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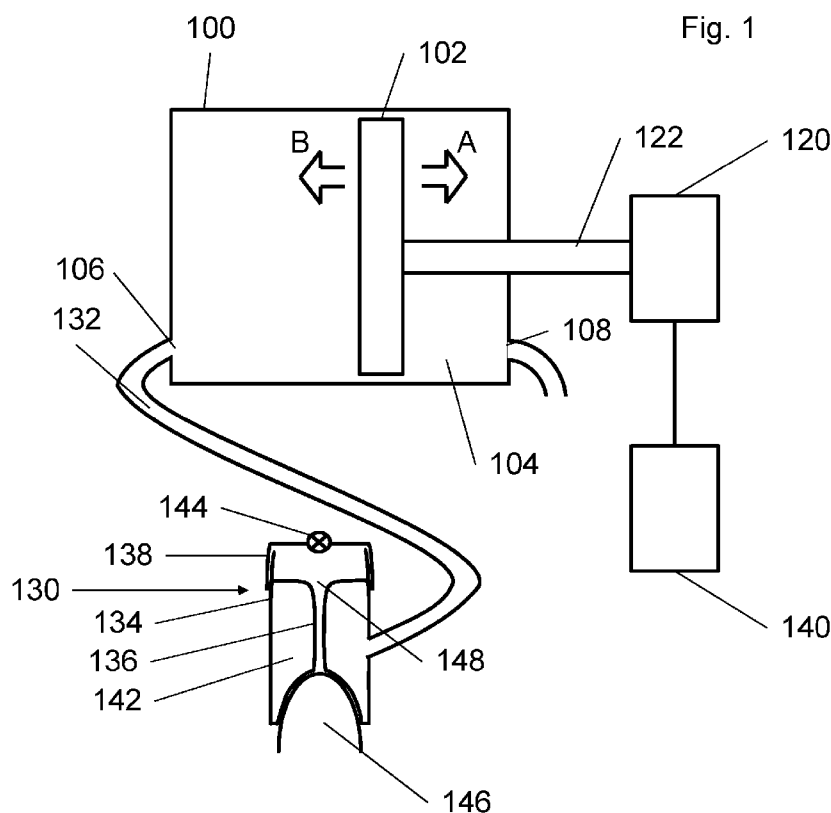
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(57) Abstract: A stimulation device assembly is disclosed comprising a pump and a receiver for receiving a male genital organ, the receiver comprising a flexible inner liner and an outer body including a tubular portion and an end portion, the outer body being adjustable in length, the end portion being attachable to the tubular portion and the inner liner being attachable to the receiver to create an air tight space in fluid communication with the pump.

STIMULATION DEVICE AND METHOD

The invention relates to a stimulation device for example a male genital stimulation device.

A known device is described in US5501650 and comprises a receiver for receiving a male organ including a rigid tubular outer body and a flexible inner liner with a sealed air space between them connected to an external pump. By creating an alternating under and overpressure in the air space the receiver performs a reciprocating motion on the organ. The reciprocation/displacement and rate can be varied by altering the range of pressure variation and rate of pressure variation respectively.

Known systems suffer from various disadvantages. For example known systems are designed to fit one size of organ only—meaning that a wide range of receivers is required; provide a limited stroke variation displacement or rate and do not accommodate additional stimulation accessories.

The invention is set out in the claims. By providing a receiver including an outer body having an adjustable tubular portion and end portion to which a liner is fitted, the tubular portion being adjustable in length, the assembly can be made suitable for various different organ sizes. By providing a pump including outlets to respective accessories in both directions of piston or diaphragm reciprocation, either side of the working chamber can be used and additional functionality can be provided. By providing a pump with a variable pressure or stroke arrangement, the action of the pump can be varied more effectively during operation.

Embodiments of the invention will now be described by way of example with reference to the drawings of which:

Fig. 1 shows a schematic view of a stimulation device assembly according to the claimed subject matter;

Fig. 2a shows the assembly in a first reciprocation position;

Fig. 2b shows the assembly in the second reciprocation position;

Fig. 3 shows the pump assembly in more detail;
Fig. 4 shows a variable crank arm in the pump assembly;
Fig. 5a shows a reciprocating piston in cross section;
Fig. 5b shows the detail of the arrangement of 5a;
Fig. 6 shows the receiver of the assembly in assembled configuration;
Fig. 7 shows the detail of the receiver assembly in cross section;
Fig. 8 shows the entire receiver assembly as assembled in cross section;
Fig. 9a shows a first length of a tubular portion of the receiver;
Fig. 9b shows a second length of a tubular portion of the receiver assembly;
Fig. 10a shows a first assembly stage for the receiver portion;
Fig. 10b shows a second assembly stage for the receiver;
Fig. 10c shows a third assembly stage for the receiver;
Fig. 10d shows a cross section of a detail of the receiver;
Fig. 11 shows pressure variation for different crank angles;
Fig. 12 shows pressure variation at different receiver insertion depths;
Fig. 13 shows a pressure relief sub-assembly for the stimulation device assembly;
Fig. 14 shows the exterior of a pump housing;
Fig. 15 shows a schematic view of a diaphragm pump;
Fig. 16a shows a multi-piece receiver assembly in cross section;
Fig. 16b shows a telescopic receiver assembly in cross section;
Fig. 17 shows pressure variation when a variable expansion vessel system is activated;
Fig. 18 shows a cross section of the receiver with bung;
Fig. 19 shows a cross section of a pulsating inflatable stimulation accessory;
Fig. 20 shows a cross section of a reciprocating phallic simulacrum accessory;
Fig. 21 shows a cross section of a reciprocating phallic simulacrum accessory with protruding relief valves; and
Fig. 22 shows a cross section of a reciprocating phallic simulacrum accessory with pressure operated relief valves.

In overview, a stimulation device assembly such as a male genital stimulation device assembly includes a male organ receiver which has an adjustable length outer body, for example by cutting or telescoping, and a cap assembly. A tubular liner of flexible material

folds on to the receiver to create a pump space hence providing a variable length receiver. The stroke or pressure variation provided by the pump can be adjusted, for example by providing a pressure relief or bleed assembly or variable expansion vessel for normal operation, which can be switched out such that the pressure variation can be rapidly changed to enhance the action of the device. Yet further, where a pump chamber includes a reciprocating diaphragm or similar piston assembly, both halves of the stroke, that is, both sides of the working chamber, can be used to pump air or other fluid to respective assemblies (independently of each other and without performance loss associated with running accessories in parallel on the same side of the pump), such that additional accessories to the receiver can be added.

Referring to Fig. 1, a stimulation device assembly according to an embodiment of the invention can be understood in more detail. The assembly includes a piston pump 100, a drive 120, a receiver 130 and a controller or remote control 140. The piston pump 100 includes a reciprocating piston 102 which can reciprocate in opposing directions A and B in a pump chamber 104. The chamber includes pressure outlets 106, 108 at each side of the chamber such that over/under-pressure can be used in both directions of reciprocation of piston 102.

The piston 102 is driven by a drive 120 which can include for example an eccentric crank arm, in conjunction with a drive rod 122. The pump pressure outlet 106 is in fluid communication via a pipe or other fitting 132 with the receiver 130 which includes a rigid tubular or similarly shaped outer body 134, a flexible liner 136 and a cap 138. The flexible liner 136 and outer body 134 form an airtight space 142 therebetween, which is in fluid communication with the piston pump 100 via fitting 132. As a result the space 142 inflates and deflates with the pressure variation from the pump. The cap 138 includes a valve 144 relieving excess pressure in the space 142 above a male organ 146 received within the inner surface defined by the liner 136. As the air space 142 inflates, the increase in pressure drives the receiver 130 upwardly due to a squeezing action on the male organ 146. As the air space 142 deflates, the receiver reciprocates downwardly on the male organ. This is because of the pressure drop in the airtight space 142 formed above the male organ, which

draws it in. During the squeezing stroke, the one way valve 144 provides release if there is excess air in the space 148.

This can be understood further in Figs. 2a and 2b. Referring firstly to Fig. 2a, as the airspace 142 is inflated, the receiver 130 is driven upwardly on the male organ 146 due to a squeezing action of liner 136, with excess air being relieved through valve 144. When the airspace 142 is deflated as shown in Fig. 2b, a vacuum is created in space 148 above the male organ 146 because the one way air valve 144 is closed, as a result of which the receiver is drawn downwardly on the male organ 146. As discussed in more detail below, the rate of reciprocation can be varied by varying the rate of the pump operation. The stroke length or displacement of the receiver can be varied by altering the pressure variation in the airspace 142. The penetration depth or mean displacement of the receiver, that is to say the position about which it reciprocates, can be altered by adjusting the total amount of air in the system (meaning the air contained between the piston 102 and the flexible liner 136).

Referring now to Fig. 3, the pump and drive assembly can be understood in more detail. Throughout the Figures, like reference numerals denote like parts. In particular, as can be seen from Fig. 3, drive rod 122 drives a piston (not shown) in piston pump 100 as described above. The drive rod in turn is driven by a connector rod 300 connected to a rotating crank arm 302 driven by a motor of any appropriate form (not shown). Hence rotation of the crank arm 302 causes reciprocation of the drive rod 122. The rate of reciprocation is controlled by the rate of rotation of the crank arm 302. The displacement of the reciprocation, that is, the stroke of the drive rod 122, is controlled by the eccentricity of the connector rod 300 on the rotating crank arm 302. This can be seen in Fig. 4 in which the end of the connector rod 300, which is connected to the crank arm 302, that is, end 400, is mounted in a slot 402 in the crank arm 302. The position of the end 400 in the slot 402 can be varied by sliding along the slot and securing it in any appropriate way for example using bolt and nut 404. End 400 can be easily and conveniently accessed via the slot 1404 in the window 1402 of the pump housing 1400 (shown in Fig 14). As a result the stroke of the drive rod 122 can be varied by a continuously variable amount between upper and lower limits by simple adjustment. This also permits compensation for variations in male organ length and diameter by means of changing volume of air/fluid displaced.

Operation of the pump can be further understood with reference to Figs. 5a and 5b. The piston 102 is driven to reciprocate within the chamber 104 of piston pump 100 by drive rod 122. The piston includes opposing seals 500, 502 as can be best seen in Fig. 5b such that an over-pressure or under-pressure is created within the chamber 104 in both directions of reciprocation. As a result pressure outlet 106 can be connected, for example, to the receiver 130 and pressure outlet 108 can either vent to atmosphere or can be connected to an additional fitting for further accessories or stimulation devices driven by pressure variation. It will be noted that any appropriate seal type can be used, for example, opposing V-type seals as shown in Fig. 5b.

A diaphragm pump 1508, shown in Fig. 15, comprises a diaphragm 1500 within a pump chamber 1514. The diaphragm 1500 divides the pump chamber 1514 into two separate halves and is secured at the sides of the chamber by airtight side clamps 1510, 1512. A diaphragm clamp 1506 connects a drive rod 122 to the centre of the diaphragm 1500. The diaphragm 1500 is flexible yet robust such that when the drive rod 122 reciprocates, the diaphragm reciprocates in turn, causing an increase in pressure on one side of the chamber followed by an increase in pressure on the other side of the chamber. Similar to pressure outlets 106, 108 on piston pump 100, the chamber 1514 contains pressure outlets 1502, 1504 to which a receiver 130 or additional accessories such as a pulsating inflatable stimulation accessory 1906 or reciprocating phallic simulacrum 2014 such as a Fleshlight^(TM) can be connected. Thus, diaphragm pump 1508 can be used in lieu of pump piston 100.

The piston pump 100 or diaphragm pump 1500 can be mounted in any appropriate manner. In the preferred embodiment it is mounted in a briefcase or other carrier device and isolated from the carrier, for example by mounting it on a foam base or housing. Fig. 14 shows an example of a housing 1400 for a piston pump 100. This housing comprises a safety guard 1406 with a window 1402 in it. A slot 1404 in the window provides easy access to the crank arm adjustment 404 with a tool without needing to remove the safety guard. To facilitate alignment of bolt & nut 404 into view through slot 1404 to enable crank eccentricity adjustment, keyway 1408 in motor shaft is provided such that adjustment can be made with an appropriate tool. Typically the same tool would then be used to adjust 404.

For space fitting requirements, the motor driving the crank arm can be mounted on an underside of a common chassis with foam housing to provide acoustic isolation. The chassis supporting the components can be a one piece bent metal construction and can provide a tunnel-like structure through which air is drawn to cool the motor or any drive electronics. Because the whole pump unit is isolated mechanically from the case it can be very quiet, and provide improved functionality, packaging, assembly design, simplicity and low cost manufacturing. Additional cooling elements in conjunction with the assembly for example fan cooling can be provided as appropriate. Control of the pump operation by remote control 140 can, for example, be by use of wireless or wired electrical signals providing both switching of the various components and additionally variation of the various parameters including motor speed, any pressure release systems of the type described below and so forth.

The receiver can be seen in more detail in Figs. 6, 7, 8, 9a, 9b, 10a-10c and 10d.

Referring to Fig. 6, the receiver 130 in assembled form can be seen including outer body portion 134, cap 138, pressure inlet/outlet 600 and valve 144.

Referring to Fig. 7, the cap 138 can be seen in more detail. The liner is not shown for clarity. Outer body portion 134 comprises end portion 700 which fits onto the tubular portion 701 and, for example, can be glued or otherwise fitted into place. The end portion 700 includes a flared cylindrical lower end 702 with an outwardly projecting lower annular flange 704 and a frustoconical upper portion 706 including a sealing open-top end 708. As discussed in more detail below, the flexible liner extends from the base of the receiver to the top 708 and then folds back on itself to point 718 of the end portion 700.

As discussed above, a vacuum is created above the male organ when received in the flexible liner, causing a reciprocating motion. To that end, an end cap 710 is fitted over the end portion 700 (with liner 136 attached, not shown) and a seal is formed against the liner 136 via intermediate seal member 712. The intermediate seal member comprises a disc of sealing material such as plastic, PVC, silicone or rubber which fits over and seals to the flexible liner 136 fitted over the end 708 of end portion 700. The seal 712 includes a central

aperture 714 allowing venting to one-way valve 144 as discussed in more detail below. The end cap 710 is a snap fit (alternatively attached with twist lock, screw fit, bayonet fit, friction or any other appropriate means) over the end portion 700, for example by virtue of one or more inward projections 715 on the end cap 710 flexing outwardly, resiliently snapping over an outwardly projecting rib 716 on the end portion 700. The cap also maintains the seal 712 in position and seals against it optionally with an additional seal back up ring 720 comprising a resilient flexible annulus. The end cap 710 further includes a central aperture 722 onto which a one way valve 144 is fitted to permit excess air escape, for example upon insertion of the male organ. The end valve can be of any appropriate form, for example a duck bill valve, but should be suitable for maintaining a vacuum in the space 148 above the male organ, whilst allowing excess air to escape, and preventing ingress of air.

In lieu of end cap 710 and intermediate seal 712, a bung 1800 with pressure release valve 1802 can be used to seal the top of the receiver as shown in Fig. 18. The bung can be of any appropriate shape and made of any suitable material that would form an airtight seal such as plastic, PVC, silicone or rubber.

Referring to Fig. 8 the manner in which the flexible inner liner or sleeve 136 is fitted can be understood better. In particular the liner 136 effectively comprises an elongate, flexible tube, for example of rubber, latex or other appropriate flexible material. Opposing ends 800, 802 are folded over and outwardly, gripping the lower and upper ends of the tubular portion 701 and end portion 700 respectively, forming an airtight seal and hence a closed airspace 142 which can be inflated or deflated via the pressure outlet 600 to the piston pump 100. End 800 of the inner liner 136 is preferably of thickened sections, e.g. double thickness, compared to the remainder in order to provide enhanced sealing around the organ 146, resilience, grip and lifetime, whilst the upper portion is thinner in order to maintain enhanced flexibility.

