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(54) **ACCESS VALVE**  
ZUGANGS VENTIL  
SOUPAPE D'ACCES

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(56) References cited:  
**EP-A- 0 045 668 EP-A- 0 638 290**  
**DE-B- 1 116 001 DE-C- 961 045**  
**US-A- 2 846 179 US-A- 4 092 010**  
**US-A- 4 195 810 US-A- 4 412 669**  
**US-A- 4 929 235 US-A- 5 211 370**  
**US-B1- 6 276 661**

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## Description

**[0001]** This invention relates to a medical device and, in particular, to a fluid control or, access valve and, more particularly, to an access valve of the constriction type.

**[0002]** US 4,412,669 discloses an access valve having a cylindrical diaphragm and a cord passed around the diaphragm to constrict it, the cord being tightened by a handle-operated ring to at least partially close off the aperture within the diaphragm. The disclosure of this document corresponds generally to the preamble of claim 1.

**[0003]** US 2,846,179 discloses an access valve with a cylindrical sleeve which is closed by an endless cord passing over a pulley system operated by a handle.

## Summary of the Invention

**[0004]** It is an object of this invention to provide an access valve which can be controlled to vary the size of the aperture through the valve and be flexible so that a seal may be formed against an instrument or other object inserted through the access valve.

**[0005]** According to the present invention, there is provided an access valve having a housing and a cylindrical diaphragm with a longitudinal aperture therethrough, a flexible member passed circumferentially around the cylindrical diaphragm and extending substantially radially and/or tangentially therefrom and a rotary actuator attached to the flexible member wherein rotation of the rotary actuator with respect to the housing causes the flexible member to be pulled around the diaphragm to constrict it to at least partially close off the longitudinal aperture, characterized in that the rotary actuator extends circumferentially around the housing.

**[0006]** It will be seen that there is provided an arrangement by which an aperture through a cylindrical valve member can be closed off by constriction by the pulling of a flexible member on the outer surface of the cylindrical diaphragm. Depending on how much the flexible member is pulled radially and/or tangentially the cylindrical diaphragm can be completely constricted to prevent fluid flow through the valve or can be constricted to the extent that it closes around an instrument, for instance a catheter, passed through the valve.

**[0007]** In embodiments of the present invention, the cylindrical diaphragm is supported in a substantially cylindrical housing into which the diaphragm is received. There may be apertures in the cylindrical housing through which the flexible member extends.

**[0008]** Preferably the cylindrical diaphragm is formed from a resilient material so that after constriction and release of the flexible member the valve reopens.

**[0009]** In one preferred embodiment the flexible member may be pulled from one of its ends and fastened to the cylindrical housing at its other end.

**[0010]** Alternatively the flexible member may be mounted at both of its ends to an actuator arrangement and hence the flexible member can be simultaneously

pulled in substantially opposite directions to constrict the valve.

**[0011]** In the case of the access valve according to this invention used for medical tools the cylindrical housing may be mounted for instance onto an access point on a laparoscopic device. When it is required to insert a laparoscopic device through the valve the valve can be opened sufficiently to allow insertion of the device and then the access valve can be constricted around the device to prevent loss of blood or inflation gas from within a body cavity during operation of the device.

**[0012]** Alternatively the cylindrical housing may be mounted on a prosthesis delivery catheter and the access valve be adapted to close around a prosthesis delivery device.

**[0013]** The rotary actuator may be retained in position by the flexible member extending from the rotary actuator and through the cylindrical housing. Alternatively the rotary actuator may be retained by a radial flange on the cylindrical housing or the cylindrical diaphragm. Alternatively the rotary actuator may be retained on the cylindrical housing by the ball and detent arrangement discussed in more detail below.

**[0014]** In a preferred form the cylindrical diaphragm of the valve may be constructed from an elastomeric material such as silicone rubber.

**[0015]** The flexible member may be a string, suture or band or other suitable material.

**[0016]** The rotary actuator may have a tactile indication of its action by means of a ball or other device acting into detents between the actuator and the cylindrical housing. The ball or other device acting into the detents may be spring loaded. The ball or other device may be mounted into the rotary actuator and travel in a circumferential groove in the cylindrical housing. This may also assist with retaining the rotary actuator on the cylindrical housing.

