interfaces may be externally displaced. FIG. **3**C shows the ports **10** and **11** following the external displacement. The ports **10** and **11** are securely engaged with each other and the openings **17** and **18** being uncovered by valves **5** and **7**, respectively and remained as such, allowing fluid passageway and communication between the vessels **4** and **8**.

[0152] FIGS. **4**A-**4**D show top views of connection interface **6** of system **1**. The connection interface **6** presents a rectangular-like shape. FIG. **4**A illustrates the connection interface **6** when positioned along a diameter of port **11** and sealing opening **17** and/or aperture **9**. Aperture **9** is configured to allow the accommodation of connection interface **6** prior to the external displacement. When present, the connection interface **6** seals aperture **9**. FIGS. **4**B-**4**C depict the connection interface **6** during the external displacement. FIG. **4**C depicts aperture **9** resealing at about the time of external displacement of connection interface **6**. FIG. **4**D depicts the connection interface following the external displacement, aperture **9** reseals and opening **17** is exposed enabling fluid flow between vessels **4** and **8**. It is to be noted that aperture **9** may be made of a elastomeric, rubber or plastic material which may facilitate the resealing of aperture **9** at about the time of external displacement of connection interface **6**. It is also to be noted that aperture **9** reseals at about the time of external displacement of connection

interface **6** due to the force of engagement between vessels **4** and **8** or due to the force of engagement between ports **10** and **11**.

[0153] FIGS. **5**A-**5**E present connection interfaces **2** and **6** of decontamination system **1** which further includes a first rail mechanism **12** configured to provide external displacement of first connection interface **2** and a second rail mechanism **14** configured to provide external displacement of second connection interface **6** (shown in FIGS. **5**C-**5**E). FIG. **5**A presents ports **10** and **11** of vessels **4** and **8**, sealed by the connection interfaces **2** and **6**, respectively. A seal (not shown) or cover (not shown) may be disposed between port **10** and first connection interface **2** which keeps the fluid passageway **18** of vessel **4** sealed during and/or after external displacement of connection interface **2**. A seal (not shown) or cover (not shown) may be disposed between port **11** and second connection interface **6** which keeps the fluid passageway **17** of vessel **8** sealed during and/or after external displacement of connection interface **6**. The seal (not shown) or cover (not shown) may be frangible and/or pierceable. FIG. **5**B presents an engagement between the interfaces **2** and **6** and ports **10** and **11**. FIGS. **5**C and **5**D show the ports **10** and **11** during the external displacement of connection interfaces **2** and **6**. Following engagement of the interfaces, the interfaces **2** and **6** are externally displaced, optionally by sliding axially the interfaces along rails **12** and **14**. Aperture **9** is resealed at about the time, prior to or thereafter the external displacement, optionally by a valve (not shown). FIG. **5**E shows the ports **10** and **11** after the external displacement. Aperture **19** is resealed at about the time, prior to or thereafter the external displacement, optionally by a valve (not shown). Apertures **9** and **19** are configured to displace connection interfaces **2** and **6** therethrough while maintaining the hermetic seal between the first vessel **4** and the second vessel **8**. The ports are securely engaged, and the openings **18** and **17** maintain fluid communication between the vessels **4** and **8**. The interfaces may be displaced externally by pulling out tabs **3** and **13**. Accordingly, first connection interface **2** and second connection interface **6** are configured to slide with respect to first vessel **4** and second vessel **8**.

[0154] Reference is now made to FIGS. **6**A- **6**E which illustrate a further exemplary decontamination system **20** of the invention. Decontamination system **20** includes a first connection interface **22** attached to a first vessel **34**, optionally, via a port **30**. Decontamination system **20** further includes a second connection interface **26** attached to a second vessel **24**, optionally, via a port **31**. Decontamination system **20** further comprises an engagement mechanism **23** configured to provide a secure engagement between first vessel **34** and second vessel **24**. Engagement mechanism **23** is shown when located on port **30** of the first vessel **34**. Nevertheless, engagement mechanism **23** may be positioned also on the second vessel **24**, or on both vessels **24** and **34**. Optionally, engagement mechanism **23** may abut a wall of the first vessel **34** and/or of the second vessel **24**. Engagement mechanism **23** includes ratchet teeth mechanism, but other forms of an engagement mechanism are contemplated, such as a thread, a luer, and an adhesive tape. System **20** further includes lock-unlock mechanism **32** and **35** located on first connection interface **22** and second connection interface **26**, respectively. Lock-unlock mechanism **32** and **35** are configured to allow locking and/or engagement of the connection interfaces, such that first connection interface **22** and second connection interface **26** are locked to each other at about the time of engagement thereof or after vessel engagement and are unlocked from any previous connection to ports **30** and **31**.

[0155] It is to be noted that lock-unlock mechanism **32** and **35** may be disposed onto one or both vessels, vessel's ports, or connection interfaces. Lock-unlock mechanism **32** and **35** may additionally, allow locking the connection interfaces **22** and **26** to their respective vessel and unlock thereof at about the time or following engagement of the vessels **34** and **24** and/or connection interfaces **22** and **26** to allow the external displacement.

[0156] FIG. **6**A shows the first and second connection interfaces **22** and **26**, when spaced apart and when ambient air AA particles interfacing therebetween. FIG. **6**B shows the interfaces when attached to each other and wherein AA particles entrapped between the interfaces. FIG. **6**C shows the engagement mechanism **23** which allows a secure engagement between first vessel **34** and second vessel **24**. The engagement mechanism **23** may be twisted and/or pushed downwardly and engage with a complementary thread or teeth or any other mechanism located on second vessel **24**.

[0157] FIG. **6**D shows the connection interfaces **22** and **26** when externally displaced from the vessels **34** and **24**, respectively. Tab **33** allows for an external displacement of first connection interface **22** and optionally also of second connection interface **26**. Tab **33** can be pulled out axially by a user, allowing for a displacement of the connection interface **22** and **26** from the first and second vessels **34** and **24**, respectively. FIG. **6**E shows decontamination system **20** after external displacement of the connection interfaces. The decontamination system **20** establishes a hermetically sealed connection of the two vessels which is maintained during external displacement of the connection interfaces and while the vessels remain in contact. The engagement between the first and second vessels **34**, and **24**, respectively, results in an ambient air AA particle-free engagement, wherein air particles interfacing the first and second interfaces are entrapped by the interfaces. In an embodiment of the invention, the first and second vessels **34** and **24**, respectively, are in fluid communication with one another after external displacement of the connection interfaces **22** and **26** from first and second vessels **34** and **24**, receptively.