Variable sleeve or liner diameters can be provided to fit different organ proportions as appropriate and similarly variable lengths can be provided such. Once the liner 136 is fitted over the receiver, the seal 712 and end cap 710 are snap fit over to provide an airtight space

over the male organ when inserted, permitting full operation. Excess pressure in the space 148 above the organ can be vented by one-way valve 144.

Figs. 9a and 9b show the manner in which the tubular portion 701 can be adjusted in length. It can be formed of any appropriate material but is preferably light weight and formed by, for example, one piece plastic injection moulding to reduce the risk of leak paths. Graduation marks can be provided for adjusting the length of the receiver tubular portion 701 such that it can be cut to the desired length before placing the end portion 700 on, which then has a radiused top end 708 to prevent any risk of damaging the liner. The tubular portion 701 also includes a radiused lower end 900 again to avoid damaging the liner or sleeve 136 and an upper rib 902 is provided to guide where the end of the sleeve should be folded to. A similar feature 718 is provided on the end portion 700.

Adjustment of tubular portion 701 can be achieved, for instance, with the aid of a cutting ring that fits tightly over the tubular portion as a cutting guide. Alternatively, the receiver 130 can be telescopic or multi-piece. For example, with reference to Fig. 16a., section pieces 1600 can be added or removed to adjust the length of tubular portion 701. This can be via an adhesive means (e.g. glued), twist lock, bayonet fit, friction or any other appropriate means. With reference to Fig 16b, an example of a telescopic receiver 1610, 1620 is shown. An elongated end portion 1630 accommodates tubular portion 701. The tubular portion 701 can slide inside the elongated end portion 1630, allowing the overall length of the receiver 130 to be adjusted. The receiver can be seen in an extended configuration 1610 and a shortened configuration 1620. The tubular portion 701 may be held in place with a ratchet mechanism or fixed in place via an adhesive means or otherwise fitted into place to create an airtight seal.

As a consequence of length adjustment, prior to folding, the upper end 802 of the liner 136 (rather than the strengthened lower end 800) may need to be cut to length by the user to compensate for any adjustments that have been made to the length of the receiver.

Figs. 10a-10c show the assembly steps in more detail; in Fig. 10a the end portion 700 is fitted onto the tubular portion 701 and glued, press fit, sealed by a ring or maintained in any

other air tight fixed arrangement thereon. In Fig. 10b the liner 136 (not shown) is folded into position with its thickened end 800 folded over the radiused lower end 900 of the tubular portion 701 and the thinner end folded over end portion 700, terminating at 902 and 718 respectively. In Fig. 10c the end cap 710 is then snap fit over to finalise the assembly. The pump line 132 can then be attached to the receiver. It will be noted that manufacture of the tubular portion 701 can be performed in any appropriate manner and can include a draft angle from the longitudinal centre to simplify manufacture.

Referring to Fig. 10d, the cap assembly can be seen in more detail. The end cap 710 can fix to the end portion 700 in any appropriate manner such as snap fitted as described above, twist lock, bayonet fit, friction or any other appropriate means. The end cap 710 can be frustoconical for styling and can include internal ribs 1000 for supporting the seal back up ring 720 against the upper surface of the annular seal 712. The lower face of the annular seal 712 contacts on the sleeve or liner to prevent air entering and is held in place by the end cap 710. The snap fit will not be prejudiced by increased pressure in the space 148 above the male organ because excess pressure can be vented by valve 144. The under surface of the annular seal 712 in the preferred embodiment includes an outer downward cylindrical projection with an angled inner face providing a strong seal against the upper end 708 of the end portion 700 (with the liner 136 in between – not shown), and a downwardly angled centre portion to the aperture 714 providing easy rinsing and cleaning for fluids 713 trapped after use. Because a complete seal is formed with the inside of the cap it is easier to rinse and the central aperture 714 can include a downwardly projecting cylindrical portion 1002 with a central aperture 1006 which can provide grip if manual assembly or disassembly is required. Moreover, the cylindrical portion 1002 is primarily downwardly projecting to encourage any fluid to collect around the aperture 1006, rather than inside it, thus preventing fluid in the receiver from being ejected via valve 144 if an over-pressure is generated in space 148. The central aperture 1006 may be of labyrinth form or contain a mesh, gauze or sponge to prevent fluid leakage. Similar features may be added to bung 1800 (described above).

The liner, or sleeve 136 can be made in any appropriate manner for example by forming from latex or synthetic latex or multi shot moulded with a more sympathetic, optionally

flesh-like, inner liner texture. The thickened section at end 800 can be achieved by a simple double dip, and alternative manufacturing techniques are possible such as injection moulding or otherwise. The liner 136 can include a flared end to facilitate the outward folding operation to grip the lower end of the receiver 134, which is particularly useful given the greater thickness.

Control of the device can be done in the appropriate manner. For example with reference to controller 140 in Fig. 1, this can be remote control or fit to pump housing as appropriate. It can provide control of the speed of the motor and hence the stroke rate, as well as pressure variation by changing the actual pressure or stroke arrangement as described in more detail below, together with additional functionality such as control of accessories and so forth. Additional control can be provided in conjunction with the motor for example to control speed or to provide over-current motor stall protection. Additionally, pre-programmed cycles can be provided including slow to fast to slow speed, gradually ascending speed, variable stroke length and so forth.

In operation, the device is assembled as described above and then put into operation by activating the motor and hence driving the piston back and forth to provide the over/under-pressure as described in more detail above. Additional functionality can be provided in relation to stroke control as shown in Fig. 11. The variation in pressure against crank angle is shown in that Figure and it will be seen that the pressure variation and hence the displacement of the device on the male organ can be varied by increasing or decreasing the crank eccentricity by moving the connecting rod 300 end 404 towards or away from the centre of the crank arm 302 along the slot 402 shown in Fig. 4. As shown in Fig. 14, the crank arm 302 and connecting rod 300 can be adjusted through a slot 1404 in the window 1402 of the pump housing 1400, allowing adjustment without removing the safety guard 1406.

In particular as shown in Fig. 11, with the connecting rod 300 effectively at the centre of the slot 402, pressure variation will be approximately shown as at curve 1100. With reduced eccentricity and movement of the connector rod end 404 towards to the centre of the rotor arm, reduced pressure variation will be shown as at 1102 whereas with increased

eccentricity and movement of the connector rod 300 end 404 towards the outer end of the slot 402 increased pressure variation is provided as shown by curve 1104. At outlet 106, positive pressure is provided on the crank forward stroke and negative pressure on the crank back stroke, with the opposite being true at outlet 108. In addition to varying the reciprocation distance of the device by variation of the crank eccentricity, the depth of insertion of the organ and the force exerted on it can be varied by use of a pressure relief or bypass system or variable expansion vessel as described with reference to Figs. 12 and 13.

As described above, the crank eccentricity is proportional to displacement of the stimulation device receiver about a fixed point on the male organ. However, varying the crank arm eccentricity is difficult to achieve quickly and so an alternative approach is described in which real time variability is provided. According to one embodiment an auto adjusting crank arm or variable linear actuator can be implemented. An alternative approach is shown in Fig. 13 at 1300. In particular, a variable expansion vessel provides a reservoir for pressure variation in addition to the airspace 142 in the receiver itself. As a result less air is received by the receiver, reducing the motion as described above. The manner in which pressure is bled off can be via valve 1310 to an appropriate recipient assembly or variable expansion vessel such as bellows 1318 (in arrangement 1302). The maximum volume of the bellows can be limited with end stop 1301. End stop 1301 may be controlled electronically. Optional return assist spring 1319 helps to expel air from the bellows when the pressure decreases. The valve 1310 is left open in normal operation. When closed at an instance of minimum pressure, the displacement variation in the airspace 142 of the receiver 130 immediately increases providing instant and significant variation in device reciprocation stroke distance.

The effect of closing valve 1310 on pressure with respect to crank angle can be seen in Fig. 17. During normal operation illustrated by line 1702, valve 1310 is left open. As the piston 102 pushes air through outlet 106, the increase in pressure is gradual as air is initially taken in by bellows 1318 due to the fact that the bellows are less able to resist pressure change than airtight space 142. Once the bellows 1318 are at full capacity, the airtight space 142 within the liner 136 begins to fill. However, due to the volume of the bellows 1318, there is a small change in total pressure resulting in a small variation in device reciprocation stroke

distance. If the maximum capacity of the bellows is reduced, by tightening the adjustable end stop 1301, the pressure and therefore device reciprocation stroke distance will increase, as described by line 1700. When valve 1310 is closed at an instance of minimum pressure, the reciprocation stroke distance will reach a maximum, as illustrated by line 1704. Thus, closing valve 1310 provides instant and significant variation in device reciprocation stroke distance.

Optionally, the opening and closing of valve 1310 may be dependent on the position of the piston 102. A crank position sensor 1330, which senses the position of the crank arm, which is directly correlated to the position of the piston 102, may be used to determine the position of the piston 102. Alternatively, the opening and closing of valve 1310 may be dependent on position sensors 1332 which determine the degree of inflation of the bellows 1318.

Mean depth of insertion of the organ 146 is determined by the total amount of air present in the cavity between the piston 102 and liner 136 (that is to say the number of moles of air confined between the piston 102 and liner 136 and all intermediate components such as the pump line 132 or bellows 1318). Consequently, mean depth can be varied by increasing or decreasing the amount of air. Increasing the amount of air can be achieved with assembly 1304. When solenoid valve 1314 is opened, air enters via one way valve 1320. Decreasing the amount of air in the system can be achieved with assembly 1305. When solenoid valve 1315 is opened, air exits via one way valve 1321. The benefit of using one way valves 1320, 1321 is that they can be opened at any stage in the pumping cycle. In effect, therefore, this varies the depth of insertion of the organ 146 in the receiver instantly, again providing improved functionality.

The effect of increasing and decreasing the total amount of air in the device can be seen in Fig. 12. Ordinarily, the system pressure with respect to crank angle varies according to line 1200. Upon opening solenoid valve 1314, when the pressure drops below 1 atm, air enters the cavity between the piston and liner. As the valve is a one way value, the total amount of air trapped in the device increases. As a result, on the forward stroke of the piston, the peak pressure is greater and therefore the receiver 130 is driven further up the male organ 146.

This corresponds to line 1202. Conversely, upon opening solenoid valve 1315, when the pressure rises above 1 atm, air exits the device. Minimum pressure is reduced and receiver 130 is drawn further downward onto the male organ 146. This corresponds to line 1204. Note that the total reciprocation distance of the receiver remains broadly unaffected and only the mean position of reciprocation changes.

As described above, in relation to Figs. 5a and 5b in particular, by using a reciprocating piston 102 with dual outlets for each stroke direction, 106, 108, both the forward and reverse stroke of the piston can be used to drive accessories. In the embodiment shown, the forward stroke is used to drive the receiver liner but of course this can be reversed. The back stroke can be used, for example to drive another “pulsating” device, for example a massage or insertable accessory for stimulation of other zones or organs, or for dual use.

In Fig. 19 a cross section of one such accessory, a pulsating inflatable stimulation accessory 1906, is shown. The accessory is connected to one of the pressure outlets 106, 108 via an inlet 1900 attached to a body 1902. The body 1902 can be formed of any appropriate material but is preferably light weight and formed by, for example, one piece plastic injection moulding to reduce the risk of leak paths. Balloon 1904, which is designed to be inserted into an orifice of the body, inflates and deflates in accordance with increases and decreases in pressure. The balloon is made from a flexible yet strong material, such as rubber or latex, so that it is able to inflate freely without bursting or being easily ruptured.

In Fig. 20 a cross section of another accessory, a reciprocating phallic simulacrum 2014, sometimes known as a dildo, is shown. A chamber 2012 is connected to one of the pump pressure outlets 106, 108 via an air inlet 2000. A plunger 2010 is connected to a plunger seal 2002 at one end. The plunger seal 2002 is designed such that it prevents air entering or escaping the system, yet allows the plunger 2010 to slide freely inside the chamber 2012. The opposite end of the plunger 2010 is connected to a phallic simulacrum 2008. The phallic simulacrum 2008 may be detachable such that it can be easily replaced or substituted. The exterior of the chamber may optionally include a handle 2004 or a mounting connector 2006 for connection to a stand or similar. As the pressure at the outlets 106 or 108 varies, an over/under-pressure is created inside the chamber 2012. As the plunger 2010 is free to

slide within the chamber 2012, it reciprocates within the chamber in response to the changing pressure, causing the phallic simulacrum 2008 to reciprocate in turn.

Depending on the starting position of the piston 102 of pump 100 and the starting position of the plunger 2010, it is possible that on the first stroke of the pump 100, the plunger 2010 will hit one of the ends of the chamber 2012 (bottom out). This may cause the pump 100 to stall and cut out or overheat. This will happen when the pump piston 102 and the plunger 2010 are not synchronised. One method of overcoming this issue is to place a sensor in the chamber 2012. This sensor senses the position of the plunger 2010 by sensing a magnet in the plunger 2010, or by any other appropriate means. When the plunger reaches an end the chamber 2012, the pressure in the system is relieved, for example, via one way valve 1321 by opening solenoid valve 1315.

Alternatively, mechanical feedback means may be used to adjust the pressure to prevent the pump 100 from cutting out or overheating. With reference to Fig. 21, a reciprocating phallic simulacrum with protruding valves can be seen in two extreme configurations 2110, 2120 (where the plunger 2010 has bottomed out) and an intermediate configuration 2100. A system of protruding valves (an inlet protruding valve 2102 allowing air into the system and an outlet protruding valve 2101 allowing air out of the system) relieve an under-pressure or over-pressure should the plunger 2010 bottom out. The ends of the protruding valves 2101, 2102 protrude outwards from the plunger 2010 and will touch their respective ends of the chamber 2012 before the plunger 2010 does. This is shown in configuration 2110 and 2120. If this happens, it will open the valve from the valve seat and allow air past as indicated by the dashed arrows 2111, 2121. Thus, on the forward stroke of the pump 100, air may be let out of the system (via outlet protruding valve 2101 and an air inlet/outlet 2103 in the end of the chamber 2012, as shown in configuration 2120) and on the back stroke air is let into the system (via inlet protruding valve 2102 and air inlet/outlet 2103, as shown in configuration 2110). The protruding valves 2101, 2102 can have conical, flat or spherical seats and be spring assisted shut. By relieving an over/under-pressure the pump 100 can continue to turn and the pump 100 and plunger 2010 will synchronise in direction.

In another embodiment, with reference to Fig. 22, pressure operated valves (an inlet pressure operated valve 2201 allowing air into the system and an outlet pressure operated valve 2202 allowing air out of the system) may replace the protruding valves 2101, 2102. Typically, the pressure operated valves 2201, 2202 are ball on seat type, with a spring (not shown) to hold them shut. However, there are many different valves that could be used such as reed valves, conical valves or umbrella valves. In an under-pressure situation the inlet pressure operated valve 2201 allows air into the system. In an over-pressure situation the outlet pressure operated valve 2202 allows air out of the system.

Note that the inlet pressure operated valve 2201 and/or outlet pressure operated valve 2202 could also be fitted to the body of the chamber 2012; to a hose connected to the air inlet 2000 or near the pump 100.