**[0017]** The rotary actuator may be adapted to be rotated through an angle of from 30° to 90° in one or both directions from a central rest position to cause the flexible member to be pulled which in turn causes the cylindrical diaphragm to be constricted.

**[0018]** In a preferred form of the invention there may be provided an additional apertured diaphragm seal in the valve to assist with closing off of the delivery catheter or other medical device.

**[0019]** In an alternative embodiment the invention may be said to reside in an access port on a laparoscopic catheter the access valve having a cylindrical diaphragm with a longitudinal aperture therethrough, a flexible member passed circumferentially around the cylindrical diaphragm and extending radially and/or tangentially therefrom and an extension arrangement to pull the flexible member radially and/or tangentially to constrict the diaphragm to at least partially close off the longitudinal aperture through the access port.

**[0020]** In a further form, the invention may be said to reside in an intraluminal deployment device having a

catheter, the catheter having an access point at a proximal end thereof, the access point being adapted for the insertion of deployment devices or prostheses and a valve arrangement to close off the access point, the valve arrangement having a cylindrical diaphragm with a longitudinal aperture therethrough, a flexible member passed circumferentially around the cylindrical diaphragm and extending substantially radially and/or tangentially therefrom and an extension arrangement to pull the flexible member radially and/or tangentially to constrict the diaphragm to at least partially close off the longitudinal aperture in the valve arrangement.

#### Brief Description of the Drawing

**[0021]** This then generally describes the invention, but to assist with understanding reference will now be made to the accompanying drawings which show preferred embodiments of the invention.  
In the drawings:

FIG 1 shows a cross-sectional view of one embodiment of a constriction valve according to this invention;

FIG 2 shows the cross-sectional view shown in FIG 1 with the valve in its partially constricted position;

FIG 3 shows a cross-sectional view along the lines 3-3' in FIG 1;

FIG 4 shows a cross-sectional view along the lines 4-4' in FIG 2;

FIG 5 shows a perspective view of a delivery catheter including a constriction valve according to this invention and;

FIG 6 shows an alternative embodiment of constriction valve including a split diaphragm according to the invention.

#### Detailed Description

**[0022]** Now looking more closely at the drawings and particularly the embodiment shown in Figures 1 to 5 it will be seen that the access valve generally shown as 2 is mounted onto a catheter body 4. The access valve has a cylindrical housing 6 into which is received a cylindrical elastomeric diaphragm 8. The cylindrical elastomeric diaphragm 8 defines a cylindrical aperture 3 therethrough. The end of the cylindrical diaphragm 8 nearest the catheter 4 has an outwardly extending radial flange 10 which is clamped against the end of the catheter by means of the cylindrical housing 6. The flange 7 on the cylindrical housing 6 is received in slot 9 in the catheter body 4 to hold and seal the valve 2 to the catheter body 4. A rotary actuator 12 is mounted onto the cylindrical housing 6 and retained in position by a radial flange 11 extending from the external end of the cylindrical diaphragm. A string 14 is mounted into the rotary actuator with a knot 16 at one end and then passes through an aperture 20 in the cylindrical housing 6 and then is wound preferably twice

around the cylindrical diaphragm 8 preferably in a recessed region 22 and then passes through a further aperture 24 in the cylindrical housing before being fixed by knot 18 again in the rotary actuator. Rotation of the rotary actuator 12 with respect to the cylindrical housing 6 will cause the string 14 to be pulled in both directions at once and hence the cylindrical diaphragm 8 to be constricted.

**[0023]** The internal cylindrical surface 13 of the rotary actuator 12 has a circumferential groove 15 which allows the string 14 to extend around the outside of the cylindrical housing 6 when the rotary actuator 12 is rotated. Alternatively the cylindrical housing 6 may have a circumferential groove on its outer surface to allow the string 14 to extend around the outside of the cylindrical housing 6 when the rotary actuator 12 is rotated.

