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(54) **PRESSURE-GENERATING PIPE DEVICE FOR A PRESSURE VESSEL**
DRUCKERZEUGUNGSROHRVORRICHTUNG FÜR EIN DRUCKGEFÄSS
DISPOSITIF DE TUBE GENERATEUR DE PRESSION POUR UN RECIPIENT SOUS PRESSION

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Description

BACKGROUND ART

[0001] The present invention relates to a pressure-generating pipe device for a pressure vessel arranged for intake and discharge of fluid to and from the pressure vessel in accordance with the preamble to Claim 1.

[0002] The present invention can be used in manufacturing industry for couplings, pressure vessels, hydraulic and pneumatic systems, but is not limited to this.

[0003] Several types of pressure vessel are currently available for intake and discharge of fluid to and from various external containers, such as brake fluid reservoirs, reservoirs for cooling installations, other liquid containers for various purposes within the processing industry, vehicle industry and other engineering industry, etc.

[0004] Previously, it was usual for a user to have to change apparatus for different purposes. When the user wanted to feed in fluid to, for example, a brake fluid reservoir, he used a pressurized container of fluid, or alternatively a traditional pump. For emptying the brake fluid reservoir, the user could change apparatus and instead use an underpressure-generating vessel or a suction pump. This procedure was time consuming.

[0005] The problem was solved by drawing and discharging fluid into and from one and the same vessel by means of one and the same pipe device. Pressure vessels that are currently available for intake and discharge of fluid to and from the pressure vessel have, however, the disadvantage that several manual operations are required for changing and switching between pressurizing (overpressure and underpressure) of the pressure vessel's pipe device. By arranging the discharge part with a duct shaped as a venturi tube that tapers at the middle part of the duct, approximately where the discharge device discharges (or the discharge device discharges slightly behind (after) the middle part viewed in the direction of the airflow), an underpressure can be generated in the discharge device and hence in the pressure vessel. By means of the underpressure that is created, fluid is fed to the pressure vessel from the external container.

[0006] A pressure vessel comprising a pressure-generating pipe device is described in patent application number GB 2 371 602. This describes a front sleeve arrangement that can be adjusted by the user that requires the user to use his free hand to regulate the airflow from the discharge part of the pipe device, by direct setting of the air-regulating device of the discharge part of the second section, to create overpressure or underpressure in the pressure vessel. Such an operation is complicated, as the user is primarily focused on filling/emptying the fluid reservoir in the vehicle/machine, etc.

[0007] Document US4073602A discloses a pressure-generating device according to the preamble of claim 1.

[0008] Known pressure vessels generate a high noise level when operating. Similarly, the use of known pressure vessels involves frequent changes of the seal be-

tween the lid of the pressure vessel and the vessel. In known pressure vessels, the airflow that is discharged from the pipe device flows in the direction towards the user, that is the side that is opposite to the connection point for compressed air. This results in a poorer working environment.

[0009] In addition, known pressure vessels have the disadvantage that the direct regulation of the front sleeve arrangement means that safety is jeopardized. If the user should tighten the sleeve arrangement too much, whereby an abnormal overpressure is generated, he is relying only upon a safety valve in the pressure vessel. It is thus up to the user to set the sleeve arrangement in such a way that a suitable pressure is built up. Known pressure vessels arranged for intake and discharge of fluid currently do not have a simply constructed self-regulating air-regulating device that is simple to operate by means of a single manual operation.

[0010] The object of the present invention is to develop known technology further and to solve the abovementioned problem relating to the pressure-generating pipe device and the pressure vessel described in the introduction, which problem is solved by what is described in the characterizing part of Claim 1.

[0011] By this means, a user can regulate the airflow to and from the pressure vessel, to achieve the intake and discharge of fluid from and to, for example, the brake fluid reservoir of a vehicle, by means of a single manual operation. The first section, that is part of the pressure-generating pipe device and is designed as a handle, can be held by the user in one hand, whereby the user can regulate the airflow at the discharge part by means of the handle without needing to move his hand to any additional valve. When the user moves the first section in a certain direction, the discharge part can, for example, be completely shut off by means of the control device, with the airflow being directed instead through the discharge device of the second section, generating an overpressure in the pressure vessel, and fluid is discharged from this.

When the user moves the first section to a second position, the opening in the discharge part is opened and the airflow passes through the discharge part, which can suitably also be called the ejector or venturi tube. The venturi effect brings about a suction of the airflow through the discharge device (underpressure in the discharge device), whereby an underpressure is created in the pressure vessel and fluid is drawn into this. When the user does not want to use the function of the pressure-generating pipe device, the compressed air source is shut off.

[0012] Alternatively, the control device comprises a regulator arranged to form a seal with the discharge part in an overpressure position (A), bringing about a rerouting of the airflow through the discharge device for pressurizing of the pressure vessel.

[0013] In this way, the first section can move the regulator, such as a ball, a cone, a flap, etc, via the control device with camming, and cause the duct arrangement of the second section to cease to act as a venturi tube.

The first section is moved by the user carrying out a single manual operation.

[0014] The end surfaces of the first and second sections are suitably arranged with at least one opening to allow the airflow to pass from one section to the other.

[0015] By this means, the airflow can pass between the two sections independent of the relative positions of the first section and the second section, comprising the discharge device, for pressurizing and for underpressure.

[0016] The end surfaces of the first and second sections are preferably arranged to form a seal against each other in the event of the said movement and, in a shutting-off position (B), they are arranged to shut off the airflow between the first and the second sections by means of a sealing surface.

[0017] Accordingly, the user does not need to switch on or shut off the airflow by using the on and off function of the compressed air source. In this way, the user can shut off the airflow by carrying out the same manual operation, suitably as a middle position of the first section. As far as function is concerned, the first and second sections are thereby arranged to be integral, acting as a single valve. The end surface of the first section can advantageously have a sealing surface within the area of the discharge part.

[0018] Thus the duct arrangement of the discharge part of the second section can act as a venturi tube. The regulator, such as a ball, cone, flap, etc. is acted upon indirectly by the control device so that the regulator is allowed to leave the outlet of the discharge part and assume a position for trapping, thereby opening the outlet of the discharge part. Alternatively, the regulator can be connected to the control device of the first section to bring about a regulation of the air-regulating device of the discharge part, comprising the discharge device. The discharge device that opens out from the duct arrangement of the second section has now a suction effect as a result of the venturi effect in the discharge part. Alternatively, the venturi tube can be created by the part that precedes the discharge device in the direction of the airflow being partially integrated into the duct arrangement of the first section, in order to make the second section less bulky.

[0019] In this way, the pressure vessel is ergonomically advantageous, as the airflow flowing out from the pipe device is delivered backwards in relation to the main working direction of the user. At the same time, the first section of the pipe device can be used as a sound damper for the exhaust gases, which is advantageous as far as the working environment is concerned. Regulators are preferably arranged in the duct arrangement for the exhaust gases in the first section to reduce the velocity of the airflow, whereby the noise is also reduced. Accordingly, no physical sound damper filter needs to be incorporated.

[0020] A front wall of the first section facing towards the second section preferably comprises a first opening and a second opening, the first opening being positioned

in the front wall in such a way that, in the event of the said movement to an overpressure position (A), the first opening is aligned with the discharge part of the second section and, in the event of continued movement to an underpressure position (C), the second opening is similarly aligned with the discharge part of the second section.

[0021] Accordingly, an intermediate section between the openings can serve as a sealing surface, shutting off the airflow from the first section to the second section.

[0022] Alternatively, the first opening has a smaller diameter than the second opening.

[0023] In this way, the stresses on the air-regulating device are reduced, without the compressed air source needing to be set to a lower working pressure.

[0024] A spring element is suitably comprised in the control device, which spring element has a spring-back effect on a regulator in a direction essentially towards the discharge part to form a partial seal in an overpressure position (A) to bring about rerouting of the airflow through the discharge device for pressurizing of the pressure vessel.

[0025] In this way, a safety function can be integrated into the pipe device. If the working pressure increases, the pipe device thereby automatically regulates the excess pressure by means of the spring element. The spring element has a double function, urging the regulator towards the outlet of the discharge part, and automatically balancing the pressure by spring-back of the regulator in the event of too high a pressure in the pressure vessel.

