

Description

This invention relates to a device for temporarily sealing a pipe, as for example the production tubing of an oil well.

Devices of this kind are known and are sometimes referred to as "subs". "Subs" are usually used in conjunction with plugs for production tubing; the subs are normally closed but, when open, provide a passage for the flow of oil through the plug, thus enabling a well to start or recommence production without requiring removal of the plug.

"Subs" which are openable upon the application thereto of pressure by pumping oil or mud down the production tubing are known as "pump out subs".

A previously known "pump out sub" comprises a plunger held by shear pins in a position in which it seals an opening through which oil may pass up the production tubing. The shear pins may be sheared by the pressure of the pumped fluid so that the plunger drops away from the sealing position.

A second previously known "pump out sub" comprises a disc which is sheared from the sub when a sufficient pressure of fluid is applied.

These known "pump out subs" have the disadvantage that deposition of debris, such as sand or shale, will result in formation of a plug of debris on the plunger or disc when fluid is pumped under pressure onto it. In consequence greater pressure must be applied before the pins or disc will shear than if the plug of debris were not present. Also the shear parts may be prematurely sheared by jarring the plug when it is set down inside the tubing by wireline.

A further disadvantage of the aforesaid "pump out subs" is the high pressure differential necessary to effect shearing. Thus for shear disc holding a well pressure of 2000 psi it is usually necessary to apply at least 3000 psi to produce shearing; this high pressure differential of 1000 psi necessitates the use of well Christmas trees capable of coping with the high pressures required for sub opening, and imposes restrictions on the use of subs in wells in which the Christmas trees are rigged to cope with relatively low pressures.

US-A-3570595 (Berryman) discloses a hydraulically operated valve for controlling fluid flow through a well packer. The valve comprises a piston and a valve sleeve, arranged with a chamber such that the valve remains closed even though pressure is imposed from inside or outside the chamber. The valve is opened by means of a flow conductor movable into position on the valve to selectively isolate one axial end of the piston and valve sleeve assembly which may be acted upon by a predominant fluid pressure in the flow conductor to open the valve.

US-A-3183040 (Gold) discloses a hydraulic metering valve for use in a brake system. The valve comprises a piston and a valve member which cooperate to seal the passageway from an

inlet to an outlet port. Upon application of a predetermined fluid pressure at the inlet, the piston and valve member move away from the inlet and remain in sealing cooperation until the valve member contacts a stop member, whereupon the piston continues its movement away from the inlet and breaks the seal with the valve member to open the valve. The stop member is movable to a restraining position in which the valve member is prevented from movement away from the inlet, whereby the metering function of the valve is obviated.

According to this invention there is provided a valve device for temporarily sealing a pipe comprising a cylindrical body defining a chamber having a first and second port, said first port being positioned intermediate the axial ends of the chamber, and said second port being positioned at one axial end of the chamber, a piston axially slidable within the cylindrical body, said piston and said cylindrical body cooperating to define an annular passageway between them, said passageway communicating said first port with said second port when the valve device is open, an annular member arranged within the said cylindrical body, said member having limited axial movement between two fixed axial planes of the cylindrical body and being in sealing contact with said cylindrical body throughout its axial movement and acting so as to seal the passageway when in conjunction with the piston, said piston being movable at least between a first position, and a second position in which the configuration of the passage is dependent on the displacement of the said annular member from a second one of said planes, and retaining means for restraining the piston, when in its second position, from moving towards its first position, characterised in that said annular member is positively restricted in its movement away from the first said plane by the adjacent end portion of the piston whereby the passageway is positively sealed by the annular member situated at said first plane when the piston is at its first position.

Devices in accordance with the present invention will be referred to herein sometimes as "pump open subs".

In devices described below the movable member is a collet mounted on the piston.

In preferred embodiments described hereunder the piston is movable, in said chamber, from the first to the second position under the influence of fluid pressure applied to an end face thereof.

In the preferred embodiments, the device is adapted such that when installed in a pipeline the piston can be moved from the first position to the second position by increasing the fluid pressure at the second port or outlet side of the chamber, and the annular member may then be moved, to permit said fluid flow, by reducing the said outlet side pressure to below the pressure at the first port or inlet(s).

In preferred embodiments of the device, the piston is resiliently biased towards the first position by for example, compression springs.

Preferably the annular member is movable from the piston under the influence of a fluid pressure force applied to a surface thereof.

