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[Continued on next page]

(54) Title: FLUID FLOW VALVE

(57) Abstract: A fluid flow valve comprising a valve head configured with an inside fluid port being in fluid flow communication with an outside fluid port, said valve head is configurable for coupling at a top portion of a substantially upright tube section; a valve module disposed below said valve head and displaceable under fluid pressure along a longitudinal axis between an open position at which fluid flow is facilitated thorough said valve head, and a sealed position at which the valve module sealingly engages the inside fluid port to thereby prevent fluid flow through the valve head.

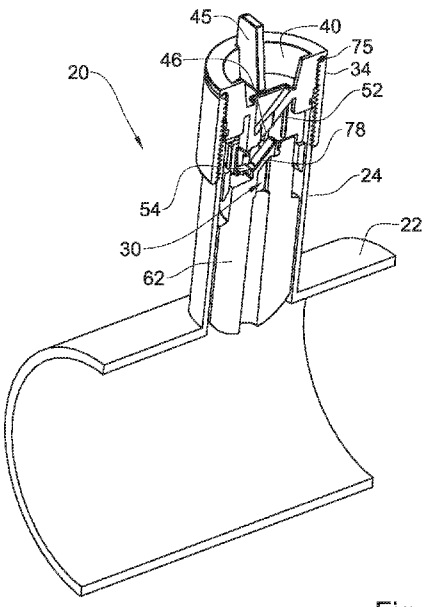

Fig. 1C

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FLUID FLOW VALVE

TECHNOLOGICAL FIELD

The present disclosure relates to fluid flow valves of the type configured on the one hand to allow discharge of trapped gas, and on the other hand allow ingress of gas so as to provide vacuum relief when a line is drained.

BACKGROUND ART

References considered to be relevant as background to the presently disclosed subject matter are listed below:

US4,770,201

US2010/108156

Acknowledgement of the above references herein is not to be inferred as meaning that these are in any way relevant to the patentability of the presently disclosed subject matter.

BACKGROUND

Air purge valves are generally fitted to liquid conduits such as, for example, mains distribution lines or sewage distribution conduits and are designed to ensure the release of air or other gases from the conduits, thereby avoiding the production of air locks, for example, which would interfere with the flow of the liquid.

US4,770,201 is concerned with a fluid flow valve such as a faucet or air-purge valve comprising a housing having defined therein a fluid through-flow aperture with a valve seating formed in the housing and bounding said aperture. A flexible closure membrane is secured at one end to the housing and is adapted to be biased, under fluid pressure in the housing, against the valve seating so as to seal the aperture. Membrane displacing means are secured to an opposite end of the membrane so that displacement of the displacing means in a first sense progessively detaches successive transverse portions of the membrane from the seating so as to open the aperture while

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displacement of the displacing means in an opposite sense allows for the membrane to become sealingly biased against the seating.

US2010/108156 discloses a gas purge valve that includes a housing formed with a fluid inlet and a fluid outlet. The fluid outlet is bounded by a kinetic valve seating, and a sealing assembly, which includes a float member coaxially displaceable within the housing, and a sealing cap coupled to said float member. The sealing cap is axially displaceable with respect to the float member between a first position in which it conjoins the float, and a second position in which it departs from the float. The sealing cap is formed at an outside face thereof with a kinetic seal fitted for sealing engagement of the kinetic valve seating, and an automatic valve aperture formed in the sealing cap and bounded by an automatic valve seating. An automatic sealing member articulated is at an upper end of the float member for sealing engagement of the automatic valve seating.

GENERAL DESCRIPTION

The present disclosure is directed to a fluid flow valve comprising a valve head configured with an inside fluid port being in fluid flow communication with an outside fluid port, said valve head is configurable for coupling at a top portion of a substantially upright tube section; a valve module disposed below said valve head and displaceable under fluid pressure along a longitudinal axis between an open position at which fluid flow is facilitated thorough said valve head, and a sealed position at which the valve module sealingly engages the inside fluid port to thereby prevent fluid flow through the valve head.

In particular the disclosed fluid flow valve is configured to facilitate ingress/egress flow of gaseous material, while prevent liquid flow there through, wherein the valve module opens for gaseous material flow and seals under liquid pressure.

The arrangement of the presently disclosed fluid flow valve is that it is devoid of a housing and is thus configured for encapsulating within a substantially upright tube section, vertically extending from and being in flow communication with a flow line (i.e. the main fluid flow line). The upright tube section can be integral with or articulately coupled to the flow line.

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The upright tube section thus facilitates as a pressure body and a capsule for housing and supporting the valve head and the valve module.

According to one configuration of the disclosure, the valve module is a so-called *automatic valve* and is configured for facilitating fluid discharge of substantially pressurized gaseous material, at substantially low flow rates, whilst preventing liquid flow there through.

According to another configuration of the disclosure the valve module is a so-called *kinetic valve* and is configured for facilitating gaseous material discharge at substantially high flow rates, though substantially not under pressure.

According to yet another configuration of the disclosure the valve module is a so-called *combined valve*, i.e. providing features of both an automatic valve and a kinetic valve. A combined valve, offers discharge of sudden bursts of large quantities of gaseous material to be released through the kinetic valve portion, whilst continuous releasing of relatively small amounts of gaseous material through the automatic valve portion.

Another aspect of the disclosure is directed to a fluid flow valve comprising a valve head configured with a fluid inside port being in fluid flow communication with a fluid outside port, said valve head coupled at a top portion of a substantially upright tube section which in turn is in flow communication with a main flow pipe; a valve module disposed below said valve head and displaceable under fluid pressure along a longitudinal axis between an open position at which gaseous material flow is facilitated thorough said valve head, and a sealed position at which the valve module sealingly engages the inside port to thereby prevent fluid flow through the valve head.

The arrangement is such that liquid level in the tube section governs the operative position of the module, wherein liquid level rising within the tube section entails sealing of the valve module to prevent fluid there through.

Any one or more of the following features, designs and configurations can be applied to any aspect of the fluid flow valve subject of the present disclosure, independently or in combinations thereof:

- The valve modular can comprise, or be articulated with, a float member;
- The fluid flow valve can be configured for articulation to a plain upright tube section, i.e. an upwardly extending tube section having a regular and continuous cross-section;

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- The fluid flow valve can be a modular unit in the sense that is suitable for retrofit in substantially any upright tube section;
- The valve head can be configured in the shape of a plug coupleable to the upright tube section;
- The valve head is configured for sealingly coupling within the top portion of a substantially upright tube section. Such sealing can be for example by an O-ring disposed between a portion of the valve head and a top portion of the upright tube section or a coupling member interconnecting same;
- The fluid flow valve can be articulated to the upright tube section through a standard screw coupling;
- The fluid flow valve can be articulated to the upright tube section by a flange coupling configuration, wherein the valve head is configured with a flanged portion coupleable to a corresponding flange at the top of the upright tube section;
- The fluid flow valve can be articulated to the upright tube section by a Bayonet-type coupling, wherein the valve head is configured with a bayonet portion configured for interlocking with a corresponding bayonet portion of the upright tube section;
- The fluid flow valve can be articulated to the upright tube section at an internal mounting;
- The fluid flow valve can be articulated to the upright tube section at an external mounting, there being further provided a coupling member (e.g. coupling ring) interconnecting between the valve head an external coupling portion (e.g. threading) of the upright tube section;
- Axial displacement of the valve module in a downwards sense can be restricted by a valve module support extending from the valve head or from the upright tube section;
- The valve module support can be a sealing member articulated at one end to the valve head and at another end to the valve module;
- The valve module is typically restrained so as to limit displacement thereof in an axial sense, while prohibiting tilt and roll motion thereof about the longitudinal axis;

