

FLUID CONTAMINATION PREVENTION SYSTEM

TECHNOLOGICAL FIELD

This invention relates to fluid treating systems and more particularly to systems configured with a partition compartment for preventing mixing and contamination of fluids at an upstream and a downstream of the concerned system.

5 BACKGROUND

An important consideration in treating of liquids is to prevent contamination of untreated liquid with treated liquid. One suitable example exemplifying the need is a filtration devise wherein raw liquid enters a filtration unit, with filtered liquid exiting therefrom. It is required to prevent sealing breakthrough (at times this may be referred
10 to as a 'gasket/seal shortcut', or as a 'sealing element override' of raw liquid towards the filtered (treated) liquid to prevent contamination thereof.

Another example is a liquid mixing system where a first liquid, say fresh water, is mixed with some chemical agent and the mixtures then egresses through an outlet of the liquid treating system. It is a requirement that the chemical agent does not flow
15 downstream in direction of the first liquid, possibly contaminating the fresh water or even worse posing a hazardous situation.

Various solutions are generally proposed to reduce the likelihood of leak between upstream and downstream flow portions of a liquid treating system. Most common are sealing arrangements including various gaskets, O-rings, surface-to-surface
20 contact sealing, etc.

However, it often occurs that such sealing arrangements are insufficient or fail, e.g. owing to high pressure fluids managing to overcome such sealing arrangements, or for example owing to the presence of dirt at the sealing vicinity (which may enter during assembly of the device or be carried thereto by the fluid), or owing to misplacing
25 or pinching of a sealing member during assembly, or even owing to wear during the regular course of use which might take place both in the case of static devices and

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dynamic devices where one or more elements displace linearly and/or rotatably about a sealing element, where in the later case (dynamic devices) wear is generally increased.

GENERAL DESCRIPTION

A *fluid treating system* as referred to hereinafter in the specification and claims
 5 denotes any fluid system configured with at least one fluid inlet and at least one manipulating chamber in which the fluid undergoes treatment of any type prior to egress through at least one fluid outlet.

Treating fluid as referred to hereinafter in the specification and claims denotes any sort of fluid treatment e.g. filtration, mixing of two or more fluid components,
 10 chemical treating, etc.

The present disclosed subject matter provides an arrangement configured for preventing or significantly reducing fluid mixing/contaminating within a fluid treating system.

According to the disclosed subject matter there is provided a fluid treating
 15 system comprising a housing configured with at least one fluid inlet port and at least one fluid outlet port, with at least one fluid treating chamber disposed between and being in flow communication with said at least one fluid inlet port and at least one fluid outlet port, and at least one intermediate chamber disposed between at least one inlet port and at least one of the fluid treating chamber and outlet port; wherein the at least
 20 one intermediate chamber is vented to the atmosphere or coupleable to a vacuum source.

The arrangement is such that the pressure at each respective inlet port P_{in} , and the pressure at the fluid treating chamber P_{tc} or at the outlet pressure P_{out} is higher than the pressure at the intermediate chamber P_s , namely:

$$25 \quad P_{in} > P_s < P_{out}$$

And likewise:

$$P_{in} > P_{tc} < P_{out}$$

However, the pressure at the fluid treating chamber P_{tc} may be substantially equal to the pressure at the outlet port, i.e. $P_{tc} = P_{out}$.

30 The arrangement being such that a leak occurring at any location within the fluid treating system will flow from a high pressure zone towards a low pressure zone, i.e. any leaks within the fluid system will flow into an intermediate chamber, resulting in

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that at the event of a leak occurring in the system, any leakage fluid flows to the intermediate chamber from where it is drained, and however does not flow between regions having different fluids so as to avoid mixing and/or contamination thereof.

According to another aspect of the disclosed subject matter, there is provided a fluid filter system comprising a housing configured with at least one fluid inlet port and at least one fluid outlet port, with at least one fluid treating chamber disposed between and being in flow communication with said at least one fluid inlet port and at least one fluid outlet port, and at least one intermediate chamber disposed between at least one inlet port and at least one of the fluid treating chamber and the at least one fluid outlet port; wherein the at least one intermediate chamber is vented to the atmosphere or coupleable to a vacuum source.