The devices in accordance with the invention comprise means for locking the piston into the second position.

In the embodiments described below the piston comprises at least one flexible tongue having a shoulder portion adapted to snap into engagement with a complementary shoulder portion fixed with respect to the cylindrical body or casing upon the piston reaching the second position, whereby coaction of the shoulders prevents movement of the piston back towards the first position. In the embodiments described the piston has a depending skirt, and said flexible tongue is defined by an elongate generally U-shaped slot formed in said skirt.

Usually the annular member is a collet which in the second position of the piston has one of its end faces exposed to the exterior of the chamber via said inlet or inlets and another end face exposed to the exterior of the chamber via said outlet, and is thus movable, to a non-sealing position, under the influence of a pressure differential between said end faces. In one embodiment the collet is resiliently biased towards the first axial plane. Possibly the piston may be provided with a shear pin, adapted to co-act with a shear surface fixed with respect to the casing, the arrangement being such that it is necessary to shear the pin, during movement of the piston towards the second position, before the piston can reach the second position.

In order that the invention may be more fully understood embodiments in accordance therewith will now be described by way of example only with reference to the accompanying drawings in which:—

Figure 1, is a section through an oil well production pipeline with a plug and "pump open sub" in position;

Figure 2 is a partial cross sectional elevation of a "pump open sub" in its closed condition;

Figure 3 is a view similar to that of Figure 2 but showing the sub in its open condition;

Figure 4 is a perspective view of a piston of the embodiment shown in Figures 2 and 3;

Figure 5 is a partial cross sectional elevation of another form of "pump open sub"; and

Figure 6 is a partial cross sectional elevation of yet another form of "pump open sub".

In the drawings like parts in the various embodiments are given the same reference numbers.

Figure 1 is a general view showing how the pump open subs 1 described below are usually located in position in production tubing 4 within an outer tube or casing 7. The sub is connected to a plug 2 in a conventional manner; the plug 2 is held in a tubing nipple 3, provided in conventional manner on riser pipe 4, by means of locking keys 5 on the plug and keyways 6 in the nipple 3.

Referring now, also, to Figure 2 the pump open sub 1 has an outer casing 8 defining a chamber 8'.

The bottom of the casing 8 is closed by a cap 9. The casing 8 comprises an intermediate sleeve 10 threadedly connected to an upper sleeve 11. Intermediate sleeve 10 is formed with a lower portion 10' and an upper portion 10'' of larger diameter than the lower portion 10', connected via an inclined shoulder portion 10a. A plurality of openings 12 are formed in shoulder portion 10a so as to connect the chamber 8' with the annular space 13 between the sub and the inner surface of the production tubing 4 on the down side of the plug 2. The casing 8 has an outlet at the top whereby the upper part of the chamber 8' has an upside portion 14 which communicates via the plug 2 with the production tubing 4 on the upside of the plug 2, and thence with the well head. In the open condition (see Figure 3) of the sub, to be described below, oil may flow up the production tubing 4, through openings 12, into chamber 8' through upside portion 14 and then through the production tubing 4 on the upside of the plug 2 to the well head: as shown in Figure 2 however, such flow is prevented by the sealing function of the piston 15 and collet 16.

Referring also to Figure 4 it will be seen that piston 15 has a head portion 19 and depending skirt portion 20 defining an inner space 20' within which a spiral compression spring 21 is located. The spring 21 engages the inner faces of head portion 19 and the cap 9 so as to urge the piston in the direction of arrow A i.e. so as to close the sub. The head portion 19 is stepped at 19' so as to define an annular shoulder 19a. The collet 16 is in the form of a short, hollow, cylinder fitting snugly, but slidably within the upper portion 10'' of the casing 10, between the shoulder 19a and an upper shoulder 11a formed by the end of section 11. O-rings 17 and 18 provide fluid tight seals between collet 16 and the upper portion of the casing 11 and head portion 19 respectively. It will be appreciated from Figures 2 and 3 that the collet is held between shoulders 19a and 11a when the sub is in the closed condition (Figure 2) whereby it cannot move longitudinally of the sub, but would be enabled to undergo such longitudinal movement only upon increased separation of the shoulders 19a and 11a.