The remote control 140 for the stimulation device can be integrated into the outside of the chamber 2012, handle 2004 or mounting connector 2006 of the reciprocating phallic simulacrum 2014, or have a clip feature so that it can be attached/removed from the reciprocating phallic simulacrum 2014. There can also be a vibrating element within the phallic simulacrum 2008 which can be activated by the remote control 140.

As described above, with reference to Fig. 17 in particular, the reciprocation or expansion of accessories can be controlled by providing an inline variable expansion vessel which acts as a reservoir for pressure variation. Similarly, with reference to Fig. 12 in particular, the mean position of displacement or mean expansion of an accessory can be controlled by increasing or decreasing the total amount of air contained between the pump and accessory.

In a further embodiment, operation of the device, including rhythm, stroke, rate, depth and so forth can be varied based on external circumstances such as an image or show being watched by the user. For example when a stimulating movie or video is watched, using screen motion detection software and/or sound recognition, code can be written that would detect and recognise rhythmic motion and/or sound. As a result rhythmic acts such as rhythmic sexual acts can be viewed on electronic devices such as TVs, phone screens, VR display/headset or laptops etc and the rhythm or intensity can be transferred to drive the

device described herein at the same speed/with the same rhythm or intensity as the viewed act thus enhancing the user's experience, for example based on repetition rate or sound volume, to control a parameter of the stimulation motion. For example the stimulator motion may be to the receiver, dong, syringe, balloon, or any other accessory and the parameter may be frequency, rhythm, amplitude, rotation, inflation etc.

Any appropriate motion detection software can be used for example relying on data derivable from MPEG coding or otherwise and the software may be written into a program or app on any compatible device to detect the motion or sound and output it as a usable signal. This signal may change in amplitude, frequency or intensity as a result of the speed or amplitude of the detected rhythmic motion or sound or both. For example, the faster the detected rhythmic motion or sound the more intense or higher amplitude or frequency the signal may become.

The output signal from the screen device may be transferred to the device described herein by cable, Bluetooth or WiFi or any other wired or wireless means and the device as described herein will interpret the output signal and correlate the output speed or stroke of its motor, setting operation speed of the receiver unit or other accessory such that it now can operate at the same interpreted speed, or a derivative thereof, as the viewed act.

It will be appreciated that the various components can be made from any appropriate material and using any appropriate manufacturing process. For example an electric motor can be used to drive the crank and any appropriate dual operation piston and valve assembly can be implemented in any appropriate manner. The electrical and hydraulic connections can be performed using conventional components as desired. The receiver components can be formed of any appropriate rigid or flexible material as appropriate, and manufactured in any appropriate manner.

It will be appreciated that the approach as described herein can be applied to any suitable stimulation device and accessory as appropriate.

Claims:

1. A stimulation device assembly comprising a pump and a receiver for receiving a male genital organ, the receiver comprising a flexible inner liner and an outer body including a tubular portion and an end portion, the outer body being adjustable in length, the end portion being attachable to the tubular portion and the inner liner being attachable to the receiver to create an air tight space in fluid communication with the pump.
2. An assembly as claimed in claim 1 further comprising a cap which is fit over the end portion.
3. An assembly as claimed in claim 2 further including a seal between the cap and end portion.
4. An assembly as claimed in claim 3 in which the seal comprises an aperture with an outer downward cylindrical projection.
5. An assembly as claimed in claim 4 in which the aperture is of labyrinth form.
6. An assembly as claimed in claim 4 or 5 in which the aperture contains a mesh, gauze or sponge.
7. An assembly as claimed in any preceding claim in which the cap further comprises a one way valve permitting pressure relief.
8. An assembly as claimed in any preceding claim in which the liner comprises an elongate flexible tube outwardly foldable at respective ends to form an air tight seal with the outer body.
9. An assembly as claimed in claim 8 in which one or both ends of the tube are thickened relative to the centre.

10. An assembly as claimed in any of claims 8-9 in which the tube is multi shot moulded.
11. An assembly as claimed in any preceding claim in which the tubular portion is telescopic or multi-piece.
12. An assembly as claimed in any preceding claim in which the pump is driven by a crank arm of continually variable eccentricity.
13. An assembly as claimed in any preceding claim in which the pump includes a double-acting piston or double-acting diaphragm in a chamber having one or more pressure outlets on either side of the piston or diaphragm.
14. An assembly as claimed in any preceding claim further comprising a variable pressure or stroke arrangement.
15. An assembly as claimed in claim 14 in which the arrangement comprises a switchable pressure relief path.
16. An assembly as claimed in claim 15 in which the pressure relief path comprises a variable expansion vessel.
17. An assembly as claimed in claim 16 in which the variable expansion vessel comprises bellows.
18. An assembly as claimed in claim 16 or 17 in which the variable expansion vessel is spring assisted.
19. A method of assembling a stimulation device comprising adjusting a length of a tubular body, fitting an end portion to the tubular body, fitting a liner to the tubular body and end portion to create an air tight space therebetween and fitting a cap over the liner and end portion to create an air tight seal.

20. A receiver for an assembly as claimed in any of claims 1 to 18.
21. An assembly as claimed in any of claims 1 to 18 further comprising an accessory attached to the pump.
22. An assembly as claimed in claim 21 wherein the accessory is a pulsating inflatable stimulation device comprising a body with an air inlet and a balloon.
23. An assembly as claimed in claim 21 wherein the accessory comprises a chamber with a reciprocable plunger and a phallic simulacrum or other accessory attached thereto.
24. An assembly as claimed in claim 23 wherein the reciprocable plunger comprises one or more pressure relief valves.
25. A pump for a stimulation device assembly comprising a pump chamber and a displacement member in the chamber arranged to create an overpressure in each of a first and second direction of reciprocation, the chamber including a pressure outlet for overpressure in each direction of reciprocation, for connection to a respective accessory.
26. A pump as claimed in claim 25 in which the displacement member comprises a reciprocating piston or diaphragm.
27. A stimulation device assembly including a pump as claimed in claim 26.
28. A pump for a stimulation device assembly comprising a pump chamber including a pressure outlet for overpressure and a variable pressure or stroke arrangement.
29. A pump as claimed in claim 28 in which the variable pressure or stroke arrangement comprises a switchable pressure relief line.

30. A pump as claimed in claim 29 in which the switchable pressure relief line includes a closable valve and a variable expansion vessel.
31. A pump as claimed in any of claims 28-30 in which the variable pressure or stroke arrangement comprises an automatically adjustable crank length assembly.
32. A pulsating inflatable stimulation device comprising a body with an air inlet and a balloon.
33. A stimulation device comprising a pressure chamber with a reciprocable plunger movable dependent on pressure variation in the chamber and a phallic simulacrum attached thereto.
34. A stimulation device including a pump as claimed in any of claims 25, 26 and 28-31.
35. A stimulation device comprising a switchable pressure relief line comprising a closable valve.
36. A stimulation device comprising a switchable pressure relief line comprising a variable expansion vessel.
37. A stimulation device comprising a stimulation motion element, the device further comprising a signal reception means for receiving an external signal representative of a parameter of motion of the stimulation motion element, the signal being derived from an audio and/or visual signal.
38. A device as claimed in claim 37 in which the signal is derived from a viewed moving image.
39. A device as claimed in claim 37 in which the stimulation motion element comprises at least one of a receiver for receiving a male genital organ and means for creating reciprocating motion between the receiver and the organ;

a syringe, a balloon, and phallic simulacrum.

40. A device as claimed in claim 37, 38 or claim 39 further comprising a computer readable medium for deriving the external signal and communicating it to the device.

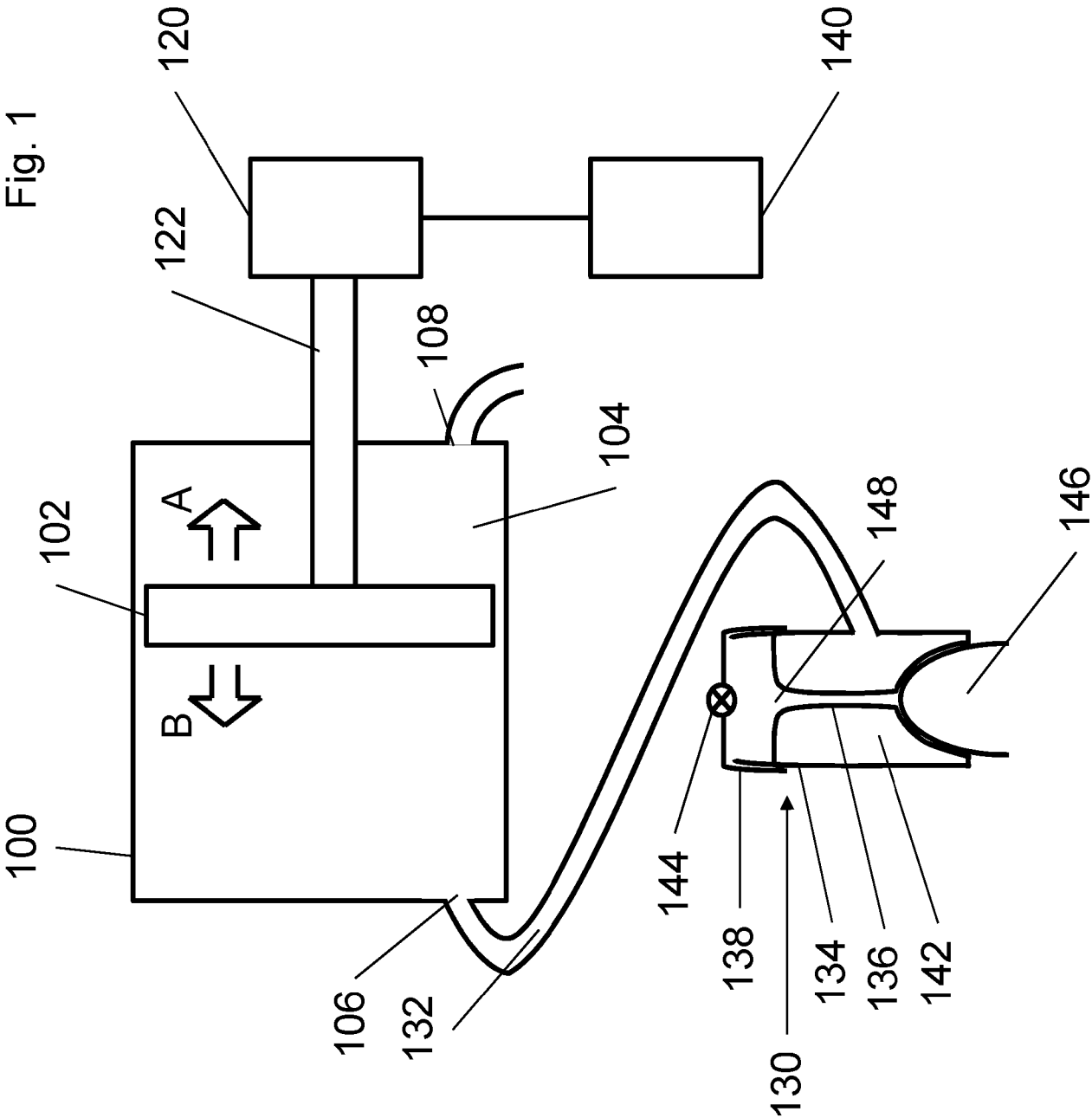
41. A method of operating a stimulation device comprising a stimulation motion element and means for creating motion of the stimulation motion element the method comprising receiving an external signal derived from an audio or visual signal and controlling motion of the device based on said signal.

42. A method of adjusting the stroke of a crank connected to an eccentric arm in a stimulation device having a housing and a housing aperture comprising accessing a crank end to advance the crank for adjustment of a stroke adjustment function with said aperture.

43. A computer readable medium comprising instructions for executing a method of claim 41.

44. A stimulation device comprising a switchable pressure relief line including a pump as claimed in any of claims 25, 26 and 28-31.