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- A shutoff valve can be articulated on a portion of the upright tube section, below the valve module, to facilitate fluid flow shutoff through said upright tube section, e.g. for mounting and servicing the fluid flow valve;
- The valve head can be readily detachably attachable to the upright tube section;
- The upright tube section can be a standard tubing member extending from a main pipe section. The upright tube section can be integral with the main pipe section or detachably articulated thereto;
- The upright tube section can extend from an intersecting pipe section configured for coupling to the main pipe section (as an intermediate or end piece);
- The upright tube section can extend from an elbow-shaped fitting (i.e. at an end of a main pipe section) or from a T-shaped fitting (i.e. intermediate a main pipe section), Such fittings can be for example screw fittings, fast fittings, latch/snap fittings, etc.;
- The upright tube section can extend from a boss tube clamp member fitted over a main pipe section;
- The upright tube section in its capacity as a pressure body and a capsule for housing and supporting the valve head and the valve module is substantially rigid;
- The valve module can comprise a fluid through-flow aperture of the inside fluid port with a valve seating formed at a bottom face of the valve head and bounding the aperture; a flexible closure seal secured at one end to the valve head, and an opposite end of the seal secured to the valve module; the arrangement being such that the displacement of the valve module downwards entails progressive detaching successive transverse portions of the seal from the seating so as to open the aperture whilst displacement of the displacing means upwards allows the seal to become sealingly biased against the seating;
- The valve module comprises a float member, or is articulated to a float member, such that the valve module is adapted to be biased, under fluid pressure in upright tube section, against the valve seating so as to seal the aperture;
- The seal can be a so-called pealing seal, at times also referred to as a rolling seal.

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BRIEF DESCRIPTION OF THE DRAWINGS

In order to better understand the subject matter that is disclosed herein and to exemplify how it may be carried out in practice, embodiments will now be described, by way of non-limiting examples only, with reference to the accompanying drawings, in which:

Fig. 1A is a perspective view of a main pipe line with an integral upright tube section fitted with a fluid flow valve according to an example of the present disclosure;

Fig. 1B is a perspective sectioned view along line B-B in Fig. 1A;

Fig. 1C is a perspective sectioned view along line C-C in Fig. 1A;

Fig. 1D is a perspective exploded view of Fig. 1A;

Fig. 2A is a vertically sectioned vertical view through the fluid flow valve at an open position thereof;

Fig. 2B is a vertically sectioned view through the fluid flow valve at a closed position thereof;

Figs. 3A and **3B** are a longitudinal sectioned view of a fluid flow valve according to another example, at an open position and a closed position, respectively;

Fig. 3C is a perspective exploded view of the fluid flow valve of Figs. 3A and 3B;

Figs. 4A and **4B** are a longitudinal sectioned view of a fluid flow valve according to a modification, at an open position and a closed position, respectively.

Fig. 5 is a longitudinal section through a pipe system fitted with a fluid flow valve, wherein a shutoff valve is provided; and

Fig. 6 is a sectioned top portion of a fluid flow valve according to another example of the present disclosure.

DETAILED DESCRIPTION OF EMBODIMENTS

Reference is first being made to figures 1A to 1D of the drawings illustrating a fluid flow valve system according to a first example of the present disclosure, generally designated **20**. The system comprises a main pipe line **22**, e.g. water supply line, and an upright tube section **24**, disposed substantially vertically along a longitudinal axis **X**, and which in the present example is integrated with main pipe line **22**.

A fluid flow valve generally designated **30** is fitted within a top portion of the upright tube section **24** and is securely articulated thereto by a retention ring **34** being

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internally threaded and configured for screw coupling over corresponding external threading **38** of the upright tube section **24** and for sealingly receiving a valve head **40** of the fluid flow valve **30**, by a threading **42** configured for screw coupling with threading **36** of the retention ring **34**.

The valve head **40** is a plug-like element and comprises at a top thereof a pair of wing-like members **45** configured to facilitate easy assembly and disassembly of the fluid flow valve **30**, e.g. for servicing. It is appreciated that other arrangements can be configured for facilitating assembly and disassembly of the fluid flow valve onto the pipe augment.

The valve head is configured for sealingly coupling within the top portion of the substantially upright tube section **24** by an O-ring **75** disposed between the valve head **40** and the upright tube section **24**.

The valve head **40** is further configured with an inside fluid port **46** and an outside fluid port **48** (open to the atmosphere), with a flow channel **50** extending therebetween. The inside fluid port **46** is defined by a fluid through-flow aperture with a valve seating **52** formed at a bottom face of the valve head and bounding the aperture. A flexible closure seal **54** is secured at one end to the valve head **40** at location **56**, and an opposite end of the seal **54** is secured at **60** to a valve module **62** disposed within the upright tube section **24** below the valve head **40**. The seal **54** is configured for gradually detaching from the valve seating **52**. The valve seating **52** is inclined along the longitudinal axis X and as will be discussed hereinafter, serves a sealing surface for the flexible seal **54**.

The valve module **62** is a float element axially displaceable within the upright tube section **24** along the longitudinal axis X and is articulated to the valve head **40** by several lateral supports **70** (a pair in the present example; best seen in Figs. 1B and 1D) projecting into axially extending slots **72** formed in side walls of the valve head **40**, thereby preventing the valve module **62** from rotation and restricting its axial displacement along the longitudinal axis.

The valve module **62** is freely slidable within the upright tube section **24**, with a clearance **76** residing between the side walls of the float and the inner walls of the upright tube section **24**, to facilitate gas flow therethrough.

A top portion of the valve module **62** is configured with a seal support **78** (Fig. 1D), said seal support configured as a surface inclined and oriented in correspondence

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with the valve seating **52**, whereby when the float member **62** is urged upwardly, under fluid pressure within the upright tube section **24**, the flexible seal sealingly bears against the valve seating **52** and seals the inside fluid port **46**.

The arrangement is such that at the absence of fluid pressure within the upright tube section **24**, the valve module **62** is disposed at its lowermost position under (Fig. 2B) under self weight of the float **62**. At this position small amounts of gas can be vented (either ingress or egress) through the clearance **76**. However, at the event of liquid rise within the upright tube section **24**, the float member **62** is urged upwards (Fig. 2A) resulting in sealing engagement of the closure seal **54** against the valve seating **52**, resulting in sealing of the fluid flow valve **30**.

At the event of liquid level dropping within the upright tube section **24**, the valve module **62** displaces downwards (under its weight), entailing progressive detaching successive transverse portions of the seal **54** from the seating **52**, so as to open the aperture of the inside fluid port **46**, until the inside fluid port is fully open to facilitate fluid flow also at substantially high flow rates.

Figures 3 and 4 illustrate a fluid flow valve system according to modifications of the present disclosure, wherein for sake of simplicity like elements as in the previous example are designated with like reference numbers, however shifted by 100.

With reference first being made to figures 3A to 3C there is illustrated a fluid flow valve system according to the second example of the present disclosure, generally designated **120.** The system comprises a main pipe line **122**, and an upright tube section **124**, disposed substantially vertically along a longitudinal axis X, and which in the present example is integrated with main pipe line **122.**

A fluid flow valve generally designated **130** is fitted within the top portion of the upright tube section **124** and is securely articulated thereto by screw coupling of a valve head **140**, through external threading **141**, over corresponding internal threading **138** of the upright tube section **124.** The valve head **140** is configured for sealingly coupling within the top portion of the substantially upright tube section **124** by an O-ring **175** disposed between the valve head **140** and the upright tube section **124.**

The valve head **140** is a plug-like element configured to facilitate easy assembly and disassembly of the fluid flow valve **130**, e.g. for servicing.

The valve head **140** is further configured with an inside fluid port **146** and an outside fluid port **148** (open to the atmosphere), with a flow channel **150** extending

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therebetween. The inside fluid port **146** is defined by a fluid through-flow aperture with a valve seating **152** formed at a bottom face of the valve head **140** and bounding the aperture (inside fluid port **146**). An outlet **139** from the valve head **140** extends sideways and is threaded, such that different elements can be secured thereto, e.g. a drain pipe (not shown), a screen (not shown), etc.