[0026] As a result of the safety function (the safety valve) of the second section having been achieved, a safety valve does not need to be mounted in the lid of the pressure vessel. Accordingly, the area of the lid can be made smaller. This means that a smaller compressive force is exerted on the lid, which in turn results in a smaller amount of material being required to manufacture the lid, which is cost-effective. In order to provide additional safety, an extra safety valve is preferably also mounted in the bottom of the lid.

[0027] A front wall of the first section that faces towards the second section preferably comprises a cam groove, in which cam groove cam followers in a cage move in a forward and backward direction in the longitudinal direction of the pipe device when the first section is rotated. The cage encloses a regulator that is arranged to partially seal the discharge part in one rotational direction and a spring element is in contact with the cage and a collar on the second section to release the regulator in the second rotational direction. The front wall is arranged with a first opening that is aligned with the discharge part of the second section, in the event of the rotational movement to an overpressure position (A), and with a second opening that is similarly aligned with the discharge part of the second section, in the event of continued rotational movement to an underpressure position (C). The front wall is, in addition, arranged with a sealing surface that is aligned with the discharge part, in the event of continued rota-

tional movement to a shutting-off position (B).

[0028] By this means, a valve is obtained that, by means of rotational movement of the first section, brings about an overpressure or alternatively an underpressure in the pressure vessel and, by means of further rotational movement of the first section, also brings about shutting off of the airflow to/from the pressure vessel. In the event of shutting off, the pressure that has been built up in the pressure vessel is retained and the user can transport the pressure vessel with the compressed air source disconnected and still use the pressure vessel.

[0029] In this way, the user can transport and regulate/set the pressure vessel in a user-friendly way using only one hand for all the work operations: intake and discharge of fluid and shutting off. The handle has preferably a locking function in the position for shutting off, to prevent accidental discharge of fluid during transportation.

[0030] The abovementioned problem is also solved by a pressure vessel for the pipe device described in the introduction, characterized in that the pressure vessel has a support element arranged to support the pipe device, with the support element having at least one slide surface that is in contact with the pipe device.

[0031] By this means, the pipe device can be supported at a distance from the lid of the pressure vessel and the first section can be used as a moving part for adjusting the airflow.

[0032] The pressure vessel suitably comprises a removable lid, comprising a sealing element such as an O-ring, X-ring, etc, that can be fastened on a collar on the said fluid container by means of a locking ring, upon which lid there is arranged the support element comprising a front and a rear bracket arranged with air holes to match the duct arrangements of the pipe device, and between which brackets the first section is arranged.

[0033] In this way, assembly and disassembly of the connection between the lid and the pressure vessel is made easier, as the sealing element is compressed axially, in contrast to the more traditional threaded connections that create an unwanted compressive force on a sealing element when they are screwed on. At the same time, the lid and the vessel can be assembled or disassembled by a simple operation of a locking ring of the snap-lock type. Such a locking ring provides a strong connection and distributes the force evenly over the collar of the pressure vessel and the lid when it is fastened.

[0034] A safety valve device is preferably recessed into the lid in the area essentially below a pipe device located at a distance from the top of the lid.

[0035] By this means, an additional safety function is achieved. In the event of abnormal overpressure in the pressure vessel, the air-regulating devices are activated initially by means of the pressure-regulating function of the spring element. If there is still an abnormal function, the safety valve device is activated. The location of the safety valve device, below the pipe device and recessed into the lid, also means that accidental knocks, etc, on this are largely avoided.

BRIEF DESCRIPTION OF DRAWINGS

[0036] The invention will now be described with reference to schematic drawings, in which

Figures 1-3 show a pressure-generating pipe device according to an embodiment of the present invention;

Figures 4a-4b show a float illustrated in Figure 1; Figures 5a-5c show passages in a bracket in a pressure vessel and changes in the position of the front wall of a first section with duct arrangement in the event of rotational movement;

Figure 6 shows the front wall in Figures 5a-5c in greater detail;

Figure 7 shows a lid comprising a support element for the pressure-generating pipe device according to the third embodiment;

Figure 8 shows a cross section of a part of the pressure-generating pipe device with air-regulating device and part of the pressure vessel in cross section; Figure 9 shows a pressure vessel for both emptying and filling with fluid;

Figure 10 shows a front wall where the end surface of the first section has an opening for the airflow generating the overpressure or underpressure; and Figure 11 shows a locking ring for fastening the lid of the pressure vessel.

MODES FOR CARRYING OUT THE INVENTION

[0037] The present invention will now be described with reference to the attached drawings. Components that are not of significance for the present invention have been omitted for the sake of clarity. Components without reference numerals correspond to identical component with reference numerals in other drawings.

[0038] Figures 1-3 show schematically a pressure-generating pipe device 1 according to an embodiment. The pipe device 1 comprises a first elongated section 3 that is circular in cross section. The first section 3 is arranged with a first duct arrangement 5 positioned centrally along an axis of rotation a. The first section 3 is designed as a turning handle 35 and is mounted in such a way that it can rotate in a support element 13 comprising a front and a rear bracket 63, 65. The support element 13 constitutes an integral part of the lid 67 of the pressure vessel 11. A connection 69 for compressed air is arranged on the rear bracket 65 centrally in line with the axis of rotation a. The first duct arrangement 5 for incoming compressed air (such as a single duct 71) runs through the handle 35 (the first section 3) up to a front wall 53 in the handle 35. The front wall 53 comprises suitably positioned holes of various shapes and sizes for controlling the airflow F (which will be described in greater detail below). The front bracket 63 has a slide surface that is in contact with the front wall 53 of the pipe device 1.

[0039] The airflow F is shown by black arrows and Fig-

ure 1 shows how, in an underpressure position (C), the airflow F passes through holes in the front wall, such as a second opening 79 that, in this position, is positioned in front of the duct 41 of the discharge part 21, and is otherwise positioned to form a seal against the front bracket 63. A regulator 43, in the form of a ball 81, is blown from the outlet 23 of the discharge part 21 in the direction towards a top part 83 of a plastic cage 85. The cage 85 thus holds the ball 81 in position for opening the discharge part 21. The airflow F passes through the discharge device 25 comprising an essentially vertical tube 87 that extends down into the upper part of the pressure vessel 11 and has a lower end that is surrounded by a float 89. The upper end of the tube 87 opens out into the narrower part of the discharge part and an underpressure is created in the tube 87. An underpressure is thereby created in the pressure vessel 11 and fluid 15 is drawn from an external container (not shown) into the pressure vessel 11.

[0040] In the said underpressure position (C), the airflow F generated through the pipe device 1 is turned in the opposite direction after it has passed through the outlet 23 of the discharge part 21 by means of an airflow rerouting device 91 arranged in this and within the area of the top part 83 of the cage 55, such as an internal surface 90 of a conical part 93. After the airflow F leaves the discharge part, the airflow is designated exhaust gases E and is marked by white arrows. The exhaust gases E thus go in the opposite direction and pass through an exhaust gas pipe 95 arranged in the front bracket 63 and continue through the exhaust gas hole 97 in the front wall 53 of the handle 35, serving as a regulator 99. The regulator 99 is arranged to reduce the velocity of the flow of exhaust gas, whereby the noise is also reduced. In the exhaust chamber 101 in the handle 35, the velocity of the exhaust gases E is reduced still further before they pass out through the hole 103 in the rear bracket 65. In this way, the pipe device 1 of the pressure vessel 11 is given an ergonomically advantageous function, as the exhaust gases E flowing out from the pipe device 1 are discharged backwards in relation to the working direction of the user. The handle 35 thus serves as a sound damper. The regulator 99 is arranged to reduce the velocity of the exhaust gases E. Accordingly, no physical sound damper filter needs to be incorporated.

[0041] On the opposite side to the top part 83, the cage 85 comprises two guides (forming cam followers) 105, 107 (107 is hidden in the drawing) and a collar 109 for a spring element 111, such as a spiral spring 113. The spiral spring 113 is in contact with the collar 109, and with an internal lip 115 in the conical part 93. The guides 105, 107 run through guide holes 121 (see Figures 5a-5c) in the front bracket 63 and are in contact with cam grooves 117 (see also Figure 6). In the underpressure position (C), the guides 105, 107 are in contact with the highest part (nearest the outlet 23 viewed in the direction towards this) of the cam grooves 117 and the spiral spring 113 is in the greatest compression. Thus, in the position

(C), the cage 85 is positioned in such a way that the ball 81 can leave the outlet 23 of the discharge part 21.