**[0024]** As particularly shown in Figures 3 and 4 a detent arrangement having a ball 28 loaded by a spring 29 in an aperture 30 in the rotary actuator runs in a groove 32 in the cylindrical housing 6. The groove 32 has a central recess 34 and end recesses 36. There may also be further recesses or detents between the central recess and the end recesses. The rotary actuator may be rotated in either direction to cause constriction of the constriction valve, and the detents provide tactile feel the action of the valve.

**[0025]** Particularly as shown in Figure 4 when the rotary actuator is moved through perhaps 45° of rotation, it will be seen that the flexible member 14 has been pulled tangentially in both directions and the cylindrical diaphragm has been stretched radially inwards or constricted and the valve partially closed off. Rotation of the rotary actuator back to the central position where the detent ball 28 is received in depression 34 will cause the sutures to loosen again so that the resilient cylindrical diaphragm will retain its original shape as shown in Figures 1 and 3. Depending upon the number of turns of the flexible member around the cylindrical diaphragm rotation of the rotary actuator may be up to 90° or more in either direction to enable complete closing off of the valve.

**[0026]** In the embodiment of constriction valve shown in Figure 6 the sealing action of the valve as discussed above is assisted by means of an apertured diaphragm 40 which is also clamped between the cylindrical housing 6 and the catheter body 4. The apertured diaphragm 40 has an aperture or a slit 41 completely through it or a half slit 41, 43 from each side crossed at right angles to provide extra sealing for the time that the valve is opened to allow an instrument to be passed through it. The apertured diaphragm may be formed from a silicone rubber and may be formed integrally with or separately from the cylindrical diaphragm.

**[0027]** In this embodiment the rotary actuator is retained by a radially outwardly extending flange 42. This flange may alternatively be positioned so that it engages in a groove on the internal cylindrical surface of the rotary actuator. The rotary actuator may be pushed on over the flange to click into position to retain it.

**[0028]** It will be seen that by this invention there is pro-

vided an access or constriction valve arrangement which will close over a range of diameters of devices passed through the valve or can close completely down to be self sealing.

[0029] Throughout this specification various indications have been given as to the scope of the invention but the scope of the invention is limited only by the appended claims. The examples are given for illustration only and not for limitation.

## Claims

1. An access valve (2) having a housing (6) and a cylindrical diaphragm (8) with a longitudinal aperture (3) therethrough, a flexible member (14) passed circumferentially around the cylindrical diaphragm (8) and extending substantially radially and/or tangentially therefrom and a rotary actuator (12) attached to the flexible member (14) wherein rotation of the rotary actuator (12) with respect to the housing (6) causes the flexible member (14) to be pulled around the diaphragm (8) to constrict it to at least partially close off the longitudinal aperture, **characterized in that** the rotary actuator (12) extends circumferentially around the housing (6).
2. An access valve as in Claim 1 wherein the rotary actuator (12) is adapted to pull the flexible member (14) from both of its ends.
3. An access valve as in Claim 1 wherein the rotary actuator (12) is adapted to pull the flexible member (14) from one of its ends.
4. An access valve as in any preceding claim, including apertures (20,24) in the housing (6) through which the flexible member (14) extends.
5. An access valve as in any preceding claim, wherein the rotary actuator (12) is retained in position on the housing (6) by the flexible member (14) extending from the rotary actuator to the cylindrical diaphragm (8) through the housing.
6. An access valve as in any of Claims 1 to 4, wherein the rotary actuator (12) is retained in position on the housing by a radial flange (11) on the housing or the cylindrical diaphragm.
7. An access valve as in any preceding claim, wherein the cylindrical diaphragm (8) is formed from a resilient material.
8. An access valve as in any preceding claim wherein the flexible member (14) is a string, suture or band.
9. An access valve as in any preceding claim, further

including a ball and detent arrangement (28,34) whereby tactile feel of the action of the rotary actuator (12) is provided.

