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

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VALVE ANTI-RETOUR POUR ADOUCISSEUR D'EAU

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(56) References cited:
**US-A- 2 056 357 US-A- 2 161 204
US-A- 4 646 775 US-A- 5 592 964**

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Description

Field of the Invention

[0001] The present invention relates to a siphon apparatus according to the preamble of claim 1 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] US patent US 5 592 964 relates to an air gap anti-siphon system designed for high flow rate drainage of waste water from household water softeners and the like. The patent describes conventional air-gap anti-siphon system, which can be converted for low flow rate drainage of waste water from household reverse osmosis units.

[0008] US patent 2 161 204 describes a vacuum breaker adapted to be used with piping, for example between a supply pipe and a waste tank, wherein the vacuum breaker is operable to prevent contaminated water from the tank being sucked into the supply pipe.

Summary of the Invention

[0009] In accordance with the present invention, there is provided a siphon apparatus as recited in claim 1. 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] Further preferred embodiments are defined by the features of dependent claims 2-11.

[0011] 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

[0012] Embodiments of the present invention are described 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

[0013] 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.

[0014] 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.

[0015] 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.

[0016] 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).

[0017] Figure 2b illustrates an assembled arrangement of the siphon apparatus 14.

[0018] 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.

[0019] 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.

[0020] 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.

[0021] 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.

[0022] The tapered flange 44 facilitates directing the flow of fluid from the inlet nozzles 40 towards the inner funnel 42.

[0023] 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.

[0024] 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. The apertures 52 provided through the wall of the body 18 provide an air gap as required by regulatory authorities.

[0025] 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 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.

[0026] 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.

[0027] 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.

[0028] 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 (14) operable to be connected, in use, to a water softener device, wherein 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) and wherein at least one window (56) defines an aperture (52) laterally through the one or more walls;

a closure member (32) provided at one end of the body (18) and wherein the closure member (32) comprises one or more ports (38), which is/are in fluid communication with the hollow body (18), wherein the/each port (38) is provided through the closure member (32);

an inner funnel (42) extending down from the closure member and extending at least partially into the hollow body (18), **characterised in that** the inner funnel (42) is centrally located in a removable flanged insert (44), which rests inside an inlet end (20) of the hollow body (18), wherein

- the removable flanged insert (44) includes a sloping surface (45) tapering downwards towards the inner funnel and towards an outlet end (22) of the hollow body (18), wherein, in use, the sloping surface (45) of the removable flanged insert (44) facilitates directing fluid from the one or more ports (38) towards the inner funnel (42), wherein the length of the inner funnel (42) is dimensioned such that an outlet of the inner funnel (42) is positioned outside the perimeter (56) or substantially level with the perimeter of the aperture (52); and a meshed member (46) comprising a plurality of openings (48), wherein the meshed member (46) is configured to be received within the inner funnel (42), wherein, in use, the flanged insert (44), the inner funnel (42) and the meshed member (46) are operable to channel and stabilize fluid entering the inner funnel (42) from the one or more ports (38).
2. A siphon apparatus as claimed in claim 1, wherein the closure member (32) includes a positionable insert (36) which is received in the inlet end (20) of the hollow body (18) and rests upon an edge of the inlet end (20), wherein the closure member (32) is insertable and removable from the hollow body (18).
 3. A siphon apparatus as claimed in claim 1 or 2, further comprising a screw-fit cap (34), which is removable and attachable to the inlet end (20) of the hollow body (18), wherein the screw-fit cap (34) secures the closure member (32) relative to the hollow body (18).
 4. A siphon apparatus as claimed in any preceding claim, wherein the meshed member (46) is an insert, which is removable from and attachable to the inner funnel (42), wherein the meshed insert is positioned relative to the inner funnel and the tapered flange (45) such that fluid flow from the ports (38) impinges on the meshed member (46).
 5. A siphon apparatus as claimed in any preceding claims, wherein the meshed member comprises a regular pattern of openings.
 6. A siphon apparatus as claimed in any of claims 1 to 4, wherein the meshed member comprises an irregular pattern of openings.
 7. A siphon apparatus as claimed in any of claims 1 to 4, wherein the openings comprise a pattern comprising radially extending trapezoids, which extend from a substantially circular centre portion (50).
 8. A siphon apparatus as claimed in claim 7, wherein the centre portion is solid.
 9. A siphon apparatus as claimed in claim 7, wherein the centre portion is hollow.
 10. A trap comprising a siphon apparatus (14) as claimed in any preceding claims, wherein the trap facilitates removal of waste from the siphon apparatus to a waste removal element, such as a sewer.
 11. A water softener comprising a siphon apparatus as claimed in any of claims 1 to 9.