[0042] When the user rotates the handle 35 (the first section 3), this rotates together with the front wall 53 comprising the cam grooves 117 so that a deeper part 119 of the cam grooves 117 comes to rest within the area of the guide holes 121 (see the description below with reference to Figures 5a-5c). By means of the compressive force of the spiral spring 113, the cage 85 is moved in the direction towards the airflow F, with the guides 105, 107 of the cage 85 making contact with the bottom surfaces of the cam grooves 117 (see Figure 6) (camming surfaces 131).

[0043] Figure 2 shows schematically when the handle 35 has been turned to an overpressure position (A). In the overpressure position (A), the ball 81 is arranged to seal the discharge part 21, bringing about a rerouting of the airflow F through the discharge device 25 for pressurizing of the pressure vessel 11. The guides 105, 107 have now been moved into the cam grooves 117 by the compressive force of the spiral spring 113 and the ball 81 is pressed towards the outlet 23 of the discharge part 21 by the top part 83 of the cage 85 to such an extent that the airflow F turns through the tube 87 of the discharge device 25 and generates an overpressure in the pressure vessel 11. If the pressure rises too much in the pressure vessel 11, the air-regulating device 39 automatically regulates this by the spiral spring 113 being compressed by the compressive force of the ball 81 against the top part 83 of the cage 85, created by the excess pressure, whereby the cage 85 and the ball 81 are moved in the direction away from the discharge part 21 and the excess pressure is regulated. When the required pressure has been achieved again, the ball 81 is moved back towards the outlet 23 by the spring force (spring back). The position of the spiral spring 113 over the ejector (the discharge part 21) means that the pipe device 1 can be made less bulky in the longitudinal direction, as the long spring length can be used to compensate for input/supply pressure. That is, if supply is carried out at, for example, 4 bar, the ball 81 does not open as much as when the pressure is supplied at, for example, 10 bar, when the ball 81 opens. In the overpressure position (A), an excess of air constantly passes out via the exhaust gas hole 97 and the exhaust chamber 101, that is, the quantity of air that does not go down into the pressure vessel 11 to create the overpressure goes out via a small opening between the ball 81 and the outlet 23. In the event of variations in the supply pressure of the pressure source, there is a self-regulating function of the air-regulating device 39. That is, if the supply pressure increases in excess of the build up of pressure in the pressure vessel 11, the spiral spring 113 will be compressed further and the distance between the outlet 23 and the ball 81 will increase, whereby a larger quantity of air will go out as exhaust gases E. In the event of a very high supply pressure, the ball 81 can even come to rest at the greatest possible distance from the outlet 23, whereby the airflow automat-

ically changes from creating overpressure in the pressure vessel 11 to flowing completely out through the discharge part 21, creating an underpressure in the pressure vessel (by the venturi effect). This means that it is possible to control the pressure that goes down into the pressure vessel 11 to, for example, 1-2 bar in a reliable way.

[0044] The first and the second sections 3, 7 are thus arranged to rotate in relation to each other, that is the first section 3 is arranged to rotate in relation to the second section 7. The first section 3 comprises a control device 29 that operates the air-regulating device 39 arranged on the discharge part 21 for changing of direction of the airflow through the discharge device 25 and creating overpressure or underpressure in the pressure vessel 11. The control device 29 with the air-regulating device 39 comprises, among other things, the front wall 53, cage 85, cam grooves 117, ball 81 and spiral spring 113.

[0045] Figure 3 shows schematically an intermediate position or a shutting-off position (B). The handle 35 has now been rotated back to an intermediate position so that sealing surfaces 61 of the first 3 and second 7 sections form a seal with each other. As the first opening 77 intended for the overpressure position (A) and the second opening 79 intended for the underpressure position (C) come to rest on opposite sides of an imaginary continuation of the discharge part 21 in the shutting-off position (B), the airflow F between the first 3 and the second 7 sections is shut off.

[0046] Figures 4a and 4b show schematically the float 89 in Figure 1. When a large quantity of fluid 15 has been drawn into the pressure vessel 11, the plastic float 89 is pressed against the discharge device 25, preventing fluid 15 from being drawn into the tube 87, and the airflow into the discharge device 25 is shut off (see Figure 4b). The float 89 and the float housing are made of plastic.

[0047] Figures 5a-5c show the front bracket 63 from in front. The front wall 53 of the first section 3 is essentially hidden behind this. Figure 5a shows the underpressure position (C), in which the second opening 79 arranged through the front wall 53 is aligned with the central axis of the discharge part 21/ejector (the venturi tube). The discharge part 21 is made of plastic as an integral part of the second section 7 of the pipe device 1. This simplifies the manufacture and reduces the need to assemble separate parts, which is cost-effective.

[0048] A groove 123 for exhaust gases is arranged in the front bracket 63. Exhaust gas holes 97 in the front wall 53 coincide with the groove 123. An inner 117' and an outer 117" cam groove are arranged in the front wall 53. In the event of a rotational movement, the cam grooves 117 press the guides 105, 107 in the cage 33 in a direction parallel to the central axis of the discharge part 21. As a result of the inclination of the cam grooves 117 (viewed in the plane of the front wall), a camming action (mechanical advantage) of the cage 85 is obtained when the handle 35 is rotated (camming surfaces of the cam grooves). Guide holes 121 for the guides 105, 107 are arranged in the front bracket 63 to guide the cage

85. A clearance is created between the guides 105, 107 and the guide holes 121 in order to prevent locking of the cage 85. Figure 5a shows how the highest points 125 of the cam grooves 117 (see also Figures 6 and 7) press the cage 85 against the direction of the spring force to release the ball 81.

[0049] Figure 5b shows the shutting-off position (B) in which a sealing surface 61 between the first and second openings 77, 79 in the front wall 53 comes to rest covering the discharge part 21. The cage 85 has been moved into and in a direction towards the first section 3 by the spring force and by the inclination of the cam grooves 117.

[0050] In the event of continued rotational movement (see Figure 5c) to the overpressure position (A), the first opening 77 comes to rest in line with the central axis of the discharge part 21. The first opening 77 has a smaller diameter than the second opening 79, in order to reduce the compressive force on the ball 81 and the spiral spring 113. In the overpressure position (A), the deepest parts 119 of the cam grooves 117 (see also Figure 6) receive the guides 105, 107 and the top part 83 of the cage 85 presses the ball 81 against the outlet 23 of the discharge part 21 by the action of the spiral spring 113, whereby the ball 81 forms a seal against the outlet 23 and the airflow F is rerouted so that it flows through the tube 87 of the discharge device 25. The discharge part 21 and the tube 87 together have the form of a T (see Figure 2). An inlet part 146 (see Figure 8) comprised in the duct arrangement 5 in the handle 35 has a slightly larger internal diameter than the internal diameter of the inlet part within the area of the end surface 52 of the second section 7. The duct in the inlet part that is defined between the discharge device 25 and the said end surface 52 tapers in the direction towards the handle 35.

[0051] Figure 6 shows the front wall 53 in Figures 5a-5c in greater detail. The inner 117' and outer 117" cam grooves are arranged on opposite sides of the sealing surface 61. A seal 129 is located in a recess 127. The cam grooves 117', 117" have a camming effect from the underpressure position (C) to a maximum position (the overpressure position A) in the front wall 53 of the handle 35 with a depth of 4 mm. The rotational movement extends over 70 degrees (β) from the first opening 77 to the second opening 79. When the handle 35 is turned through 35 degrees (α) in either direction from the shutting-off position (B), either the first 77 or the second 79 opening comes to rest in front of the discharge part 21, while at the same time the camming surfaces 131 of the inner and outer cam grooves 117', 117" move the respective guides 105, 107 +/- 2 mm in a direction parallel to the extent of the handle 35. Alternatively, the angle of rotation can be 60-90 degrees, preferably 65-85 degrees. Alternatively, the depth of the cam grooves can be 3-5 mm, preferably 3.5-4.5 mm.

[0052] A small guiding projection 133 and a larger positioning projection 135 are arranged on the front wall 53. The projections 133, 135 run in non-rigid grooves 137', 137" (see Figure 7 below) made of plastic material ar-

ranged in the front bracket 63. The groove 137" for the positioning projection 135 has gates 139 to enable the user to detect the different positions A, B and C.