[0158] Reference is now made to FIGS. **7**A-**7**D which show a further exemplary decontamination system **40** of the invention. The system **40** includes a first connection interface **42** attached to first vessel **44** and a second connection interface **46** attached to second vessel **54**. The first connection interface **42** may be coupled to, optionally, integrally manufactured with, first vessel **44**. The second connection interface **46** may be coupled to, optionally, integrally manufactured with, second vessel **54**.

[0159] The connection interfaces **42** and **46** further comprise an engagement mechanism in the form of ratchet teeth **43** and **45** positioned on interfaces **42** and **46**, respectively. Engagement mechanism **43**/**45** is configured to provide a secure engagement between the interfaces and to form an airtight seal between the first connection interface and the second connection interface. Other engagement mechanisms that may secure the first connection interface **42** to a second connection interface **46** are contemplated and may include an adhesive that secures the first connection interface **42** to the second connection interface **46** or an indentation that

may secure the connection interfaces. The engagement mechanism **43**/**45** includes a mechanical object in the form of a hook **53**. Hook **53** allows for a simultaneous external displacement of first and second connection interfaces **42** and **45**. Optionally, the hook **53** may be a handle or a tab.

[0160] FIG. **7**A shows the first and second connection interfaces **42** and **46**, when spaced apart and when ambient air AA particles interfacing therebetween the interfaces. FIG. **7**B shows the interfaces when attached to each other via the engagement mechanism **43** and **45** which interlocks the interfaces and allows to entrap the AA between the interfaces **42** and **46**.

[0161] FIG. **7**C shows the connection interfaces **42** and **46** while externally displacing from the vessels **44** and **54**, respectively. Hook **53** allows the user to externally displace first connection interface **42** and second connection interface **46**. Hook **53** can be pulled axially by a user, allowing for a displacement of the connection interfaces **42** and **46**. Decontamination system **40** may further comprise a first rail mechanism **55** on first vessel **44** that is configured to provide external displacement of the first connection interface **42** via a sliding motion. A second rail mechanism **56** configured to provide external displacement of second connection interface **46** via a sliding motion, may be positioned on second vessel **54**. The rail mechanism **55** may be positioned on a port **50** of vessel **44**. Optionally, rail mechanism **55** may abut a wall, may be flush mounted or may be surface mounted to a wall of vessel **44**. FIG. **7**D shows decontamination system **40** after external displacement of the connection interfaces. The decontamination system **40** establishes a hermetically sealed and decontaminated connection of the two vessels which is maintained as long as the connection interfaces are pulled out and while the vessels remain in contact. The engagement between the vessels **44** and **54** results in an ambient air AA particle-free engagement and allows fluid communication therebetween the vessels. In an embodiment of the invention, when first connection interface **42** or second connection interface **46** slides off the first **55** and/or second rail **56** mechanisms, the hermetic connection between the first **44** and second vessels **54** is maintained. In an embodiment of the invention, the first connection interface **42** and the second connection interface **46** externally displace from the engagement between the first **44** and second **54** vessels at or about the same time.

[0162] Reference is now made to FIGS. **8**A-**8**B demonstrating decontamination system **60** comprising a first connection interface **62** attached to port **70** of a first vessel (not shown) and a second connection interface **66** attached to port **71** of a second vessel (not shown). First connection interface **62** may include opposing longitudinal ends **65**. Second connection interface **66** may include opposing longitudinal ends **64**. Ends **65** are entirely concealed within the hermetically sealed connection between the first vessel and the second vessel (shown in FIG. **8**B). Ends **64** are an exterior portion of the connection interface **66** and protrude from upper wall **61** of port **71**. Accordingly, ends **64** are exposed to contaminants. Ends **65** do not protrude from lower wall **63** of port **70** and their portions facing wall **63** are not exposed to contaminants. Accordingly, upon engagement of first connection interface **62** and second connection interface **66** ambient air particles are entrapped between the first **62** and second **66** connection interfaces (shown in FIG. **8**B)

[0163] Reference is now made to FIGS. **9**A-**9**B that illustrate back cut views of yet a further exemplary system **80** that includes a first connection interface **82** coupled to first vessel **81** and second connection interface **86** coupled to second vessel **83**. First rail mechanism **84** is configured to allow the external displacement of first connection interface **82** and second rail mechanism **85** is configured to provide the external displacement of second connection interface **86**. The exterior surfaces of the first connection interface **82** and the second connection interface **86** are about equal in surface area. First connection interface **82** may remain attached to first rail mechanism **84** or to first vessel **81** by a frangible seal or an adhesive. Upon external displacement of first connection interface **82** from first rail mechanism **84** or from first vessel **81** the frangible seal or the adhesive shall break or release the first connection interface **82** from the sealed position on the first rail mechanism **84** or from the first vessel **81**. Alternately, first and second connection interfaces **82** and **86** may remain attached to first and second rail mechanisms **84** and **85** or to first and second vessels **81** and **83** respectively by a frangible seal or an adhesive. Upon external displacement of first and second connection interfaces **82** and **86** from first and second rail mechanisms **84** and **85** or from first and second vessels **81** and **83** the frangible seal or the adhesive shall break or release the first and second connection interfaces **82** and **86** from the sealed position on the first and second rail mechanisms **84** and **85** or from the first and second vessels **81** and **83**.

[0164] Reference is now made to FIGS. **10**A-**10**B that illustrate back cut views of yet a further exemplary system **90** that includes a first connection interface **92** coupled to first vessel **91** and second connection interface **96** coupled to second vessel **93**. First rail mechanism **94** is configured to allow the external displacement of first connection interface **92** and a second rail mechanism **95** is configured to allow the external displacement of second connection interface **96**. The exterior surfaces of the first connection interface **92** and the second connection interface **96** are not equal. In one or more embodiments, the difference in surface area between the exterior surface area of the first connection interface **92** and the exterior surface area of the second connection interface **96** is less than 0.3 inches squared. In one or more embodiments, a portion (not shown) of first rail mechanism **94** may extend over an external portion (facing ambient air particles/contaminants AA) of first connection interface **92** thus preventing first connection interface **92** from falling off of first rail mechanism **94**. In one or more embodiments, a portion (not shown) of second rail mechanism **95** may extend over an external portion (facing ambient air particles/contaminants AA) of second connection interface **96** thus preventing second connection interface **96** from falling off of second rail mechanism **95**.