A flexible closure seal **154** is secured at one end to the valve head **140** at location **156**, and an opposite end of the seal **154** is secured at **160** to a valve module **162** disposed within the upright tube section **124** below the valve head **140.** The valve seating **152** is inclined along the longitudinal axis X and as will be discussed hereinafter, serves a sealing surface for the flexible seal **154.**

The valve module **162** is a float element axially displaceable within the upright tube section 1**24** along the longitudinal axis X. a support member in the form of an L-shaped arm **135** is fixedly articulated to the valve head **140** and depends downwards with a short arm portion **137** extending below the float member **162**, thereby restricting its downward axial displacement. The long arm portion **139** is flat and resides in a gap configured between the inner wall of the upright tube section **124** and a flattened wall portion **143** (Fig. 3C) of the float member, such that he later is prevented from rotation within the upright tube section **124**.

Similar to the arrangement disclosed in connection with the earlier example, the valve module **162** is freely slidable within the upright tube section **124**, with a clearance **176 (seen in Figs. 3A and 3B)** residing between the side walls of the float and the inner walls of the upright tube section **124**, to facilitate gas flow therethrough.

A top portion of the valve module **162** is configured with a seal support **178**, being a surface inclined and oriented in correspondence with the valve seating **152,** whereby when the float member **162** is urged upwardly, under fluid pressure within the upright tube section **124**, the flexible seal **154** sealingly bears against the valve seating **152** and seals the inside fluid port **146**.

The fluid flow valve system **120** with the fluid flow valve **130** function in the same fashion as discussed herein above with reference to figures **1** and **2** namely, at the absence of fluid pressure within the upright tube section **124,** the valve module **162** is disposed at its lowermost position under (Fig. 3A) under self weight of the float **162,** bearing over the short arm portion **137.** At this position small amounts of gas can be vented (either ingress or egress) through the clearance **176.** However, at the event of

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liquid rise within the upright tube section **124,** the float member **162** is urged upwards (Fig. 3B) resulting in sealing engagement of the closure seal **154** against the valve seating **152,** resulting in sealing of the fluid flow valve **130.**

At the event of liquid level dropping within the upright tube section 1**24**, the valve module 1**62** displaces downwards (under its weight), entailing progressive detaching successive transverse portions of the seal 1**54** from the seating 1**52**, so as to open the aperture of the inside fluid port 1**46**, until the inside fluid port is fully open to facilitate fluid flow also at substantially high flow rates.

Turning now to figures 4A and 4B of the drawings, there is illustrated a fluid flow valve system 220 being almost similar to that disclosed in connection with the example of Figs. 3A to 3C, with the only difference residing in the method of articulating the fluid flow valve thereto, and thus the explanation following hereinafter is directed to that aspect only.

In the example of Figs. 4A and 4B the fluid flow valve **230** is in fact identical with fluid flow valve **130** of the previous example, and comprises a valve head **240** configured with an external threading **241** which is adapted for screw coupling at **239** within a top portion of a coupling ring **234** (resembling ring **34** of Figs. 1A to 12A), said coupling ring **234** configured at a bottom portion thereof with an internal threading **245** for screw coupling over a corresponding external thread **247** at a top portion of the upright tube section **224.**

Apart for that difference, the fluid flow valve **230** operates similar to that disclosed in connection with the previous example.

In Fig. 5 there is illustrated a fluid flow valve **250,** substantially as disclosed herein above, however wherein the upright tube section **252** is configured with an externally operated shutoff valve **254** disposed below the fluid flow valve generally designated **256**. The shutoff valve **254** is configured with an actuator **258** facilitating fluid shutoff through the upright tube section **252**, thereby facilitating mounting/dismounting and servicing of the fluid flow valve **256** without affecting flow through the main pipe line **262**.

The arrangement of Fig. 6 illustrates a modification of a valve head generally designated **270**, which differs from previous examples in the fashion of how it couples to the upright tube section **272**. As can be seen, the valve head is integrally configured with a downwardly extending coupling sleeve **276** internally threaded at **278** and

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configured for screw coupling over a top threaded portion **280** of the upright tube section **272**, with a sealing ring **284** disposed between a shoulder **286** of the valve head and a top edge of the upright tube section **27**2.

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CLAIMS:

1. A fluid flow valve comprising a valve head configured with an inside fluid port being in fluid flow communication with an outside fluid port, said valve head is configurable for coupling at a top portion of a substantially upright tube section; a valve module disposed below said valve head and displaceable under fluid pressure along a longitudinal axis between an open position at which fluid flow is facilitated thorough said valve head, and a sealed position at which the valve module sealingly engages the inside fluid port to thereby prevent fluid flow through the valve head.

2. A fluid valve according to claim 1, wherein it is devoid of a housing and is configured for encapsulating within an upright tube section, vertically extending from and being in flow communication with a flow line, said upright tube section being integral with or articulately coupled to the flow line.

3. A fluid valve according to claim 2, wherein the valve module is an automatic valve and is configured for facilitating fluid discharge of substantially pressurized gaseous material, at substantially low flow rates, whilst preventing liquid flow there through.

4. A fluid valve according to claim 2, wherein the valve module is a kinetic valve and is configured for facilitating gaseous material discharge at substantially high flow rates, though substantially not under pressure.

5. A fluid valve according to claim 2, wherein the valve module is a combined valve combining features of both an automatic valve and a kinetic valve.

6. A fluid valve according to claim 2, wherein liquid level in the tube section governs an operative position of the module, wherein liquid level rising within the tube section entails sealing of the valve module to prevent fluid there through.

7. A fluid valve according to claim 2, being a modular unit suitable for retrofit in an upright tube section.

8. A fluid valve according to claim 2, wherein the valve head is configured in the shape of a plug coupleable to the upright tube section.

9. A fluid valve according to claim 2, wherein the valve head is configured for sealingly coupling within the top portion of a substantially upright tube section.

10. A fluid valve according to claim 2, wherein the fluid flow valve is articulated to the upright tube section through a standard screw coupling.

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11. A fluid valve according to claim 2, wherein the fluid flow valve is articulated to the upright tube section by a flange coupling configuration, wherein the valve head is configured with a flanged portion coupleable to a corresponding flange at the top of the upright tube section.

12. A fluid valve according to claim 2, wherein the fluid flow valve is articulated to the upright tube section by a Bayonet-type coupling, and wherein the valve head is configured with a bayonet portion configured for interlocking with a corresponding bayonet portion of the upright tube section.

13. A fluid valve according to claim 2, wherein the fluid flow valve is articulated to the upright tube section at an internal mounting.

14. A fluid valve according to claim 2, articulated to the upright tube section at an external mounting, there being further provided a coupling member interconnecting between the valve head an external coupling portion of the upright tube section.

15. A fluid valve according to claim 1, wherein axial displacement of the valve module in a downwards sense can be restricted by a valve module support extending from the valve head or from the upright tube section.

16. A fluid valve according to claim 15, wherein the valve module support is a sealing member articulated at one end to the valve head and at another end to the valve module.

17. A fluid valve according to claim 2, wherein the valve module is restrained so as to limit displacement thereof in an axial sense, while prohibiting tilt and roll motion thereof about the longitudinal axis.

18. A fluid valve according to claim 2, wherein a shutoff valve is articulated on a portion of the upright tube section, below the valve module, to facilitate fluid flow shutoff through said upright tube section.

19. A fluid valve according to claim 2, wherein the valve head is readily detachably attachable to the upright tube section.

20. A fluid valve according to claim 2, wherein the upright tube section is a standard tubing member extending from a main pipe section.

21. A fluid valve according to claim 2, wherein the upright tube section extends from an intersecting pipe section configured for coupling to the main pipe section, as an intermediate or end piece.

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22. A fluid valve according to claim 2, wherein the upright tube section extends from an elbow-shaped fitting or from a T-shaped fitting.

23. A fluid valve according to claim 2, wherein the upright tube section can extend from a boss tube clamp member fitted over a main pipe section.

24. A fluid valve according to claim 2, wherein the upright tube section is rigid and thus serves as a pressure body and a capsule for housing and supporting the valve head and the valve module.