Patentansprüche

1. Siphoneinrichtung (14), die betriebsfähig ist, in Verwendung mit einer Wasserenthärtervorrichtung verbunden zu werden, wobei die Siphoneinrichtung (14) umfasst:

einen Körper (18), der durch eine oder mehrere Wände definiert ist, wobei die Wände ein Durchgangsloch durch den Körper (18) definieren und wobei mindestens ein Fenster (56) einen Durchlass (52) seitlich durch die eine oder mehreren Wände definiert;
 ein Verschlusselement (32), das an einem Ende des Körpers (18) bereitgestellt ist und wobei das Verschlusselement (32) einen oder mehrere Anschlüsse (38) umfasst, die in Fluidkommunikation mit dem hohlen Körper (18) ist/sind, wobei der/jeder Anschluss (38) durch das Verschlusselement (32) bereitgestellt ist;
 einen inneren Trichter (42), der sich von dem Verschlusselement nach unten erstreckt und sich mindestens teilweise in den hohlen Körper (18) erstreckt, **dadurch gekennzeichnet, dass** der innere Trichter (42) mittig in einem abnehmbar angeflanschten Einsatz (44) gelegen ist, der in einem Einlassende (20) des hohlen Körpers (18) liegt, wobei der abnehmbar angeflanschte Einsatz (44) eine geneigte Oberfläche (45) beinhaltet, die sich nach unten zu dem inneren Trichter und zu einem Auslassende (22) des hohlen Körpers (18) verjüngt, wobei in Verwendung die geneigte Oberfläche (45) des abnehmbar angeflanschten Einsatzes (44) erleichtert, Fluid von dem einen oder den mehreren Anschlüssen (38) zu dem inneren Trichter (42) zu leiten, wobei die Länge des inneren Trichters (42) so dimensioniert ist, dass ein Auslass des inneren Trichters (42) außerhalb des Umfangs (56) oder im Wesentlichen bündig mit dem Umfang des Durchlasses (52) positioniert ist; und ein maschenförmiges Element (46), das eine Vielzahl von Öffnungen (48) umfasst, wobei das maschenförmige Element (46) konfiguriert ist, in dem inneren Trichter (42) aufgenommen zu werden, wobei in Verwendung der angeflansch-

te Einsatz (44) der innere Trichter (42) und das maschenförmige Element (46) betriebsfähig sind, Fluid zu kanalisieren und stabilisieren, das in den inneren Trichter (42) von dem einen oder den mehreren Anschlüssen (38) eintritt.

