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(54) **BACKFLOW PREVENTION DEVICE FOR WATER SOFTENER**

(57) A siphon apparatus (14) is operable to be connected to a water softener device (10). The siphon apparatus (14) comprises a body (18) defined by one or more walls, wherein the walls define a through bore through the body (18). At least one window defines an aperture (52) through the one or more walls. A closure member (32) is provided at one end of the body (18). The closure member (32) comprises one or more ports (38), which are in fluid communication with the hollow body (18). Each port (38) is provided through the closure member (32). An inner funnel (42) extends from the closure member (32) and at least partially into the hollow body (18), wherein the inner funnel (42) is in fluid communication with the one or more ports (32). A meshed member (46) is provided within the inner funnel (42). In use, the meshed member (46) is operable to channel and stabilize fluid entering the inner funnel (42) from the one or more ports (32).

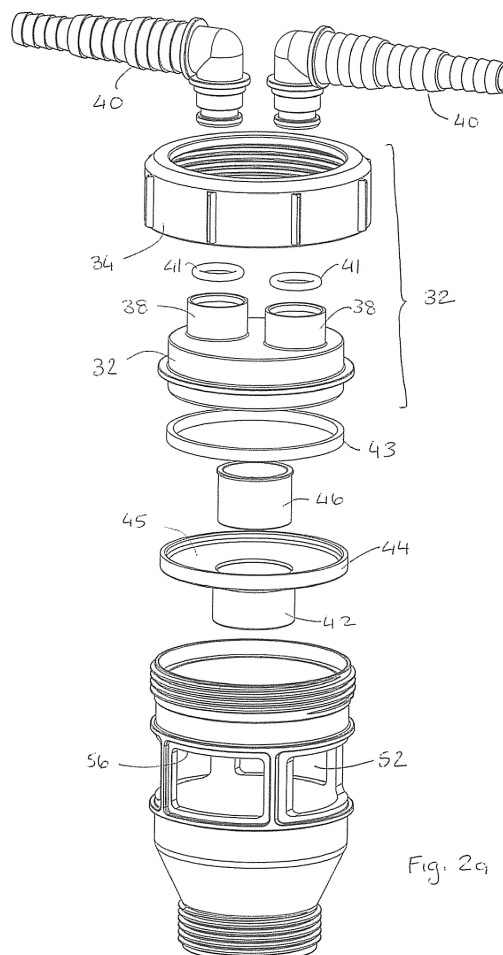


Fig. 2a

Description

Field of the Invention

[0001] The present invention relates to a siphon apparatus for use with water softening apparatus, in order to control waste removal.

Background to the Invention

[0002] Water softeners are typically configured to remove calcium and magnesium from hard water; calcium and magnesium are the likely cause of scale and scum which builds up in wet areas, such as showers and around the outlet of taps/faucets and within appliances, such as washing machines and dishwashers.

[0003] An example of removing calcium and magnesium from hard water is by ion exchange which typically uses an ion exchange resin. The resin comprises tiny polymeric beads which are specially formulated so that they can be charged with certain ions. As water passes through the resin, calcium and magnesium ions swap places with sodium ions on the resin. Unlike calcium and magnesium, sodium is highly soluble. Therefore, scale and scum build-up is reduced or eliminated.

[0004] It will be appreciated that the process generates waste fluid, which needs to be removed. A siphon is generally used in order to remove the waste product from the water softener. Typically, the siphon is connected to the water softener unit and comprises at least two inlets, where the inlets provide an overflow function and pressure relief. The overflow facility provides a cleaning function where regeneration water and overflow from the salt tank can be removed to a drain or sewer and pressure relief is provided as an overflow for pressurized water, which is being pushed through the system.

[0005] The siphon is typically connected to the water softener with an air break in order to discharge waste fluid away from the water softener. Typically, a trap, valve or seal is connected to the siphon to facilitate connection of the water softener to a sewer for removal of waste to the sewer.

[0006] Splashing and backflow of waste product from the sewer through the siphon is to be avoided.

[0007] An improved siphon unit is desirable.