25. A fluid valve according to claim 2, wherein the seal is pealing seal.

26. A fluid valve according to claim 1, wherein the valve module comprises a fluid through-flow aperture of the inside fluid port with a valve seating formed at a bottom face of the valve head and bounding the aperture, a flexible closure seal secured at one end to the valve head, and an opposite end of the seal secured to the valve module and where displacement of the valve module in a downwards direction entails progressive detaching successive transverse portions of the seal from the seating so as to open the aperture whilst displacement of the displacing means upwards allows the seal to become sealingly biased against the seating.

27. A fluid valve according to claim 1, wherein the valve module comprises a float member, or is articulated to a float member, such that the valve module is adapted to be biased, under fluid pressure in upright tube section, against the valve seating so as to seal an aperture.

28. A fluid flow valve comprising a valve head configured with a fluid inside port being in fluid flow communication with a fluid outside port, said valve head coupled at a top portion of a substantially upright tube section which in turn is in flow communication with a main flow pipe, a valve module disposed below said valve head and displaceable under fluid pressure along a longitudinal axis between an open position at which gaseous material flow is facilitated thorough said valve head, and a sealed position at which the valve module sealingly engages the inside port to thereby prevent fluid flow through the valve head.

29. A fluid flow system comprising a fluid pipe fitted with at least one upright tube section, configured at a top portion thereof with a fluid flow valve comprising a valve head configured with an inside fluid port being in fluid flow communication with an outside fluid port, a valve module disposed below said valve head and displaceable under fluid pressure along a longitudinal axis between an open position at which fluid

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flow is facilitated thorough said valve head, and a sealed position at which the valve module sealingly engages the inside fluid port to thereby prevent fluid flow through the valve head.

30. A fluid flow system according to claim 29, wherein the fluid flow valve is devoid of a housing and is configured for encapsulating within an upright tube section, vertically extending from and being in flow communication with a flow line, said upright tube section being integral with or articulately coupled to the flow line.

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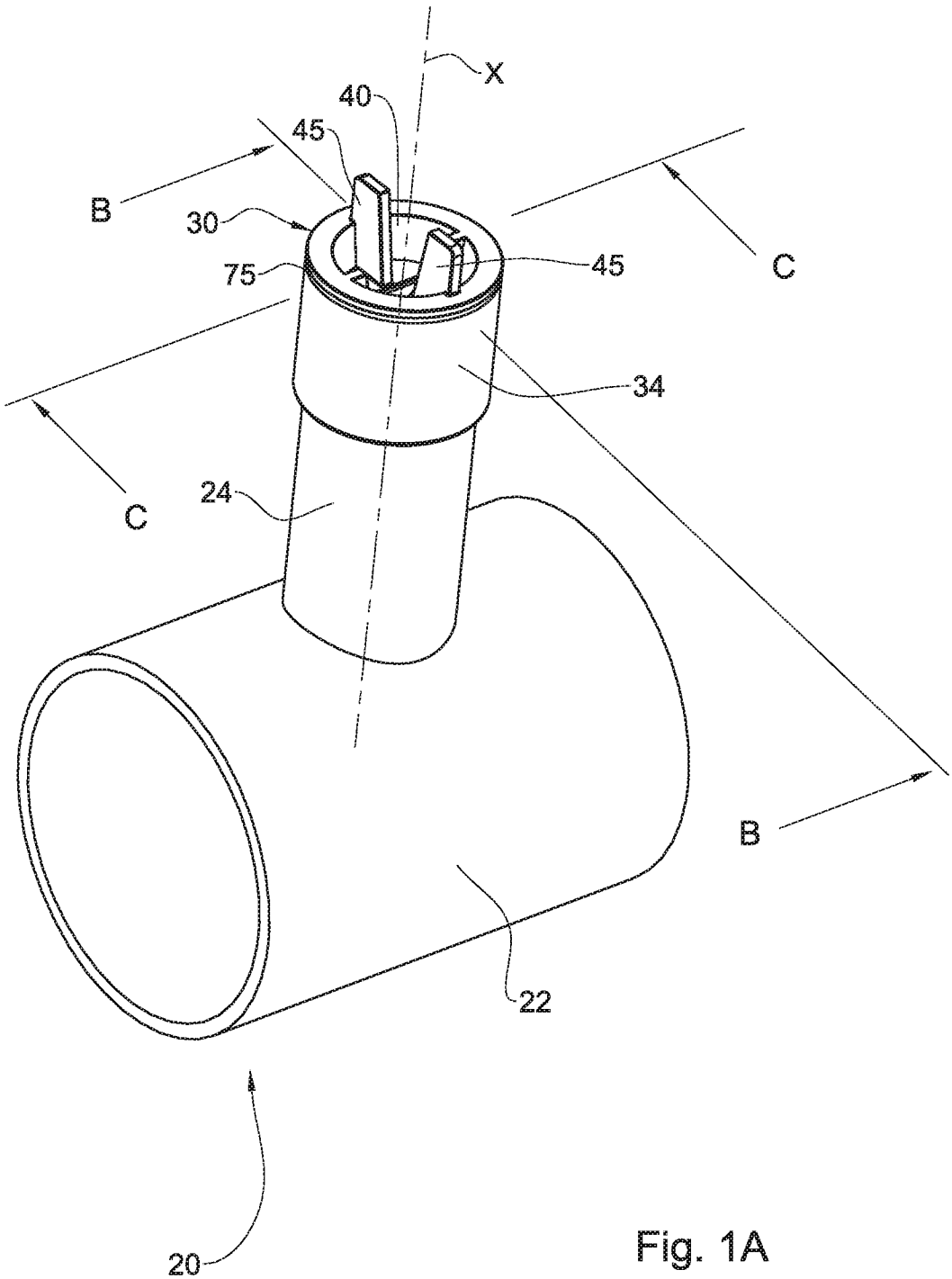

Fig. 1A

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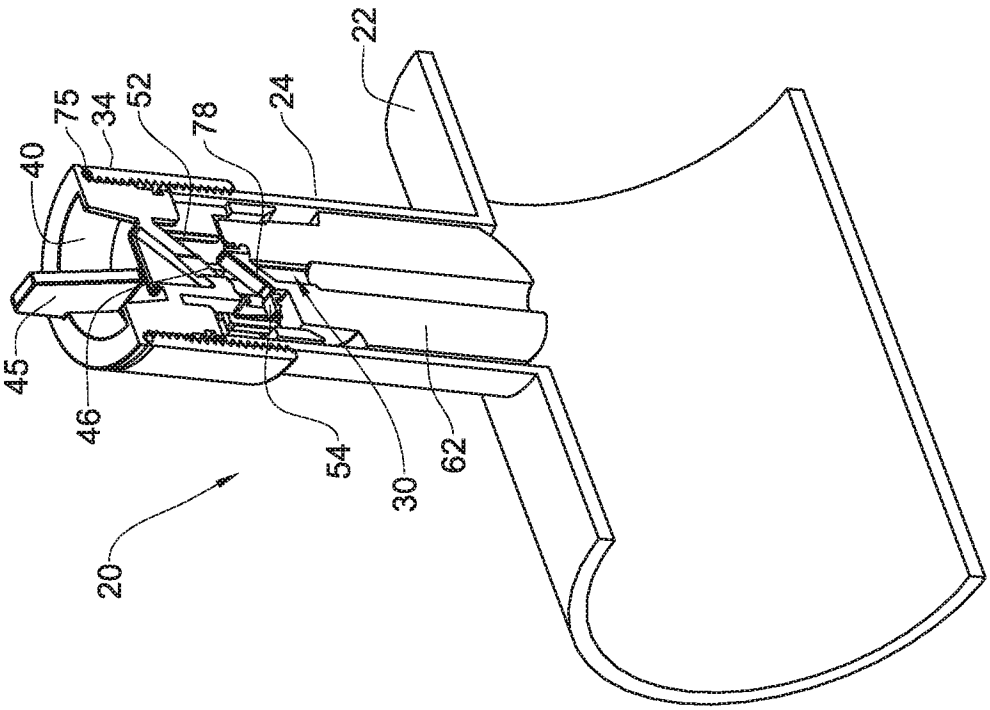