[0053] A forming tool (not shown) can manufacture these projections 133, 135 in a single operation, with tool relief of the finished projections being carried out in one direction. This is cost-effective as far as manufacture is concerned.

[0054] Figure 7 shows a section of a lid 67 comprising a support element 13 (front 63 and rear 65 brackets), for supporting the pipe device 1 shown in Figure 6, so that it is mounted in such a way that it can rotate around an axis of rotation x. The figure shows clearly the different holes in the support element 13, such as the intake air opening 141 (sealing O-rings shown schematically) for supplied compressed air, duct 41 in the discharge part 21, guide holes 121, exhaust gas slot 95 and exhaust gas openings 97 and non-rigid grooves 137', 137" for the guiding and positioning projections 133, 135. A sealing device 143 for the first 77 or second 79 opening is shown in the sealing position for the selected setting of the pressure generation. Note that the seal shown around the duct 41 can relate to the front wall 53 and the scaling surface 61.

[0055] Figure 8 shows a cross section of a part of the pressure-generating pipe device 1 with air-regulating device 39 and part of the pressure vessel 11 in cross section. In the underpressure position (C), the ball 81 is suspended in the airflow F (see Figure 3a) flowing out from the discharge part 21 (the ejector) and is supported against the top part 83 of the cage 85. Figure 8 shows by a broken line the total depth of the inner cam groove 117' into the front wall 53, corresponding to the distance that the ball 81 moves to form a seal against the outlet 23 of the discharge part 21. The handle 35 is arranged with a locking function designed as a snap-in lock 145, comprising a trigger 147 operated by the user's index finger (not shown). In the shutting-off position (B), a lug 149 snaps into a recess 151 in the front bracket 63 and the handle 35 is locked in position. The user can now transport the pressure vessel 11 by carrying it by the handle 35, without accidental changes in pressure arising in the pressure vessel 11. Figure 8 shows an inlet 146 in the handle (the part corresponding to the part in a venturi tube that precedes the outlet of the discharge part viewed in the direction of flow). The inlet extends parallel to the extent of the handle from the front wall 53 to a position inside the handle. The distance that the inlet 146 extends into the handle is approximately 5-35 mm, preferably 10-15 mm. The internal diameter of the discharge part 21 at the outlet 23 is approximately 1.6 mm. The internal duct in the discharge part 21 then tapers in the direction towards the tube 87 (the discharge device 25) and is 1-2.5 mm in diameter at its narrowest section (where the discharge device 25 is positioned).

[0056] Figure 9 shows a pressure vessel 11 comprising a removable lid 67. The lid 67 is attached by sealing elements, such as O-rings, X-rings, etc, that can be se-

cured on a collar 153 on the vessel 11 by means of a locking ring 155. The lid 67 comprises the front 63 and rear 65 brackets arranged with air holes arranged in positions to match the duct arrangements 5, 9 of the pipe device 1. The first section 3 is arranged between the brackets 63, 65. As a result of the utilization of the locking ring 155 and the O-ring for attaching the lid 67 to the vessel 11, the manufacture of the lid 67 can be made more efficient, as the material of which it is manufactured can be made thinner in relation to known lids for pressure vessels where threaded connections are used. The lid 67 is made of plastic. The lid 67 comprises a connector 157 recessed into the lid 67 for connection, via a pipe (not shown), to an external container, such as a brake fluid reservoir in a vehicle, reservoir for cooling installations, fluid containers for various purposes within industry, etc. A compressed air source 17 is connected to the pipe device 1 for generating an airflow F in this. An additional safety valve 159 is recessed into the lid 67. Similarly, a manometer 161 is recessed into the lid 67.

[0057] Figure 10 shows a front wall 53 of the first section 3, which has a U-shaped opening 55 for the airflow F generating overpressure or underpressure in the pressure vessel 11.

[0058] Figure 11 shows a locking ring 163 for securing the lid 67 of the pressure vessel 11. A catch 165 for operating a pull rod 167 is hinged to the locking ring 163. The pull rod 167 is in turn hinged to the locking ring 163 and to the catch 165.

[0059] There can be other embodiments within the framework of the present invention, which is defined by the appended claims. For example, the ducts can have an oval cross section, and the support element can comprise one bracket. The lid and the duct arrangement in the second section are suitably manufacture in one piece, for example of plastic, metal or other material. The ejector and bracket can be manufactured as one integral unit. The pressure vessel can have a circular, oval or rectangular cross section. The terms "venturi tube", "ejector", "nozzle", etc, can be used as synonyms for the term "discharge part". The regulator can be made of metal, plastic or other suitable material. Other camming mechanisms can be arranged to move the first section (the handle) in relation to the function of the discharge part of the second section. The discharge part can either be an integral part of the second section or a separate part of the second section. Different materials can be used for the different parts, such as plastic (acetal POM plastic, etc), metal, etc.

Claims

1. Pressure-generating pipe device for a pressure vessel (11) arranged for intake and discharge of fluid (15) to and from the pressure vessel (11), which pipe device (1) comprises a first section (3) that can be connected to a compressed air source (17), which first section (3) has a duct arrangement (5); a second

- section (7) comprising a discharge part (21); and at least one discharge device (25) that is in communication with the duct arrangement (5) and the pressure vessel (11), the first and the second sections (3, 7) are arranged to move in relation to each other, the first section (3) comprises a control device (29) for operating an air-regulating device (39) arranged in the discharge part (21) for changing of direction of the airflow through the discharge device (25) to bring about overpressure and underpressure in the pressure vessel (11), and the second section has the discharge device (25) and whereby, in an underpressure position (C), the control device (29) opens the air-regulating device (39) at the outlet (23) of the discharge part (21) allowing the airflow (F) to pass through, thereby generating an underpressure in the discharge device (25), **characterized in that**, in the underpressure position (C), the airflow (F) generated through the pipe device (1) is turned in the opposite direction after it passes through the outlet (23) of the discharge part (21) by means of an airflow-rerouting device (91) arranged in this, wherein the first section (3) is designed as a handle.
2. Pipe device according to Claim 1, wherein the handle is a turning handle (35).
 3. Pipe device according to Claim 1 or 2, **characterized in that** end surfaces (52) of the first and second sections (3, 7) are arranged with at least one opening that enables the airflow to pass between the sections (3, 7).
 4. Pipe device according to any one of Claims 1-3, **characterized in that**, in a shutting-off position (B), end surfaces (52) of the first and second sections (3, 7) are arranged to form a seal with each other in the event of the said movement and to bring about a shutting off of the airflow (F) between the first and the second sections (3, 7).
 5. Pipe device according to any one of the preceding claims, **characterized in that** a front wall (53) of the first section (3) facing towards the second section (7) comprises a first opening (77) and a second opening (79), which first opening (77) is positioned in the front wall (53) in such a way that the first opening (77) is aligned with the discharge part (21) of the second section (7), in the event of the said movement to an overpressure position (A), and the second opening (79) is similarly aligned with the discharge part (21) of the second section (7), in the event of continued movement to an underpressure position (C).
 6. Pipe device according to Claim 5, **characterized in that** the first opening (77) has a smaller diameter than the second opening (79).
 7. Pipe device according to any one of the preceding claims, **characterized in that** a spring element (111) is comprised in the control device (29), which spring element (111) has a spring-back effect on a regulator in the direction essentially towards the discharge part (21) to form a partial seal, to bring about rerouting of the airflow (F) through the discharge device (25), in an overpressure position (A), for pressurizing of the pressure vessel (11).
 8. Pipe device according to any one of the preceding claims, **characterized in that** a front wall (53) of the first section (3) facing towards the second section (7) comprises a cam groove (117), in which cam groove (117, 117") cam followers in a cage (85) move in a forward and backward direction in the longitudinal direction of the pipe device (1) when the first section (3) is rotated, which cage (85) encloses a regulator (43) that is arranged to partially seal the discharge part (21) in one direction and to release the regulator (43) in the second direction, a spring element (111) is in contact with the cage (85) and a part of the second section (7), the front wall (53) is arranged with a first opening (77) that, in the event of a rotational movement to an overpressure position (A), is aligned with the discharge part (21) of the second section (7) and with a second opening (79) that, in the event of continued rotational movement to an underpressure position (C), is similarly aligned with the discharge part (21) of the second section (7), the front wall (53) is, in addition, arranged with a sealing surface (61) that, in the event of continued rotational movement to a shutting-off position (B), is aligned with the discharge part (21).
 9. Pressure vessel arranged for a pipe device (1) according to any one of the preceding claims, **characterized in that** the pressure vessel (11) comprises a support element (13) arranged to support the pipe device (1), which support element (13) has at least one slide surface that is in contact with the pipe device.
 10. Pressure vessel according to Claim 9, **characterized in that** the pressure vessel (11) comprises a removable lid (67), comprising sealing elements, that can be fastened on a collar (153) on the said vessel (11) for fluid (15) by means of a locking ring (155, 163), upon which lid (67) is arranged the support element (13) comprising a front and a rear bracket (63, 65) arranged with air holes matching the duct arrangements of the pipe device (1), between which brackets (63, 65) the first section (3) is arranged.
 11. Pressure vessel according to Claim 9 or 10, **characterized in that** a safety valve device (159) is recessed into the lid (67) in the area essentially below a pipe device (1) positioned essentially at a distance

from the top of the lid (67).