Summary of the Invention

[0008] A first aspect of the present invention provides a siphon apparatus operable to be connected, in use, to a water softener device, wherein the siphon apparatus comprises:

a body defined by one or more walls, wherein the walls define a hollow through the body and wherein at least one window defines an aperture through the one or more walls;

a closure member provided at one end of the body and wherein the closure member comprises one or more ports, which is/are in fluid communication with the hollow body, wherein the/each port is provided through the closure member;

an inner funnel extending from the closure member and at least partially into the hollow body, wherein the inner funnel is in fluid communication with the one or more ports; and

a meshed member provided with the inner funnel, wherein, in use the meshed member is operable to channel and stabilize fluid entering the inner funnel from the one or more ports.

[0009] Advantageously, an inner funnel comprising a meshed member according to an embodiment of the present invention reduces or eliminates splashing and backflow of fluid being removed from the device to which the siphon is attached, for example a water softener. As such, a siphon apparatus according to embodiments of the present invention ensures that the soft water is not contaminated in any way and therefore in use with a water softener the soft water that is produced is safe to use. This means more efficient flow of water from the water softening appliance through the system.

[0010] The closure member may be attachable to and removable from the hollow body.

[0011] The siphon apparatus may further comprise a removable insert, which is removable and attachable to the hollow body. The inner funnel may extend from the removable insert at least partially into the hollow body. The inner funnel may be dimensioned to extend to the window.

[0012] The meshed member may be an insert, which is removable from and attachable to the inner funnel such that fluid flow from the ports impinges on the meshed member. The meshed member may comprise a regular pattern of openings. Alternatively, the meshed member may comprise an irregular pattern of openings. In one embodiment, the openings may comprise a pattern comprising radially extending trapezoids, which may extend from a substantially circular centre portion. The centre portion may be solid or hollow.

[0013] A further aspect of the present invention provides a trap comprising a siphon apparatus according to the first aspect, wherein the trap facilitates removal of waste from the siphon apparatus to a waste removal element, such as a sewer. This arrangement prevents backflow of waste and minimises odour escape.

[0014] A further aspect of the present invention provides a water softener apparatus comprising a siphon apparatus according to the first aspect.

Brief Description of the Drawings

[0015] Embodiments of the present invention are de-

scribed below, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic representation of a water softener device including a siphon apparatus according to an embodiment of the present invention;

Figure 2a is a schematic representation of an exploded view of a siphon apparatus according to an embodiment of the present invention;

Figure 2b is a schematic representation of an outlet end of a siphon apparatus according to an embodiment of the present invention; and

Figure 2c is a schematic representation of a meshed member as used with the siphon apparatus according to an embodiment of the present invention.

BRIEF DESCRIPTION

[0016] Figure 1 illustrates a schematic representation of a setting comprising a water softener apparatus 10, which is operable to soften water in hard water areas.

[0017] The water softener 10 is connected to a water supply 12, wherein water is supplied to the water softener 10 and is subject to a water softening process within the water softener 10. In figure 1, a siphon apparatus 14, according to an embodiment of the present invention, is provided at an outlet 16 of the water softener apparatus 10, where the siphon apparatus 14 may be connected to a trap (not illustrated) or valve system (not illustrated) such as a mechanical valve or seal operable to facilitate removal of waste from the siphon apparatus (14) to a sewer.

[0018] Referring to figure 2a, in the illustrated embodiment the siphon apparatus 14 comprises a hollow body 18, which in the illustrated embodiment comprises an inlet end 20 and an outlet end 22. In the illustrated embodiment, the outlet end 22 is tapered such that the outlet end 22 can have a smaller diameter than the inlet end 20. This arrangement facilitates connection of the siphon apparatus 14 to other equipment.

[0019] The outlet end 22 may comprise a threaded connection 24 (see figure 2a) or a plain, push-fit connection 26 (see figure 2b) to facilitate attachment of the siphon apparatus 14 to other equipment, for example a trap (not illustrated) or a valve, for example a self-closing waste valve (not illustrated). The trap or valve facilitate removal of waste from the siphon apparatus (14) to a sewer (not illustrated).

[0020] Figure 2b illustrates an assembled arrangement of the siphon apparatus 14.

[0021] In the embodiment illustrated in figure 2a, the siphon apparatus 14 is illustrated as a modular construction, wherein it is manufactured from discrete component parts which can be assembled to provide the siphon apparatus 14 according to an embodiment of the present

invention. This arrangement eases manufacture, construction, installation and maintenance.