[0165] Reference is now made to FIGS. **11**A-**11**E that illustrate connection interface **100** that may be attached to, optionally integrally manufactured with, a vessel, which may be a bag **103** (shown in FIG. **11**A), a vial **102** (shown in FIG. **11**B), an infusion line **104** (shown in FIG. **11**C), a syringe **108** (shown in FIG. **11**D), or a filter **110** (shown in FIG. **11**E). A second vessel, such as vial **102**, bag **103**, infusion line **104**, connector **106**, syringe **108**, or filter **110** can attach to connection interface **100** via connection interface **101**.

[0166] FIG. **12** schematically illustrates a vessel which is vial **102** coupled to a plurality of connection interfaces **100**

which can be coupled to connection interface **101** which is attached to infusion line **104**, syringe **108**, bag **103**, connector **106**, and/or filter **110**. The vessel **102** may also be a bag, a bottle or a syringe having a plurality of connection interfaces **100**. The plurality of connection interfaces **100** may be externally displaceable connection interfaces. The vessel **102** may also have a plurality of rail mechanisms (not shown) configured to provide for the external displacement of the plurality of connection interfaces **100**. The plurality of connection interfaces **100** of vessel **102** may abut a wall of vessel **102**, may be surface mounted to vessel **102** or may be flush mounted to vessel **102**. Optionally, vessel **102** may have a plurality of hinge mechanisms (not shown) configured to provide for the external displacement of the plurality of connection interfaces **100** of vessel **102**. Optionally vessels/devices **103**, **104**, **106**, **108** and **110** may have hinge mechanisms (not shown) configured to provide for the external displacement of connection interfaces **101** from their respective vessels/device. Optionally, vessel **102** may have a plurality of connection interfaces **100** that are peelable from vessel **102** and that are configured to engage with a plurality of peelable connection interfaces **101** of vessels/devices **103**, **104**, **106**, **108** and **110**.

[0167] FIGS. **13**A-**13**C shows an exemplary decontamination connector **200** configured for decontaminating a connection between vessels **202** and **204**. The decontamination connector **200** includes a port **206** that can be attached to first vessel **202**. The decontamination connector **200** further includes a connection interface **208** that is configured to cover port **206** of the decontamination connector **200**. Connection interface **208** may be coupled to port **206**. Connection interface **208** may be integrally manufactured with port **206** or may be manufactured separately and connected thereto subsequently in a sterile manner. Connection interface **208** and/or port **206** may be attached to first vessel **202**. First vessel **202** may be a container, device or medical device. Connection interface **208** is configured to displace externally from port **206** of the decontamination connector **200**. Decontamination connector **200** further includes an engagement mechanism **210** in the form of a thread, although alternative forms of engagement mechanisms are contemplated. The engagement mechanism **210** is configured to provide coupling between port **206** and second vessel **204**. The engagement mechanism **210** further provides a secure engagement between decontamination connector **200** and second vessel **204**. Valves **207** and **214** may be disposed within port **206**, or within port **212** (shown in FIG. **14**A) of vessel **204**. The valves **207** and **214** are configured to be closed prior to engagement and external displacement of the connection interface **208** (shown in FIG.**13**). The valves **207** and **214** configured to be opened at about or at the time of engagement and/or external displacement of the connection interface **208** (shown in FIG. **13**C). Opening of valves **207** and **214** may be actuated by a user pushing down on an actuator **624** (shown in FIGS. **20**A-**20**E), or by a twisting/turning motion of vessels in relation to each other. Lock-unlocking mechanism **218** may be disposed onto ports **206** and/or **212** (shown in FIG. **14**A) such to allow unlocking of connection interface **208** from port **206** and connection interface **209** from port **212** (shown in FIG. **14**A) at about the time of external displacement. Lock-unlocking mechanism **218** may additionally or alternatively include a hook **219** which is movable and may release or allow opening of valves **207** and **214**. The hook **219** may actuate the opening of valves **207** and **214**. Valves **207** and **214** may be one-way valves.

[0168] A sealed aperture or valve (not shown) may be disposed between port **206** and connection interface **208** and is configured to allow for the accommodation and external displacement of interface **208**. Optionally, a frangible seal (not shown) may be disposed between port **206** and connection interface **208**. The frangible seal may be breakable or rupturable by applying a force by hand. Optionally, a pierceable seal (not shown) may be disposed between port **206** and connection interface **208**. The pierceable seal may be pierced by a piercing member (not shown) of the connector or by a piercing member (not shown) of vessel **204**. The decontamination connector **200** may further include a rail mechanism **215** positioned between port **206** and interface **208**. Optionally, rail mechanism **215** may be positioned on the decontamination connector **200**. The rail mechanism **215** is configured to provide for the external displacement, optionally via a sliding motion, of the connection interface **208**. Alternatively, interface **208** may be peeled off when external displacement occurs. Interface **208** may be externally displaced via a pulling motion. Optionally, interface **208** may be peeled off via a pulling motion.

[0169] FIG. **13**B shows connector **200** when attached or coupled to bag **202**. The connector **200** may be integrally manufactured with bag **202** or may be manufactured separately from bag **202** and connected thereto subsequently in a sterile manner. The connector **200** may form a unitary structure with the bag **202**. FIG. **13**C shows engagement, via engagement mechanism **210** (shown FIB. **13**B), between the connector **200** and second vessel **204**. The engagement allows for a hermetically coupled connection between decontamination connector **200** and vessel **204**. The connection interface **208** (shown FIG. **13**A) is externally displaced from port **206** (shown FIG. **13**A) while maintaining the hermetically coupled connection between vessel **202** and vessel **204**. The decontamination connector **200** further includes a tab **216** configured to allow for the external displacement of the connection interface **208** with respect to port **206** of decontamination connector **200**. Tab **216** is configured to be pulled axially by a user, the axial pulling of tab **216** is configured to displace connection interface **208** from port **206** while maintaining a hermetic seal between decontamination connector **200** and vessel **204**. Valves **207** and **214** are opened at about the time and/or at the time of external displacement of connection interface **208** allowing fluid passageway between the vessels. While connection interface **208** externally displace, the valves **207** and **214** are activated to be open. Further lock-unlocking mechanism **218** unlocks any connection between connection interface **208** from port **206** allowing the external displacement of connection interface **208**. Optionally, lock-unlocking mechanism **218** may be located on a wall, may abut a wall, may be surface mounted to a wall or may be flush mounted to a wall of vessel **202**.