45. A method or apparatus substantially herein described with reference to the Figures.



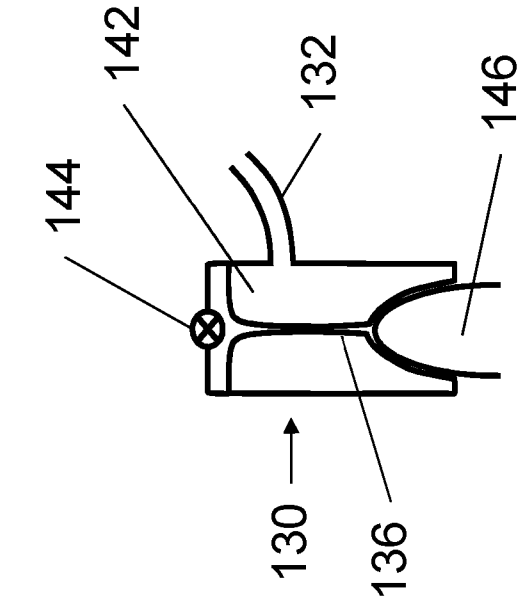


Fig. 2a

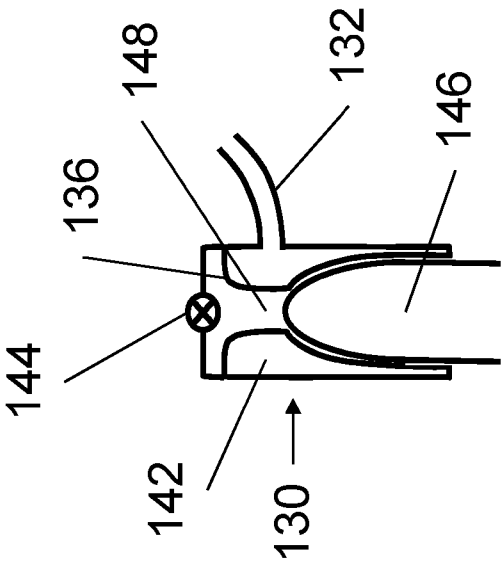


Fig. 2b

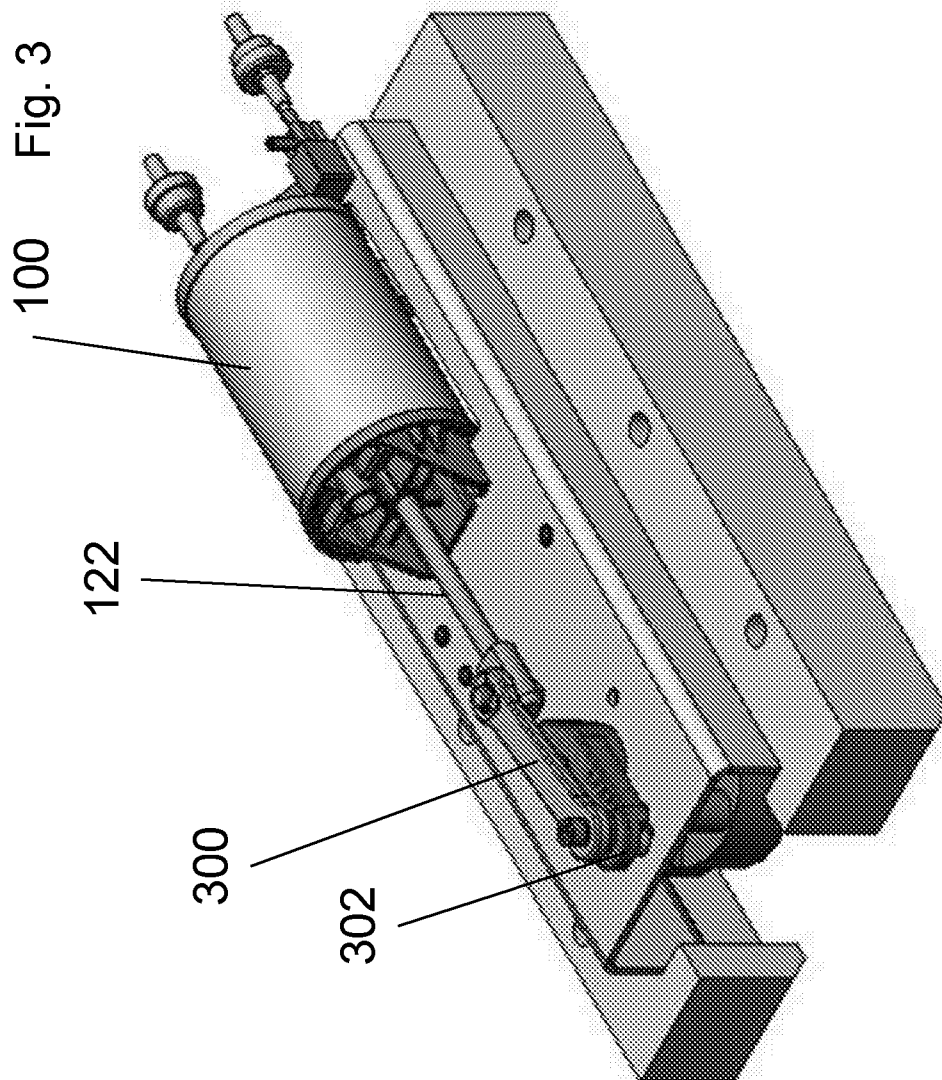
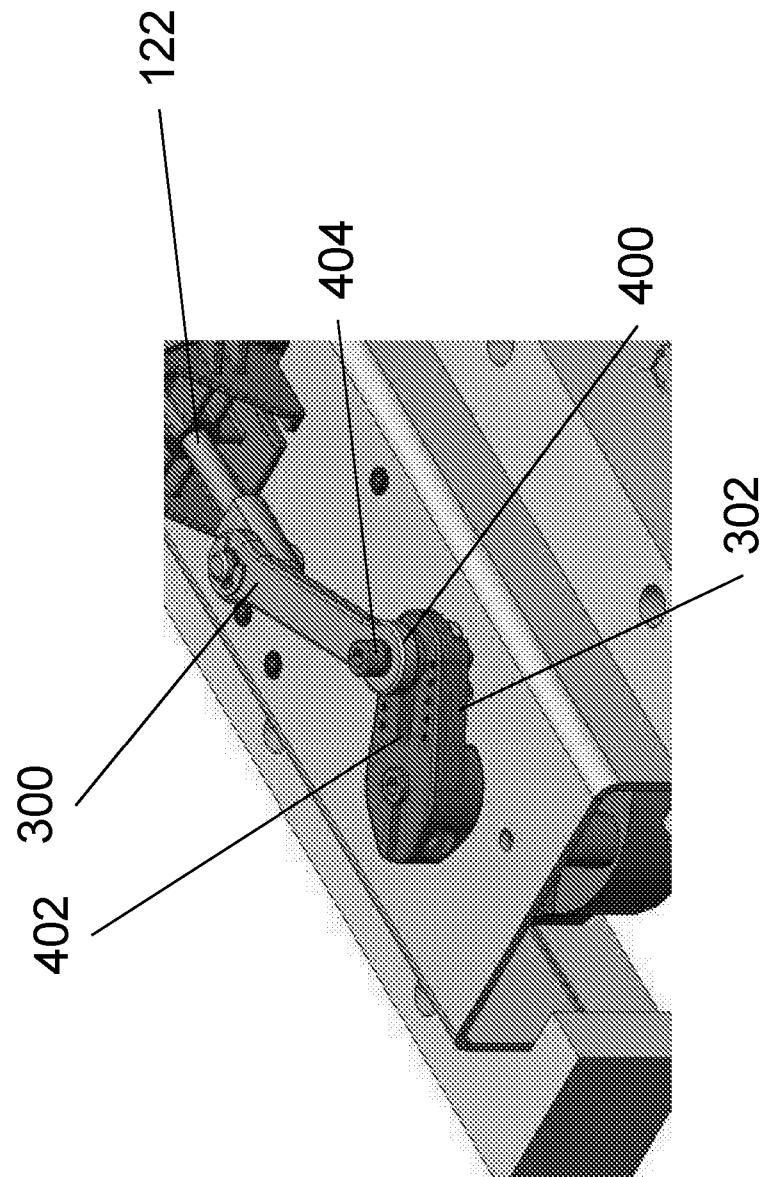


Fig. 4



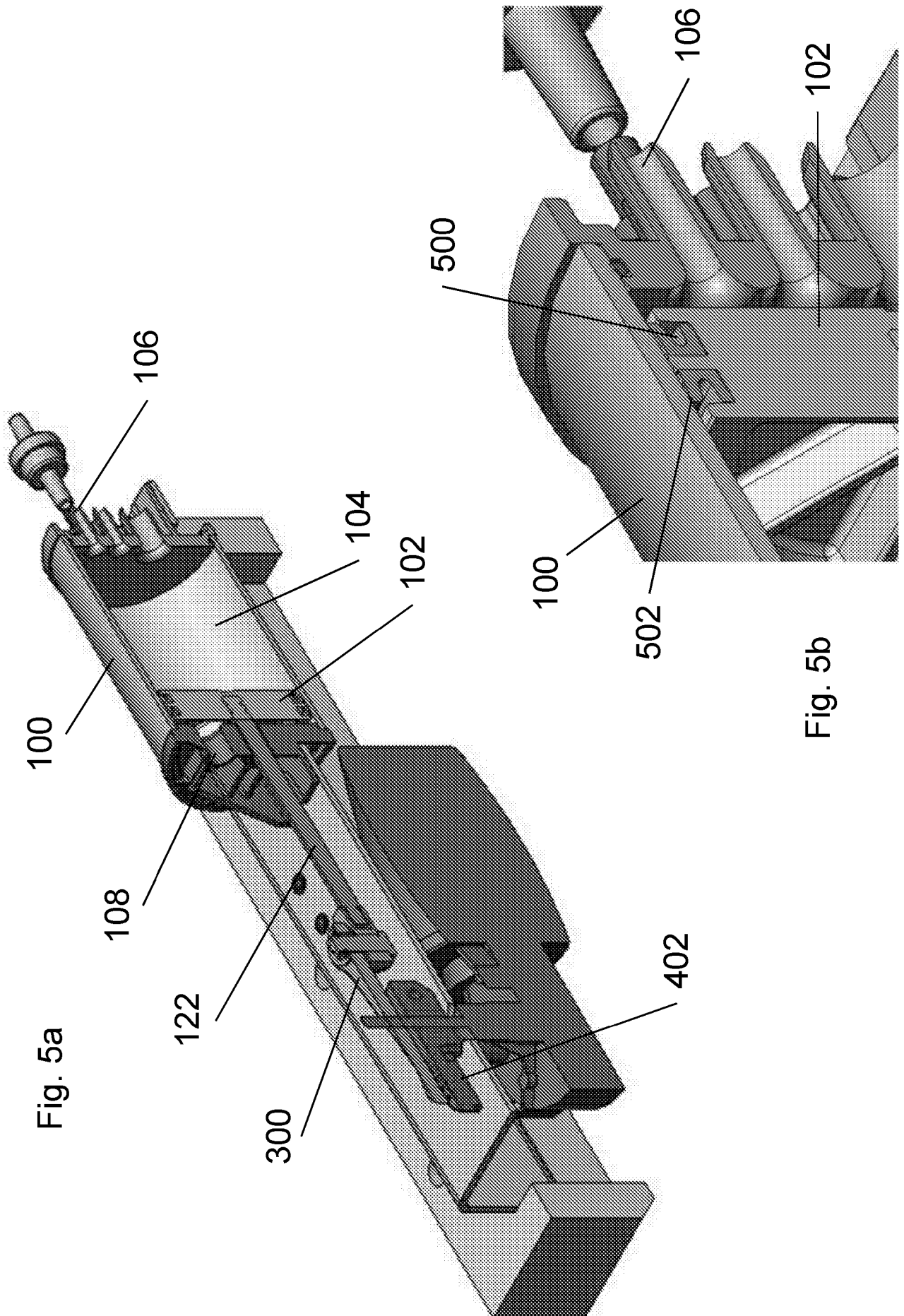


Fig. 5a

Fig. 5b

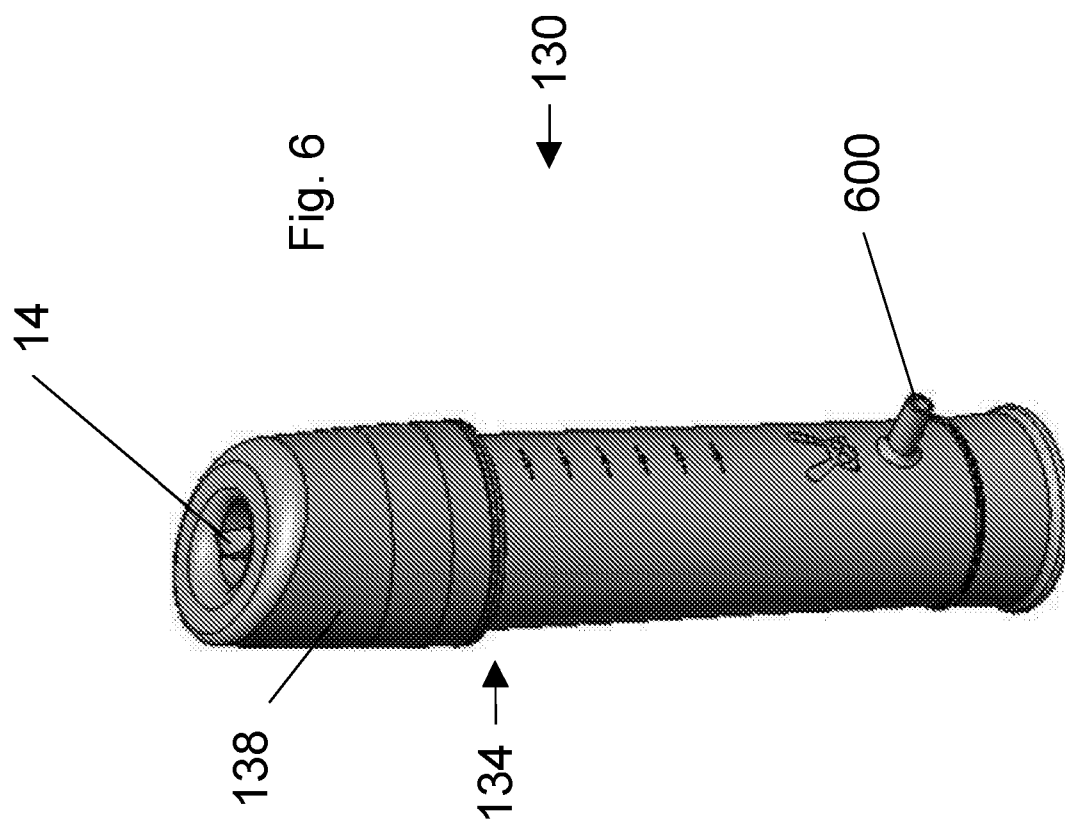
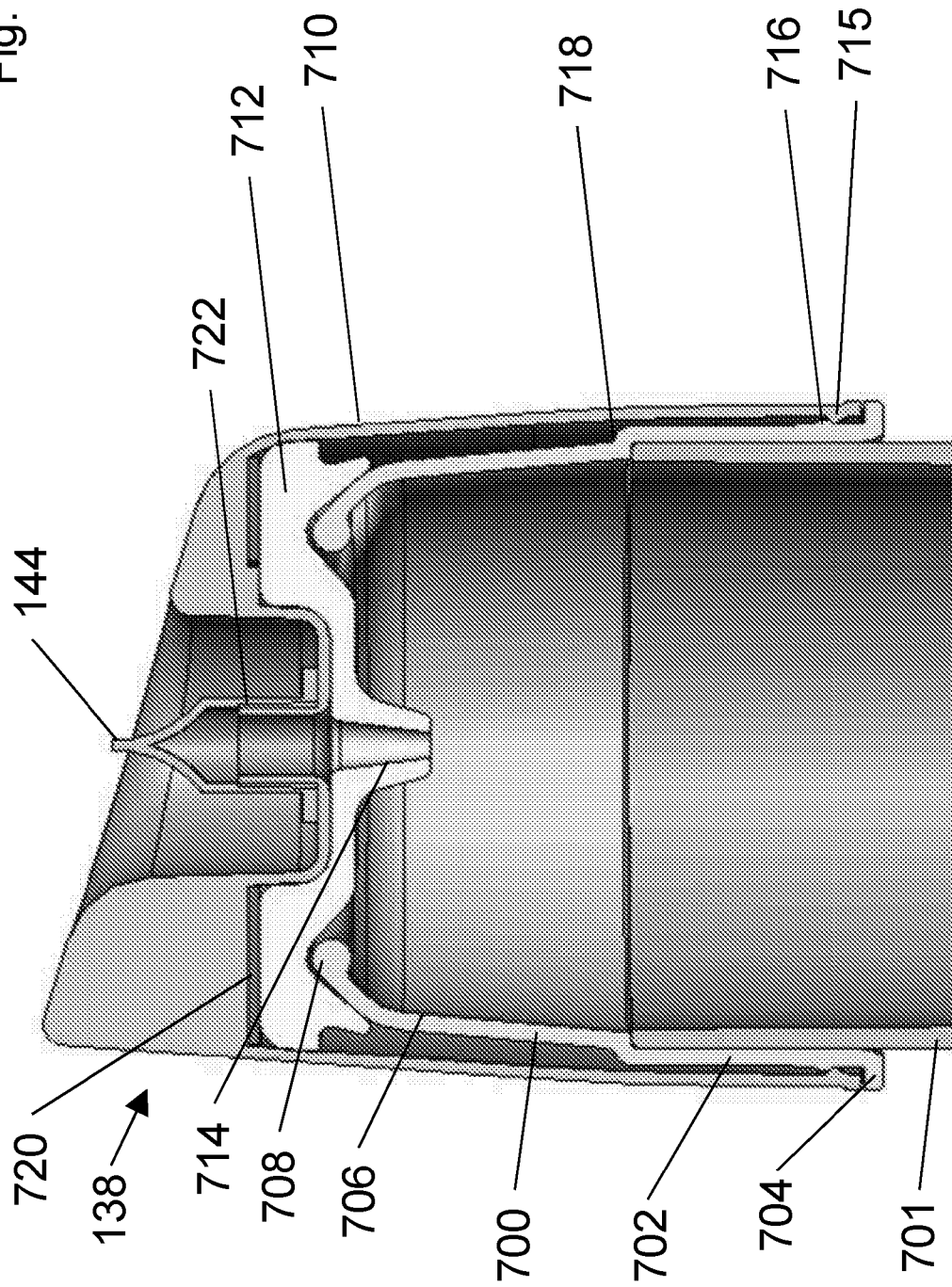