In accordance with an example, the arrangement is such that the pressure at each respective inlet port P_{in} , and the pressure at the fluid treating chamber P_{tc} or at the outlet pressure P_{out} is higher than the pressure at the at least one intermediate chamber P_s .

The arrangement is such that the fluid inlet port extends into a raw fluid chamber and at least one filtration module extends between the raw fluid chamber and the at least one fluid treating chamber. In accordance with an example, two filtration modules are provided. The at least one fluid treating chamber is separated from the raw fluid chamber by at least two partition walls.

In accordance with an example, the at least two partition walls are substantially parallel to each other and define a space therebetween, thereby defining the at least one intermediate chamber. In accordance with yet an example, at least three partition walls are provided, defining therebetween at least two intermediate chambers.

Any one or more of the following design and configurations can be applied to a fluid treating system, separately or in combinations:

- According to one particular example, the liquid treating chamber and the at least one outlet port are in direct flow communication and reside at substantially the same pressure;
- An intermediate chamber is common with an upstream side of the fluid treating system and the downstream side of the fluid treating system;

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- An independent intermediate chamber is associated with an upstream side of the fluid treating system and with the downstream side of the fluid treating system, i.e. with an inlet port and with an outlet port thereof. The independent intermediate chambers being distinct, i.e. not extending in direct flow communication;
- The intermediate chamber is vented to the atmosphere or exposed to vacuum;
- Sealing between the ports and chambers within the fluid treating system can take place by various gaskets, O-rings, surface-to-surface contact sealing, etc.;
- The intermediate chamber is configured for coupling to a drain pipe;
- An outlet of the intermediate chamber is fitted with a one way valve or trap, to prevent egress of fluids, dirt, insects and the like into said intermediate chamber. Substantially there is no pressure drop over the barrier;
- The fluid treating system according to the disclosed subject matter is configured for treating any fluid, i.e. liquids or gases or combinations thereof;
- The fluid treating system according to the disclosed subject matter is configured for use in connection with different fluid treating applications in different industries and purposes, including, but not limited, pharmaceutical industry, medical use (e.g. drug administration, etc.), food industry, chemical industry, and the like;
- A fluid treating system, wherein the fluid treating system is a liquid filter unit.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to understand the present disclosed subject matter and to see 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. 1 is top perspective view of a fluid filter according to a first example of the present disclosed subject matter;

Fig. 2 is a longitudinal section along line II-II in Fig. 1;

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Fig. 3 is planer view of Fig. 2;

Fig. 4 is top perspective view of a fluid filter according to another example of the present disclosed subject matter;

Fig. 5A is a longitudinal section along line V-V in Fig. 4;

5 **Fig. 5B** is an enlargement of the portion marked VI in Fig. 5A;

Fig. 6 is top perspective view of yet a fluid filter according to another example of the present disclosed subject matter;

Fig. 7 is a longitudinal section along line VII-VII in Fig. 6;

10 **Figs. 8** are schematic representations illustrating different configurations of fluid treating systems, wherein:

Fig. 8A illustrates a fluid treating system comprising an intermediate chamber common with an inlet port and an outlet port;

Fig. 8B illustrates a fluid treating system comprising an intermediate chamber independently associated with an inlet port and with an outlet port;

15 **Fig. 8C** illustrates a fluid treating system comprising an intermediate chamber independently associated with two inlet ports and outlet port; and

Fig. 9 is a representation of a portion of a different fluid treating system according to the disclosed subject matter.

DETAILED DESCRIPTION OF EMBODIMENTS

20 Attention is first directed to Figs. 1 to 3 of the drawings and to Fig. 8A, illustrating a fluid treating system namely a liquid filter unit generally designated **10**.

The fluid treating system **10** comprises a cylindrical housing **12** configured with a fluid inlet port **14** (raw fluid inlet port) configured at a bottom portion of the housing **12** and extending into a raw fluid chamber **16**. Extending at an upper portion of the
25 housing **12** there is a fluid treating chamber **18** configured with a fluid outlet port **20**. It is appreciated however, that fluid flow may take place in reverse direction too.