2. Siphoneinrichtung nach Anspruch 1, wobei das Verschlusselement (32) einen positionierbaren Einsatz (36) beinhaltet, der in dem Einlassende (20) des hohlen Körpers (18) aufgenommen ist und auf einer Kante des Einlassendes (20) liegt, wobei das Verschlusselement (32) eingesetzt und von dem hohlen Körper (18) entfernt werden kann. 10
3. Siphoneinrichtung nach Anspruch 1 oder 2, weiter umfassend eine Aufschraubkappe (34), die abnehmbar und an das Einlassende (20) des hohlen Körpers (18) befestigbar ist, wobei die Aufschraubkappe (34) das Verschlusselement (32) relativ zu dem hohlen Körper (18) sichert. 15 20
4. Siphoneinrichtung nach einem der vorstehenden Ansprüche, wobei das maschenförmige Element (46) ein Einsatz ist, der von dem inneren Trichter (42) abnehmbar und daran befestigbar ist, wobei der maschenförmige Einsatz relativ zu dem inneren Trichter und dem verjüngten Flansch (45) positioniert ist, sodass Fluidfluss von den Anschlüssen (38) auf das maschenförmige Element (46) auftritt. 25 30
5. Siphoneinrichtung nach einem der vorstehenden Ansprüche, wobei das maschenförmige Element eine regelmäßige Struktur von Öffnungen umfasst.
6. Siphoneinrichtung nach einem der Ansprüche 1 bis 4, wobei das maschenförmige Element eine unregelmäßige Struktur von Öffnungen umfasst. 35
7. Siphoneinrichtung nach einem der Ansprüche 1 bis 4, wobei die Öffnungen eine Struktur umfassen, die sich radial erstreckende Trapezoide umfasst, die sich von einem im Wesentlichen kreisförmigen Mittelabschnitt (50) erstrecken. 40
8. Siphoneinrichtung nach Anspruch 7, wobei der Mittelabschnitt fest ist. 45
9. Siphoneinrichtung nach Anspruch 7, wobei der Mittelabschnitt hohl ist. 50
10. Falle, umfassend eine Siphoneinrichtung (14) nach einem der vorstehenden Ansprüche, wobei die Falle Entsorgen von Abfall von der Siphoneinrichtung zu einem Abfallentsorgungsbauteil, wie einer Kanalisation, erleichtert. 55
11. Wasserenthärter, umfassend eine Siphoneinrichtung nach einem der Ansprüche 1 bis 9.

Revendications

1. Appareil siphon (14) utilisable pour être raccordé, en utilisation, à un dispositif adoucisseur d'eau, dans lequel l'appareil siphon (14) comprend :

un corps (18) défini par une ou plusieurs parois, dans lequel les parois définissent un alésage débouchant à travers le corps (18) et dans lequel au moins une fenêtre (56) définit une ouverture (52) latéralement à travers les une ou plusieurs parois ;

un organe de fermeture (32) prévu au niveau d'une extrémité du corps (18) et dans lequel l'organe de fermeture (32) comprend un ou plusieurs orifices (38), qui est/sont en communication fluide avec le corps creux (18), dans lequel le/chaque orifice (38) est prévu à travers l'organe de fermeture (32) ;

un entonnoir intérieur (42) s'étendant vers le bas depuis l'organe de fermeture et s'étendant au moins en partie dans le corps creux (18), **caractérisé en ce que** l'entonnoir intérieur (42) est situé de manière centrale dans un insert à collerette (44) amovible, qui repose à l'intérieur d'une extrémité d'admission (20) du corps creux (18), dans lequel l'insert à collerette (44) amovible inclut une surface en pente (45) se rétrécissant vers le bas vers l'entonnoir intérieur et vers une extrémité d'évacuation (22) du corps creux (18), dans lequel, en utilisation, la surface en pente (45) de l'insert à collerette (44) amovible facilite la direction d'un fluide depuis les un ou plusieurs orifices (38) vers l'entonnoir intérieur (42), dans lequel la longueur de l'entonnoir intérieur (42) est dimensionnée de sorte qu'une évacuation de l'entonnoir intérieur (42) soit positionnée à l'extérieur du périmètre (56) ou sensiblement au niveau du périmètre de l'ouverture (52) ; et

un organe emboîté (46) comprenant une pluralité d'ouvertures (48), dans lequel l'organe emboîté (46) est configuré pour être reçu dans l'entonnoir intérieur (42), dans lequel, en utilisation, l'insert à collerette (44), l'entonnoir intérieur (42) et l'organe emboîté (46) servent à canaliser et stabiliser un fluide entrant dans l'entonnoir intérieur (42) depuis les un ou plusieurs orifices (38).