Referring again to piston 15 it will be seen from Figure 4 that three longitudinally extending tongues 22a, 22b, 22c are formed in the skirt portion 20 being defined by generally U-shaped slots cut or otherwise formed through the thickness of the skirt material and extending from position X at the head end of the piston, to position Y adjacent the open end of skirt 20. One arm of at least one of the slots is extended up to the shoulder 19a in the form of a groove 23 for a purpose to be described below.

A small, for example 3mm diameter hole 23' is formed through the thickness of the skirt about mid way between each tongue and at a position such that, with the piston 15 and collet 16 in the closed condition, the hole is just higher than the lower face of the wall of openings 12.

Each tongue 22a, 22b and 22c is provided at its

free end with a flange or shoulder 24 extending outwardly from the skirt. Each flange 24 in section has a front face 24' extending normal to the outer face of the skirt 20 and a sloping rear face 25. The flanges, in the closed condition of the sub being located in complementary recesses in the inner face of lower portion 10'.

In operation, to open the sub, fluid such as oil or mud can be pumped down the production tubing 4 so as to exert a downward pressure on upper face of collet 16 and the upper face of piston head 19. When this pressure exceeds the combined upward pressure of the fluid downside of the sub (which is the fluid pressure in chamber 20') the pressure exerted by spring 21 and the resistance to fluid flow from the chamber 20', the piston 15 and collet 16 together begin to move downwardly i.e. in a direction opposite that of arrow A. The sloping faces 25 of flanges 24 coact with the complementary walls of the recesses so as to cause the tongues 22a, 22b, 22c to be pushed inwardly as the piston moves down the chamber 8' towards the closed end. When the flanges pass the bottom edge 200 of the lower sleeve portion 10' the flanges 24 are thereupon free to snap outwardly so as to bring the tongues 22a, 22b, 22c in their relaxed condition again. When this occurs front faces 24' of the flanges 24 will engage with the end face 26 of the lower sleeve portion 10' to prevent the piston 15 moving in the direction of arrow A: thus the flanges 24 and the end face of the lower sleeve portion act to lock the piston 15 in the position shown in Figure 3. During the downward movement of collet 16 with the piston 15 the collet remains in fluid tight relationship with the head 19 and upper sleeve portion 10' but the interior wall of the chamber is so configured that it contacts, and prevents further downward movement of the collet 16 when the collet 16 is at the position shown in dotted lines in Figure 3 i.e. the collet will have the position shown in dotted lines in Figure 3: this means that at this stage of the operation the piston and collet still substantially seal chamber 14 from opening 12.

However when the piston 15 has finally reached the position shown in Figure 3 O-ring 18 has moved to just below collet 16 thus breaking the fluid tight seal, which has the result of allowing slight leakage of fluid from the top side to the bottom side of the sub. The resulting slight pressure drop can serve as an indicator that the sub has been put in the 'locked position'.

In order to allow fluid access through openings 12 to chamber 14 all that is required is to reduce the fluid pressure applied to the piston 15 and collet 16, when the force exerted by fluid pressure on the bottom face of the collet 16 exceeds that exerted on the top face of the collet the collet will be forced upwardly in the direction of arrow A until the substantial sealing relationship between it and head 19 of piston 15 is destroyed: fluid will then flow freely through opening 12 and chamber 14 to the upside portion of production tubing 4. Usually the flowing fluid will force the collet 16 back to its original topmost portion in which it

engages the bottom face of upper sleeve 11.

It will be appreciated that the slot defining tongue 22a and groove 23 formed in skirt 20 provide fluid flow communication between chamber 20' and the exterior of the sub via openings 12: this will apply at any position of the piston 15 in its downward travel to the locked condition as the said slot and groove 23 give access from chamber 20' to the space 28 that exists between the head 19 and the inner surface of the wall portion 10'. Accordingly as the piston 15 is forced towards its locked position the fluid in chamber 20' is exhausted therefrom. The resistance to the flow of fluid from chamber 20' through the slot and groove 23 provide a shock absorbing effect which assists the spring in counteracting sudden shocks experienced e.g. when pointing the sub in the production tubing or surges in pressure, which may tend inadvertently to open the sub.

The holes 23' act as air vents when the sub is being assembled. Thus the piston may be inserted into a chamber defined by cap 9 and lower cylindrical wall 10' which is filled e.g. with oil; air being expelled through the holes as the piston descends to the position shown in Figure 2. The result is only a very small volume of air in the piston. It will be appreciated that as air is considerably more compressible than oil it is desirable to reduce the volume of air in space 20' to ensure more positive control of the piston and make it less susceptible to rapid movement upon experiencing sudden shocks or surges.