10. An access valve as in any preceding claim wherein the flexible member (14) is attached at both ends to the rotary actuator (12).
11. An access valve as in any preceding claim wherein the cylindrical diaphragm (8) includes a recessed region (22) arranged to receive the flexible member (14).
12. An access valve as in any preceding claim having a circumferential groove (15) on the inner cylindrical surface (13) of the rotary actuator (12) or on the outer cylindrical surface of the housing (6).
13. An access valve as in any preceding claim mounted onto an access location of a laparoscopic device.
14. An access valve as in any of Claims 1 to 12 mounted onto a prosthesis delivery device.
15. An access valve as in any preceding claim further including an additional apertured diaphragm seal in the valve to assist with a sealing action.

## Patentansprüche

1. Zugangsventil (2) mit einem Gehäuse (6) und einer zylindrischen Membran (8) mit einer Längsöffnung (3) **dadurch**, einem um den Umfang der zylindrischen Membran (8) herumgeführten flexiblen Glied, das sich im Wesentlichen radial und/oder tangential davon erstreckt, und einem an dem flexiblen Glied (14) befestigten Drehsteller (12), wobei eine Drehung des Drehstellers (12) bezüglich des Gehäuses (6) dazu führt, dass das flexible Glied (14) um die Membran (8) herum gezogen wird, um sie zusammenzuschnüren und so die Längsöffnung zumindest teilweise zu verschließen, **dadurch gekennzeichnet, dass** sich der Drehsteller (12) um den Umfang des Gehäuses (6) erstreckt.
2. Zugangsventil nach Anspruch 1, bei dem der Drehsteller (12) dazu ausgeführt ist, das flexible Glied (14) von seinen beiden Enden zu ziehen.
3. Zugangsventil nach Anspruch 1, bei dem der Drehsteller (12) dazu ausgeführt ist, das flexible Glied (14) von einem seiner Enden zu ziehen.
4. Zugangsventil nach einem der vorhergehenden Ansprüche, das Öffnungen (20, 24) im Gehäuse (6) aufweist, durch die sich das flexible Glied (14) erstreckt.