2. Appareil siphon selon la revendication 1, dans lequel l'organe de fermeture (32) inclut un insert positionnable (36) qui est reçu dans l'extrémité d'admission (20) du corps creux (18) et repose sur un bord de l'extrémité d'admission (20), dans lequel l'organe de fermeture (32) est insérable et amovible depuis le corps creux (18).

3. Appareil siphon selon la revendication 1 ou 2, com-

prenant en outre un capuchon vissé (34), qui est amovible et peut être attaché à l'extrémité d'admission (20) du corps creux (18), dans lequel le capuchon vissé (34) fixe l'organe de fermeture (32) par rapport au corps creux (18).

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4. Appareil siphon selon une quelconque revendication précédente, dans lequel l'organe emboîté (46) est un insert, qui est amovible depuis et peut être attaché à l'entonnoir intérieur (42), dans lequel l'insert emboîté est positionné par rapport à l'entonnoir intérieur et à la collerette resserrée (45) de sorte qu'un écoulement de fluide depuis les orifices (38) arrive sur l'organe emboîté (46). 10
5. Appareil siphon selon l'une quelconque des revendications précédentes, dans lequel l'organe emboîté comprend un motif régulier d'ouvertures. 15
6. Appareil siphon selon l'une quelconque des revendications 1 à 4, dans lequel l'organe emboîté comprend un motif irrégulier d'ouvertures. 20
7. Appareil siphon selon l'une quelconque des revendications 1 à 4, dans lequel les ouvertures comprennent un motif comprenant des trapézoïdes s'étendant de manière radiale, qui s'étendent depuis une partie centrale sensiblement circulaire (50). 25
8. Appareil siphon selon la revendication 7, dans lequel la partie centrale est solide. 30
9. Appareil siphon selon la revendication 7, dans lequel la partie centrale est creuse. 35
10. Garde d'eau comprenant un appareil siphon (14) selon l'une quelconque des revendications précédentes, dans lequel la garde d'eau facilite l'élimination de déchets depuis l'appareil siphon jusqu'à un élément d'élimination de déchets, tel qu'un égout. 40
11. Adoucisseur d'eau comprenant un appareil siphon selon l'une quelconque des revendications 1 à 9. 45