Patentansprüche

1. Druckerzeugende Rohrvorrichtung für einen Druckbehälter (11), die für ein Ansaugen und ein Ausstoßen eines Fluids (15) zu und von dem Druckbehälter (11) eingerichtet ist, welche Rohrvorrichtung (1) umfasst:

eine erste Sektion (3), die mit einer Quelle für komprimierte Luft (17) verbunden werden kann, welche erste Sektion (3) eine Leitungsanordnung (5) aufweist,

eine zweite Sektion (7), die ein Ausstoßteil (21) umfasst,

und zumindest eine Ausstoßvorrichtung (25), die sich in Kommunikation mit der Leitungsanordnung (5) und dem Druckbehälter (11) befindet, wobei

sich die erste und die zweite Sektion (3, 7) in Relation zueinander bewegen können, die erste Sektion (3) eine Steuervorrichtung (29) zum Betreiben einer Luftregulierungsvorrichtung (39) umfasst, die im Ausstoßteil (21) zum Verändern der Richtung des Luftstroms durch die Ausstoßvorrichtung (25) angeordnet ist, um einen Überdruck und einen Unterdruck im Druckbehälter (11) zu bewirken, und die zweite Sektion die Ausstoßvorrichtung (25) aufweist, und wodurch die Steuervorrichtung (29) in einer Unterdruckposition (C) die Luftregulierungsvorrichtung (39) am Auslass (23) des Ausstoßteils (21) öffnet, wodurch der Luftstrom (F) hindurch gelangen kann, womit ein Unterdruck in der Ausstoßvorrichtung (25) erzeugt wird,

dadurch gekennzeichnet, dass

in der Unterdruckposition (C) der durch die Rohrvorrichtung (1) erzeugte Luftstrom (F) in die entgegengesetzte Richtung gedreht wird, nachdem er durch den Auslass (23) des Ausstoßteils (21) mittels der darin angeordneten Luftumleitungsvorrichtung (91) gelangt, wobei die erste Sektion (3) als Griff ausgelegt ist.

2. Rohrvorrichtung gemäß Anspruch 1, bei der der Griff ein Drehgriff (35) ist.
3. Rohrvorrichtung gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Endflächen (52) der ersten und zweiten Sektion (3, 7) mit zumindest einer Öffnung angeordnet sind, die den Luftstrom zwischen den Sektionen (3, 7) hindurchgelangen lässt.
4. Rohrvorrichtung gemäß einem der Ansprüche 1-3, **dadurch gekennzeichnet, dass**, in einer Ver-

schlussposition (B), Endflächen (52) der ersten und zweiten Sektion (3, 7) im Falle der Bewegung eine Dichtung miteinander ausbilden können, und ein Absperren des Luftstroms (F) zwischen der ersten und der zweiten Sektion (3, 7) bewirken können.

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5. Rohrvorrichtung gemäß einem der vorangegangenen Ansprüche, **dadurch gekennzeichnet, dass** eine Vorderwand (53) der ersten Sektion (3), die in Richtung der zweiten Sektion (7) weist, eine erste Öffnung (77) und eine zweite Öffnung (79) umfasst, welche erste Öffnung (77) in der Vorderwand (53) derart positioniert ist, dass die erste Öffnung (77) mit dem Ausstoßteil (21) der zweiten Sektion (7) ausgerichtet ist, und zwar im Falle der Bewegung zu einer Überdruckposition (A), und die zweite Öffnung (79) ähnlich mit dem Ausstoßteil (21) der zweiten Sektion (7) ausgerichtet ist, und zwar im Falle einer fortgeführten Bewegung zu einer Unterdruckposition (C).

6. Rohrvorrichtung gemäß Anspruch 5, **dadurch gekennzeichnet, dass** die erste Öffnung (77) einen kleineren Durchmesser aufweist als die zweite Öffnung (79).

7. Rohrvorrichtung gemäß einem der vorangegangenen Ansprüche, **dadurch gekennzeichnet, dass** ein Federelement (111) in der Steuervorrichtung (29) umfasst ist, welches Federelement (111) einen Rückfedereffekt auf einen Regulator in der Richtung im Wesentlichen zum Ausstoßteil (21) aufweist, um eine teilweise Dichtung auszubilden, um ein Umleiten des Luftstroms (F) durch die Ausstoßvorrichtung (25) in einer Überdruckposition (A) zum Bedrücken des Druckbehälters (11) zu bewirken.

8. Rohrvorrichtung gemäß einem der vorangegangenen Ansprüche, **dadurch gekennzeichnet, dass** eine Vorderwand (53) der ersten Sektion (3), die in Richtung der zweiten Sektion (7) weist, eine Nockenut (117) umfasst, in welcher Nockenut (117', 117'') sich Nockenmitnehmer in einem Käfig (85) in einer Vorwärts- und einer Rückwärtsrichtung in der Längsrichtung der Rohrvorrichtung (1) bewegen, wenn die erste Sektion (3) gedreht wird, welcher Käfig (85) einen Regulator (43) umschließt, der das Ausstoßteil (21) in einer Richtung teilweise abdichten kann, und den Regulator (43) in der zweiten Richtung freigeben kann, wobei sich ein Federelement (111) in Kontakt mit dem Käfig (85) und einem Teil der zweiten Sektion (7) befindet, die Vorderwand (53) mit einer ersten Öffnung (77) angeordnet ist, die, im Falle einer Drehbewegung zu einer Überdruckposition (A), mit dem Ausstoßteil (21) der zweiten Sektion (7) ausgerichtet ist, und mit einer zweiten Öffnung (79) angeordnet ist, die, im Falle einer fortgeführten Drehbewegung zu einer Unterdruckposition (C) mit dem Ausstoßteil (21) der zweiten Sektion

(7) ähnlich ausgerichtet ist, die Vorderwand (53) zusätzlich mit der Dichtfläche (61) angeordnet ist, die, im Falle einer fortgeführten Drehbewegung zu einer Verschlussposition (B), mit dem Ausstoßteil (21) ausgerichtet ist.

9. Druckbehälter, der für eine Rohrvorrichtung (1) gemäß einem der vorangegangenen Ansprüche eingerichtet ist, **dadurch gekennzeichnet, dass** der Druckbehälter (11) ein Stützelement (13) umfasst, das die Rohrvorrichtung (1) stützen kann, welches Stützelement (13) zumindest eine Gleitfläche aufweist, die sich in Kontakt mit der Rohrvorrichtung befindet.
10. Druckbehälter gemäß Anspruch 9, **dadurch gekennzeichnet, dass** der Druckbehälter (11) einen Dichtungselemente umfassenden, beweglichen Deckel (67) umfasst, der mittels eines Verriegelungsring (155, 163) an einem Kragen (153) am Behälter (11) für ein Fluid (15) befestigt werden können, auf welchem Deckel (67) das Stützelement (13) angeordnet ist, das einen Vorder- und einen Rückbügel (63, 65) umfasst, die mit Luftlöchern versehen sind, welche zu den Leitungsanordnungen der Rohrvorrichtung (1) passen, zwischen welchen Bügeln (63, 65) die erste Sektion (3) angeordnet ist.
11. Druckbehälter gemäß Anspruch 9 oder 10, **dadurch gekennzeichnet, dass** eine Sicherheitsventilvorrichtung (159) im Deckel (67) in dem Gebiet im Wesentlichen unterhalb der Rohrvorrichtung (1) abgesetzt ist, die im Wesentlichen in einem Abstand vom Oberteil des Dekkels (67) positioniert ist.