[0022] At the inlet end 20 a closure member 32 is provided, which in the illustrated embodiment includes a screw-fit cap 34 to attach the closure member 32 to the hollow body 18. The closure member 32 includes a positionable insert 36, which includes two inlet ports 38. A nozzle 40 is connected to each inlet port 38. The nozzles 40 are each connected to the water softener apparatus 10 by a suitable conduit/hose (not illustrated). One nozzle 40 facilitates removal of waste from the water softener apparatus 10 and the other nozzle 40 facilitates pressure relief. In this regard, it will be appreciated that an operating flow rate of around 30 litres per minute and an operating pressure of around 8 bar is expected.

[0023] In the illustrated example the nozzles 40 are a push-fit connection with the ports 38. An O-ring seal 41 is provided to secure and ensure a sealed connection between respective ports 38 and nozzles 40.

[0024] At the inlet end 20, the siphon apparatus 14 also includes an inner funnel 42 and a seal 43. In the illustrated embodiment the inner funnel 42 is centrally located in a flange 44, which rests inside the hollow body 18 at the inlet end 20. The flange 44 includes a sloping surface 45 that tapers slightly towards the inner funnel 42. In use, the inner funnel 42 extends into the hollow body 18.

[0025] The tapered flange 44 facilitates directing the flow of fluid from the inlet nozzles 40 towards the inner funnel 42.

[0026] In the illustrated embodiment, the inner funnel 42 includes a meshed member 46, which is inserted into the inner funnel 42. In the illustrated example, the meshed member 46 comprises a regular pattern of radially extending trapezoids 48, which extend from a central circular hole 50 (see figure 2c). It will be appreciated that the arrangement of the holes forming the meshed member may be created as an irregular pattern.

[0027] The arrangement of the inner funnel 42, the flange 44 and the meshed member 46 is such that water flowing through the inlet nozzles 40 is stabilised such that upon exit of the inner funnel 42 splashing is eliminated as the fluid passes through the section of the hollow body 18 comprising apertures 52. In addition, the arrangement helps eliminate any risk of back flow. The inclusion of the meshed member facilitates controlling and smoothing fluid flowing through the hollow body; therefore eliminating the risk of splashing as the flow passes through the area comprising the apertures 52.

[0028] The apertures 52 provided through the wall of the body 18 provide an air gap as required by regulatory authorities.

[0029] The inner funnel 42 extends from the flange 44 into the hollow body 18. The length of the inner funnel 42 is dimensioned such that the outlet 54 of the inner funnel 42 is positioned outside the perimeter 56 of the aperture 52 or substantially level with the perimeter 56 of the window 52.

[0030] The meshed member 46 may be manufactured

as an insert or as an integral part of the member comprising the inner funnel 42 and the flange 44.

[0031] In the illustrated embodiment the hollow body comprises four apertures 52. This is for illustrative purposes and it should be appreciated that one or more apertures 52 may be provided.

[0032] Whilst specific embodiments of the present invention have been described above, it will be appreciated that departures from the described embodiments may still fall within the scope of the present invention.

Claims

1. A siphon apparatus operable to be connected, in use, to a water softener device, wherein the siphon apparatus comprises:
 - a body defined by one or more walls, wherein the walls define a through bore through the body and wherein at least one window defines an aperture through the one or more walls;
 - a closure member provided at one end of the body and wherein the closure member comprises one or more ports, which is/are in fluid communication with the hollow body, wherein the/each port is provided through the closure member;
 - an inner funnel extending from the closure member and at least partially into the hollow body, wherein the inner funnel is in fluid communication with the one or more ports; and
 - a meshed member provided within the inner funnel, wherein, in use the meshed member is operable to channel and stabilize fluid entering the inner funnel from the one or more ports.
2. A siphon apparatus as claimed in claim 1, wherein the closure member is attachable to and removable from the hollow body.
3. A siphon apparatus as claimed in claim 1 or 2, further comprising a removable insert, which is removable and attachable to the hollow body.
4. A siphon apparatus as claimed in claim 3, wherein the inner funnel extends from the removable insert at least partially into the hollow body.
5. A siphon apparatus as claimed in any preceding claim, wherein the inner funnel is dimensioned to extend to the window.
6. A siphon apparatus as claimed in any preceding claim, wherein the meshed member is an insert, which is removable from and attachable to the inner funnel such that fluid flow from the ports impinges on the meshed member.
7. A siphon apparatus as claimed in any preceding claim, wherein the meshed member comprises a regular pattern of openings.
8. A siphon apparatus as claimed in any of claims 1 to 6, wherein the meshed member comprises an irregular pattern of openings.
9. A siphon apparatus as claimed in any of claims 1 to 6, wherein the openings comprise a pattern comprising radially extending trapezoids, which extend from a substantially circular centre portion.
10. A siphon apparatus as claimed in claim 9, wherein the centre portion is solid.
11. A siphon apparatus as claimed in claim 9, wherein the centre portion is hollow.
12. A trap comprising a siphon apparatus as claimed in any preceding claim, wherein the trap facilitates removal of waste from the siphon apparatus to a waste removal element, such as a sewer.
13. A water softener comprising a siphon apparatus as claimed in any of claims 1 to 11.