5. Zugangsventil nach einem der vorhergehenden Ansprüche, bei dem der Drehsteller (12) durch das sich von dem Drehsteller zur zylindrischen Membran (8) durch das Gehäuse erstreckende zylindrische Glied (14) am Gehäuse (6) in Position gehalten wird. 5
  6. Zugangsventil nach einem der Ansprüche 1 bis 4, bei dem der Drehsteller (12) durch einen radialen Flansch (11) an dem Gehäuse oder der zylindrischen Membran am Gehäuse in Position gehalten wird. 10
  7. Zugangsventil nach einem der vorhergehenden Ansprüche, bei dem die zylindrische Membran (8) aus einem elastischen Material hergestellt ist. 15
  8. Zugangsventil nach einem der vorhergehenden Ansprüche, bei dem das flexible Glied (14) ein Bindfaden, ein Nahtfaden oder ein Band ist. 20
  9. Zugangsventil nach einem der vorhergehenden Ansprüche, das weiterhin eine Kugel- und Arretierungsanordnung (28, 34) enthält, wodurch ein Tastgefühl der Aktion des Drehstellers (12) bereitgestellt wird. 25
  10. Zugangsventil nach einem der vorhergehenden Ansprüche, bei dem das flexible Glied (14) an beiden Enden am Drehsteller (12) befestigt ist. 30
  11. Zugangsventil nach einem der vorhergehenden Ansprüche, bei dem die zylindrische Membran (8) einen ausgesparten Bereich (22) enthält, der zur Aufnahme des flexiblen Glieds angeordnet ist. 35
  12. Zugangsventil nach einem der vorhergehenden Ansprüche, das eine Umfangsnut (15) an der zylindrischen Innenfläche (13) des Drehstellers (12) oder an der zylindrischen Außenfläche des Gehäuses (6) aufweist. 40
  13. Zugangsventil nach einem der vorhergehenden Ansprüche, das an einer Zugangsstelle einer laparoskopischen Vorrichtung angebracht ist. 45
  14. Zugangsventil nach einem der Ansprüche 1 bis 12, die an einer Prothesenabgabevorrichtung angebracht ist. 50
  15. Zugangsventil nach einem der vorhergehenden Ansprüche, das weiterhin eine zusätzliche mit einer Öffnung versehene Membrandichtung im Ventil enthält, um eine Dichtungswirkung zu unterstützen. 55
- Revendications**
1. Soupape d'accès (2) ayant un logement (6) et une membrane cylindrique (8) avec une ouverture longitudinale (3) la traversant, un élément flexible (14) entourant circonférentiellement la membrane cylindrique (8) et s'étendant sensiblement radialement et/ou tangentiellement depuis celle-ci et un actionneur rotatif (12) attaché à l'élément flexible (14), la rotation de l'actionneur rotatif (12) relativement au logement (6) entraînant la traction de l'élément flexible (14) autour de la membrane (8) pour l'étrangler afin de fermer au moins partiellement l'ouverture longitudinale, **caractérisée en ce que** l'actionneur rotatif (12) s'étend circonférentiellement autour du logement (6).
  2. Soupape d'accès telle que dans la revendication 1, l'actionneur rotatif (12) étant adapté pour tirer sur l'élément flexible (14) par ses deux extrémités.
  3. Soupape d'accès telle que dans la revendication 1, l'actionneur rotatif (12) étant adapté pour tirer sur l'élément flexible (14) par une de ses extrémités.
  4. Soupape d'accès telle que dans l'une quelconque des revendications précédentes, comprenant des ouvertures (20, 24) dans le logement (6) à travers lesquelles l'élément flexible (14) s'étend.
  5. Soupape d'accès telle que dans l'une quelconque des revendications précédentes, l'actionneur rotatif (12) étant retenu en position sur le logement (6) par l'élément flexible (14) s'étendant depuis l'actionneur rotatif jusqu'à la membrane cylindrique (8) à travers le logement.
  6. Soupape d'accès telle que dans l'une quelconque des revendications 1 à 4, l'actionneur rotatif (12) étant retenu en position sur le logement par une bride radiale (11) sur le logement ou sur la membrane cylindrique.
  7. Soupape d'accès telle que dans l'une quelconque des revendications précédentes, la membrane cylindrique (8) étant formée à partir d'une matière élastique.
  8. Soupape d'accès telle que dans l'une quelconque des revendications précédentes, l'élément flexible (14) étant un fil, une suture ou une bande.
  9. Soupape d'accès telle que dans l'une quelconque des revendications précédentes, comprenant également un agencement à bille et cran (28, 34), ce qui permet de fournir une sensation tactile de l'action de l'actionneur rotatif (12).
  10. Soupape d'accès telle que dans l'une quelconque des revendications précédentes, l'élément flexible (14) étant attaché aux deux extrémités à l'actionneur rotatif (12).

11. Soupape d'accès telle que dans l'une quelconque des revendications précédentes, la membrane cylindrique (8) comprenant une région évidée (22) agencée de façon à recevoir l'élément flexible (14). 5
12. Soupape d'accès telle que dans l'une quelconque des revendications précédentes, ayant une gorge circonférentielle (15) sur la surface cylindrique interne (13) de l'actionneur rotatif (12) ou sur la surface cylindrique externe du logement (6). 10
13. Soupape d'accès telle que dans l'une quelconque des revendications précédentes, montée sur un emplacement d'accès d'un dispositif laparoscopique. 15
14. Soupape d'accès telle que dans l'une quelconque des revendications 1 à 12, montée sur un dispositif d'installation de prothèse. 20
15. Soupape d'accès telle que dans l'une quelconque des revendications précédentes, comprenant également une membrane supplémentaire d'étanchéité à ouverture pour contribuer à une action d'étanchéité. 25