The embodiment shown in Figure 5 is generally similar to the first embodiment but additionally has a spring 29 to bias the collet 16 towards the upper position shown. No grooves 23 extends from the U-shaped slots within which the tongues 22a, b, c extend, but fluid escaping from space 27 through the U-shaped slots can flow through recess 30 cut in the intermediate wall 8 and which accommodates the spring 29.

The third embodiment illustrated in Figure 6 includes one or more shear pins 31, made for instance of brass. The pin or pins are located in head 19 of piston 15 and are fixed in position by a respective screw(s) 31'. The coacting surface on which the pin(s) 31 will shear is surface 32, thus being the bottom surface of opening(s) 12 in casing 8. The flange 32 and pin 31 are suitably positioned relatively to each other such that the pin 31 is not sheared until the flanges 24 of the resilient tongues 23 are positioned substantially opposite the bottom edge 200 of casing 8.

By virtue of the provision of the shear pin the sealing means are not set in their lower most position (see Figure 3) until a predetermined stepwise pressure increase on top side of the piston is applied. This provides an added safeguard against accidental opening of the pipeline.

This embodiment further includes a spring seat 33, firmly set in the head 19 of the piston, for locating the spring 21.

The seat 33 is rotatable with respect to the piston 15 and by being interposed between spring

21 and the inner face of head 19 of the piston the seat also permits rotation of the spring thus allowing cap 9 to rotate and thereby be removed during dismantling the sub. The sub described herein may be located in and removed from the production tubing using a conventional wireline technique.

Claims

1. A valve device (1) for temporarily sealing a pipe (4) comprising a cylindrical body (8) defining a chamber (8') having a first (12) and second (14) port, said first port (12) being positioned intermediate the axial ends of the chamber (8'), and said second port (14) being positioned at one axial end of the chamber (8'), a piston (15) axially slidable within the cylindrical body (8), said piston (15) and said cylindrical body (8) cooperating to define an annular passageway (28) between them, said passageway (28) communicating said first port (12) with said second port (14) when the valve device (1) is open, an annular member (16) arranged within the said cylindrical body (8), said annular member (16) having limited axial movement between two fixed axial planes of the cylindrical body (8) and being in sealing contact with said cylindrical body (8) throughout its axial movement and acting so as to seal the passage (28) when in conjunction with the piston (15), said piston (15) being movable at least between a first position, and a second position in which the configuration of the passage (28) is dependent on the displacement of the said annular member (16) from a second one of said planes, and retaining means (24) for restraining the piston (15), when in its second position, from moving towards its first position, characterised in that said annular member (16) is positively restricted in its movement away from the first said plane by the adjacent end portion (19) of the piston (15) whereby the passageway (28) is positively sealed by the annular member (16) situated at said first plane when the piston (15) is at its first position.

2. A device as claimed in Claim 1, characterised in that the annular member (16) is a cylindrical member having an axial end portion adjacent to the piston (15) which has an inner diameter which is greater than the diameter of the adjacent end (19) of the piston (15), and said passageway (28) is sealed by means of an axial overlap between the inner cylindrical surface of the annular member (16) and the adjacent outer cylindrical surface of the piston (15).

3. A device as claimed in Claim 1 or 2, characterised in that the annular member (16) is resiliently biased towards said first axial plane.

4. A device as claimed in any of Claims 1 to 3, characterised in that the piston (15) is resiliently biased towards said first position.

5. A device as claimed in any of Claims 1 to 4, characterised in that the retaining means (24) comprises at least one flexible tongue (22a) formed on the piston (15), said tongue (22a) having a shoulder portion (24) adapted to snap

into engagement with a complementary shoulder portion (20a) fixed with respect to the cylindrical body (8) upon the said piston (15) reaching the second position, whereby coaction of the shoulders (24, 200) prevents movement of the piston (15) towards the first position.

6. A device as claimed in any of Claims 1 to 5 characterised in that the said cylindrical body (8) is closed at an end (9) remote from the said second port (14) and the piston (15) is positioned in the body (8) between said second portion (14) and the said closed end (9), and a restricted passage (23) is provided from the exterior of the device (1) to the chamber (20') defined by the piston (15) and the closed end (9) of the said body (8).