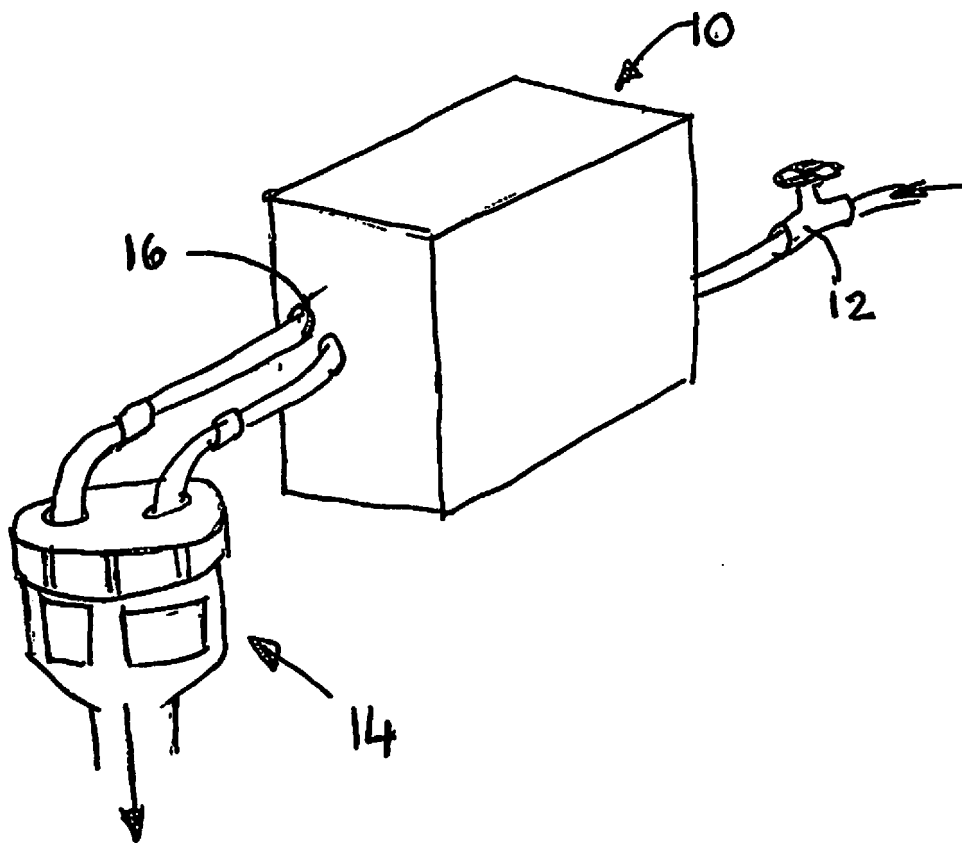


Fig. 1

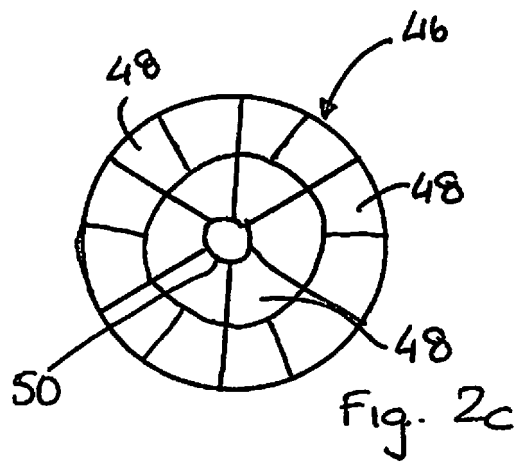
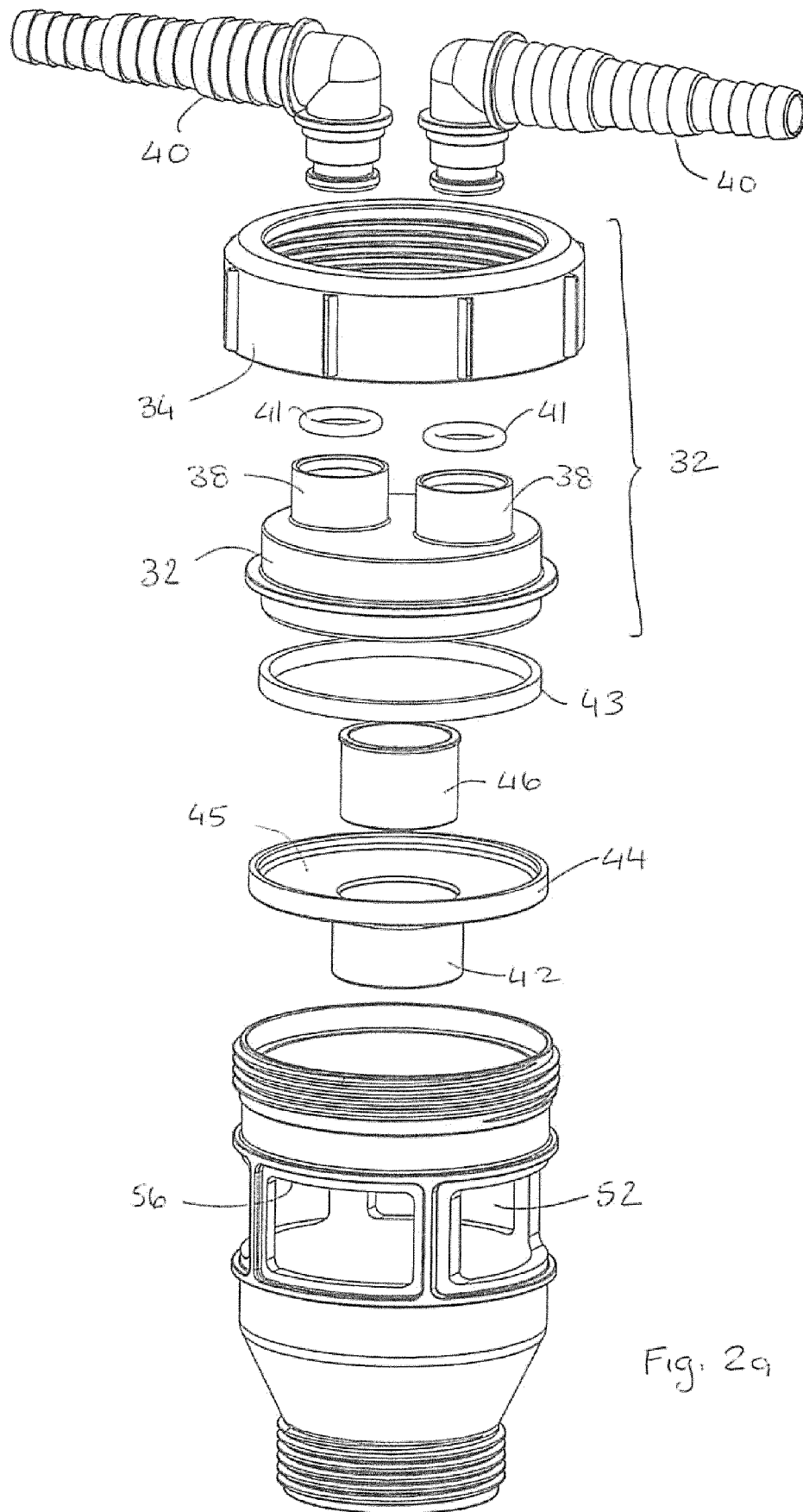