Fig. 1C

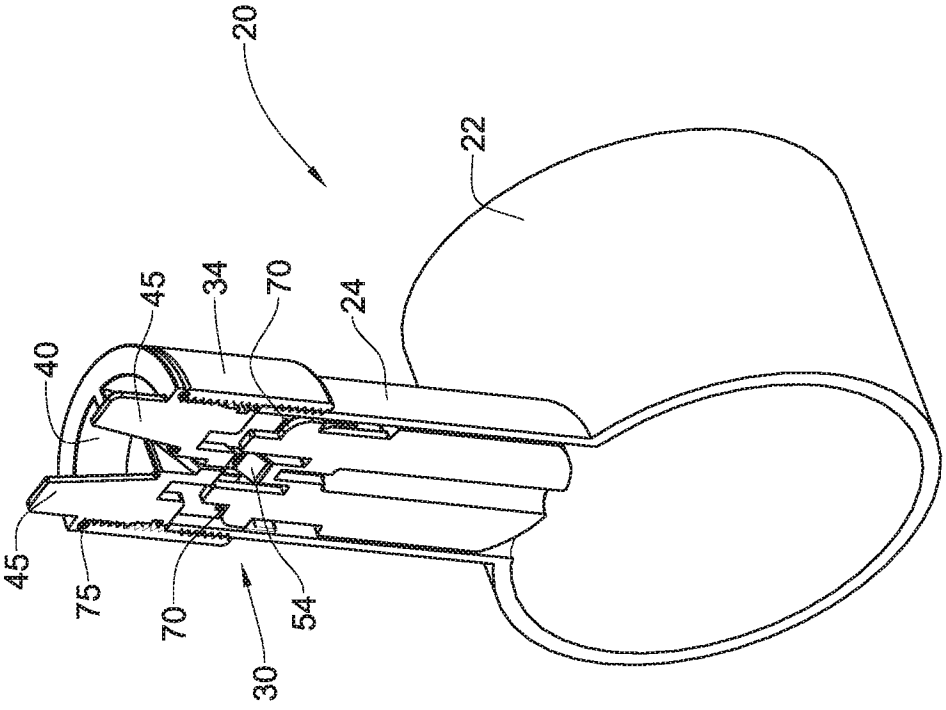

Fig. 1B

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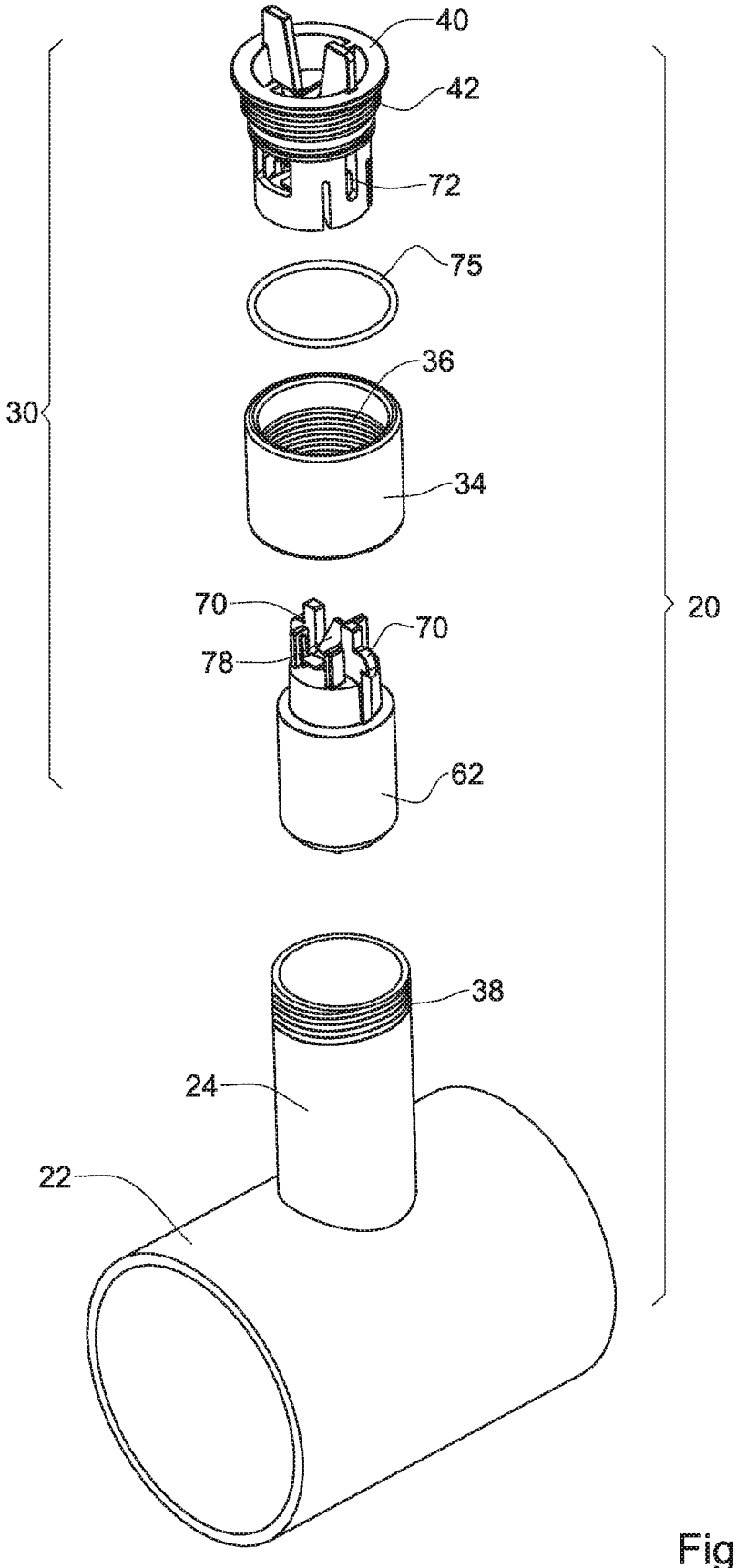