[0170] FIGS. **14**A-**14**D show steps of connecting first vessel **202** and second vessel **204** in a decontaminated manner using decontamination connector **200**. FIG. **14**A shows decontamination connector **200** when spaced apart from second vessel **204**. Connector **200** may attach to second connection interface **209** which may be coupled to, optionally integrally manufactured with second vessel **204**. Connection interface **209** may be shorter in length than connection interface **208**. Valves **207** and **214** are kept

closed prior to engagement of vessels **202** and **204**. FIG. **14**B shows decontamination connector **200** when attached to second vessel **204**, via second connection interface **209**. Connection interface **209** may cover the entire top surface of port **212** of vessel **204**. Optionally, connection interface **209** may partially cover the top surface of port **212** of vessel **204**. Optionally, connection interface **209** may cover an aperture of vessel **204**. Optionally, connection interface **209** may cover the entire aperture of vessel **204**. Optionally, connection interface **209** may cover at least a portion of an aperture of vessel **204**. The attachment can be mediated via adhesive tape **217** provided onto connection interface **209** or onto a surface of connection interface **208**. The attachment between first connection interface **208** and second connection interface **209** allows to entrap the ambient air AA particles interfacing the connector **200** and vessel **204** and to form an airtight connection between the connector **200** or first vessel **202** and the second vessel **204**. FIG. **14**C shows external displacement of connection interfaces **208** and **209**. Lock-unlocking mechanism **218** releases any connection between interfaces **208** and/or **209** and/or ports **206** and/or **212**, respectively, allowing the external displacement of connection interfaces **208** and **209**. Tab **216** allows for an external displacement of connection interfaces **208** and **209**. Tab **216** can be pulled axially by a user, allowing for a displacement of the connection interfaces **208** and **209**. Alternatively, or additionally, connection interface **208** and/or **209** can be externally displaced via a sliding motion. Valves **207** and **214** are open at about the time of external displacement. FIG. **14**D shows decontamination connector **200** after external displacement of the connection interfaces **208** and **209**. Connector **200** establishes a hermetically sealed and decontaminated connection of the vessels which is maintained when the connection interfaces are pulled out and while the vessels remain in contact. The engagement between the vessel **204** and the connector **200** results in an ambient air AA particle-free engagement and allows fluid communication therebetween two vessels. In an embodiment of the invention, when connection interface **208** displaces externally, the hermetic connection between the connector and/or first vessel and second vessel is maintained.

[0171] FIGS. **15**A-**15**C are back views of connector **200**. FIGS. **15**A and **15**B show the connection interface **208** that may be provided when submerged within port **206**, optionally within aperture (not shown) disposed within port **206** and the connection interface **209** that may be provided when submerged within port **212**, optionally within aperture (not shown) disposed within port **212**. When the external displacement occurs, the apertures (not shown) disposed within ports **206** and **212** respectfully are resealed at during, about the time or prior to external displacement of connection interfaces **208** and **209**, allowing for the hermetically sealed and air tight engagement of the vessels **202** and **204** at about the time or during external displacement of connection interfaces **208** and **209**. FIG. **15**C shows a resealed aperture after external displacement of connection interfaces **208** and **209**.

[0172] FIGS. **16**A-**16**C are side cut views showing a system **300** that includes a first medical vessel **308** attached to a first connection interface **302** and a second medical vessel **304** attached to a second connection interface **306**. A connector **301** which is coupled at opposition ends thereof to a third connection interface **310** and a fourth connection interface **312** is configured to allow the engagement of the vessels **308** and **304** and fluid passage way via a conduit **318** therethrough the vessels. System **300** may further include one or more valves **307** and **320** disposed within conduit **318** of connector **301**. The valves are kept closed prior to the engagement between the vessels **304** and **308** and become open at about the time, during or after external displacement of the connection interfaces. In an embodiment of the invention, the valves **307** and **320** are opened during the external displacement. It is to be noted that valves **307** and **320** may be disposed onto alternative locations, for example, within vessels **304** and/or **308**, and/or ports of said vessels. Lock-unlocking mechanism **322**, **324**, **326** and/or **328** may be disposed to lock the connection interfaces **302**, **310**, **312** and **306**, respectively, prior to engagement of connection interfaces and vessels and unlock thereof at about the time of engagement, allowing the external displacement. The lock-unlock mechanism may allow one or more of: locking the connection interface to a vessel or a port thereof, locking connection interfaces to each other, unlocking connection interfaces to a vessel or a port thereof at the time of or prior to the external displacement, and controlling opening of valves located at the vessels ports. FIG. **16**A depicts system **300** prior to engagement between the vessels **308** and **304**. FIG. **16**B depicts the connector **301** attached at opposing ends thereof to first vessel **308** and second vessel **304**. First connection interface **302** is attached to third connection interface **310** and second connection interface **306** is attached to fourth connection interface **312**. The connection interfaces can be externally displaced, for example, via a sliding motion by axially pulling at least one of tabs **303**, and **314** and at least one of tabs **313** and **316**. FIG. **16**C depicts the engaged vessels **304** and **308** wherein a fluid passageway is provided following the external displacement of the connection interfaces via conduit **318**. The connector **301** is maintained as long as the vessels are to be connected and used for the transfer of fluids. System **300** establishes a hermetically sealed and decontaminated connection between the two vessels **308** and **304** which is maintained during the external displacement of the connection interfaces and as long as the vessels remain in contact. The engagement, results in an AA particles-free engagement between the vessels. Ambient air AA interfacing the first and third connection interfaces **302** and **310**, and the second and forth connection interfaces, **306** and **312**, respectively, is entrapped by the engagement of the interfaces. Engagement between vessel **304** and connector **301** may occur via an engagement mechanism (not shown) on or attached to vessel **304** and/or on or attached to connector **301**. The engagement mechanism may be selected from a thread, a luer, a ratchet teeth mechanism, a snap-on mechanism, a slide-on mechanism, an adhesive mechanism or combinations thereof. Engagement between vessel **308** and connector **301** may occur via an engagement mechanism (not shown) on or attached to vessel **308** and/or on or attached to connector **301**. The engagement mechanism may be selected from a thread, a luer, a ratchet teeth mechanism, a snap-on mechanism, a slide-on mechanism, an adhesive mechanism or combinations thereof. The force of the engagement between connector **301** and vessel **304** maintains a hermetic connection between connector **301** and vessel **304** throughout or during external displacement of connection interfaces **306** and **312** and reseals the connection between connector **301** and vessel **304** prior to or at about the time of external displacement of connection interfaces **306** and **312**. The

force of engagement between connector **301** and vessel **308** maintains a hermetic connection between connector **301** and vessel **308** throughout or during external displacment of connection interfaces **302** and **310** and reseals the connection between connector **301** and vessel **308** prior to or at about the time of external displacement of connection interfaces **302** and **310**.