Fig. 7



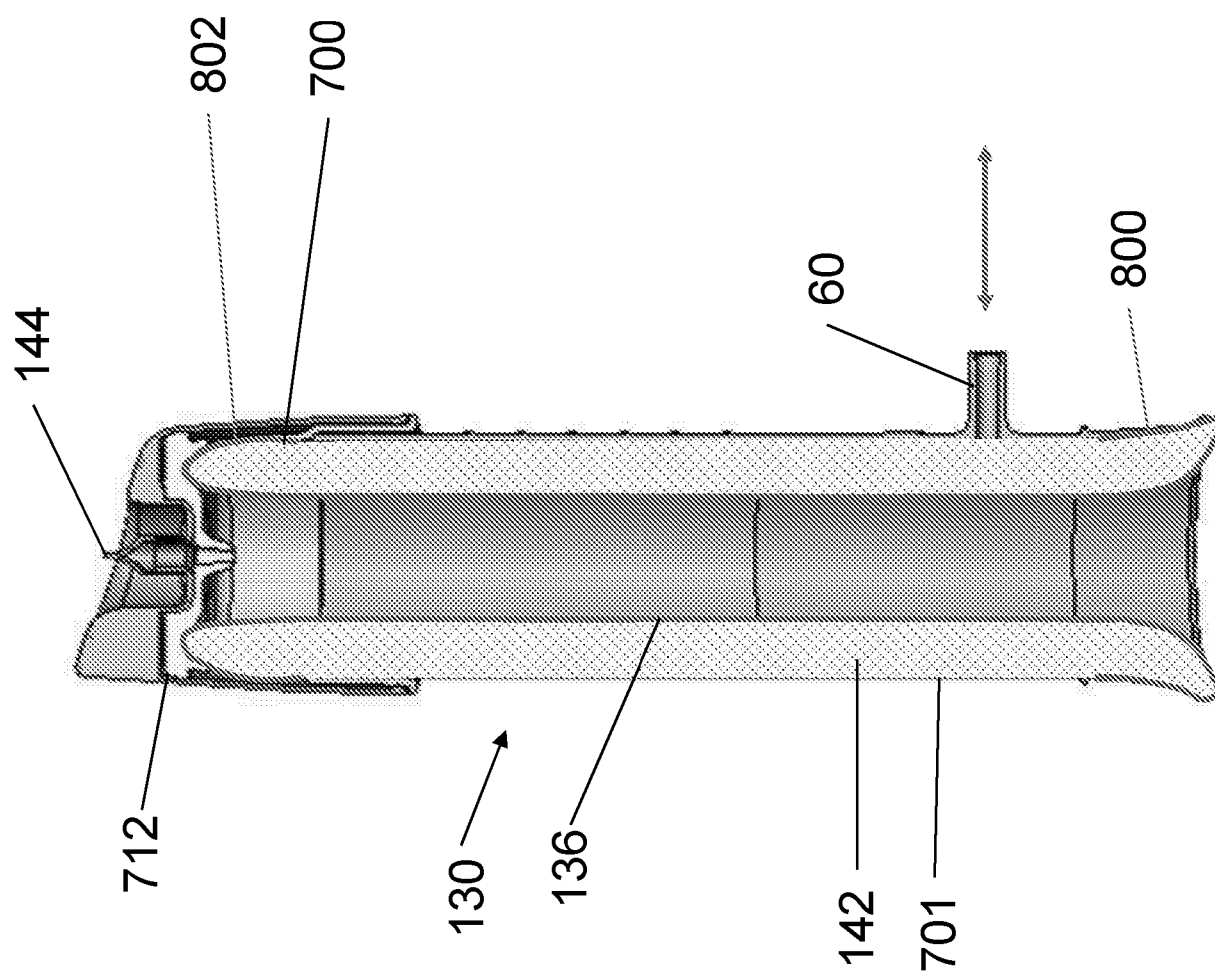


Fig. 8

Fig. 9a

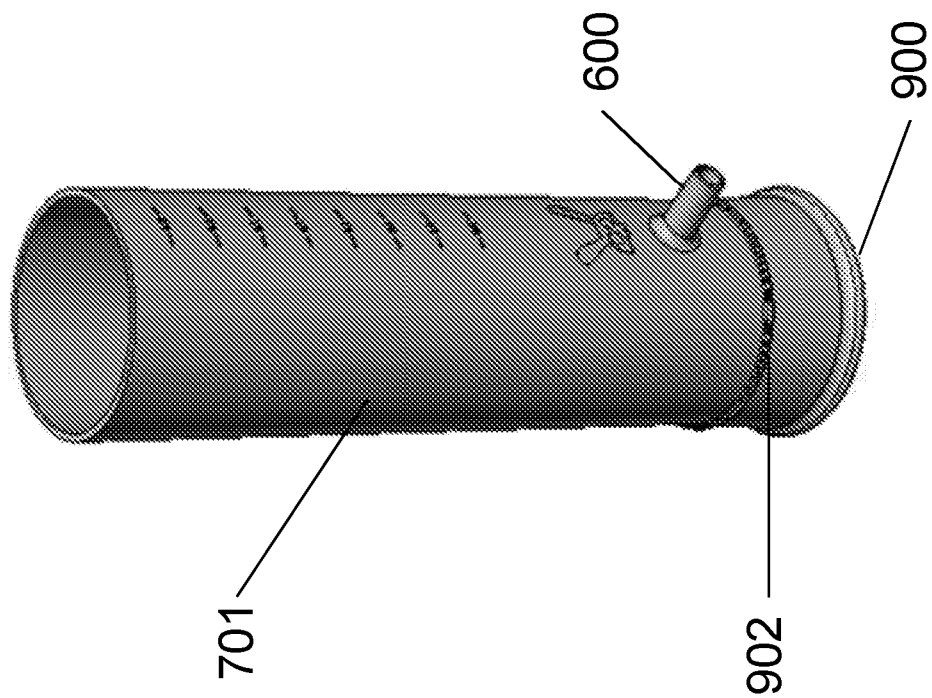
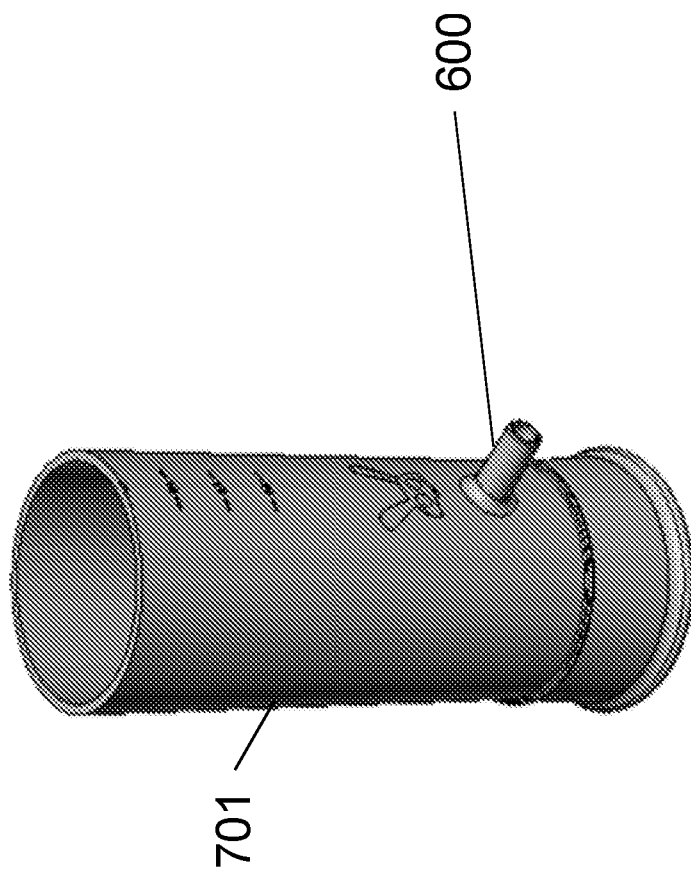


Fig. 9b



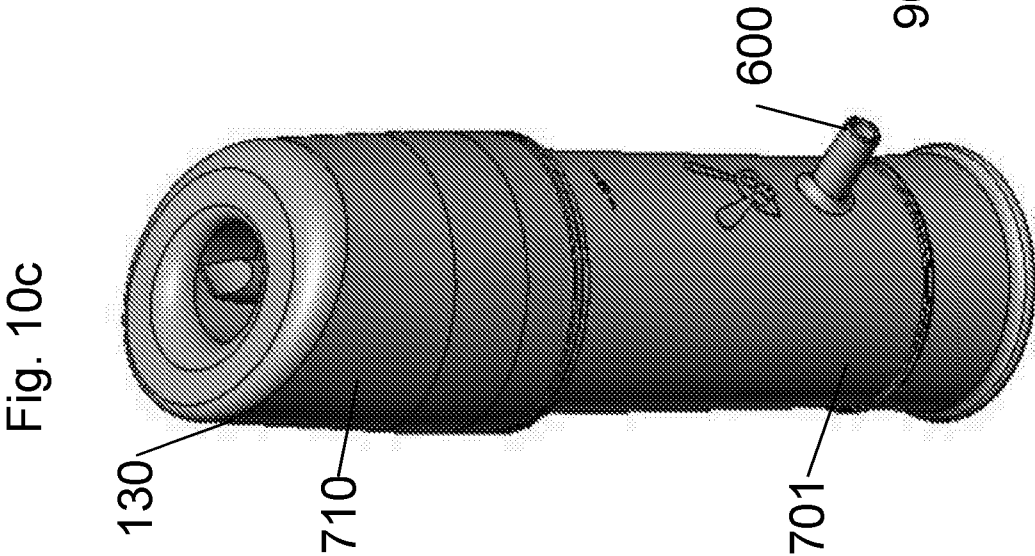
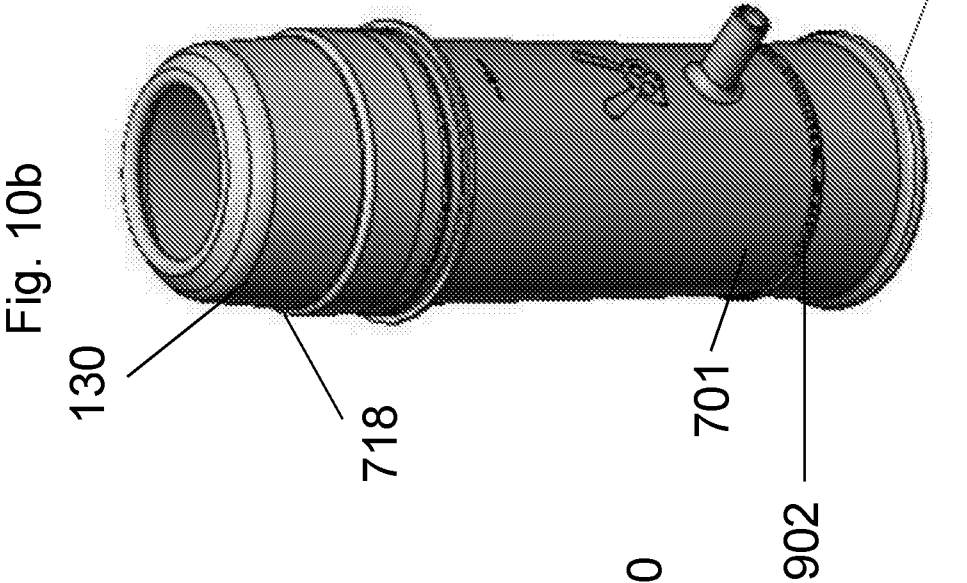
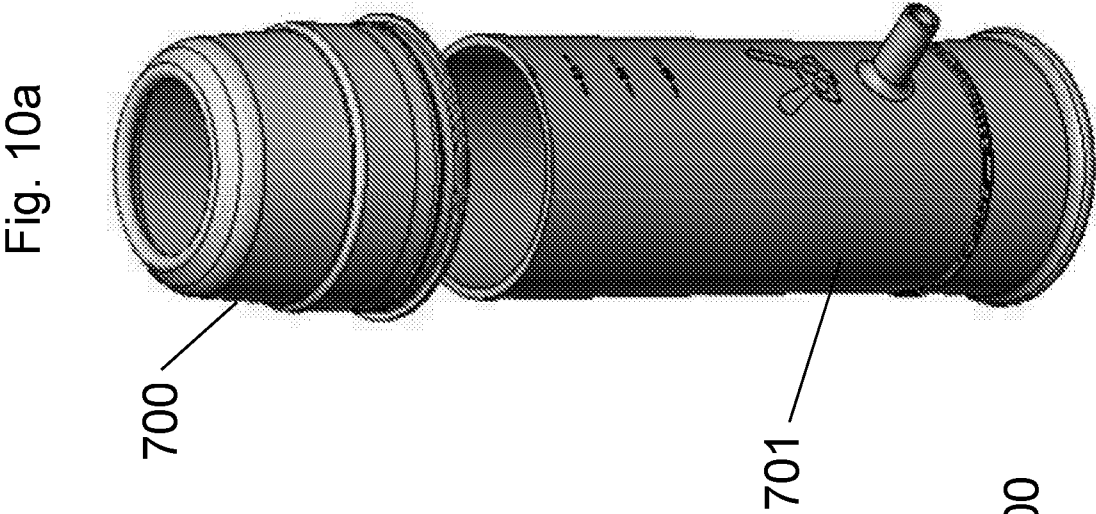