Extending between the raw fluid chamber **16** and the fluid treating chamber **18** there are configured a pair of filtration modules **24** having an inlet **26** extending within the raw fluid chamber **16**, said inlet **26** extending into a filtration space **28** of each of the
30 filtration modules **24**.

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It is appreciated that the filtration modules **24** can be any type of filtration module e.g. disc-type filtration modules, pile-type filtration modules, thread-type filtration modules, screen-type filtration modules, and the like.

It is further appreciated that the number and configuration of the filtration
5 modules may vary and further, rather than filtration modules there may be provided one or more other fluid treating units, e.g. mixers and the like.

It is further noted that the fluid treating chamber **18** is separated from the raw fluid chamber **16** by two partition levels (i.e. walls), namely partition **32** and partition **34**, thus defining between them an intermediate chamber **38**.

10 The intermediate chamber **38** is sealingly separated from the raw fluid chamber **16** and likewise from the fluid treating chamber **18** by a plurality of sealing members which in the present example are O-rings **40** and **42** extending between the lower partition **34** and respective portions of the raw fluid chamber **16** and likewise between the upper partition **32** and respective portions of the fluid treating chamber **18**.
15 However, it is appreciated that different sealing means may be provided such as a gasket, face-to-face sealing contact, etc.

Extending from the intermediate chamber **38** there is an outlet port **46** open to the atmosphere and configured with an external threading at **48** configured for coupling to a drainage pipe (not shown) or to a barrier to prevent egress of liquids, dirt, insects
20 and the like.

The arrangement of the disclosure being such that raw fluid entering through fluid inlet port **14** flows through the raw fluid chamber **16**, through the inlets **26** of the filtration modules **24** wherein the fluid undergoes filtration by pressurizing it through the filtration modules **24** out to the fluid treating chamber **18** and then out of the filter
25 treating system **10** through fluid outlet port **20**. The fluid flow path is represented in the drawings by solid arrows.

At the event of leakage between the sealing arrangement extending between the raw fluid chamber **16** and the intermediate chamber **38**, and/or between the fluid treating chamber **18** and the intermediate chamber **38**, and/or between supports of the
30 filtration modules **24** and the intermediate space **38**, any leaking fluids will necessarily flow from high pressure to low pressure zone i.e. into the intermediate chamber **38** which is vented to the atmosphere.

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It is however appreciated that rather than being vented to the atmosphere the intermediate chamber **38** may reside at low pressure, i.e. at vacuum.

In Figs. 2 and 3 a solid set of arrows represents fluid flow during the normal course of filtering a fluid entering the raw fluid chamber **16** of the fluid treating system **10** via inlet port **14** and then into the filtration modules **24** wherein the fluid under pressure passes through the filtration media and exits from the filtration space **28** into the fluid treating chamber **18** and then exiting the system through outlet port **20**. However, at the event of leakage, e.g. owing to failure or pinching of the O-rings **40** or **42** or owing to presence of dirt between the sealing components of the assembly, fluid may leak, as indicated by dashed arrows, from the raw fluid chamber **16** and/or from the fluid treating chamber **18** or from the vicinity of the filtration modules **24** into the intermediate chamber **38** and from there out through the port **48**.

The arrangement disclosed in Figs. 1 – 3 is schematically represented in the flow chart of Fig. 8A wherein solid arrowed lines represent pressurized fluid flow during the course of its treating within the fluid treating system **10** and dashed arrowed lines represent leakage between either/or the raw fluid chamber, the fluid treating chamber or the filtration modules, as discussed hereinabove.

As represented in Fig. 8A, the pressure P_{in} in the inlet port **14** and at the raw fluid chamber **16**, and the pressure P_{tc} at the fluid treating chamber **18** or the outlet pressure P_{out} is higher than the pressure P_s at the intermediate chamber **38**, namely:

$$P_{in} > P_s < P_{out}$$

And likewise:

$$P_{in} > P_{tc} \geq P_{out}$$

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Attention is now directed to Figures 4, 5A, 5B and 8B of the drawings, directed to another example of a fluid treating system generally designated **70**. The fluid treating system **70** resembles that disclosed in connection with Figures 1 and 2, however with some differences as will be discussed herein below.