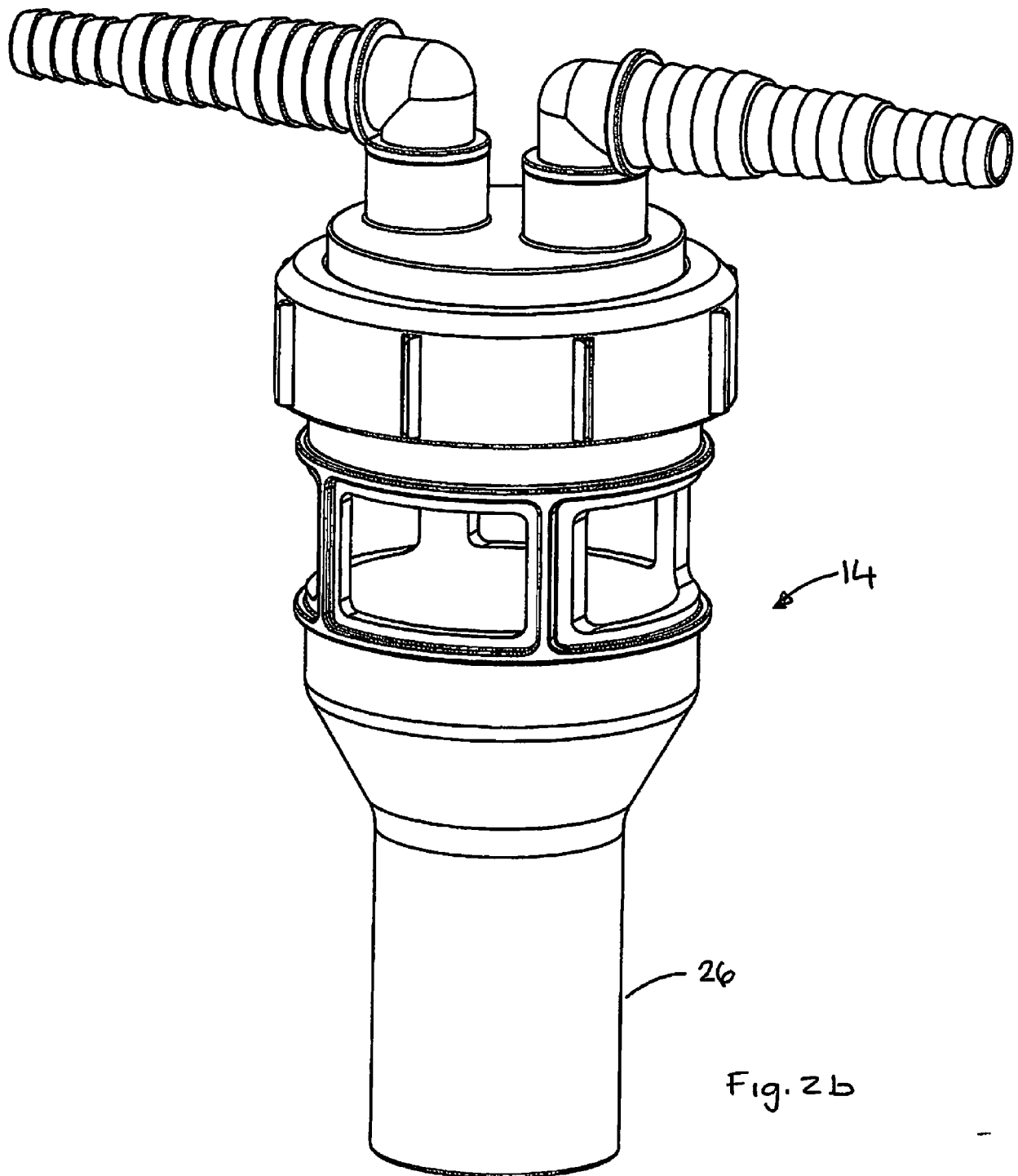


Fig. 2c







EUROPEAN SEARCH REPORT

 Application Number
EP 17 15 6864

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Place of search Munich		Date of completion of the search 14 June 2017	Examiner Leher, Valentina
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82