Fig. 10d

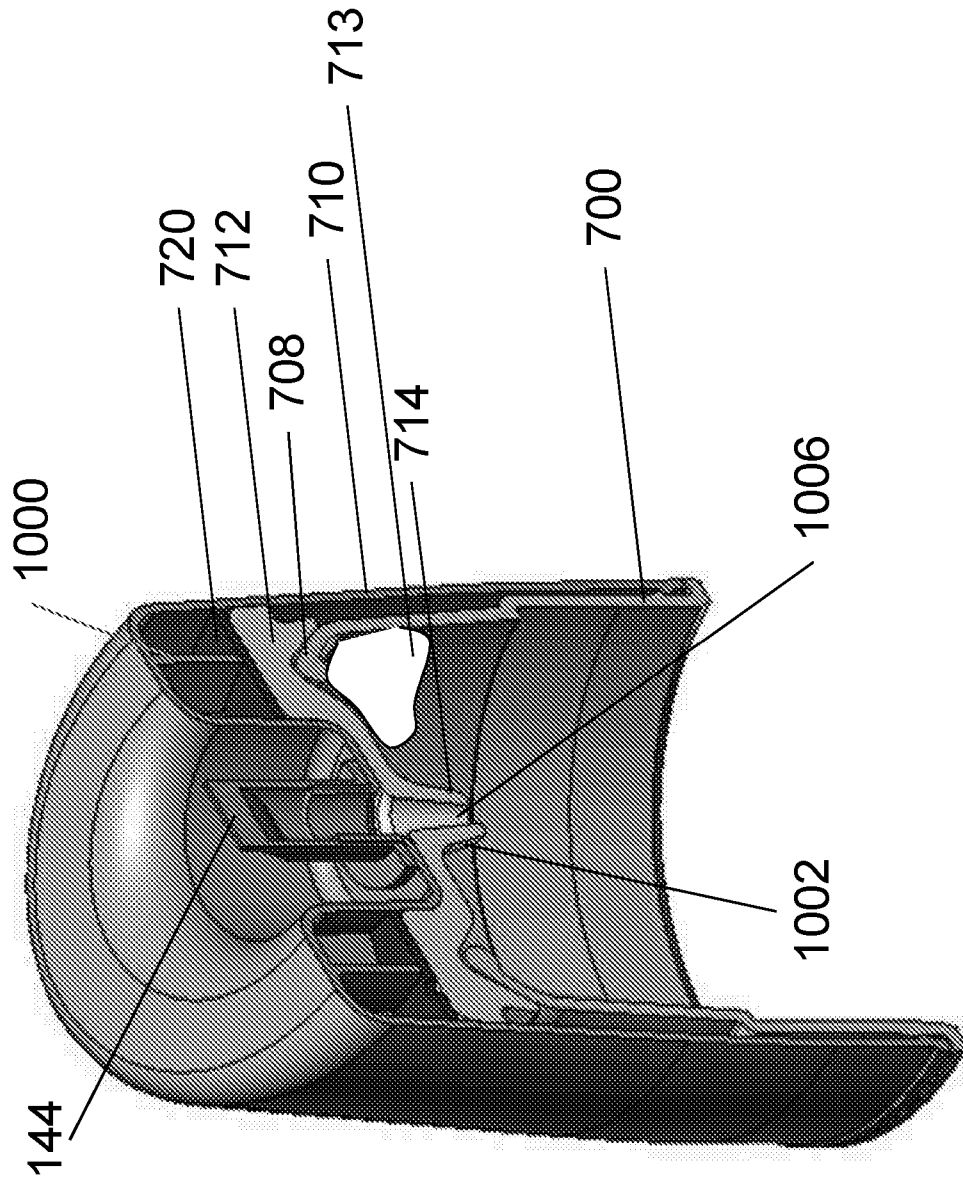


Fig. 11

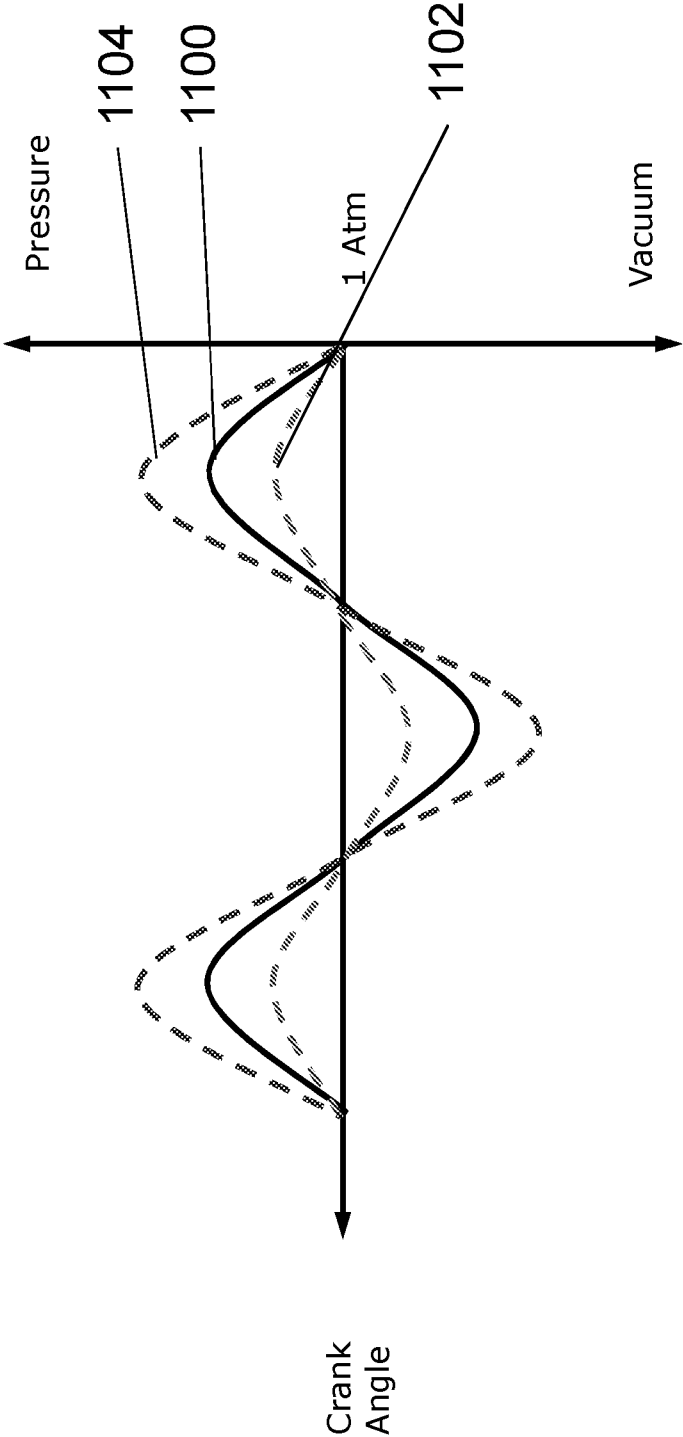


Fig. 12

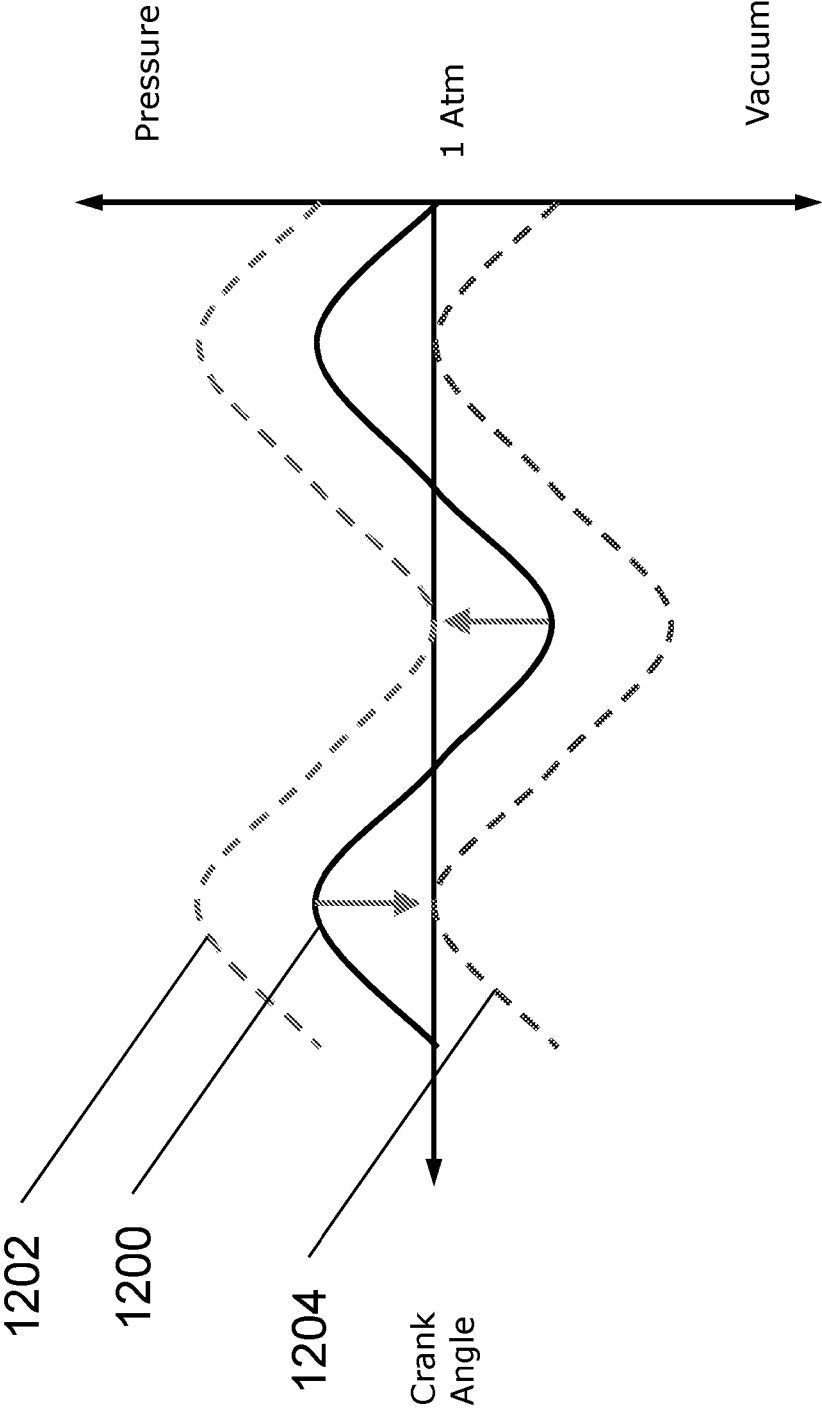


Fig. 13

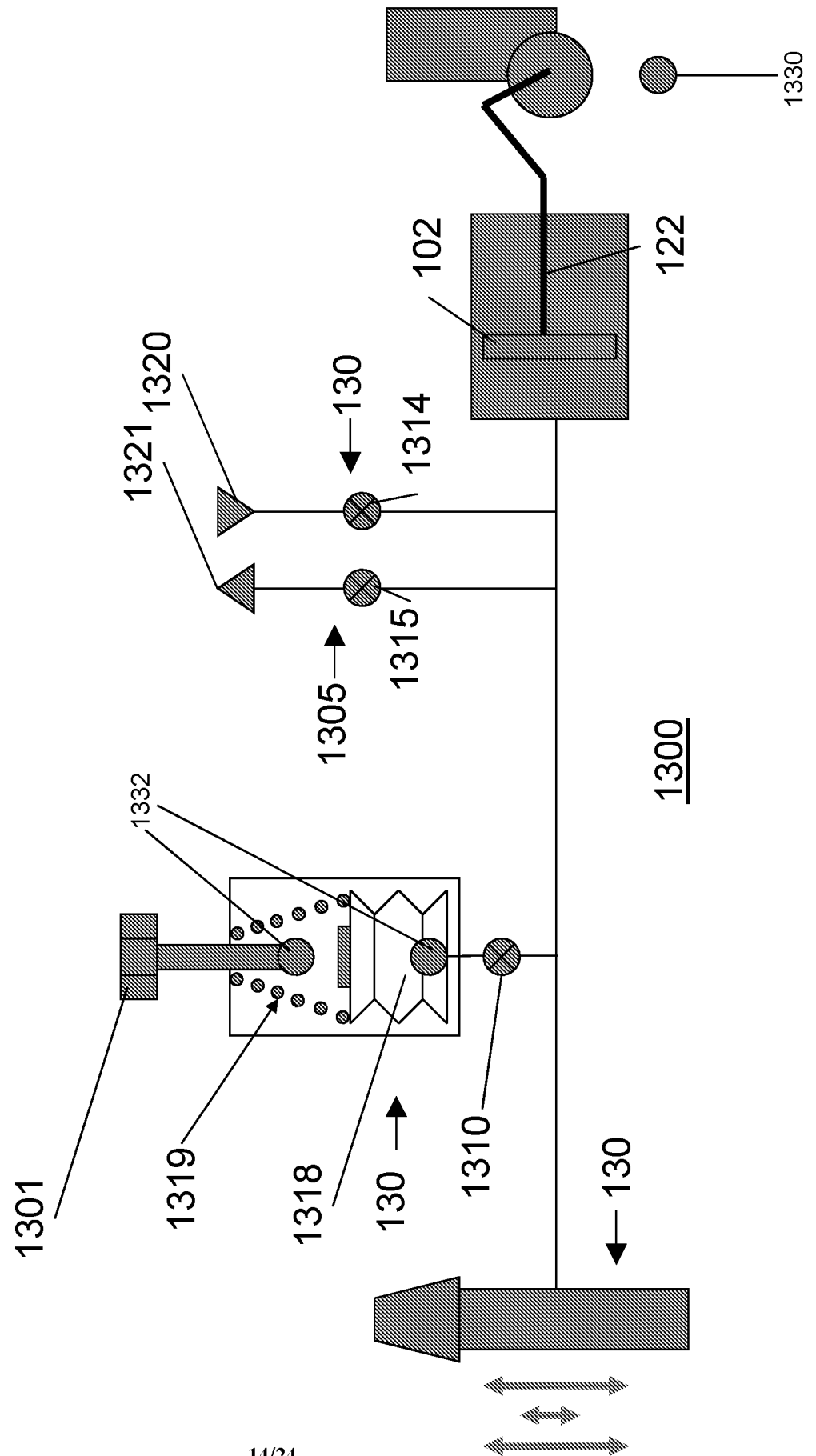


Fig. 14

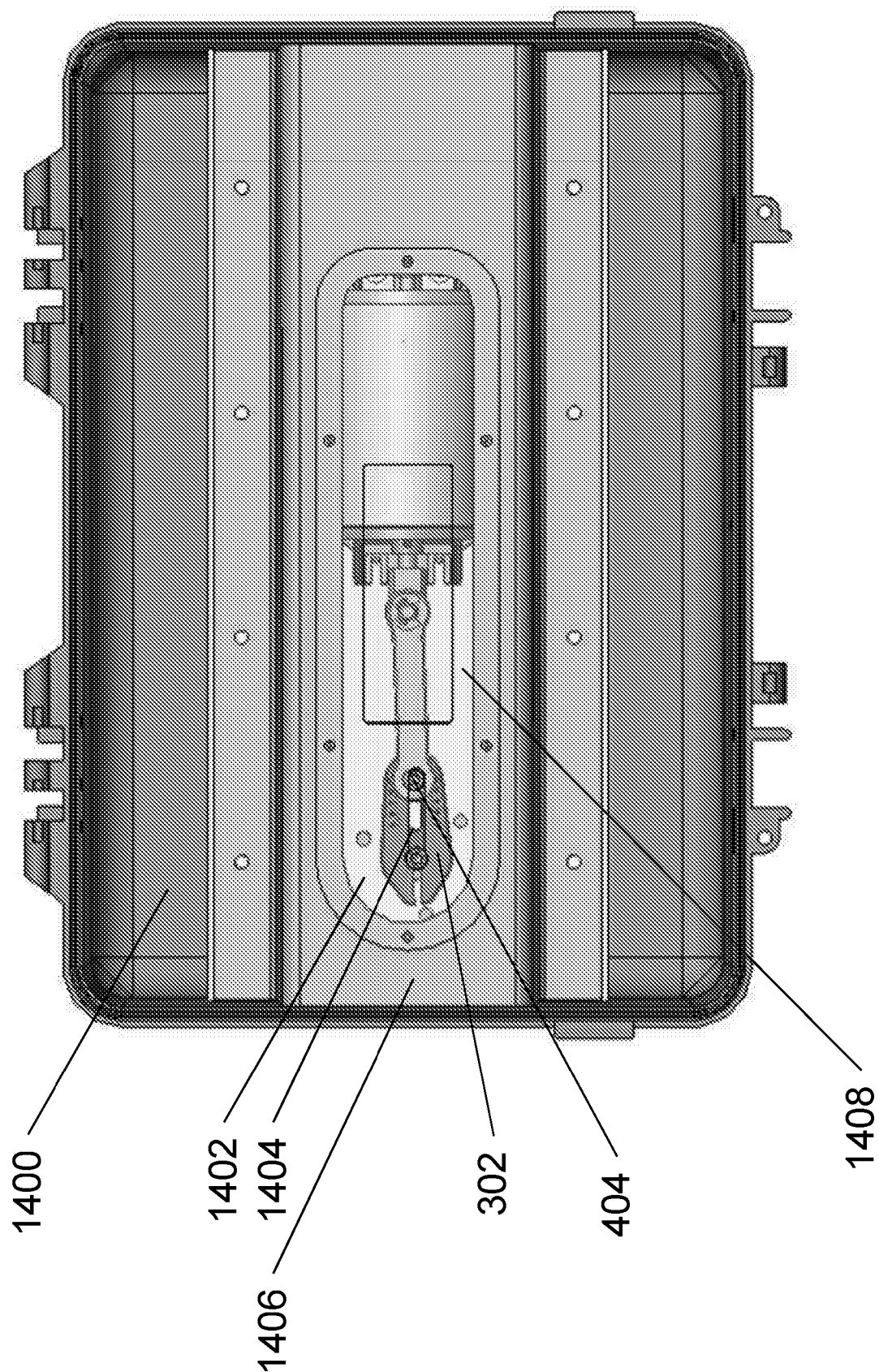


Fig. 15

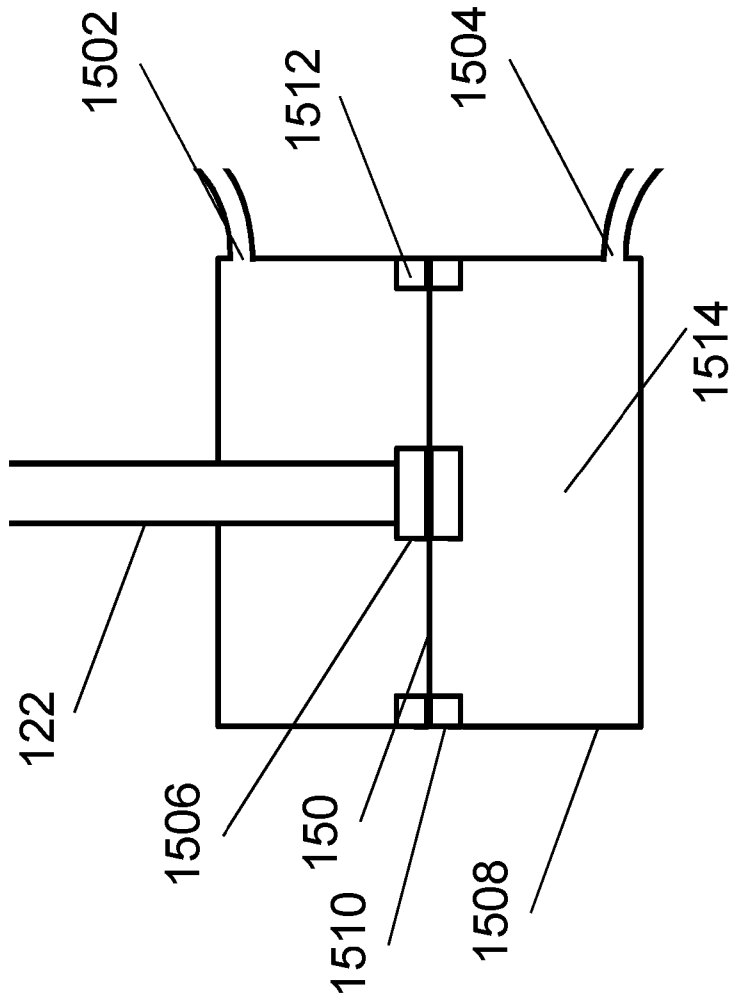


Fig. 16a

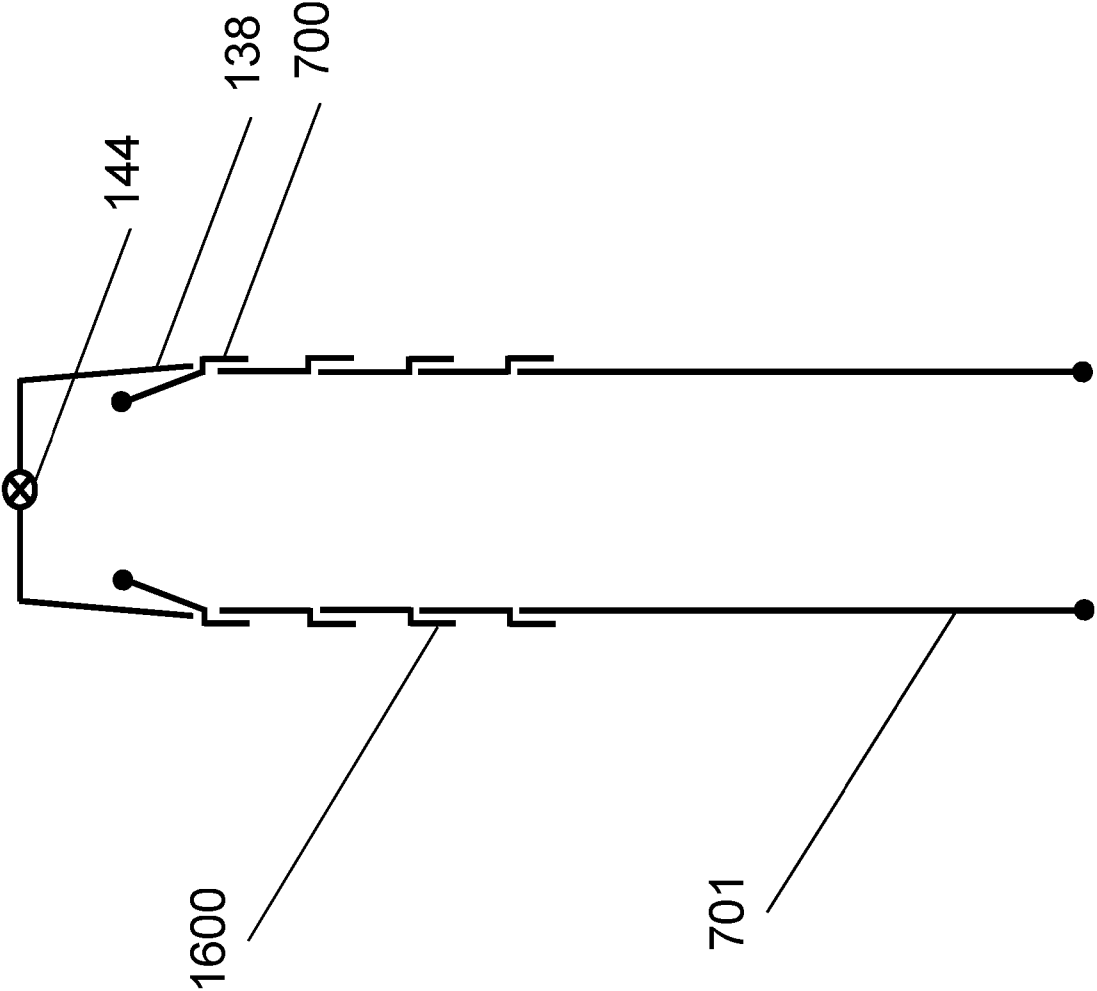


Fig. 16b

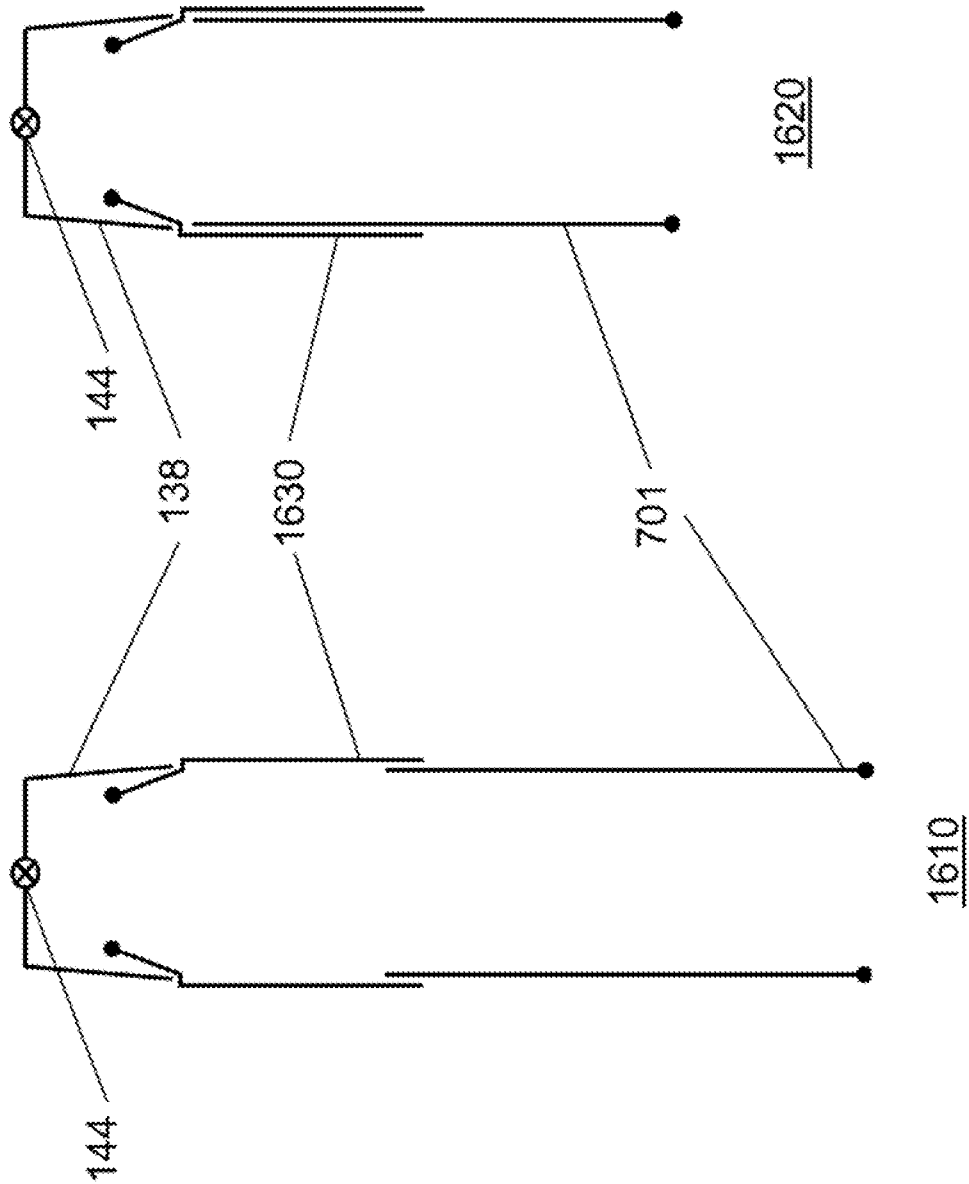


Fig. 17

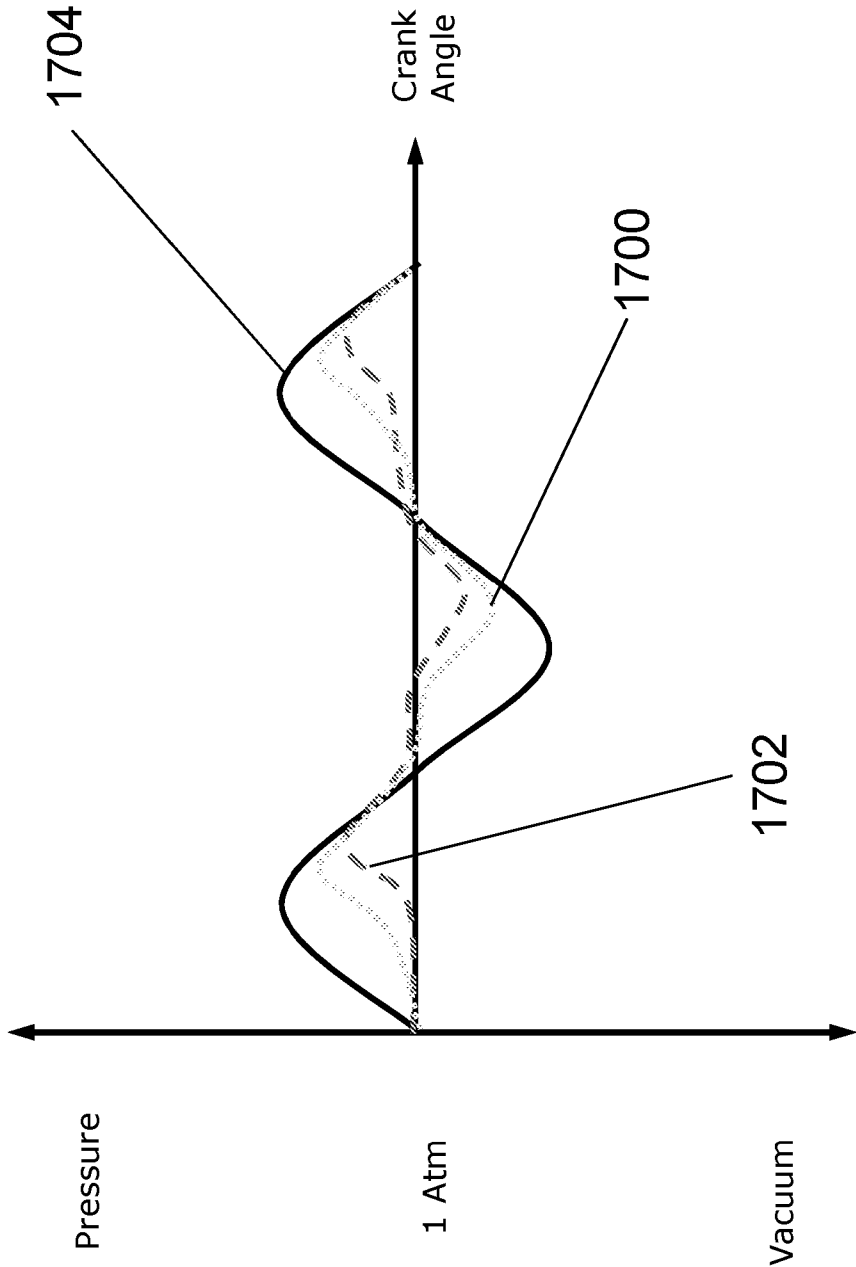


Fig. 18

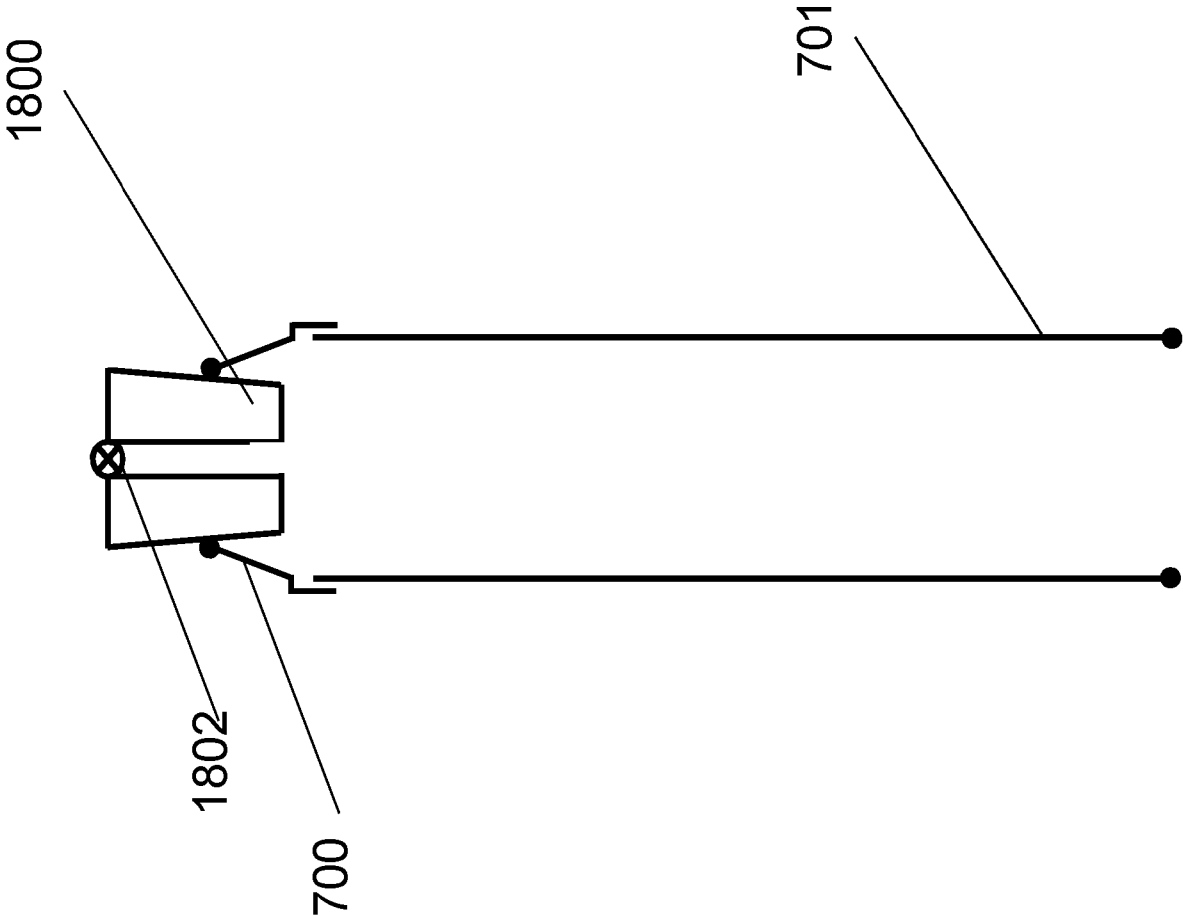


Fig. 19

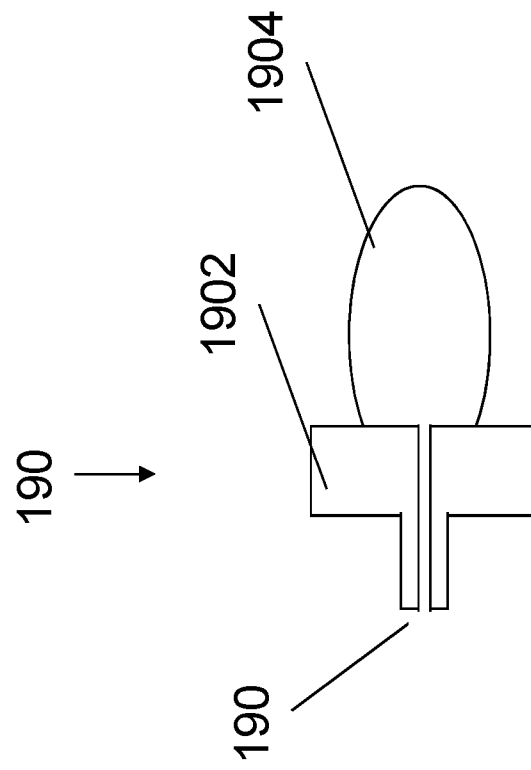
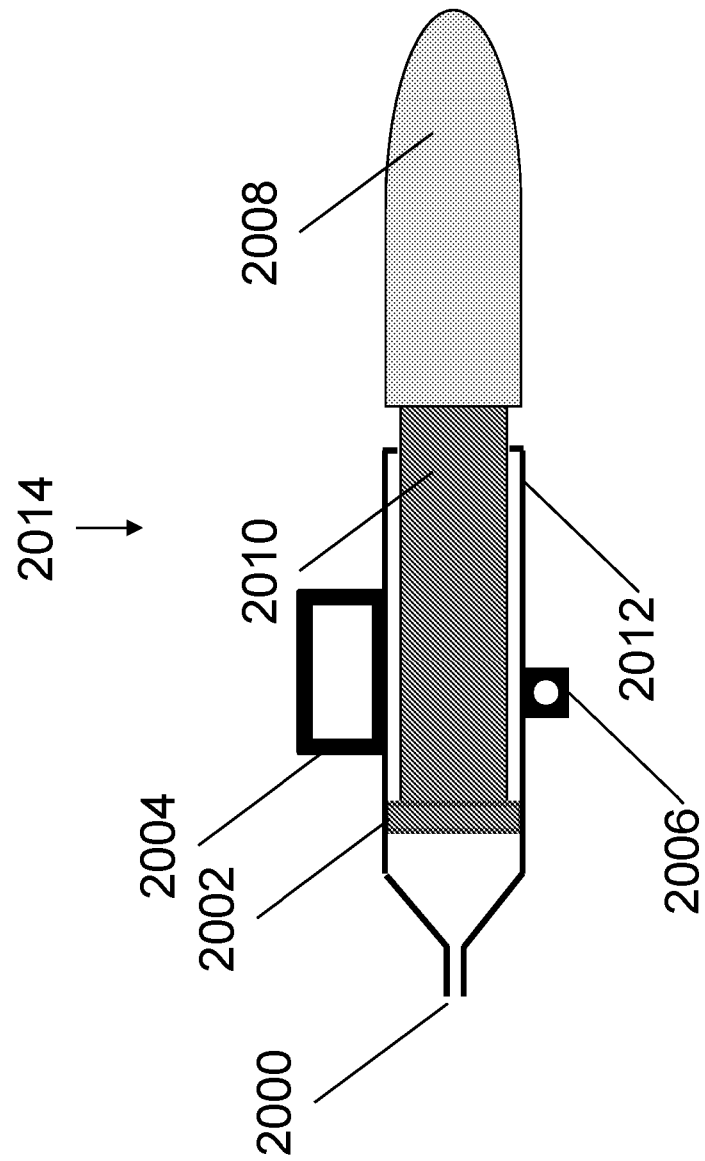


Fig. 20



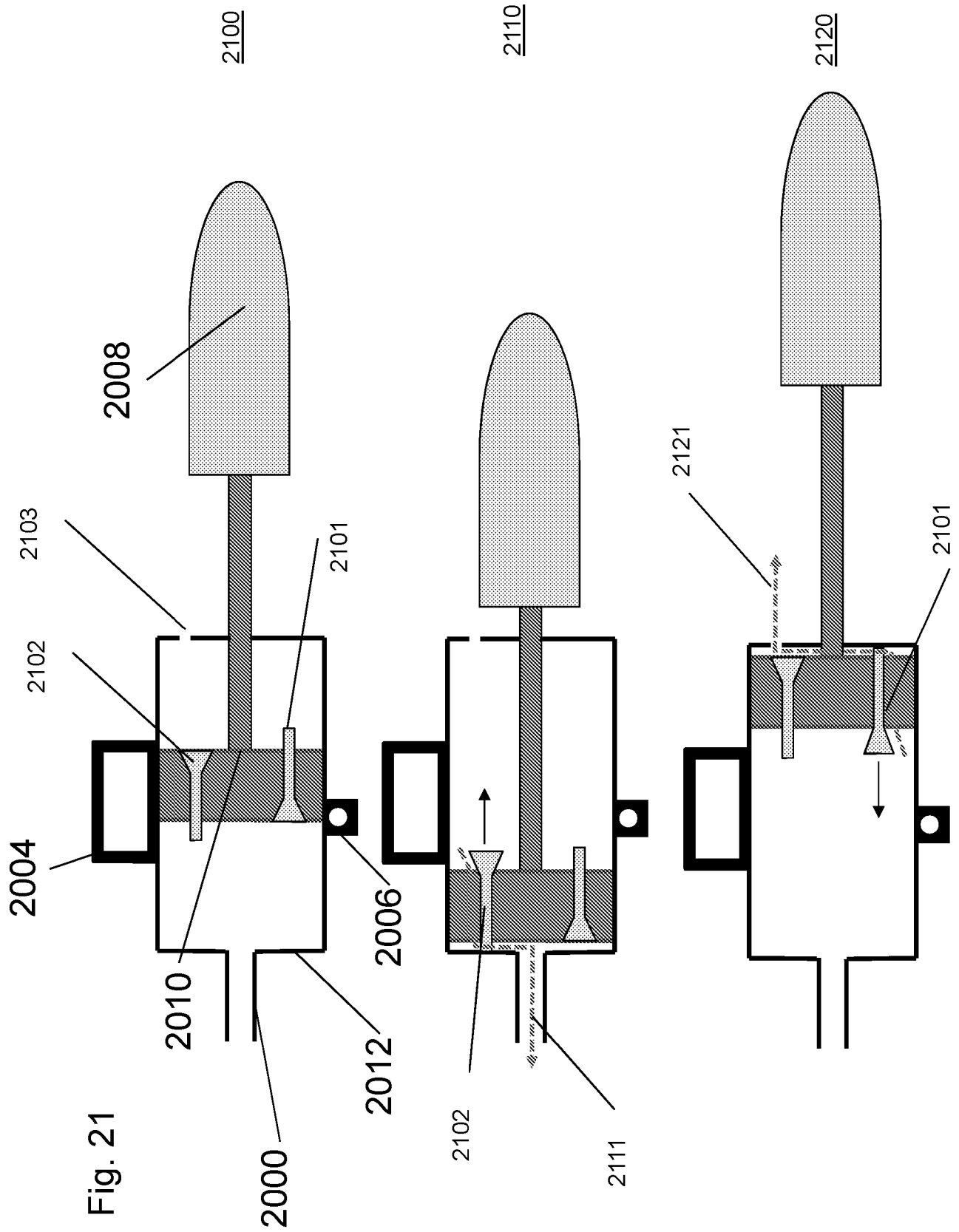
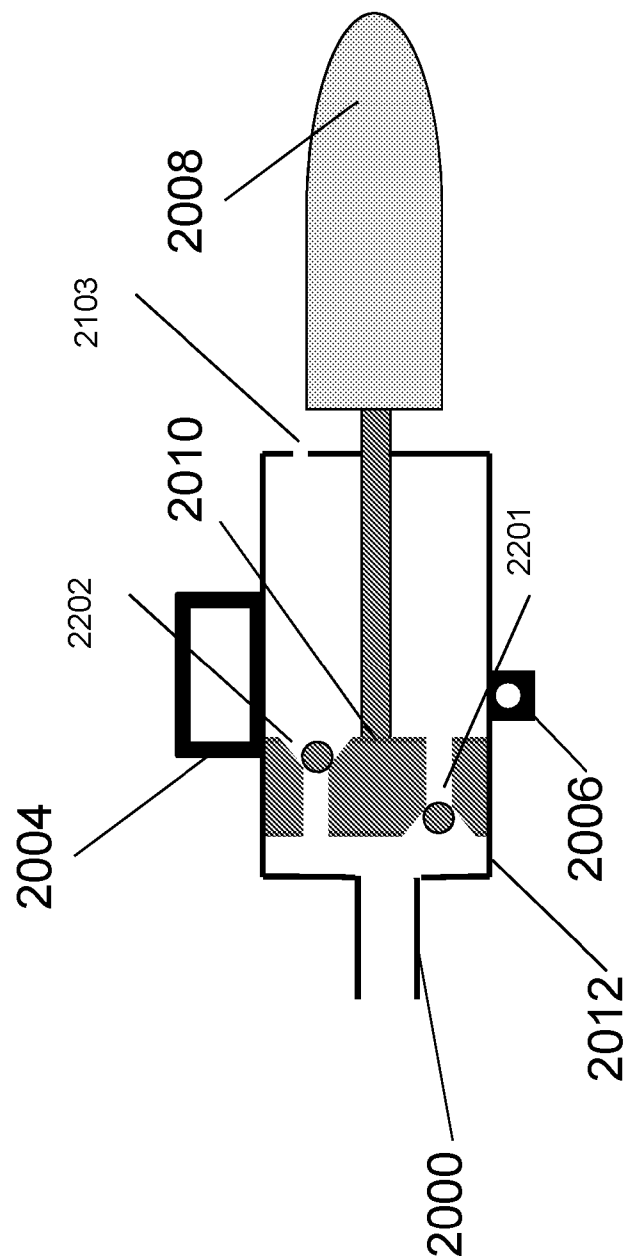


Fig. 22



INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2017/050404

A. CLASSIFICATION OF SUBJECT MATTER INV. A61H19/00 A61H9/00 A61H23/02 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) A61H A61F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2015/164678 A1 (LEE CHUNG-LIANG [TW] ET AL) 18 June 2015 (2015-06-18)	1-11, 13-17,19
Y	column 3 - column 5; figures -----	12,18
X	WO 2005/099366 A2 (KARGULA CHRISTOPHER [US]) 27 October 2005 (2005-10-27)	1-12
Y	page 3 - page 5; figures -----	12,18
A	WO 2013/178223 A2 (BIERSCHENK FRANK [DE]) 5 December 2013 (2013-12-05)	1
	page 10 - page 16; figures -----	
A	WO 2011/146948 A2 (BROWN RONALD ALLEN [US]) 24 November 2011 (2011-11-24)	1
	abstract; figures -----	
A	DE 35 15 691 A1 (STRATEN GUENTER) 27 February 1986 (1986-02-27)	1
	abstract; figures -----	
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents :		
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family	
Date of the actual completion of the international search 1 June 2017	Date of mailing of the international search report 08/08/2017	
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Borrás González, E	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2017/050404