[0173] FIG. **17** depicts a system **400** which is similar to system **300** in that it includes a first connection interface **402** and a second connection interface **406** each of which may be coupled to a medical vessel of various types such as syringe **408**, vial **407**, bag **403**, filter **405**, or infusion line **404**. The system **400** further includes a connector **401** attached at opposing ends thereof to a third connection interface **401** and a forth connection interface **412**. First connection interface **402** may engage with third connection interface **401** and second connection interface **406** may engage with forth connection interface **412**. The engagement of the interfaces allows to entrap air particles therebetween the interfaces. The interfaces can externally displace allowing a hermetic decontaminated engagement with fluid passageway between the engaged vessels. The connector **401** (positioned in the middle of FIG. **17** between the top and bottom row of vessels) may have a first rail mechanism (not shown) configured to provide for the external displacement of the third connection interface **401** and may have a second rail mechanism (not shown) configured to provide for the external displacement of the fourth connection interface **412**. The first and second rail mechanisms (not shown) of the connector **401** may be positioned on or around the ends or openings of the conduit which is disposed within the connector **401**. The third connection interface **401** may be disposed on and/or between the rails of the first rail mechanism located on the connector **401**. The fourth connection interface **412** may be disposed on and/or between the rails of the second rail mechanism located on the connector **401**. The connector **401** may further comprise at least one or a plurality of engagement mechanisms (not shown) or a retention member (not shown) configured to attach or retain at least one or a plurality of vessels. The engagement mechanism may be selected from but is not limited to a thread, a ratchet teeth mechanism, a snap-on mechanism, an adhesive or a slide-on mechanism. Optionally, the connector **401** may have more than two externally displaceable connection interfaces (not shown) so as to provide contaminant-free engagement between at least three vessels. Optionally, the connector **401** may have more than two rail mechanisms which provide for the external displacement of more than two connection interfaces. In accordance with this embodiment, the connector **401** may be a manifold. In one or more embodiments, the connector **401** may have at least two hinge mechanisms (not shown) that provide for the external displacement of at least two connection interfaces. In one or more embodiments, the connector **401** may have at least one, or a plurality, of peelable connection interfaces.

[0174] FIGS. **18**A-**18**D denote yet a further exemplary system **500** that includes a first medical vessel **502** attached to a first connection interface **510** via port **506**, and a second medical vessel **504** attached to a second connection interface **512** via port **508**. Connection interface **510** is coupled to port **506** of first vessel **502** via a hinge mechanism **514**. Connection interface **512** is coupled to port **508** of second vessel **504** via a hinge mechanism **516**. FIG. **18**A depicts system **500** prior to engagement between the vessels **502** and **504**. FIG. **18**B depicts system **500** wherein the interfaces **510** and **512** attached to each other. FIG. **18**C shows the connection interfaces **510** and **512** while externally displacing from the vessels **502** and **504**. The external displacement is mediated by an axial motion via the hinges **514** and **516**. The connection interfaces **510** and **512** remain attached to ports **506** and **508** of vessels **502** and **504**, respectively, during the external displacement.

[0175] The connection interfaces **510** and **512** may remain attached to hinges **514** and **516**, respectively. The connection interfaces **510** and **512** remain attached to ports **506** and **508** of vessels **502** and **504**, respectively, during the external displacement. The connection interfaces **510** and **512** may firstly move sideways, optionally via a sliding motion conducted through a rail mechanism and thereafter rotates upwards (as shown in FIGS. **18**C and **18**D) or downwards. FIG. **18**D demonstrates the fluid passageway formed after the external displacement. The decontamination system **500** establishes a hermetically sealed apertures and decontaminated connection of the two vessels which is maintained as long as the vessels remain in contact. The engagement between the vessels **502** and **504** results in an ambient air AA particle-free engagement and allows fluid communication therebetween the vessels. It is to be noted that the hinge mechanism may be relevant to any of the herein disclosed connectors and/or connection interfaces and/or decontamination systems.

[0176] Reference is now made to FIGS. **19**A-**19**C that show top views of connection interface **510**. The connection interface **510** externally displaces from its initial location shown in FIG. **19**A to subsequent positions shown in FIGS. **19**B and **19**C, thereby allowing a fluid passageway between vessels. Connection interface **510** rotates sideways by a hinge mechanism **514** which also allows attachment to port **506**. The external displacement in this exemplary embodiment is formed solely by the hinge mechanism. The port **506** may be made of an elastomeric material, a rubber material, a plastic material, or combinations thereof. The airtight/hermetic connection between ports **506** and **508** remains intact via a pressure/force of engagement provided by the engagement between vessels **502** and **504** (shown in FIG. **18**) by an engagement mechanism (not shown). The engagement is not limited to but may be selected from a thread/luer mechanism, ratchet teeth mechanism, an adhesive mechanism, and combinations thereof. Port **506** is resealed at about the time and/or during the external displacement of the connection interface **510** via the hinge mechanism **514** due to the pressure/force of engagement provided by said engagement mechanisms (not shown).

[0177] Reference is now made to FIGS. **20**A-**20**E which illustrate yet a further exemplary decontamination system **600**. Decontamination system **600** includes a first connection interface **610** attached to a first vessel **602** and a second connection interface **612** attached to a second vessel **604**. Decontamination system **600** further includes a piercing member **614** configured to allow for the fluid passageway during or following the external displacement of the interfaces **610** and **612**. Piercing member **614** may be present on first and/or second vessel **602** and **604**, respectively. Piercing member **614** may include any suitable element that is capable of piercing a vessel surface seal **616** present to seal an opening of at least one of vessels **602** and **604**. In an exemplary embodiment, piercing member **614** includes one or more sharp edge(s). In one or more exemplary embodi-

ments, piercing member **614** includes a needle, such as a hollow needle. The piercing member **614** may lock into a final position once piercing a surface of at least one vessel **602** and/or **604**. Optionally, the piercing member **614** may be retractable thus returning to an initial position after piercing a surface of at least one vessel **602** and/or **604**. Vessel surface seal **616** may be a layer, a stopper, a rubber bung or a membrane, or optionally a thin film made of various materials that can be punctured, such as a plastic or aluminum foil. Optionally, vessel surface seal **616** may be frangible. In one or more embodiments, vessel **602** may also have a surface seal (not shown that is pierceable and/or breakable by the piercing member **614** or by a force applied to vessel **602** and/or **604**.