7. A device as claimed in Claim 6 as appendant to Claim 15, characterised in that the piston (15) has a skirt (20) which extends into the second said chamber (20') and said flexible tongue (22a) is defined by an elongate generally U-shaped slot formed through the wall of said skirt (20), said slot comprising the restricted passage (23).

8. A device as claimed in any of Claims 1 to 7 characterised in that in its first position the displacement of the piston (15) is restricted by the annular member (16) and the piston (15) has a longer axial displacement than the annular member (16) such that in its second position a restricted pathway is provided by the piston (15) and the annular member (16) within the said passage (28) between said first port (12) and said second port (14).

9. A device as claimed in any of Claims 1 to 8 wherein the piston (15) is provided with a shear pin (31) arranged to co-act with a shear surface (32) fixed with respect to the cylindrical body (8), the arrangement being such that it is necessary to shear the pin (31), during movement of the piston (15) towards the second position thereof, before the piston (15) can reach the second position.

Revendications

1. Un dispositif à soupape (1) pour l'obturation temporaire d'un tube (4), comprenant un corps cylindrique (8) définissant une chambre (8') qui présente un premier orifice (12) et un second orifice (14), le dit premier orifice (12) étant localisé entre les extrémités axiales de la chambre (8') et le dit second orifice (14) étant localisé à une extrémité axiale de la chambre (8'), un piston (15) mobile axialement à l'intérieur du corps cylindrique (8), le dit piston (15) et le dit corps cylindrique (8) collaborant pour définir entre eux un passage annulaire (28), le dit passage (28) mettant en communication le dit premier orifice (12) avec le dit second orifice (14) lorsque le dispositif à soupape (1) est ouvert, une pièce annulaire (16) disposée à l'intérieur du dit corps cylindrique (8), la dite pièce annulaire (16) pouvant accomplir une course axiale limitée entre deux plans axiaux fixes du corps cylindrique (8) et étant en contact étanche avec le dit corps cylindrique (8) sur toute

21 and the inner face of head 19 of the piston the seat also permits rotation of the spring thus allowing cap 9 to rotate and thereby be removed during dismantling the sub. The sub described herein may be located in and removed from the production tubing using a conventional wireline technique.

Claims

1. A valve device (1) for temporarily sealing a pipe (4) comprising a cylindrical body (8) defining a chamber (8') having a first (12) and second (14) port, said first port (12) being positioned intermediate the axial ends of the chamber (8'), and said second port (14) being positioned at one axial end of the chamber (8'), a piston (15) axially slidable within the cylindrical body (8), said piston (15) and said cylindrical body (8) cooperating to define an annular passageway (28) between them, said passageway (28) communicating said first port (12) with said second port (14) when the valve device (1) is open, an annular member (16) arranged within the said cylindrical body (8), said annular member (16) having limited axial movement between two fixed axial planes of the cylindrical body (8) and being in sealing contact with said cylindrical body (8) throughout its axial movement and acting so as to seal the passage (28) when in conjunction with the piston (15), said piston (15) being movable at least between a first position, and a second position in which the configuration of the passage (28) is dependent on the displacement of the said annular member (16) from a second one of said planes, and retaining means (24) for restraining the piston (15), when in its second position, from moving towards its first position, characterised in that said annular member (16) is positively restricted in its movement away from the first said plane by the adjacent end portion (19) of the piston (15) whereby the passageway (28) is positively sealed by the annular member (16) situated at said first plane when the piston (15) is at its first position.

2. A device as claimed in Claim 1, characterised in that the annular member (16) is a cylindrical member having an axial end portion adjacent to the piston (15) which has an inner diameter which is greater than the diameter of the adjacent end (19) of the piston (15), and said passageway (28) is sealed by means of an axial overlap between the inner cylindrical surface of the annular member (16) and the adjacent outer cylindrical surface of the piston (15).

3. A device as claimed in Claim 1 or 2, characterised in that the annular member (16) is resiliently biased towards said first axial plane.

4. A device as claimed in any of Claims 1 to 3, characterised in that the piston (15) is resiliently biased towards said first position.