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

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

1. ☒ Claims Nos.: 41-43
because they relate to subject matter not required to be searched by this Authority, namely:
Claims 41,42 and claim 43 (which refers only to claim 41) relate to a therapeutic method practised on the human body. Methods for treatment of the human or animal body by therapy are excluded from patentability (Rule 39.1(iv) PCT).
2. ☒ Claims Nos.: 20, 27, 34, 44, 45
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

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

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

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-19

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.1

Claims Nos.: 41-43

Claims 41,42 and claim 43 (which refers only to claim 41) relate to a therapeutic method practised on the human body. Methods for treatment of the human or animal body by therapy are excluded from patentability (Rule 39.1(iv) PCT).

Continuation of Box II.2

Claims Nos.: 20, 27, 34, 44, 45

Claims 20,27,34,44 are drafted in such a way that the claims as a whole are not in compliance with the provisions of clarity and conciseness of Article 6 PCT, as it is particularly burdensome for a skilled person to establish the subject-matter for which protection is sought. Consequently, no meaningful search of the subject matter of claims 20,27,34,44 can be carried out (Article 17(2) PCT).

Claim 45 contravenes

Rule 6.2(a) PCT and does not allow to clearly determine the technical features of the claimed subject-matter. Consequently, no meaningful search of the subject matter of claim 45 can be carried out (Article 17(2) PCT).

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-19