The fluid treating system **70** comprises a cylindrical housing **72** configured with a fluid inlet port **74** (raw fluid inlet port) configured at a bottom portion of the housing **72** and extending into a raw fluid chamber **76**. Extending at an upper portion of the

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housing **72** there is a fluid treating chamber **78** configured with a fluid outlet port **80**. It is appreciated however, that fluid flow may take place in reverse direction too.

Extending between the raw fluid chamber **76** and the fluid treating chamber **78** there are configured a pair of filtration modules **84** having an inlet **86** extending within
5 the raw fluid chamber **76**, said inlet **86** extending into a filtration space **88** of each of the filtration modules **84**.

As discussed in connection with the example of Figs. 1 and 2, it is appreciated that the filtration modules **84** can be any type of filtration module e.g. disc-type filtration modules, pile-type filtration modules, thread-type filtration modules, screen-
10 type filtration modules and the like. Also, the number and configuration of the filtration modules may vary and further, rather than filtration modules there may be provided one or more other fluid treating units, e.g. mixers and the like.

It is further noted that the fluid treating chamber **78** is separated from the raw fluid chamber **76** by three partition levels (i.e. walls), namely partition **92**, partition **94**,
15 and partition **96**, thus defining between them two intermediate chambers, namely a first intermediate chamber **98** associated with the raw fluid chamber **76**, and a second intermediate chamber **100** associated with the fluid treating chamber **78** and with a coupling portion of the filtration modules **84**.

The first intermediate chamber **98** is sealingly separated from the raw fluid
20 chamber **76** and the second intermediate chamber **100** is sealingly separated from the fluid treating chamber **78**, and likewise said first intermediate chamber **98** is sealingly separated from the second intermediate chamber **100**, by a plurality of sealing members which in the present example are O-rings **112**, **114**, **116** and **118**. However, it is appreciated that different sealing means may be provided such as a gasket, face-to-face
25 sealing contact, etc.

Extending from the first intermediate chamber **98** there are two outlet ports **126** open to the atmosphere and configured with an external threading at **128** configured for coupling to a drainage pipe (not shown) or to a barrier to prevent egress of liquids, dirt, insects and the like. Extending from the second intermediate chamber **100** there are two
30 outlet ports **130** open to the atmosphere also configured with an external threading **128**.

The arrangement of the disclosed example being such that raw fluid entering through fluid inlet port **74** flows through the raw fluid chamber **76**, through the inlets **86** of the filtration modules **84** wherein the fluid undergoes filtration by pressurizing it

through the filtration modules **84** out to the fluid treating chamber **78** and then out of the filter treating system **70** through fluid outlet port **80**. The fluid flow path is represented in the drawings by solid arrows.

At the event of leakage between the sealing arrangement (i.e. the O-rings) extending between the raw fluid chamber **76** and the first intermediate chamber **98**, and/or between the fluid treating chamber **78** and the second intermediate chamber **100**, and/or between supports of the filtration modules **84** and either of the first and second intermediate chambers, any leaking fluids will necessarily flow from high pressure to low pressure zone i.e. into the either the first intermediate chamber **98** or into the second intermediate chamber **100** which are vented to the atmosphere.

It is however appreciated that rather than being vented to the atmosphere, either or both of the first intermediate chamber **98** and the second intermediate chamber **100** can reside at low pressure, i.e. at vacuum.

In Fig. 5 a solid set of arrows represents fluid flow during the normal course of filtering a fluid entering the raw fluid chamber **76** of the fluid treating system **70** via inlet port **74** and then into the filtration modules **84** wherein the fluid under pressure passes through the filtration media and exits from the filtration space **88** into the fluid treating chamber **78** and then exiting the system through outlet port **80**. However, at the event of leakage, e.g. owing to failure or pinching of any one or more of the O-rings **112**, **114**, **116** and **118**, or owing to presence of dirt between the sealing components of the assembly, fluid may leak, as indicated by dashed arrows, from the raw fluid chamber **76** and/or from the fluid treating chamber **78** or from the vicinity of the filtration modules **84** into the intermediate chambers **98** and **100**, respectively and from there out through the respective ports **126** and **130**.