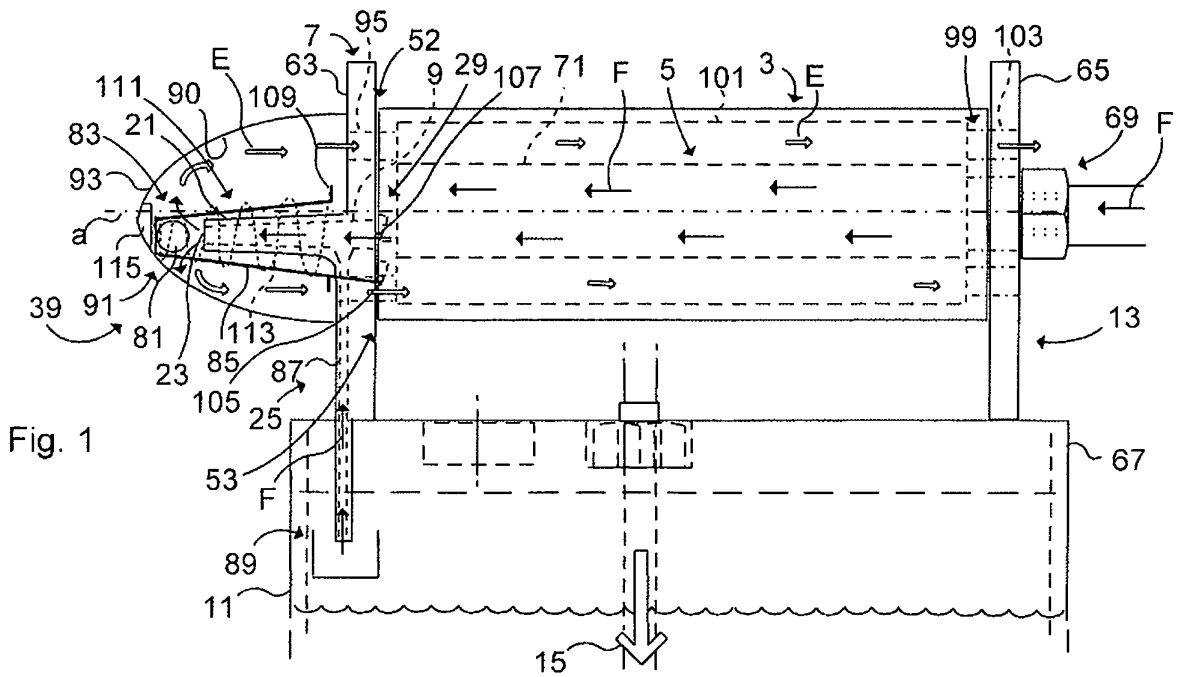
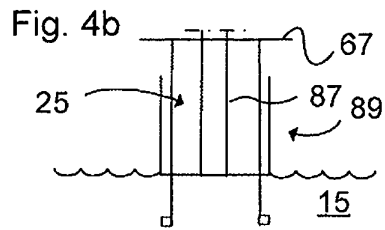
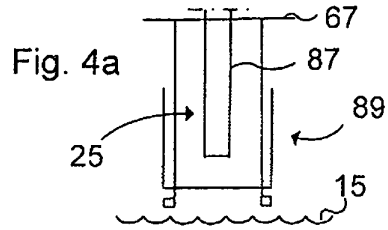
Revendications

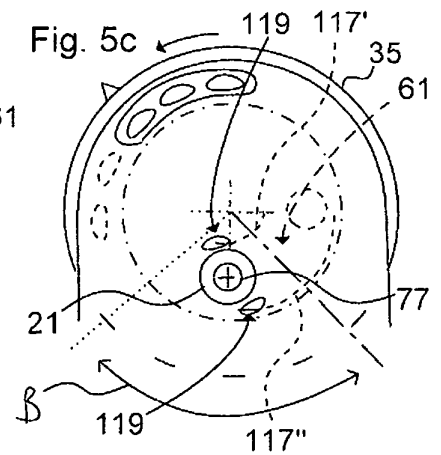
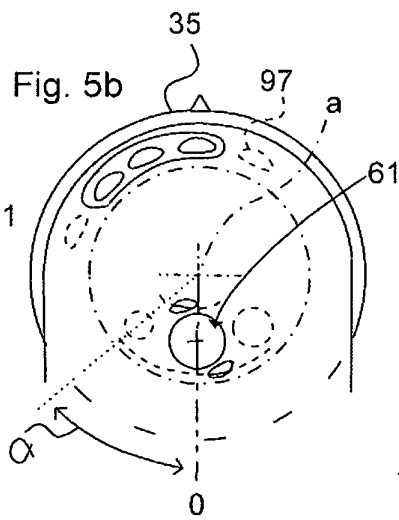
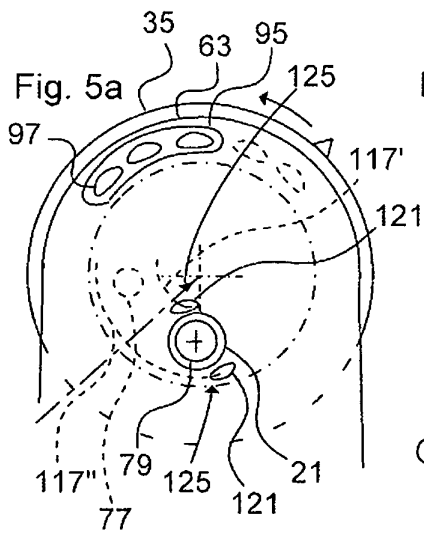
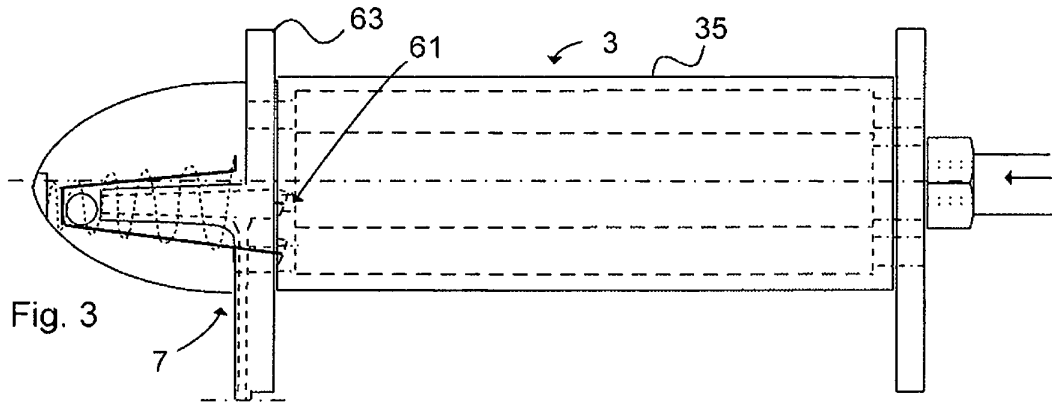
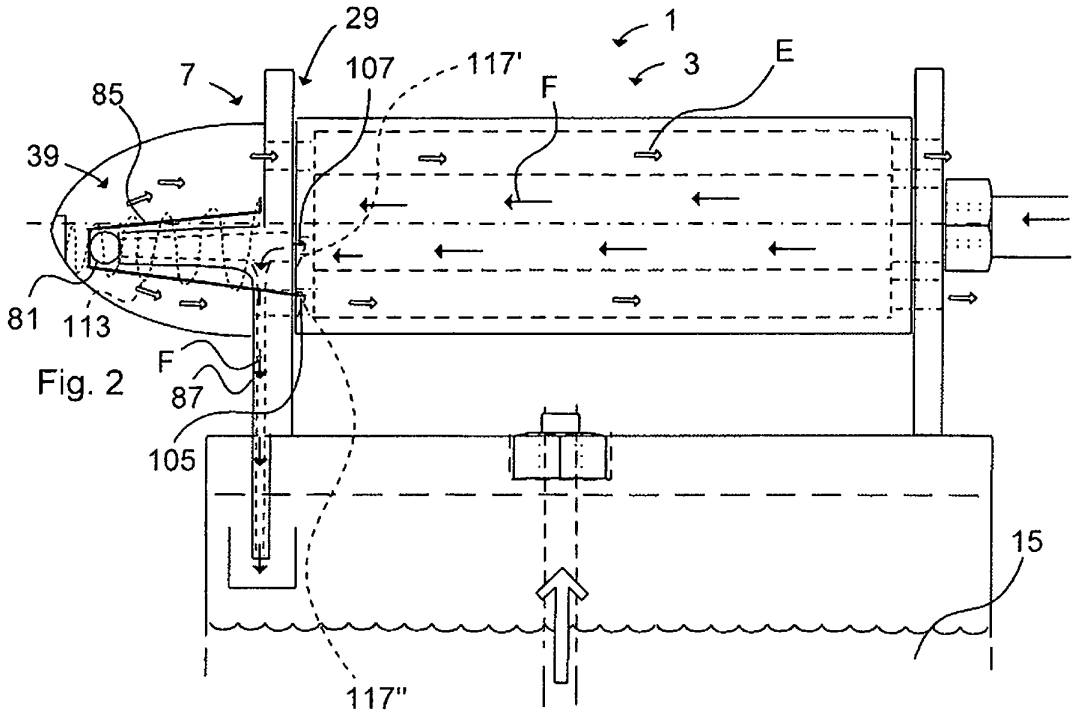
1. Dispositif de tuyau de génération de pression pour un récipient sous pression (11) agencé pour l'admission et la décharge de fluide (15) de et vers le récipient sous pression (11), lequel dispositif de tuyau (1) comprend une première section (3) qui peut être raccordée à une source d'air comprimé (17), laquelle première section (3) a un agencement de conduit (5) ; une deuxième section (7) comprenant une partie de décharge (21) ; et au moins un dispositif de décharge (25) qui est en communication avec l'agencement de conduit (5) et le récipient sous pression (11), les première et deuxième sections (3, 7) sont agencées pour se déplacer l'une par rapport à l'autre, la première section (3) comprend un dispositif de commande (29) pour actionner un dispositif de régulation d'air (39) agencé dans la partie de décharge (21) afin de changer la direction de l'écoulement d'air passant par le dispositif de décharge (25) afin de provoquer une surpression et une sous-pression dans le récipient sous pression (11), et la deuxième