A stimulation device assembly comprising a pump and a receiver with an inner liner and an outer body adjustable in length, achieving an air tight space in fluid communication with the pump and method for assembling the same

2. claims: 21, 22, 32

A stimulation device assembly comprising an accessory being a pulsating inflatable stimulation device with air inlet and a balloon, attached to the pump

3. claims: 23, 24, 33

A stimulation device assembly comprising an accessory comprises a chamber with a reciprocable plunger with pressure relief valves and a phallic simulacrum

4. claims: 25, 26

A pump for a stimulation device assembly comprising a pump chamber and a displacement member in the chamber arranged to create an overpressure in each of a first and second direction of reciprocation

5. claims: 28-31

A pump for a stimulation device assembly comprising a pump chamber including a pressure outlet for overpressure and a variable pressure or stroke arrangement

6. claim: 35

A stimulation device comprising a switchable pressure relief line comprising a closable valve.

7. claim: 36

A stimulation device comprising a switchable pressure relief line comprising a variable expansion vessel.

8. claims: 37-40

A stimulation device comprising a stimulation motion

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

element, the device further comprising a signal reception means for receiving an external signal representative of a parameter of motion of the stimulation motion element, the signal being derived from an audio and/or visual signal.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2017/050404

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2015164678	A1	18-06-2015	CN 104334125 A 04-02-2015
			GB 2524191 A 16-09-2015
			HK 1205922 A1 31-12-2015
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			JP 2014527873 A 23-10-2014
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