The arrangement disclosed in Figs. 4 and 5 is schematically represented in the flow chart of Fig. 8B wherein solid arrowed lines represent pressurized fluid flow during the course of its treating within the fluid treating system **70** and dashed arrowed lines represent leakage between either/or the raw fluid chamber, the fluid treating chamber or the filtration modules, as discussed hereinabove.

The provision of an intermediate chamber associated with each of the inlet chamber and fluid treating chamber (or with any other chamber of the fluid treating system) facilitates easy identification and distinction of a leak and its association with a respective source.

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As represented in Fig. 8B, the pressure P_{in} at the inlet port **74** and at the raw fluid chamber **76**, and the pressure P_{tc} at the fluid treating chamber **78** or the outlet pressure P_{out} is higher than the pressure P_{s1} and P_{s2} at the intermediate chambers **98** and **100**, respectively, namely:

$$P_{in} > P_{s1} ; P_{s2} < P_{out}$$

This may also be represented as:

$$P_{in} > P_{s1} \approx P_{s2} < P_{out}$$

And likewise:

$$P_{in} > P_{tc} \geq P_{out}$$

The embodiment illustrated in Figs. 6 and 7, and schematically represented in Fig. 8C is directed to a fluid treating system **120** comprising a cylindrical housing **122** configured with a first fluid inlet port **124** (first raw fluid inlet port) at a bottom portion of the housing **122** and extending into a first raw fluid chamber **126**. Extending at an upper portion of the housing **122** there is a second fluid inlet port **128** (second raw fluid inlet port) at a top portion of the housing **122** and extending into a second raw fluid chamber **130**.

A fluid treating chamber **148** extends between the first raw fluid chamber **126** and the second fluid inlet port **128**, said fluid treating chamber **148** is configured with a fluid outlet port **150**. It is appreciated however, that fluid flow may take place in reverse direction too (i.e. ingress through port **150** and egress through one or both ports **124** and **128**).

Extending within the fluid treating chamber **148** between the first raw fluid chamber **126** and the second raw fluid chamber **130** there are configured a pair of filtration modules **156**, each having a bottom inlet **158** extending within the first raw fluid chamber **126** and a top inlet **162** extending within the first raw fluid chamber **126**, said inlets **158** and **162** extending into a filtration space **164** of each of the filtration modules **156**.

As discussed in connection with the examples of Figs. 1 to 6, it is appreciated that the filtration modules can be any type of filtration module e.g. disc-type filtration modules, pile-type filtration modules, thread-type filtration modules, screen-type filtration modules and the like. Also, the number and configuration of the filtration

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modules may vary and further, rather than filtration modules there may be provided one or more other fluid treating units, e.g. mixers and the like.

It is further noted that the fluid treating chamber **148** is separated from the first raw fluid chamber **126** by three partition levels (i.e. walls), namely partitions **170**, **172** and **174**, thus defining between them two intermediate chambers, namely a first intermediate chamber **176** associated with the first raw fluid chamber **126**, and a second intermediate chamber **178** associated with the fluid treating chamber **148** and with a coupling portion of the filtration modules **156**. Likewise the fluid treating chamber **148** is separated from the second raw fluid chamber **126** by three partition levels (i.e. walls), namely partitions **180**, **182** and **184**, thus defining between them two intermediate chambers, namely a third intermediate chamber **190** associated with the second raw fluid chamber **126**, and a fourth intermediate chamber **192** associated with the fluid treating chamber **148** and with a coupling portion of the filtration modules **156**.

The first intermediate chamber **176** is sealingly separated from the first raw fluid chamber **126** and the second intermediate chamber **178** is sealingly separated from the fluid treating chamber **148**, and likewise said first intermediate chamber **176** is sealingly separated from the second intermediate chamber **178**, by a plurality of sealing members which in the present example are O-rings **202**, **204**, **206** and **208**. Likewise, the third intermediate chamber **190** is sealingly separated from the second raw fluid chamber **130** and the fourth intermediate chamber **192** is sealingly separated from the fluid treating chamber **148**, and said third intermediate chamber **190** is sealingly separated from the fourth intermediate chamber **192**, by a plurality of sealing members which in the present example are O-rings **210**, **212**, **214** and **216**, respectively.