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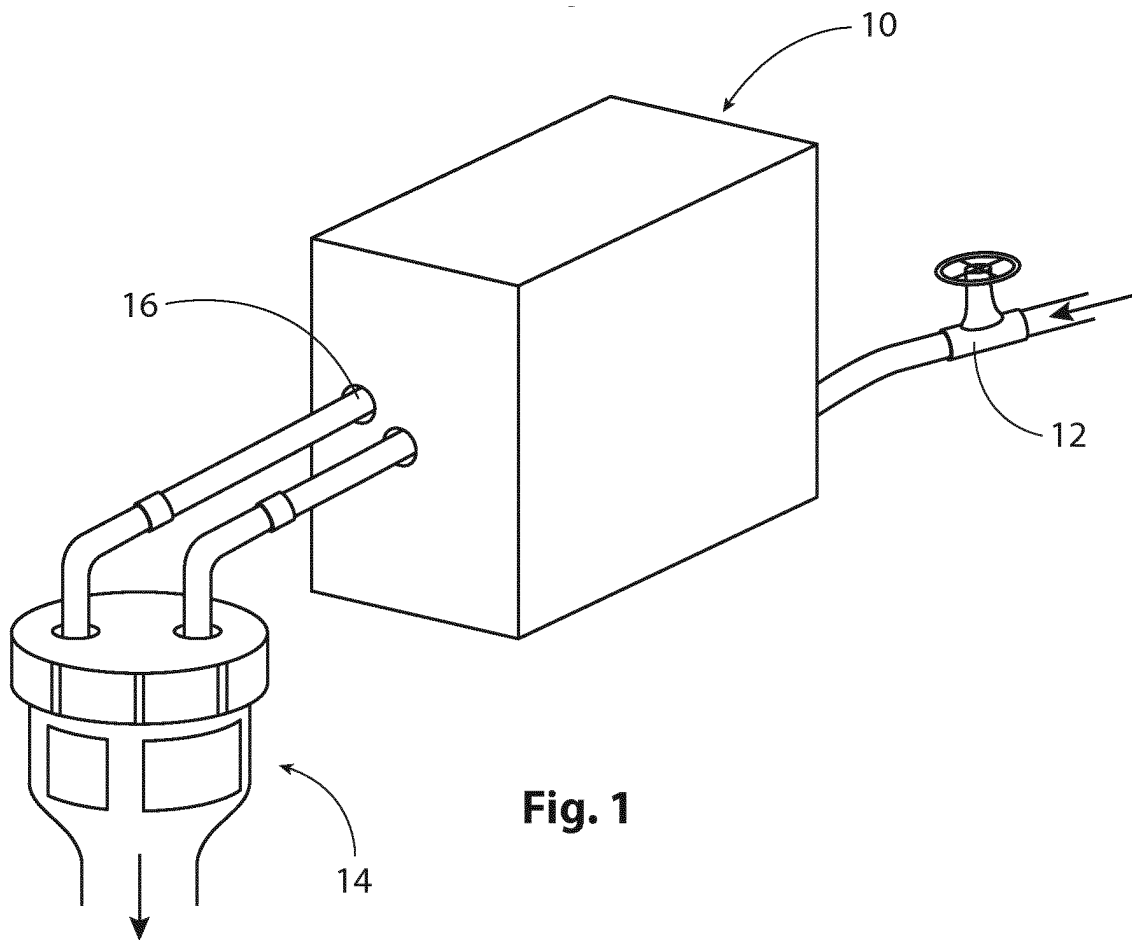