5. A device as claimed in any of Claims 1 to 4, characterised in that the retaining means (24) comprises at least one flexible tongue (22a) formed on the piston (15), said tongue (22a) having a shoulder portion (24) adapted to snap

into engagement with a complementary shoulder portion (20a) fixed with respect to the cylindrical body (8) upon the said piston (15) reaching the second position, whereby coaction of the shoulders (24, 200) prevents movement of the piston (15) towards the first position.

6. A device as claimed in any of Claims 1 to 5 characterised in that the said cylindrical body (8) is closed at an end (9) remote from the said second port (14) and the piston (15) is positioned in the body (8) between said second portion (14) and the said closed end (9), and a restricted passage (23) is provided from the exterior of the device (1) to the chamber (20') defined by the piston (15) and the closed end (9) of the said body (8).

7. A device as claimed in Claim 6 as appendant to Claim 15, characterised in that the piston (15) has a skirt (20) which extends into the second said chamber (20') and said flexible tongue (22a) is defined by an elongate generally U-shaped slot formed through the wall of said skirt (20), said slot comprising the restricted passage (23).

8. A device as claimed in any of Claims 1 to 7 characterised in that in its first position the displacement of the piston (15) is restricted by the annular member (16) and the piston (15) has a longer axial displacement than the annular member (16) such that in its second position a restricted pathway is provided by the piston (15) and the annular member (16) within the said passage (28) between said first port (12) and said second port (14).

9. A device as claimed in any of Claims 1 to 8 wherein the piston (15) is provided with a shear pin (31) arranged to co-act with a shear surface (32) fixed with respect to the cylindrical body (8), the arrangement being such that it is necessary to shear the pin (31), during movement of the piston (15) towards the second position thereof, before the piston (15) can reach the second position.

Revendications

1. Un dispositif à soupape (1) pour l'obturation temporaire d'un tube (4), comprenant un corps cylindrique (8) définissant une chambre (8') qui présente un premier orifice (12) et un second orifice (14), le dit premier orifice (12) étant localisé entre les extrémités axiales de la chambre (8') et le dit second orifice (14) étant localisé à une extrémité axiale de la chambre (8'), un piston (15) mobile axialement à l'intérieur du corps cylindrique (8), le dit piston (15) et le dit corps cylindrique (8) collaborant pour définir entre eux un passage annulaire (28), le dit passage (28) mettant en communication le dit premier orifice (12) avec le dit second orifice (14) lorsque le dispositif à soupape (1) est ouvert, une pièce annulaire (16) disposée à l'intérieur du dit corps cylindrique (8), la dite pièce annulaire (16) pouvant accomplir une course axiale limitée entre deux plans axiaux fixes du corps cylindrique (8) et étant en contact étanche avec le dit corps cylindrique (8) sur toute



la longueur de sa course axiale et permettant ainsi d'obturer le passage (28) lorsqu'elle est en conjonction avec le piston (15), le dit piston (15) étant mobile au moins entre une première position et une seconde position pour laquelle la configuration du passage (28) dépend du déplacement de la dite pièce annulaire (16) à partir d'un second des dits plans, et des moyens de retenue (24) pour empêcher le piston (15), lorsqu'il se trouve dans sa seconde position, de se déplacer vers sa première position, caractérisé en ce que la dite pièce annulaire (16) est positivement limitée dans son mouvement d'éloignement du dit premier plan, par la partie finale adjacente (19) du piston (15), le passage (28) étant positivement obturé par la pièce annulaire (16) située au niveau du dit premier plan lorsque le piston (15) se trouve dans sa première position.

2. Un dispositif suivant la revendication 1, caractérisé en ce que la pièce annulaire (16) est une pièce cylindrique présentant une partie finale axiale adjacente au piston (15) qui a un diamètre intérieur plus grand que le diamètre de l'extrémité adjacente (19) du piston (15), et en ce que le dit passage (28) est obturé au moyen d'un recouvrement axial entre la surface cylindrique intérieure de la pièce annulaire (16) et la surface cylindrique extérieure adjacente du piston (15).

3. Un dispositif suivant l'une ou l'autre des revendications 1 ou 2, caractérisé en ce que la pièce annulaire (16) est ramenée élastiquement vers le dit premier plan axial.

4. Un dispositif suivant l'une ou l'autre des revendications 1 à 3, caractérisé en ce que le piston (15) est ramené élastiquement vers la dite première position.