Fig. 1D

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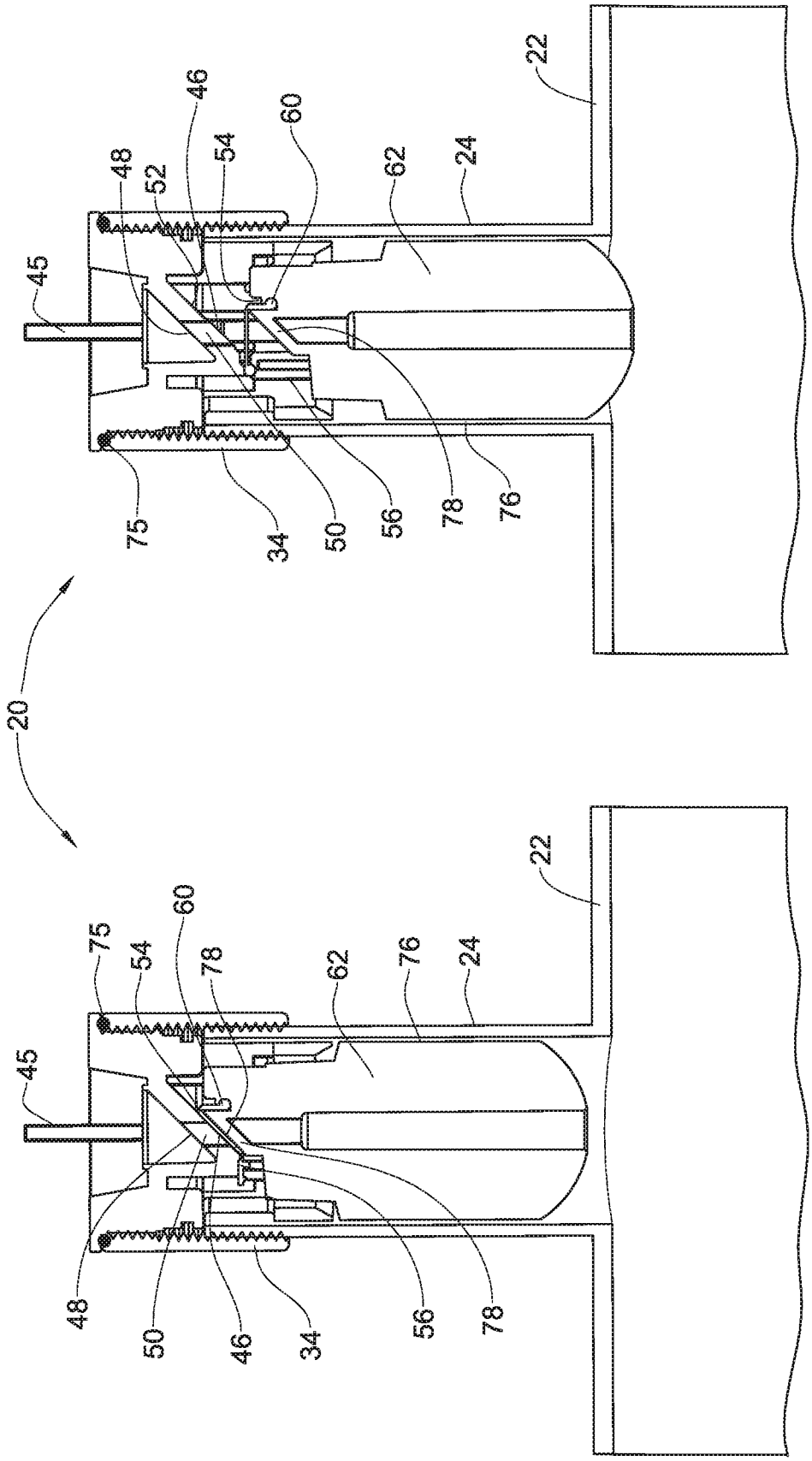

Fig. 2B

Fig. 2A

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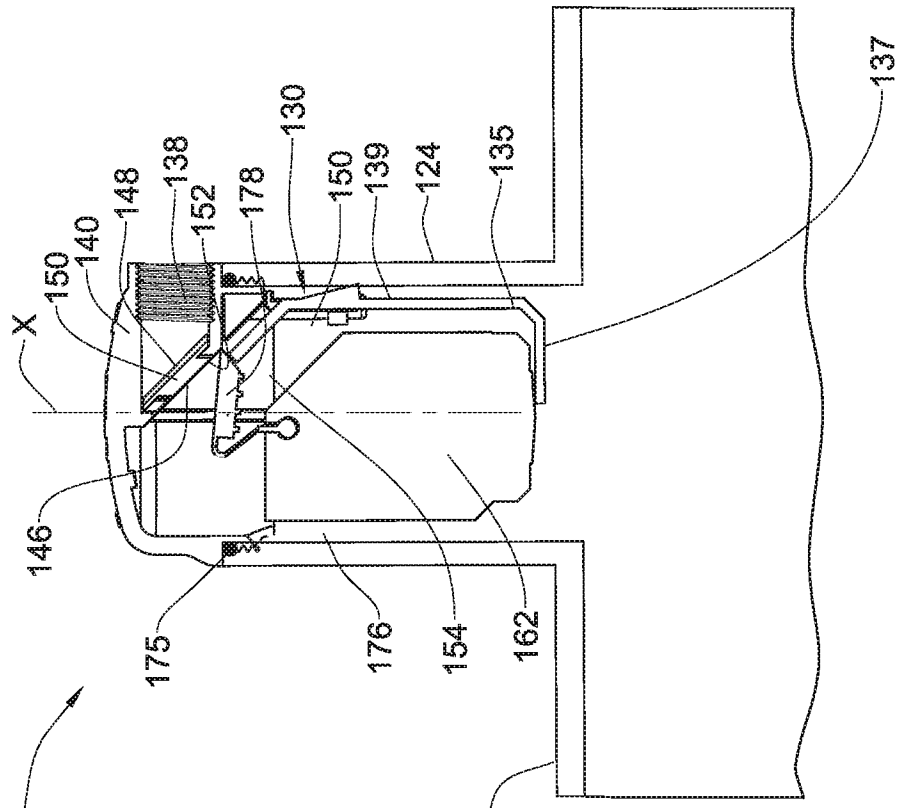