Fig. 1

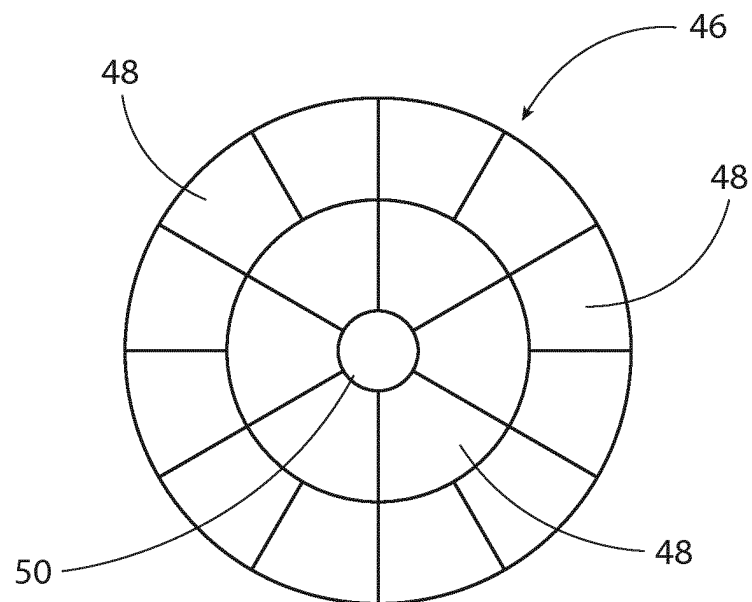


Fig. 2c

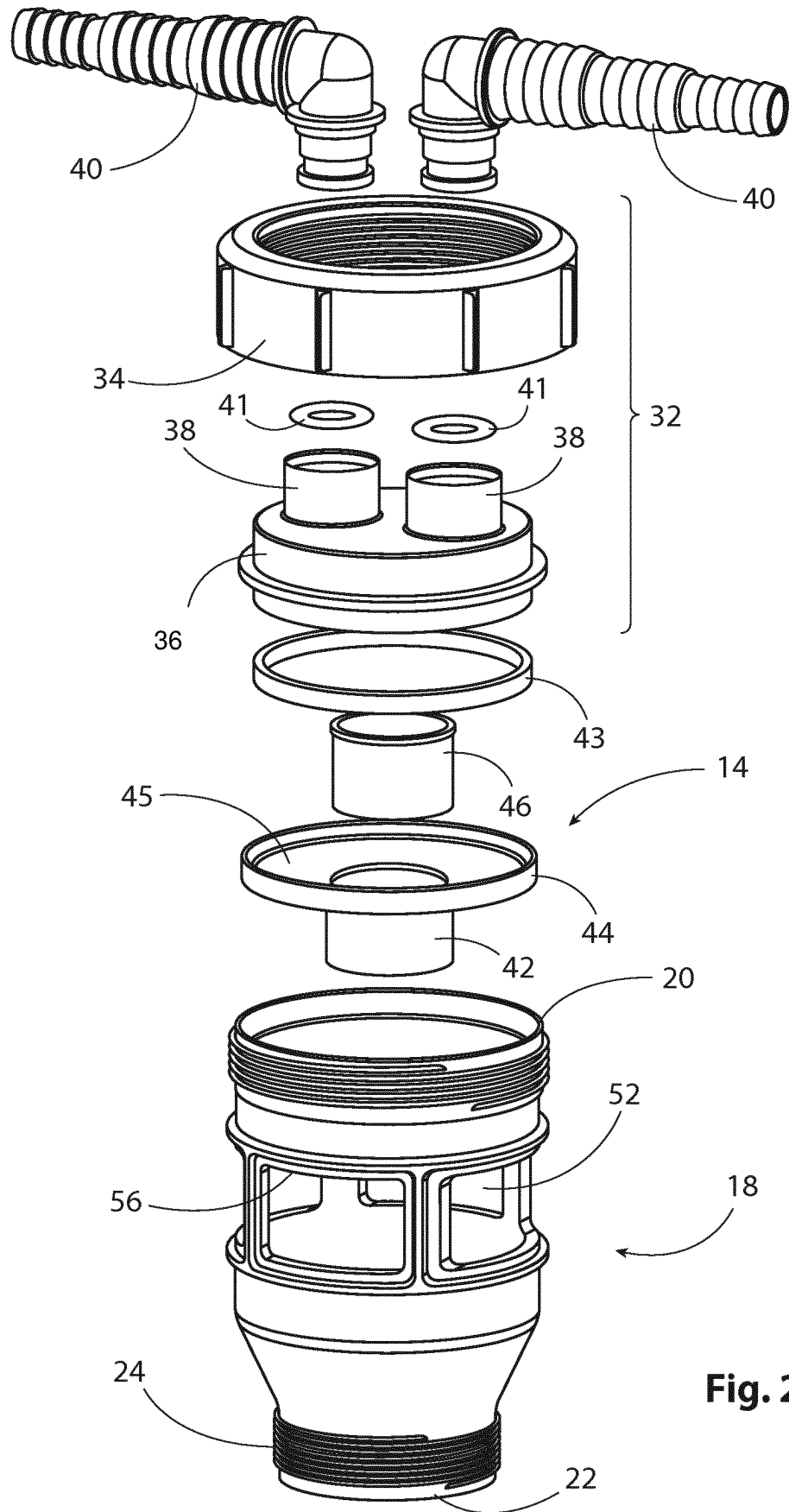


Fig. 2a