5. Un dispositif suivant l'une ou l'autre des revendications 1 à 4, caractérisé en ce que les moyens de retenue (24) comprennent au moins une languette flexible (22a) formée sur le piston (15), la dite languette (22a) comportant une partie en épaulement (24) agencée de façon à s'engager dans une partie en contre-épaulement (20a) fixe par rapport au corps cylindrique (8) lorsque le dit piston (15) atteint sa seconde position, la collaboration des épaulements (24, 20) empêchant le mouvement du piston (15) vers sa première position.

6. Un dispositif suivant l'une ou l'autre des revendications 1 à 5, caractérisé en ce que le dit corps cylindrique (8) est fermé à une extrémité (9) éloignée du dit second orifice (14), en ce que le piston (15) est disposé dans le corps (8) entre le dit second orifice (14) et la dite extrémité fermée (9), et en ce qu'un étroit passage (23) est prévu depuis l'extérieur du dispositif (1) vers la chambre (20') définie par le piston (15) et l'extrémité fermée (9) du dit corps (8).

7. Un dispositif suivant la revendication 6 associée à la revendication 5, caractérisé en ce que le piston (15) comporte une jupe (20) qui s'étend dans la dite seconde chambre (20') et en ce que la dite languette flexible (22a) est définie par une fente allongée, affectant la forme générale d'un U, ménagée dans la paroi de la dite jupe (20), la dite

fente comprenant le passage étroit (23).

8. Un dispositif suivant l'une ou l'autre des revendications 1 à 7, caractérisé en ce que dans sa première position, la course du piston (15) est limitée par la pièce annulaire (16) et en ce que le piston (15) a une course axiale plus longue que la pièce annulaire (16) de sorte que, dans sa seconde position, un passage étroit est constitué par le piston (15) et la pièce annulaire (16) à l'intérieur du dit passage (28) entre le dit premier orifice (12) et le dit second orifice (14).

9. Un dispositif suivant l'une ou l'autre des revendications 1 à 8, dans lequel le piston (15) est pourvu d'une broche de cisaillement (31) collaborant avec une surface de cisaillement (32) fixe par rapport au corps cylindrique (8), l'agencement étant réalisé de telle façon qu'il est nécessaire de cisailer la broche (31) pendant la course du piston (15) vers sa seconde position, avant que le piston (15) puisse atteindre cette seconde position.

Patentansprüche

1. Eine Ventilvorrichtung (1) zur vorübergehenden Abdichtung eines Rohres (4), bestehend aus einem eine Kammer (8') definierenden, zylinderförmigen Körper (8) mit einer ersten (12) und zweiten (14) Durchgangsöffnung, wobei die erste Durchgangsöffnung (12) zwischen den Stirnflächen der Kammer (8') und die genannte, zweite Durchgangsöffnung (14) an einer Stirnfläche der Kammer (8') angeordnet sind, einem Kolben (15), der innerhalb des zylinderförmigen Körpers (8) achsial gleitend bewegbar ist, wobei der genannte Kolben (15) und der genannte zylinderförmige Körper (8) gemeinsam einen kreisförmigen Durchgang (28) definieren und der genannte Durchgang (28) eine Verbindung zwischen der genannten, ersten Durchgangsöffnung (12) und der genannten, zweiten Durchgangsöffnung (14) sicherstellt, wenn die Ventilvorrichtung (1) geöffnet ist, einem ringförmigen Bauteil (16), das innerhalb des genannten, zylinderförmigen Körpers (8) angeordnet ist, wobei das ringförmige Bauteil (16) sich in begrenztem Umfang achsial zwischen zwei festgelegten Achsialebenen des zylinderförmigen Körpers (8) bewegen kann, während seiner gesamten Achsialbewegung in abdichtendem Kontakt zum genannten, zylinderförmigen Körper (8) steht und bewirkt, daß der Durchgang (28) bei Verbindung zum Kolben (15) abgedichtet ist, wobei der genannte Kolben (15) zumindest zwischen einer ersten Stellung und einer zweiten Stellung, in der die Konfiguration des Durchgangs (28) jeweils von der Verdrängung des genannten, ringförmigen Bauteils (16) aus der zweiten, genannten Ebene abhängig ist, bewegt werden kann, sowie einer Rückhaltevorrichtung (24), die verhindert, daß sich der Kolben (15), wenn er seine zweite Stellung eingenommen hat, in seine erste Stellung bewegen kann, dadurch gekennzeichnet, daß das genannte, ringförmige Bauteil (16) in seiner Bewegung aus der ersten, genannten Ebene heraus durch den angrenzenden Endabschnitt (19) des Kolbens (15) wirksam



begrenzt ist, wobei der Durchgang (28) durch das ringförmige Bauteil (16), das sich in der genannten, ersten Ebene befindet, wenn der Kolben (15) seine erste Stellung eingenommen hat, wirksam abgedichtet ist.