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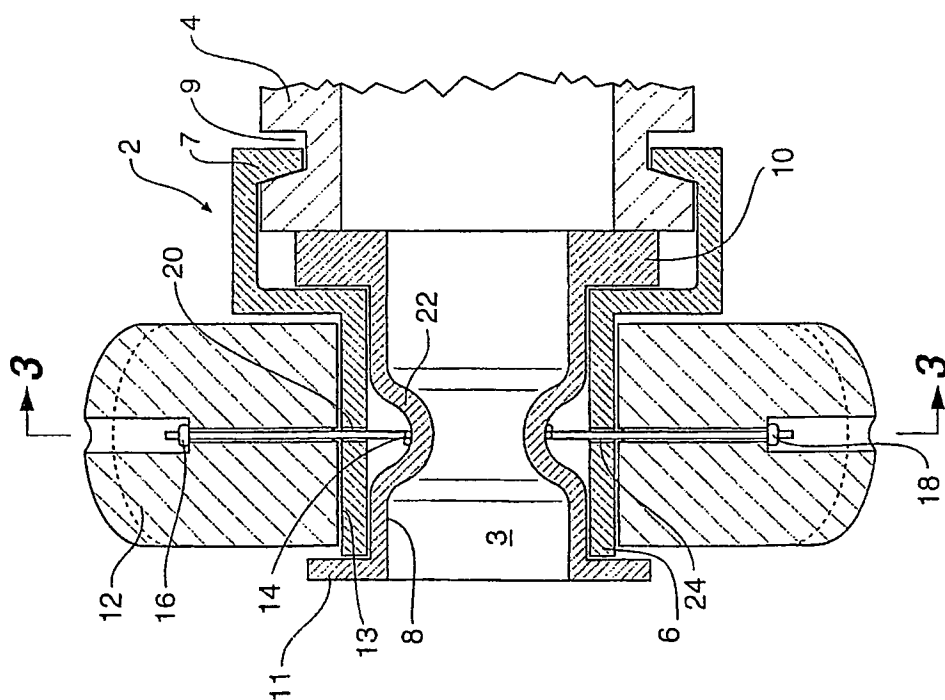
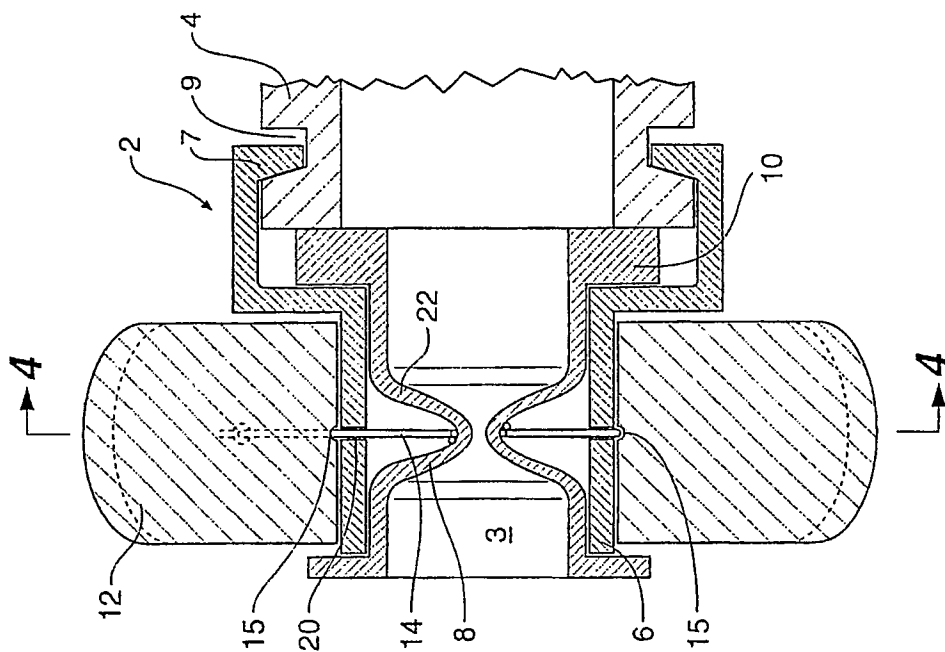
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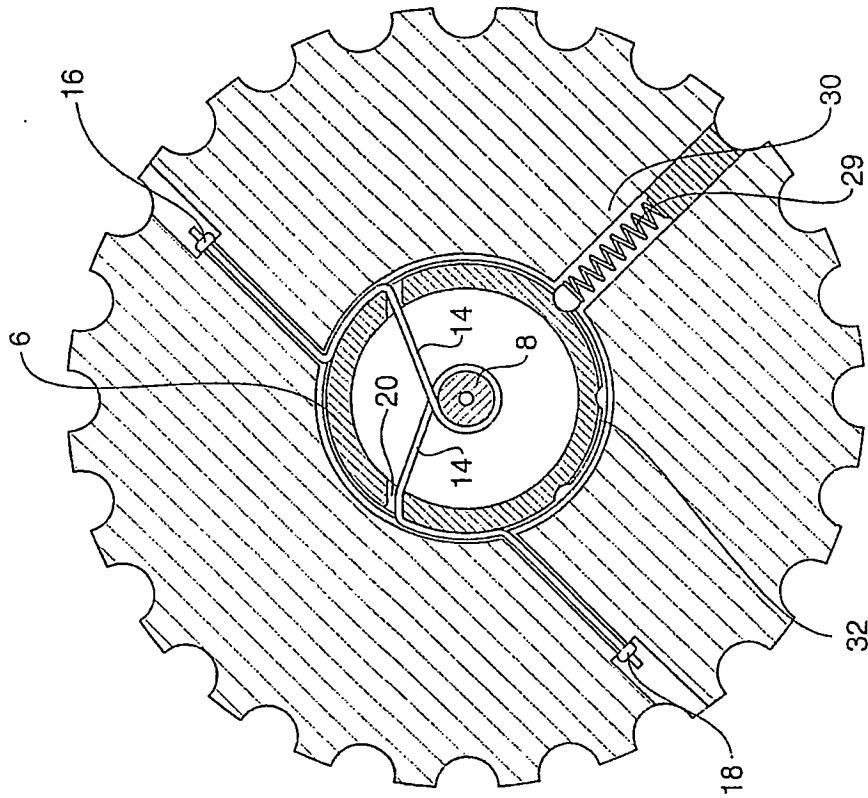