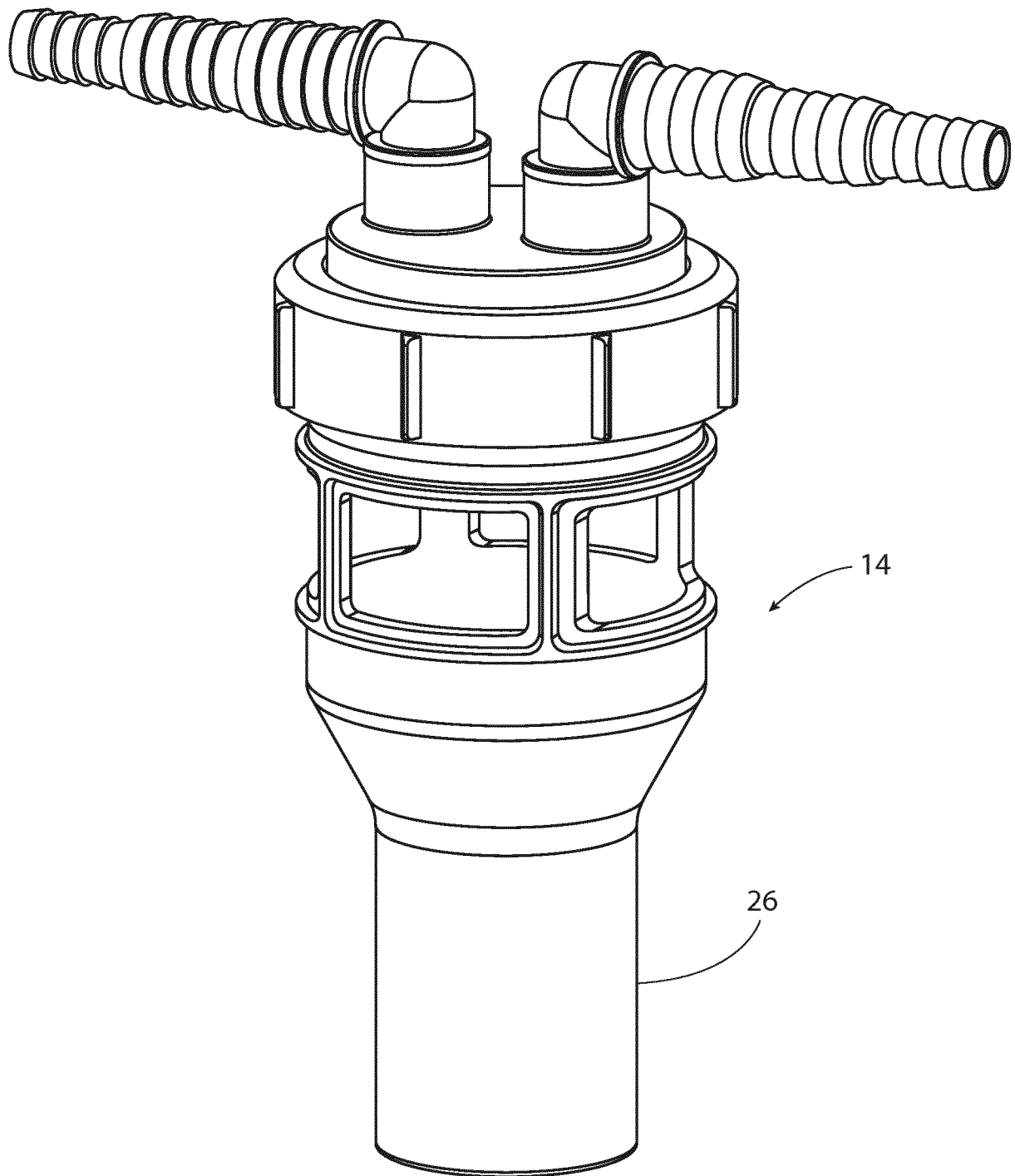


Fig. 2b

REFERENCES CITED IN THE DESCRIPTION

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