Fig. 3A

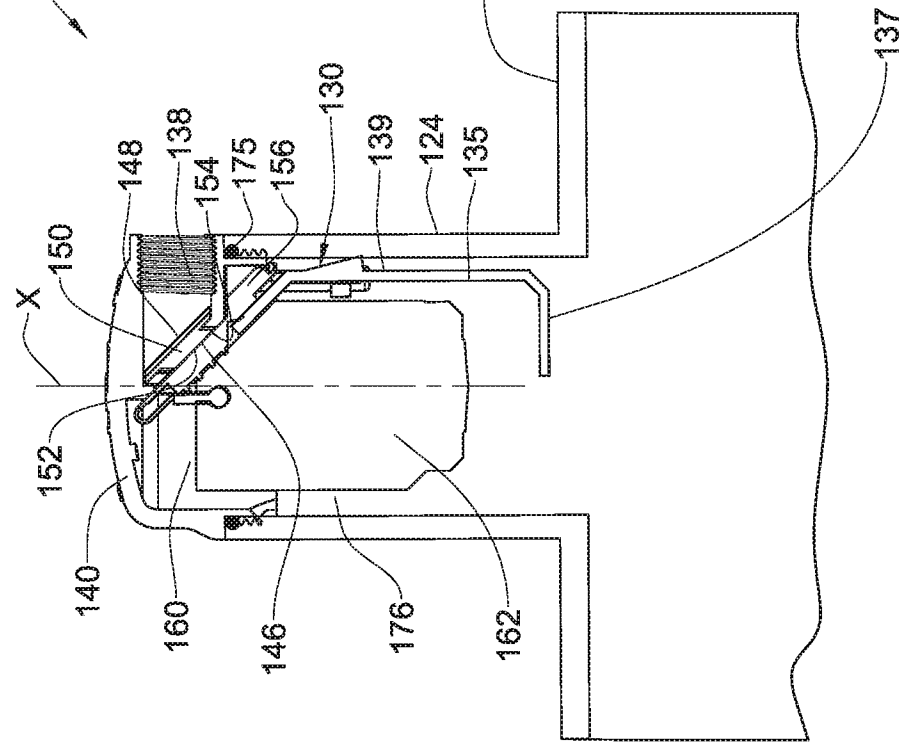

Fig. 3B

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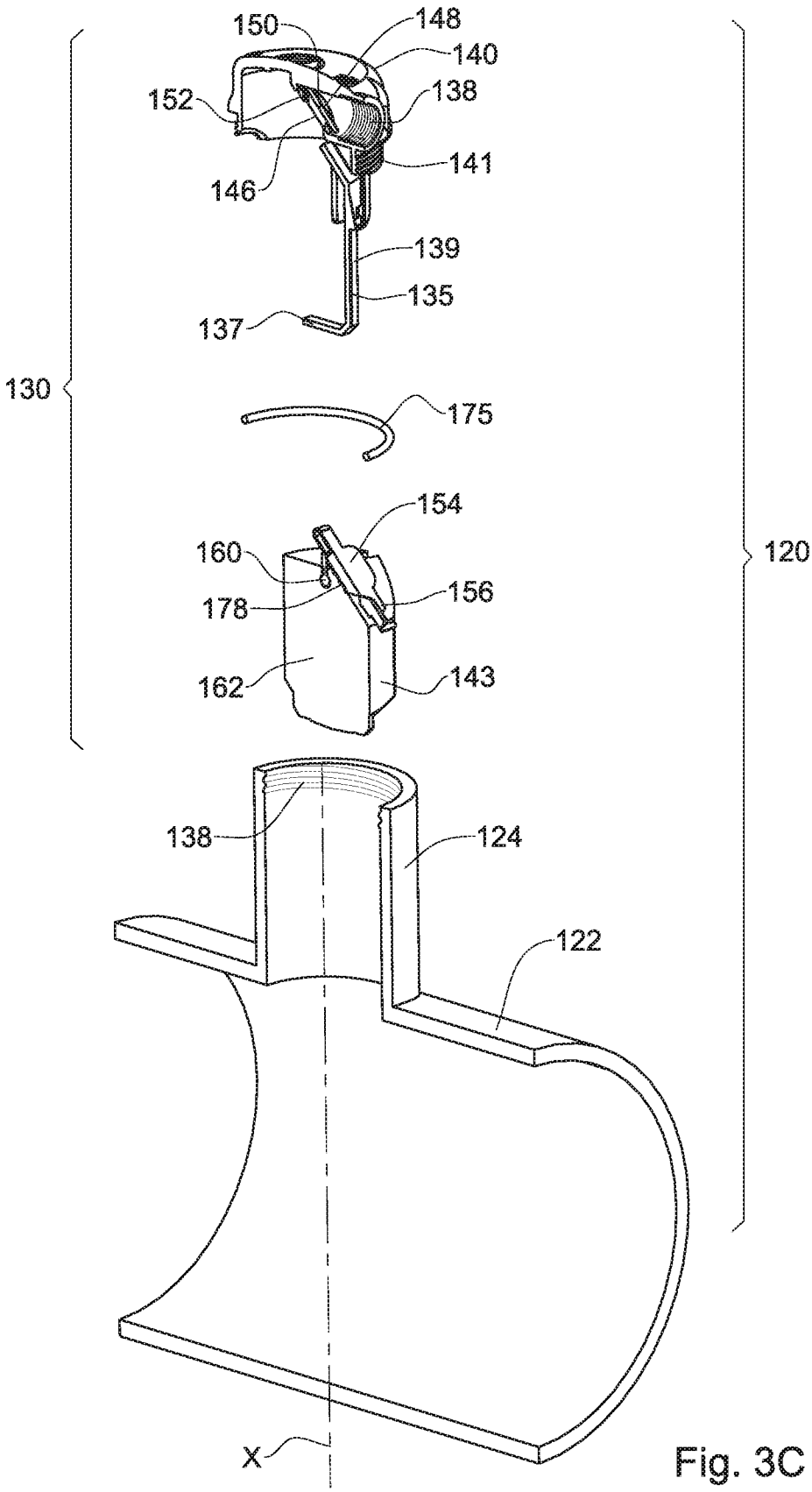

Fig. 3C

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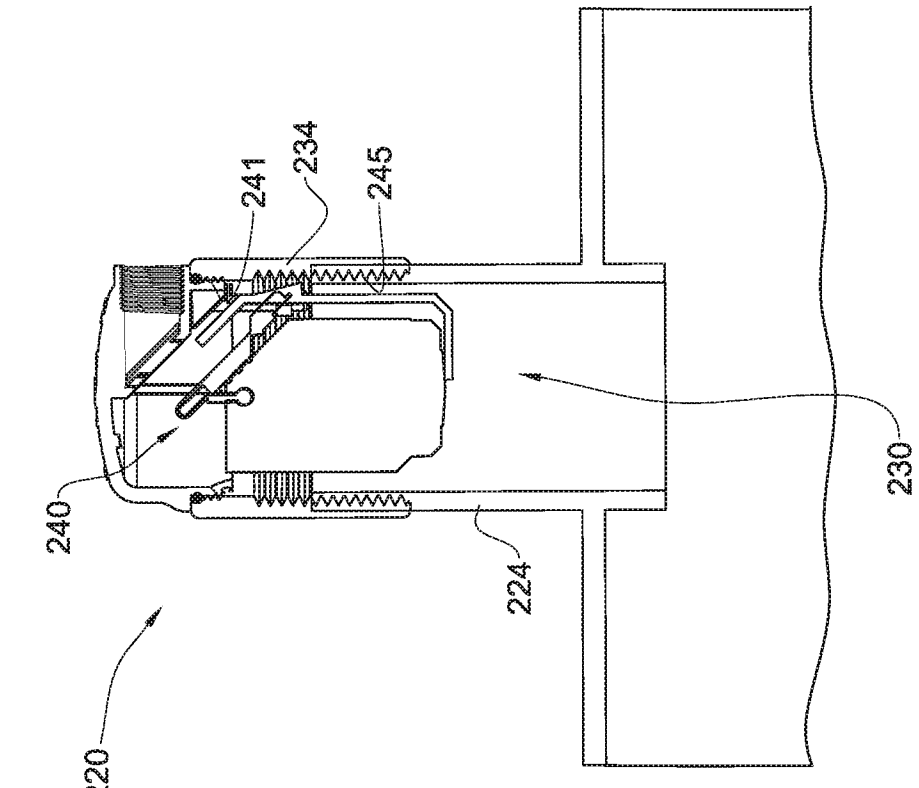