[0178] One or more of valves **607** and **620** may be disposed onto and/or inside port **606** such that the valves **607** and **620** are closed prior to and/or during the external displacement of the connection interfaces **610** and **612**. It is to be noted that similar or other valves, such as valves **607** and **620** may be disposed onto vessel **604**, or port **608** and restrict fluid passageway to the stage that follows the external displacement. The valve **607** and or **620** may be a one-way valve. Valves **607** and **620** may be actuated by valve unlocking mechanism **624** which may be operated externally by a user. Valve unlocking mechanism **624** may be actuated by any of a twisting, a turning, a pushing motion and combinations thereof. In one or more embodiments, valve unlocking mechanism **624** may be also operable to actuate the piercing member **614**. In one or more embodiments, the valve unlocking mechanism **624** may be actuated by the external displacement of connection interface **610** or by the external displacement of both connection interfaces **610** and **612**. In one or more embodiments, the valve **607** and **620** may prevent backflow of fluid from the first vessel **602** to second vessel **604**. It is to be noted that the piercing member and/or the valve unlocking mechanism **624** may be relevant to any of the herein disclosed connectors and/or connection interfaces and/or decontamination systems.

[0179] FIG. **20**A shows decontamination system **600** of the invention prior to engagement, wherein ambient air AA particles surround the connection interfaces **610** and **612**. FIG. **20**B shows decontamination system **600** following an engagement and an entrapment of ambient air AA particles between first and second connection interfaces **610** and **612**, respectively. FIG. **20**C shows decontamination system **600** at about the time and/or during external displacement of first and second connection interfaces **610** and **612**, respectively. FIG. **20**D shows decontamination system **600** following the external displacement. At FIG. **20**E, the piercing member **614** is shown when actuated to pierce an opening sealed by vessel surface seal **616** present on either or both openings of vessels **602** and **604**. Piercing member **614** may be actuated via various mechanisms. For example, piercing member **614** is actuated via a twisting or turning motion, for example, twisting of one or both of the vessels towards the other vessel. For example, piercing member **614** is actuated via a pushing motion of one or both of the vessels towards the other vessel. For example, piercing member **614** is actuated via a twist and push or push and twist actions. In yet a further exemplary embodiment, piercing member **614** is actuated by pressing and/or operating an external button located on one or more of the vessels, and/or by operating a hinge or a rail mechanism. The external button according to this embodiment may be attached to piercing member **614** and pressed downwardly to allow piercing member **614** to puncture vessel surface seal **616**.

[0180] Following the external displacement of the connection interfaces **610** and **612**, piercing member **614** is actuated to pierce vessel surface seal **616** and thereby establish a fluid communication between the vessels **602** and **604**. Piercing member **614** is thus movable from a first position wherein the piercing member **614** is concealed from ambient air particles and disposed within one or both vessels **602** and **604**, to a second position wherein the piercing member **614** is actuated to establish the fluid passageway. Piercing member **614** pierces vessel surface seal **616** at about the time and/or following a hermetic engagement between vessels **602** and **604** or at about the time and/or following a hermetic engagement between connection interfaces **610** and **610**. In an embodiment of the invention, the external displacement releases the piercing member **614** and allows it to move from the first to the second position. . Optionally, piercing member **614** pierces at least one vessel surface seal **616** of vessel **604** and/or a vessel surface seal (not shown) of vessel **602** following external displacement of connection interfaces **610** and **612**. Piercing member **614** may be locked into an initial position by a safety mechanism (not shown) disposed on or within port **606** or on or within vessel **602**. The safety mechanism (not shown) prevents premature movement/activation and/or piercing of the piercing member prior to a hermetic engagement between vessels **602** and **604**. Optionally, the safety mechanism (not shown) may be released or unlocked at or at about the time of engagement of vessels **602** and **604**, at or at about the time of engagement of connection interfaces **610** and **612**, and/or at or at about the time of external displacement of connection interfaces **610** and **612**. It is to be noted that the herein disclosed piercing member, mechanism of action of the piercing member and safety mechanism may be relevant to any of the herein disclosed connectors and/or connection interfaces and/or decontamination systems. In one or more embodiments, the vessel surface seal **616** on vessel **602** and/or vessel **604** may be a frangible seal configured to be ruptured or broken by applying a force by hand to vessel **602** and/or vessel **604** and/or port **606** thus pushing fluid from vessel **602** or vessel **604** through the vessel surface seal **616**.

[0181] Reference is now made to FIG. **21** which is a schematic illustration presenting decontamination system **600** which includes a piercing member **614** that can be actuated by a twist motion. The twist motion may be clockwise or counterclockwise. In an alternative embodiment shown in FIG. **22**, piercing member **614** can be actuated by a downward push motion of an actuator **622**. Following an external displacement, a user pushes downwardly actuator **622** to allow piercing member **614** to puncture vessel surface seal **616** (FIG. **22**). In one or more embodiments, when a piercing member is provided within the system or connector, the click sound, or another sound may alert the user that at least one interface has been pierced and fluid communication established.

[0182] Reference is now made to FIGS. **23**A-**23**D which demonstrate yet a further exemplary decontamination system **700** which includes a first connection interface **710** attached to a first vessel **702** and a second connection interface **712** attached to a second vessel **704**. The connection interfaces **710** and **712** are shown when in a folded position. It is to be noted that either or both connection