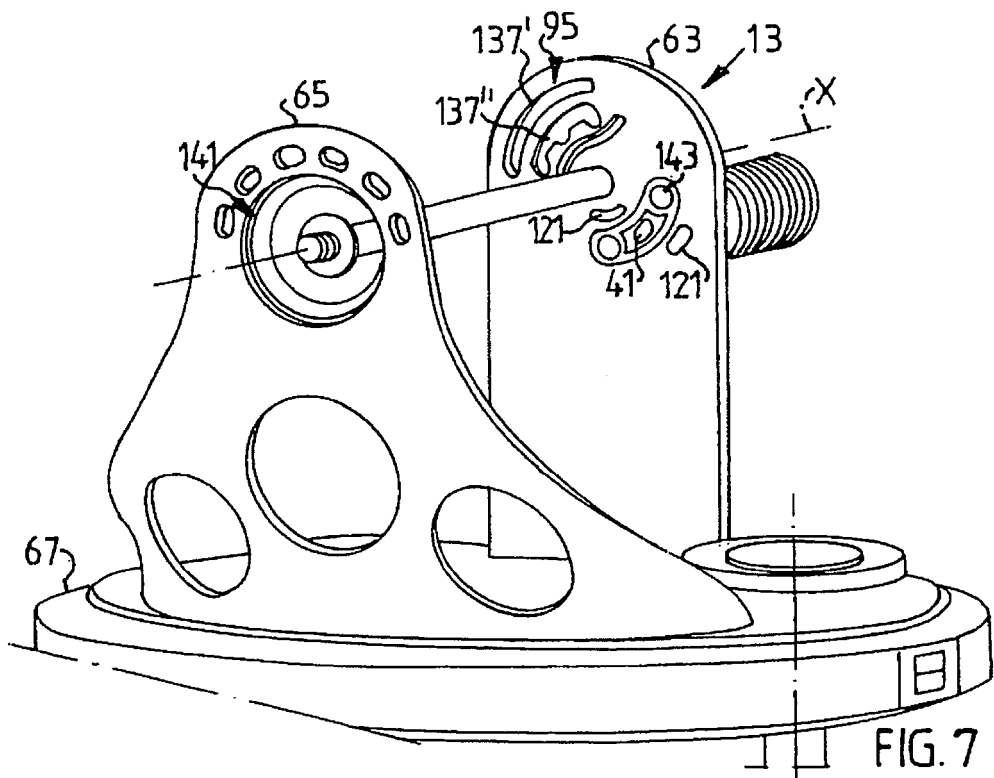
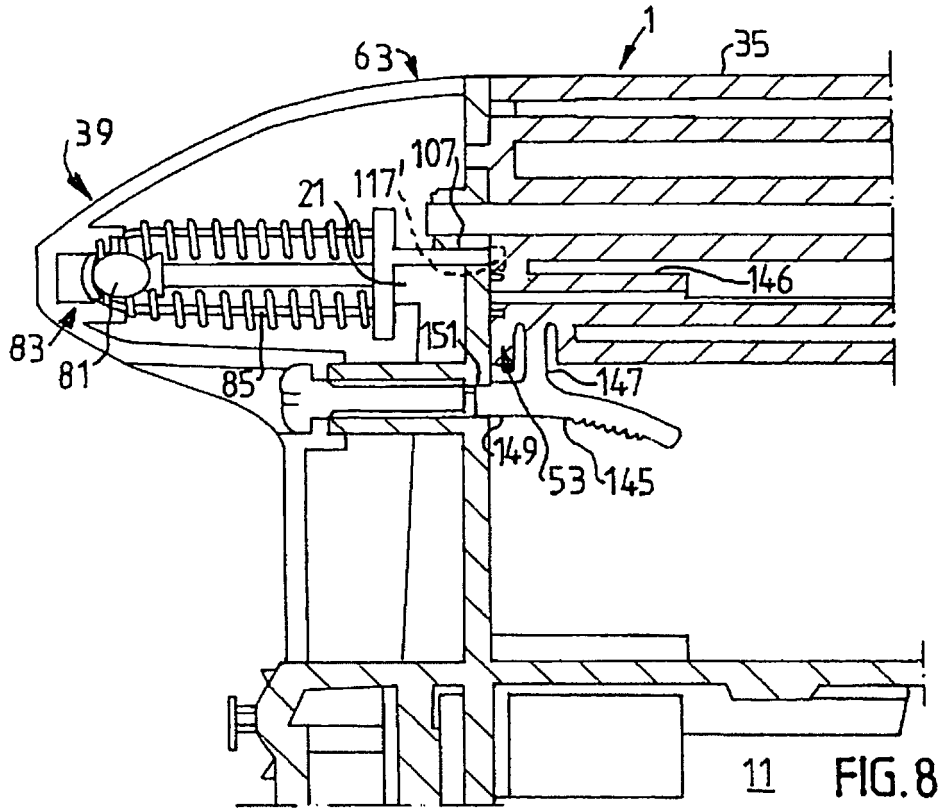
section présente le dispositif de décharge (25), et moyennant quoi, dans une position de sous-pression (C), le dispositif de commande (29) ouvre le dispositif de régulation d'air (39) au niveau de la sortie (23) de la partie de décharge (21) permettant à l'écoulement d'air (F) de passer à travers, générant ainsi une sous-pression dans le dispositif de décharge (25), **caractérisé en ce que**, dans la position de sous-pression (C), l'écoulement d'air (F) généré à travers le dispositif de tuyau (1) revient dans la direction opposée après être passé par la sortie (23) de la partie de décharge (21) au moyen d'un dispositif de réacheminement d'écoulement d'air (91) agencé dans cette dernière, dans lequel la première section (3) est conçue comme une poignée.