Fig. 4A

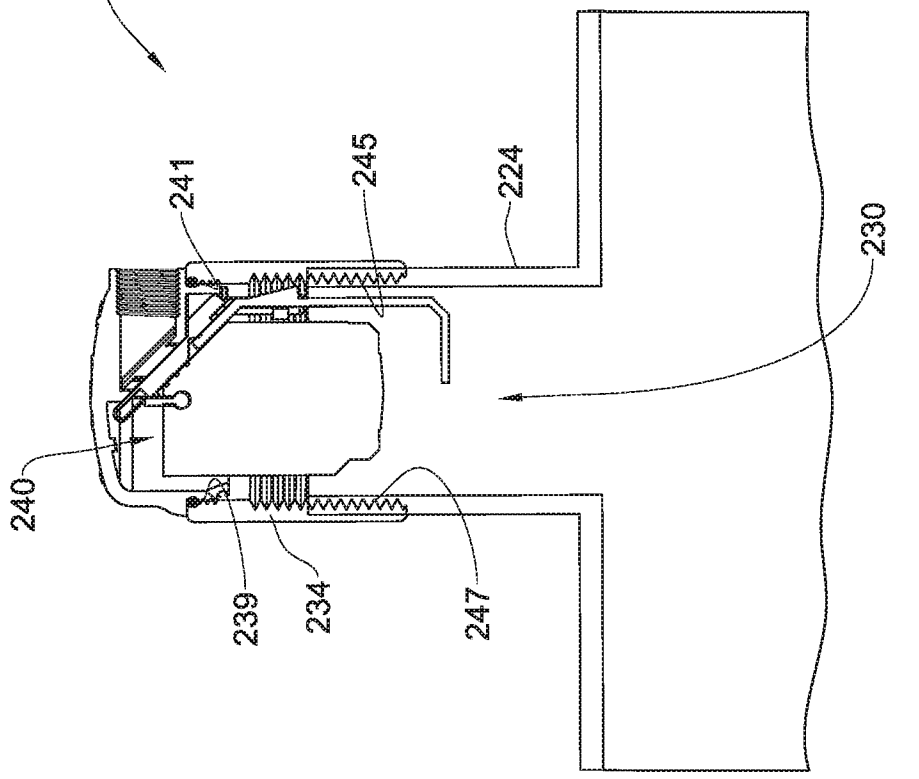

Fig. 4B

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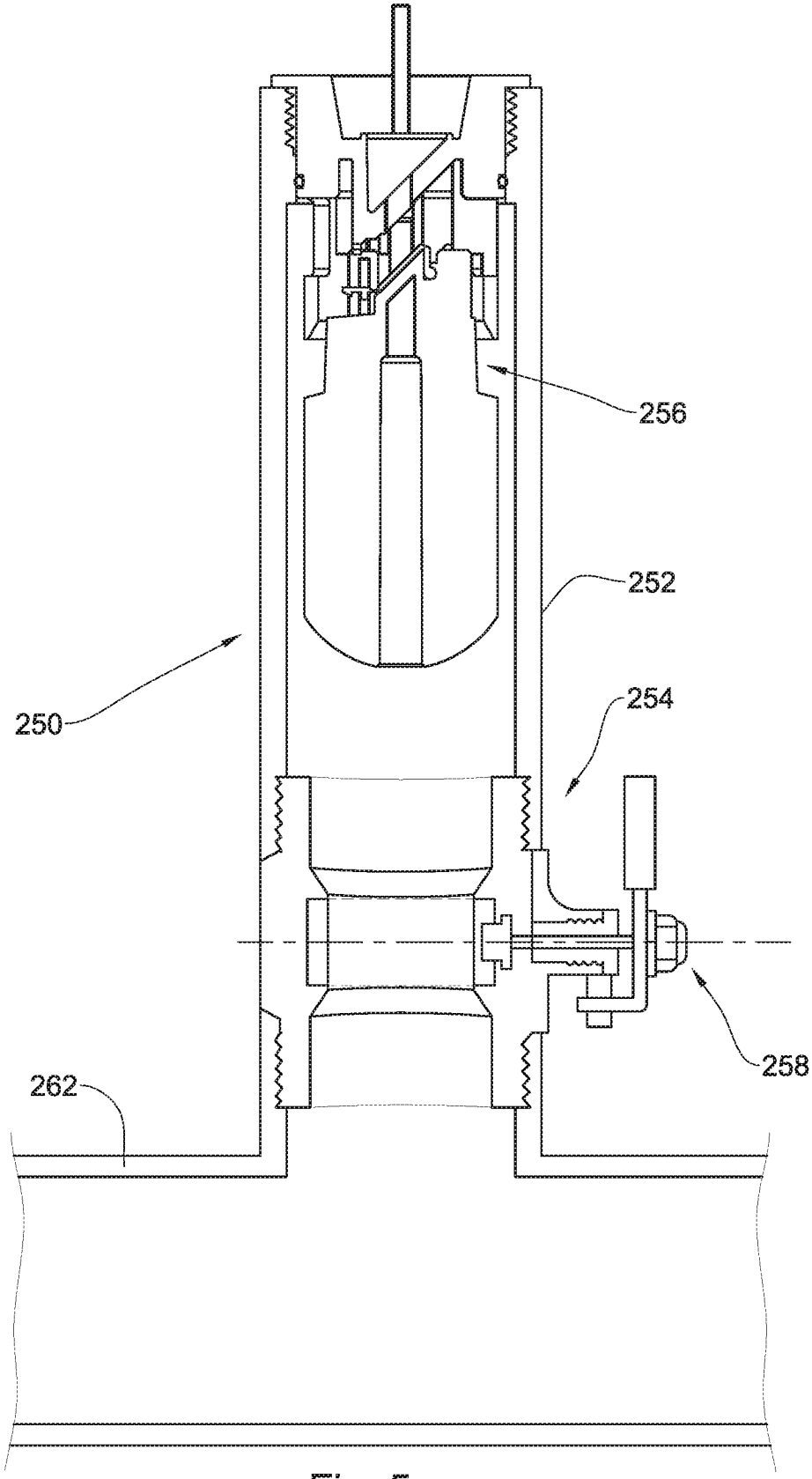

Fig. 5

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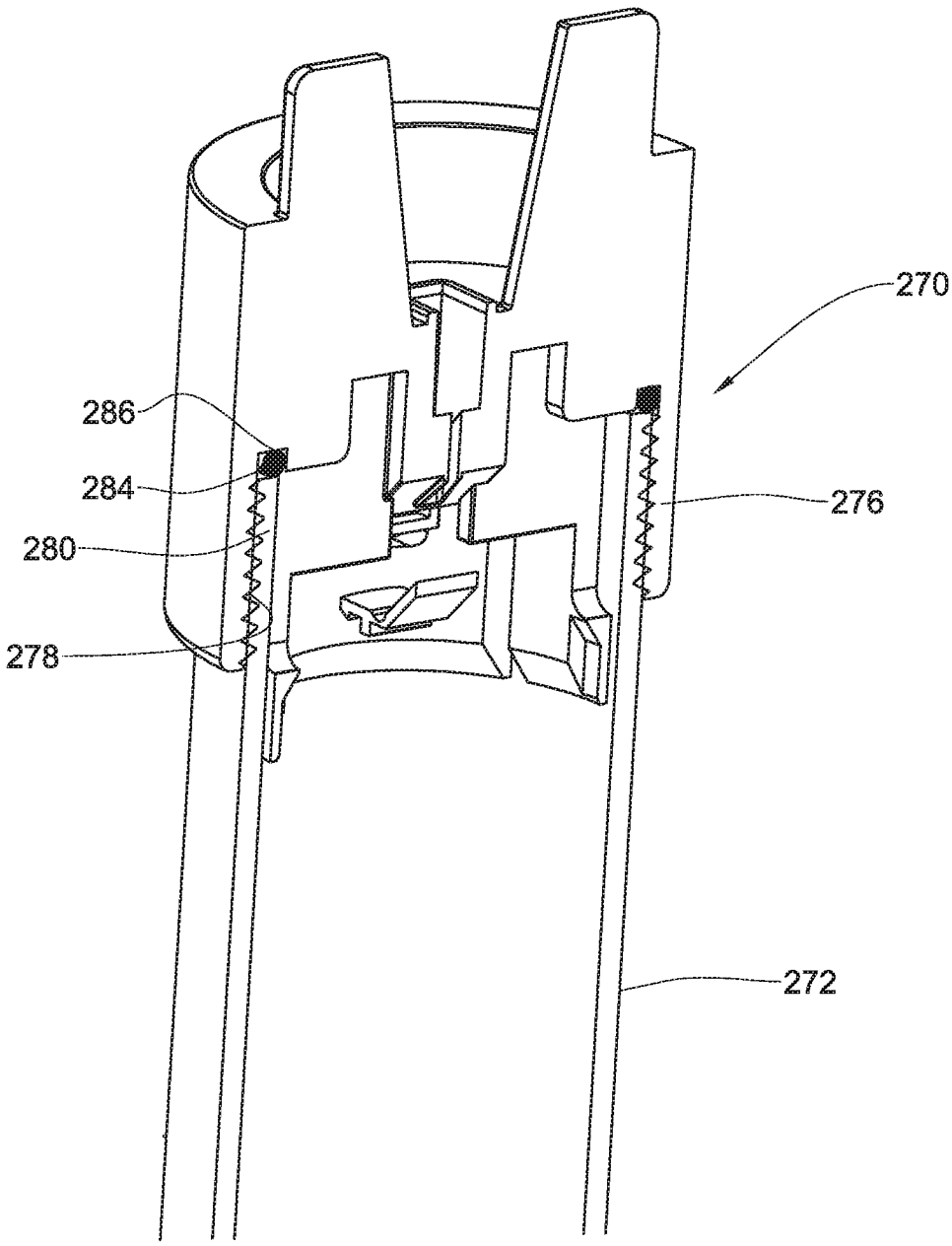

Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL2016/050778

A. CLASSIFICATION OF SUBJECT MATTER
IPC (2016.01) F16K 24/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC (2016.01) F16K 24/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Databases consulted: THOMSON INNOVATION

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6513541 B1 HERLIHY GEOFFREY FRANCIS 04 Feb 2003 (2003/02/04) the entire document	1-30
X	WO 2014141254 A1 A.R.I FLOW CONTROL ACCESSORIES LTD 18 Sep 2014 (2014/09/18) the entire document	1-30
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 Nov 2016	10 Nov 2016

Name and mailing address of the ISA:	Authorized officer
Israel Patent Office Technology Park, Bldg.5, Malcha, Jerusalem, 9695101, Israel Facsimile No. 972-2-5651616	NARGASI Ayelet Telephone No. 972-2-5651620

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL2016/050778

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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