However, it is appreciated that different sealing means may be provided such as a gasket, face-to-face sealing contact, etc.

Extending from the first intermediate chamber **176** there are two outlet ports **220** open to the atmosphere and configured with an external threading at **222** configured for coupling to a drainage pipe (not shown) or to a barrier to prevent egress of liquids, dirt, insects and the like. However, the barrier substantially does not cause pressure head loss. Extending from the second intermediate chamber **178** there are two outlet ports **226** open to the atmosphere also configured with an external threading **228**. Similarly, the third intermediate chamber **190** is configured are two outlet ports **230** open to the atmosphere and configured with an external threading at **232** configured for coupling to

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a drainage pipe (not shown) or to a barrier to prevent egress of liquids, dirt, insects and the like. Extending from the fourth intermediate chamber **192** there are two outlet ports **230** open to the atmosphere also configured with an external threading **232**.

The arrangement of the disclosure being such that raw fluid entering through the first fluid inlet port **124** and through the second inlet port **128** flows through the first raw fluid chamber **126** and the second raw fluid chamber **130** respectively, then through the inlets **158** and **162** of the filtration modules **156**, wherein the fluid undergoes filtration by pressurizing it through the filtration modules **156** out to the fluid treating chamber **148** and then out of the filter treating system **120** through fluid outlet port **150**.
The fluid flow path is represented in the drawings by solid arrows.

At the event of leakage between the sealing arrangement (i.e. the O-rings) extending between the first raw fluid chamber **126** and the first intermediate chamber **176**, and/or between the fluid treating chamber **148** and the second intermediate chamber **178**, and/or between supports of the filtration modules **156** and either of the first and second intermediate chambers, or between the second raw fluid chamber **130** and the third intermediate chamber **190**, and/or between the fluid treating chamber **148** and the fourth intermediate chamber **192**, and/or between supports of the filtration modules **156** and either of the third and fourth intermediate chambers, any leaking fluids will necessarily flow from high pressure to low pressure zone i.e. into any one or more of the respective intermediate chambers which are vented to the atmosphere.

It is however appreciated that rather being vented to the atmosphere, any one or more of the first intermediate chamber **98**, **100**, **190** and **192** can reside at lower than atmospheric pressure, i.e. at vacuum.

In Fig. 7 a solid set of arrows represents fluid flow during the normal course of filtering a fluid entering the first raw fluid chamber **126** via first inlet port **124** and the second raw fluid chamber **130** via second inlet port **128** of the fluid treating system **120**, and then into the filtration modules **156** wherein the fluid under pressure passes through the filtration media and exits from the filtration space **164** into the fluid treating chamber **148** and then exiting the system through outlet port **150**. However, at the event of leakage, e.g. owing to failure or pinching of any one or more of the O-rings **200**, **202**, **204**, **206** **210**, **212**, **214** and **216**, or owing to presence of dirt between the sealing components of the assembly, fluid may leak, as indicated by dashed arrows, from the raw fluid chambers **126** and **130**, and/or from the fluid treating chamber **148** or from the

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vicinity of the filtration modules **156** into the intermediate chambers **176, 178, 190** and **192**, respectively and from there drained out through the respective ports **122, 226, 230**, and **234**.

The arrangement disclosed in Figs. 6 and 7 is schematically represented in the flow chart of Fig. 8C wherein solid arrowed lines represent pressurized fluid flow during the course of its treating within the fluid treating system **120** and dashed arrowed lines represent leakage between either/or the raw fluid chambers, the fluid treating chamber or the filtration modules, as discussed hereinabove.

The provision of an intermediate chamber associated with each of the inlet chamber and fluid treating chamber (or with any other chamber of the fluid treating system) facilitates easy identification and distinction of a leak and its association with a respective source.

As represented in Fig. 8C, the pressure P_{in1} the first raw fluid chamber **126**, the pressure P_{in2} at the second raw fluid chamber **130** and the pressure P_{tc} at the fluid treating chamber **148** or the outlet pressure P_{out} is higher than the pressure at the respective intermediate chambers **176, 178, 190** and **192** P_{s1} , P_{s2} , P_{s3} and P_{s4} , namely:

$$P_{in1} > P_{s1} ; P_{s2} < P_{out}$$

$$P_{in2} > P_{s4} ; P_{s3} < P_{out}$$

This arrangement ensures that a leak occurring at any location within the fluid treating system will flow from a high pressure zone towards a low pressure zone, and further facilitates easy identification and distinction of a leak and its association with a respective source.