2. Dispositif de tuyau selon la revendication 1, dans lequel la poignée est une poignée tournante (35).
3. Dispositif de tuyau selon la revendication 1 ou 2, **caractérisé en ce que** les surfaces d'extrémité (52) des première et deuxième sections (3, 7) sont agencées avec au moins une ouverture qui permet à l'écoulement d'air de passer entre les sections (3, 7).
4. Dispositif de tuyau selon l'une quelconque des revendications 1 à 3, **caractérisé en ce que**, dans une position d'arrêt (B), des surfaces d'extrémité (52) des première et deuxième sections (3, 7) sont agencées pour former un joint d'étanchéité entre elles dans le cas dudit mouvement et pour provoquer un arrêt de l'écoulement d'air (F) entre les première et deuxième sections (3, 7).
5. Dispositif de tuyau selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'une** paroi avant (53) de la première section (3) faisant face à la deuxième section (7), comprend une première ouverture (77) et une deuxième ouverture (79), laquelle première ouverture (77) est positionnée dans la paroi avant (53) de telle sorte que la première ouverture (77) soit alignée avec la partie de décharge (21) de la deuxième section (7), dans le cas dudit mouvement dans une position de surpression (A), et la deuxième ouverture (79) soit alignée de manière similaire avec la partie de décharge (21) de la deuxième section (7), dans le cas du mouvement continu dans une position de sous-pression (C).
6. Dispositif de tuyau selon la revendication 5, **caractérisé en ce que** la première ouverture (77) a un plus petit diamètre que la deuxième ouverture (79).
7. Dispositif de tuyau selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'un** élément de ressort (111) est compris dans le dispositif de commande (29), lequel élément de ressort

- (111) a un effet de rappel sur un régulateur dans la direction essentiellement orientée vers la partie de décharge (21) afin de former un joint d'étanchéité partiel, afin de provoquer le réacheminement de l'écoulement d'air (F) à travers le dispositif de décharge (25), dans une position de surpression (A), pour mettre sous pression le récipient sous pression (11).
8. Dispositif de tuyau selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**une paroi avant (53) de la première section (3) faisant face à la deuxième section (7) comprend un rainure de came (117), dans laquelle rainure de came (117', 117'') des poussoirs de came dans une cage (85) se déplacent dans une direction avant et arrière dans la direction longitudinale du dispositif de tuyau (1) lorsque la première section (3) est entraînée en rotation, laquelle cage (85) enferme un régulateur (43) qui est agencé pour réaliser partiellement l'étanchéité de la partie de décharge (21) dans une direction et pour libérer le régulateur (43) dans la deuxième direction, un élément de ressort (111) est en contact avec la cage (85) et avec une partie de la deuxième section (7), la paroi avant (53) est agencée avec une première ouverture (77) qui, dans le cas d'un mouvement de rotation dans une position de surpression (A), est alignée avec la partie de décharge (21) de la deuxième section (7) et avec une deuxième ouverture (79) qui, dans le cas du mouvement de rotation continu dans la position de sous-pression (C), est alignée de manière similaire avec la partie de décharge (21) de la deuxième section (7), la paroi avant (53) est, de plus, agencée avec une surface d'étanchéité (61) qui, dans le cas du mouvement de rotation continu jusqu'à la position d'arrêt (B), est alignée avec la partie de décharge (21).
9. Récipient sous pression agencé pour un dispositif de tuyau (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le récipient sous pression (11) comprend un élément de support (13) agencé pour supporter le dispositif de tuyau (1), lequel élément de support (13) a au moins une surface coulissante qui est en contact avec le dispositif de tuyau.
10. Récipient sous pression selon la revendication 9, **caractérisé en ce que** le récipient sous pression (11) comprend un couvercle amovible (67), comprenant des éléments d'étanchéité, qui peuvent être fixés sur un collier (153) sur ledit récipient (11) pour le fluide (15) au moyen d'une bague de blocage (155, 163), sur lequel couvercle (67), est agencé l'élément de support (13) comprenant une console avant et une console arrière (63, 65) agencées avec des trous d'air correspondant aux agencements de conduit du
- dispositif de tuyau (1), entre lesquelles consoles (63, 65), est agencée la première section (3).
11. Récipient sous vide selon les revendications 9 ou 10, **caractérisé en ce qu'**un dispositif de soupape de sécurité (159) est enfoncé dans le couvercle (67) dans la zone située essentiellement au-dessous d'un dispositif de tuyau (1) positionné essentiellement à une certaine distance de la partie supérieure du couvercle (67).







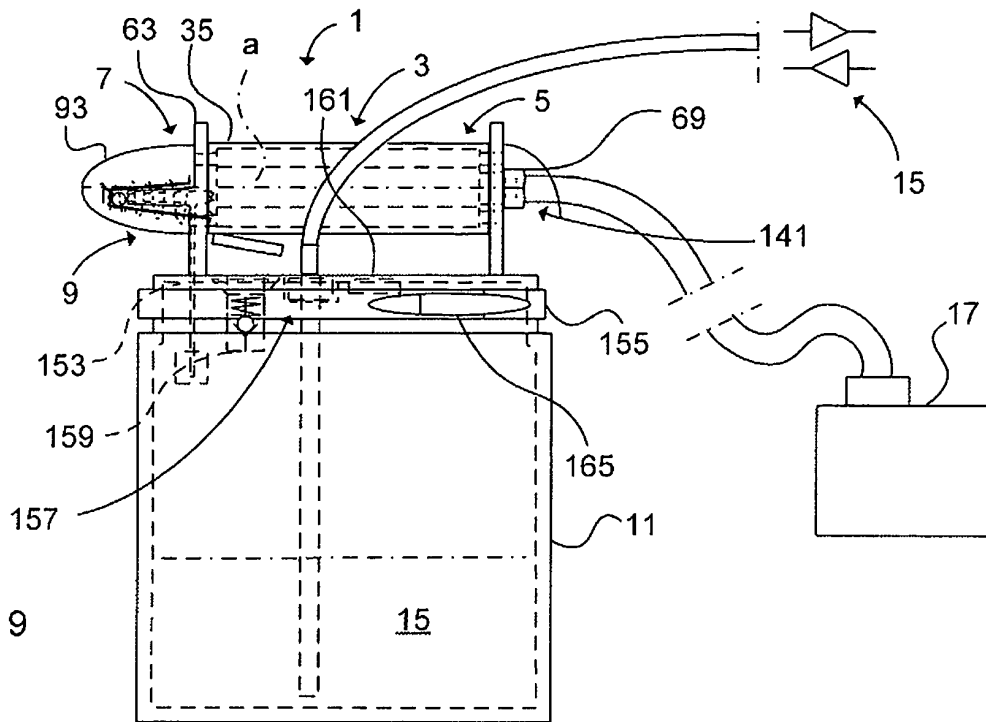


Fig. 9

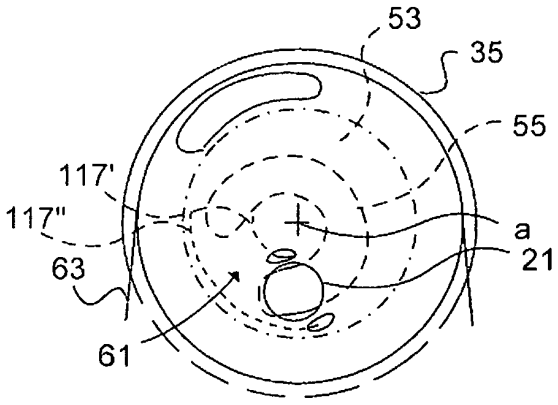


Fig. 10

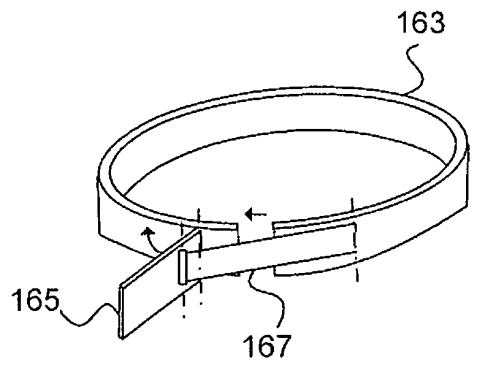


Fig. 11

REFERENCES CITED IN THE DESCRIPTION

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