2. Eine Vorrichtung gemäß Anspruch 1, dadurch gekennzeichnet, daß es sich bei dem ringförmigen Bauteil (16) um ein zylinderförmiges Bauteil mit einer Stirnfläche in unmittelbarer Nähe des Kolbens (15) handelt, wobei dessen Innendurchmesser größer als der Durchmesser des angrenzenden Endes (19) des Kolbens (15) ist, und der genannte Durchgang (28) durch axiale Überlappung zwischen der inneren, zylindrischen Fläche des ringförmigen Bauteils (16) und der angrenzenden, zylindrischen Außenfläche des Kolbens (15) abgedichtet ist.

3. Eine Vorrichtung gemäß Anspruch 1 oder Anspruch 2, dadurch gekennzeichnet, daß das ringförmige Bauteil (16) gegen die genannte, erste Achsialebene elastisch abgefedert ist.

4. Eine Vorrichtung gemäß irgendeinem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß der Kolben (15) gegen den genannten, ersten Abschnitt elastisch abgefedert ist.

5. Eine Vorrichtung gemäß irgendeinem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß die Rückhaltevorrückung (24) zumindest eine flexible Feder (22a) auf dem Kolben (15) umfaßt, wobei die genannte Feder (22a) eine Schulter (24) besitzt, die in eine Gegenschulter (20a), welche gegenüber dem zylinderförmigen Körper (8) festliegt, einrasten kann, wenn der genannte Kolben (15) die zweite Stellung erreicht, wobei das Zusammenwirken der Schultern (24, 20a) eine Bewegung des Kolbens (15) in die erste Stellung unterbindet.

6. Eine Vorrichtung gemäß irgendeinem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß der genannte, zylinderförmige Körper (8) an einem von der genannten, zweiten Durchgangs-

öffnung (14) entfernten Ende (9) geschlossen und der Kolben (15) im Körper (8) zwischen der genannten, zweiten Durchgangsöffnung (14) und dem genannten, geschlossenen Ende (9) angeordnet ist, und daß ein eingeschränkter Durchgang (23) von der Außenseite der Vorrichtung (1) bis zur Kammer (20'), definiert durch den Kolben (15) und das geschlossene Ende (9) des genannten Körpers (8), vorgesehen ist.

7. Eine Vorrichtung gemäß Anspruch 6 in Ergänzung zu Anspruch 5, dadurch gekennzeichnet, daß der Kolben (15) einen Randabschnitt (20) aufweist, der in die genannte, zweite Kammer (20') hineinragt, und die genannte, flexible Zunge (22a) durch einen längeren, im allgemeinen U-förmigen Schlitz in der Wand des genannten Randabschnitts (20) definiert ist, wobei der genannte Schlitz den eingeschränkten Durchgang (23) umfaßt.

8. Eine Vorrichtung gemäß irgendeinem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß die Verdrängung des Kolbens (15) im ersten Abschnitt durch das ringförmige Bauteil (16) eingeschränkt ist, und der Kolben (15) eine längere Achsialverdrängung als das ringförmige Bauteil (16) dadurch aufweist, daß in seiner zweiten Stellung ein eingeschränkter Durchgang durch den Kolben (15) und das ringförmige Bauteil (16) innerhalb des genannten Durchgangs (28) zwischen der genannten, ersten Durchgangsöffnung (12) und der genannten, zweiten Durchgangsöffnung (14) vorgesehen ist.

9. Eine Vorrichtung gemäß irgendeinem der Ansprüche 1 bis 8, wobei der Kolben (15) einen Scherstift (31) besitzt, der so angeordnet ist, daß er mit einer Scherfläche (32), die gegenüber dem zylinderförmigen Körper (8) festliegt, zusammenwirkt, wobei diese Anordnung es erfordert, daß der Stift (31) während der Bewegung des Kolbens (15) in die zweite Stellung abscherf, bevor der Kolben (15) die zweite Stellung erreichen kann.



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