Fig 4

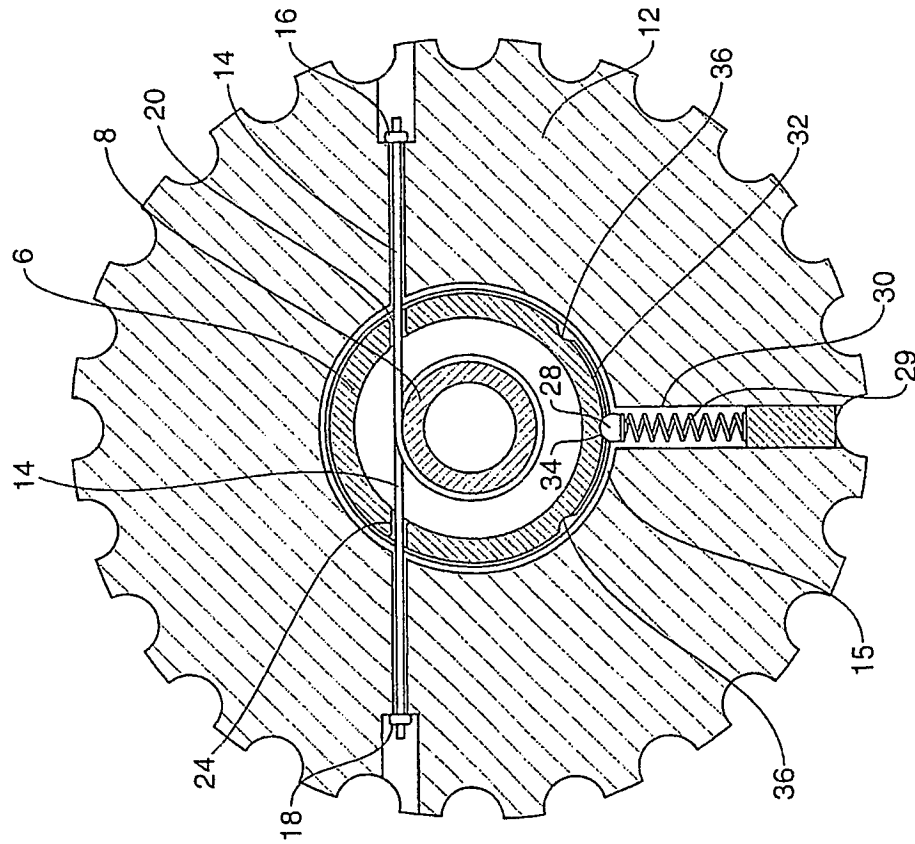
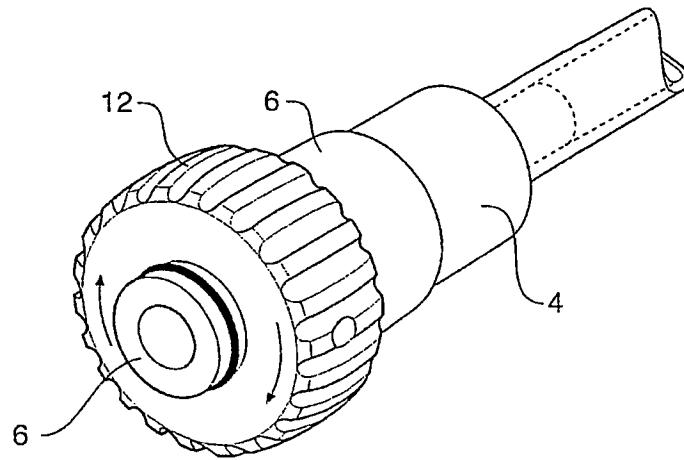
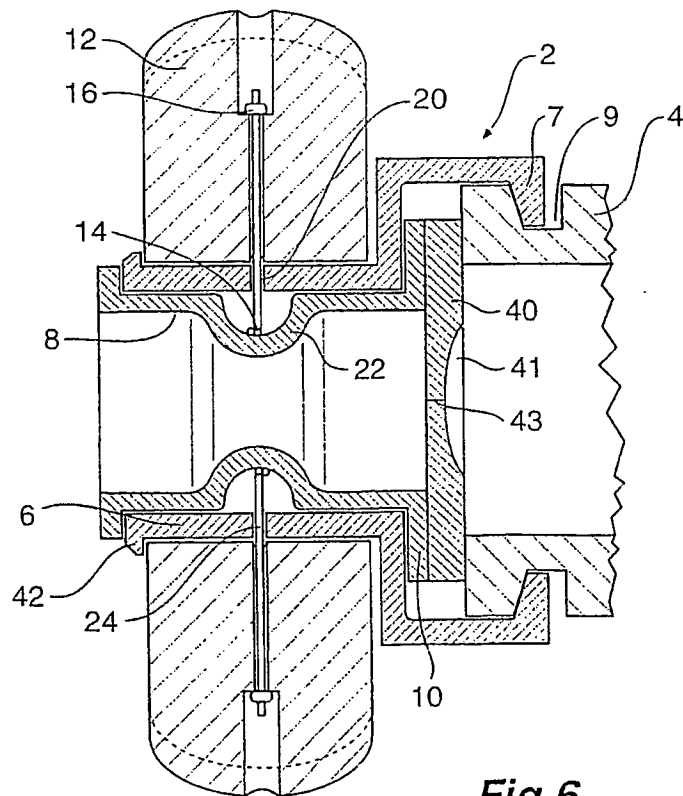


Fig 3



**Fig 5**



**Fig 6**

|                |                                                  |         |            |
|----------------|--------------------------------------------------|---------|------------|
| 专利名称(译)        | 进出阀门                                             |         |            |
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| 发明人            | HARTLEY, DAVID, ERNEST                           |         |            |
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| 代理机构(译)        | JEHAN , ROBERT                                   |         |            |
| 优先权            | 2001PR9290 2001-12-04 AU                         |         |            |
| 其他公开文献         | EP1451494A1                                      |         |            |
| 外部链接           | <a href="#">Espacenet</a>                        |         |            |

#### 摘要(译)

用于腹腔镜装置或管腔内部署装置的进入阀(2)具有带有纵向孔(3)的圆柱形隔膜(8),围绕圆柱形隔膜周向通过的柔性构件(14)和用于拉动圆柱形隔膜的延伸装置。柔性构件径向和/或切向地收缩隔膜以至少部分地封闭纵向孔。可以使用旋转致动器(12)。