interfaces **710** and **712** can be in a folded or unfolded position(not shown). FIG. **23**A shows system **700** prior to engagement between the vessels **702** and **704**. FIG. **23**B depicts system **700** wherein the interfaces **710** and **712** when in a folded position attached to each other and a hermetic connection formed between vessels **702** and **704**. FIG. **23**C shows the connection interfaces **710** and **712** while externally displacing, by peeling off motion, from the vessels **702** and **704**. The vessels **702** and **704** are resealed at about the time or prior to the external displacement. The vessels are hermetically engaged during peeling of the interfaces **710** and **712**. FIG. **23**D shows the connection interfaces **710** and **712** following the external displacement. A hermetic seal between vessels **702** and **704** is maintained by pressure of engagement between both vessels **702** and **704** provided by the engagement mechanism (not shown) on vessel **702** and/or on vessel **704**. Resealing of the aperture or valve (not shown) through which connection interfaces **710** and **712** pass through occurs at about the time or prior to external displacement of connection interfaces **710** and **712** via the peeling motion. Resealing of the aperture or valve is provided by the force of engagement between first vessel **702** and second vessel **704** provided by an engagement mechanism that connects vessel **702** to vessel **704**. The engagement mechanism (not shown) may be a thread, a luer, a ratchet teeth mechanism, a slide-on mechanism, a snap-on mechanism, a clamp rail mechanism, an adhesive mechanism or combinations thereof. In one or more embodiments, the folded position of connection interfaces **710** and/or **712** provides two film layers for each connection interface. In an embodiment of the invention, the folded position may include protrusions **703** and **713** of one of the layers, allowing usage thereof as a tab that can be peeled out to allow the external displacement. It is to be noted that the peeling mechanism may be relevant to any of the herein disclosed connectors and/or connection interfaces. External displacement of the connection interfaces **710** and/or **712** via a peeling off motion may occur between teeth of a ratchet teeth engagement mechanism or between threads of a thread/luer engagement mechanism. The peeling off motion of the connection interfaces **710** and **712** may occur via a pulling motion.

[0183] Reference is now made to FIGS. **24**A-**24**B which schematic illustration of yet a further exemplary decontamination system, wherein a click sound is heard at about the time of engagement of the vessels. In an alternative embodiment, a click sound is heard at about the time of external displacement of the vessels (FIGS. **25**A-**25**B). It is to be noted that the click sound may be relevant to any of the herein disclosed systems and connectors. In an embodiment of the invention, the click sound alerts the user that both vessels have established a hermetic engagement. In an embodiment of the invention, the click sound alerts that one or more valves have been opened. In embodiment of the invention, the click sound alerts that one or more connection interfaces has been externally displaced. In one or more embodiments, the click sound may be another sound. In one or more embodiments, the sound is audible to a user of the system.

[0184] In an aspect of the invention, the present invention provides a method of decontaminating a connection between two vessels, the method comprising the steps of: providing a first connection interface attached to a first vessel; providing a second connection interface attached to a second vessel, engaging the first vessel to the second vessel; and externally displacing the first and second connection interfaces from the engagement between the first vessel and the second vessel, while a hermetically sealed connection between the first and second vessels is maintained.

[0185] In yet a further aspect, the present invention provides a method of decontaminating a connection between two vessels, the method comprising the steps of: providing a first connection interface attached to a first vessel; providing a second vessel; engaging the first vessel to the second vessel; and externally displacing the first connection interface from the engagement between the first vessel and the second vessel, while a hermetically sealed connection between the first and second vessel is maintained.

[0186] In one or more embodiments, the step of externally displacing the first connection interface and the second connection interface occurs via a sliding motion.

[0187] In one or more embodiments, the step of externally displacing the first connection interface and the second connection interface occurs via sliding axially with respect to the first vessel and the second vessel, thereby removing contaminants located between the first and second interfaces.

[0188] In one or more embodiments, an airtight seal is formed between the first connection interface and the second connection interface prior to the external displacement of the first and second connection interfaces.

[0189] In one or more embodiments, the displacement of the first connection interface and the second connection interface is via a rail mechanism, such that the airtight sealed compartment between the first connection interface and the second connection interface slides off the rail.

[0190] In one or more embodiments, when the airtight seal between the first connection interface and the second connection interface is displaced, the connection between the first vessel and the second vessel is decontaminated.

[0191] In one or more embodiments, the airtight seal between the first connection interface and the second connection interfaces slides off the rail while maintaining the hermetically sealed connection between the first and second vessels.

[0192] In one or more embodiments, the step of externally displacing the first connection interface and the second connection interface occurs via peeling.

[0193] In one or more embodiments, the step of externally displacing the first connection interface and the second connection interface occurs via a hinge mechanism.

[0194] In one or more embodiments, the step of externally displacing the first connection interface and the second connection interface occurs at about the same time. In one or more embodiments, the step of externally displacing the first connection interface and the second connection interface occurs at the same time. In one or more embodiments, the step of externally displacing the first connection interface and the second connection interface occurs sequentially.

[0195] In one or more embodiments, the method further comprises connecting the first connection interface to the second connection interface via an engagement mechanism.

[0196] In one or more embodiments, connecting of the first connection interface to the second connection interface occurs prior to externally displacing the first and second connection interfaces from the engagement between the first vessel and the second vessel. In one or more embodiments,

connecting of the first connection interface to the second connection interface occurs at about the time of external displacement of the first and second connection interfaces from the first and second vessels.

[0197] In one or more embodiments, the connecting of the first connection interface to the second connection interface is selected from a twisting of a thread onto a complementary thread, attaching ratchet teeth to a complementary retention member, and adhering a first connection interface to the second connection interface via an adhesive.

[0198] In one or more embodiments, the sealed aperture is a valve. In one or more embodiments, the valve is a one-way valve.

[0199] In one or more embodiments, the sealed aperture reseals at about the time of external displacement of the first and second connection interfaces.

[0200] In one or more embodiments, the sealed aperture reseals prior to detachment of the first and second connection interfaces from the first and second vessels.

[0201] In one or more embodiments, at least one of the first and second vessels is a container. In one or more embodiments, the container is a bag or a bottle. In one or more embodiments, at least one of the first and second vessels is a syringe. In one or more embodiments, the container has a flexible wall.

[0202] Each of the following terms: 'includes', 'including', 'has', 'having', 'comprises', and 'comprising', and, their linguistic, as used herein, means 'including, but not limited to', and is to be taken as specifying the stated component(s), feature(s), characteristic(s), parameter(s), integer(s), or step(s), and does not preclude addition of one or more additional component(s), feature(s), characteristic (s), parameter(s), integer(s), step(s), or groups thereof. Each of these terms is considered equivalent in meaning to the phrase 'consisting essentially of'.

[0203] Each of the phrases 'consisting of' and 'consists of', as used herein, means 'including and limited to'.

[0204] The term 'method', as used herein, refers to steps, procedures, manners, means, or/and techniques, for accomplishing a given task including, but not limited to, those steps, procedures, manners, means, or/and techniques, either known to, or readily developed from known steps, procedures, manners, means, or/and techniques, by practitioners in the relevant field(s) of the disclosed invention.

[0205] Throughout this disclosure, a numerical value of a parameter, feature, characteristic, object, or dimension, may be stated or described in terms of a numerical range format. Such a numerical range format, as used herein, illustrates implementation of some exemplary embodiments of the invention, and does not inflexibly limit the scope of the exemplary embodiments of the invention. Accordingly, a stated or described numerical range also refers to, and encompasses, all possible sub-ranges and individual numerical values (where a numerical value may be expressed as a whole, integral, or fractional number) within that stated or described numerical range. For example, a stated or described numerical range 'from 1 to 6' also refers to, and encompasses, all possible sub-ranges, such as 'from 1 to 3', 'from 1 to 4', 'from 1 to 5', 'from 2 to 4', 'from 2 to 6', 'from 3 to 6', etc., and individual numerical values, such as '1', '1.3', '2', '2.8', '3', '3.5', '4', '4.6', '5', '5.2', and '6', within the stated or described numerical range of 'from 1 to 6'. This applies regardless of the numerical breadth, extent, or size, of the stated or described numerical range.

[0206] Moreover, for stating or describing a numerical range, the phrase 'in a range of between about a first numerical value and about a second numerical value', is considered equivalent to, and meaning the same as, the phrase 'in a range of from about a first numerical value to about a second numerical value', and, thus, the two equivalently meaning phrases may be used interchangeably.

[0207] The term 'about', is some embodiments, refers to ±30% of the stated numerical value. In further embodiments, the term refers to ±20% of the stated numerical value. In yet further embodiments, the term refers to ±10% of the stated numerical value.

[0208] It is to be fully understood that certain aspects, characteristics, and features, of the invention, which are, for clarity, illustratively described and presented in the context or format of a plurality of separate embodiments, may also be illustratively described and presented in any suitable combination or sub-combination in the context or format of a single embodiment. Conversely, various aspects, characteristics, and features, of the invention which are illustratively described and presented in combination or sub combination in the context or format of a single embodiment, may also be illustratively described and presented in the context or format of a plurality of separate embodiments.

[0209] Although the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications, and variations will be apparent to those skilled in the art. Accordingly, it is intended to embrace all such alternatives, modifications, and variations that fall within the spirit and broad scope of the appended claims.

[0210] All publications, patents, and patent applications mentioned in this specification are herein incorporated in their entirety by reference into the specification, to the same extent as if each individual publication, patent or patent application was specifically and individually indicated to be incorporated herein by reference. In addition, citation or identification of any reference in this application shall not be construed as an admission that such reference is available as prior art to the present invention. To the extent that section headings are used, they should not be construed as necessarily limiting.

1. A decontamination system for the engagement of vessels, the system comprising:

a first connection interface attached to a first vessel; and

a second connection interface attached to a second vessel,

wherein said first connection interface and said second connection interface are configured to allow for an engagement between said first vessel and said second vessel, and

wherein said first connection interface and the second connection interface are further configured to externally displace from said engagement between said first vessel and said second vessel while a hermetically sealed connection is maintained between said first vessel and said second vessel.

2. The system of claim **1**, wherein at least one of said first connection interface and said second connection interface is a film, a plastic, or a metal alloy.

3. The system of claim **1**, wherein, upon the engagement between said first vessel and said second vessel, said first connection interface and said second connection interface are configured to slide with respect to said first vessel and

said second vessel, thereby removing contaminants between said first vessel and said second vessel.

4. The system of claim **1**, wherein said first connection interface is configured to seal and/or cover a port of said first vessel and/or a port of said second vessel.

5. The system of claim **1**, wherein the decontamination system results in air particle-free engagement of said first vessel and said second vessel, wherein air particles interfacing said first and second interfaces are entrapped by said first connection interface and said second connection interface.

6. The system of claim **1**, further comprising an engagement mechanism configured to provide a secure engagement between said first vessel and said second vessel.

7. The system of claim **6**, wherein the engagement mechanism is located on the first vessel and/or on the second vessel.

8. The system of claim **6**, wherein the engagement mechanism is located on the first connection interface and/or on the second connection interface.

9. The system of claim **6**, wherein the engagement mechanism is selected from a thread, a luer, an adhesive, and a ratchet teeth mechanism.

10. The system of claim **6**, wherein when upon engagement via the engagement mechanism, an airtight seal is formed between said first vessel and said second vessel.

11. The system of claim **6**, wherein when said first vessel and said second vessel engage via the engagement mechanism a sealed aperture is formed between said first vessel and said second vessel.

12. The system of claim **11**, wherein the sealed aperture is configured to displace at least one connection interface through the sealed aperture while maintaining the hermetically sealed connection between the first vessel and the second vessel.

13. The system of claim **6**, wherein said engagement mechanism is a thread on said first vessel configured to engage a complementary thread on said second vessel.

14. The system of claim **13**, wherein said thread of at least one of said thread and complementary thread is a luer.

15. The system of claim **1**, further comprising a first rail mechanism on said first vessel configured to provide external displacement of said first connection interface and a second rail mechanism on said second vessel configured to provide external displacement of said second connection interface.

16. The system of claim **15**, wherein said first connection interface and said second connection interface are externally displaced via a sliding motion.

17. The system of claim **15**, wherein when said first connection interface and/or said second connection interface slides off said first rail mechanism and/or said second rail mechanism, the hermetically sealed connection between said first vessel and said second vessel is maintained.

18. The system of claim **15**, wherein said first connection interface and said second connection interface externally displace from said engagement between said first vessel and said second vessel at or about the same time.

19. The system of claim **1**, wherein circumferential ends of at least one of or both of said first connection interface and said second connection interface ends are concealed within the hermetically sealed connection between the first vessel and the second vessel.

20. The system of claim **1**, further comprising a tab on at least one of said first connection interface and said second connection interface, the tab configured to allow for external displacement of said first connection interface and said second connection interface with respect to said first vessel and said second vessel.

21. The system of claim **20**, wherein said tab is configured to be pulled axially by a user, the axial pulling of the tab configured to displace said first connection interface and said second connection interface from said first vessel and said second vessel while maintaining the hermetically sealed connection between said first vessel and said second vessel.

22. The system of claim **1**, further comprising a first hinge mechanism on said first vessel configured to provide external displacement of said first connection interface and comprising a second hinge mechanism on said second vessel configured to provide external displacement of said second connection interface.

23. The system of claim **1**, further comprising a piercing member on said first vessel and/or said second vessel configured to pierce a sealed opening of said first vessel and/or said second vessel, thereby allowing fluid passageway between the vessels.

24. The system of claim **1**, wherein an audible sound is emitted when said first vessel engages with said second vessel and/or when said first interface and said second interface are externally displaced.

25. The system of claim **1**, further comprising a locking-unlocking mechanism between said first vessel and said second vessel.

* * * * *