With reference now being made to Fig. 9 there is illustrated a portion of a different fluid treating system according to the disclosed subject matter, namely a fluid mixer generally designated **250**. The mixer comprises a housing **254** divided into three chambers **256, 258** and **260**, parallelly extending and sealed from one another, however each configured with an inlet **264, 266** and **268**, respectively. A pressure cap **264A, 266A** and **268A** is configured within each chamber respectively, for retaining the fluid contained within each chamber under relative pressure.

A mixer axle **270** extends through the housing **254** and passes through each of the three chambers **256, 258** and **260**. Sealing elements (O-rings in the example) **274** rotatably support the mixer axle **270** and seal the passages between the chambers. A

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vented intermediate chamber extends between neighboring chambers (vented intermediate chamber **282** extends between chambers **256** and **258**; vented intermediate chamber **284** extends between chambers **258** and **260**; and vented intermediate chamber **285** between the chamber **260** and the housing). Each of the vented chambers **282** and
5 **284** is configured with an outlet **286** and **288**, and **290**, respectively.

Rotation of the mixer axle **270** entails rotation of mixer blades (not shown configured for mounting at receptacles **279**) which results in mixing of the fluids contained within the chambers **256**, **258** and **260**.

However, at the event of leak at the vicinity of any of the O-rings supporting the
10 reciprocating mixer axle **270**, the leaking fluid will flow into the respective vented intermediate chamber **282**, **284** or **285** and will then flow out of the mixer **250** through the respective outlet **286**, **288** or **290**.

As exemplified, leaking fluids overriding the sealing members (namely the O-rings **274**) will flow from high pressure zone within the chambers to low pressure zone
15 residing within the respective intermediate chambers and therefrom out of the system.

Whilst in the examples disclosed hereinabove reference is made to fluid treating systems being filtration units, it is appreciated that the disclosed subject matter is configurable for any fluid treating system, e.g. medicament administrating devices, fluid mixers, fluid chemical treating devices, etc.

CLAIMS:

1. A fluid treating system comprising a housing configured with at least one fluid inlet port and at least one fluid outlet port, with at least one fluid treating chamber disposed between and being in flow communication with said at least one fluid inlet port and at least one fluid outlet port, and at least one intermediate chamber disposed between at least one inlet port and at least one of the fluid treating chamber and outlet port; wherein the at least one intermediate chamber is vented to the atmosphere or coupleable to a vacuum source.
2. A fluid treating system according to claim 1, wherein the arrangement is such that pressure at each respective inlet port P_{in} , and pressure at the fluid treating chamber P_{tc} or at the outlet pressure P_{out} is higher than pressure at the at least one intermediate chamber P_s .
3. A fluid treating system according to claim 2, wherein the pressure at the fluid treating chamber P_{tc} is substantially equal to the pressure at the outlet port P_{out} .
4. A fluid treating system according to claim 1, wherein the liquid treating chamber and the at least one outlet port are in direct flow communication and reside at substantially the same pressure.
5. A fluid treating system according to claim 1, wherein, an intermediate chamber is common with an upstream side of the fluid treating system and the downstream side of the fluid treating system.
6. A fluid treating system according to claim 1, wherein an independent intermediate chamber is associated with each of an upstream side of the fluid treating system and with an downstream side of the fluid treating system.
7. A fluid treating system according to claim 6, wherein the independent intermediate chambers are distinct.
8. A fluid treating system according to claim 1, wherein the intermediate chamber is vented to the atmosphere.
9. A fluid treating system according to claim 1, wherein the intermediate chamber is exposed to vacuum.

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10. A fluid treating system according to claim 1, wherein the intermediate chamber is configured for coupling to a drain pipe.
11. A fluid treating system according to claim 1, wherein an outlet of the intermediate chamber is fitted with a one way valve.
- 5 12. A fluid treating system according to claim 1, wherein the fluid treating system is configured for treating any fluid.
13. A fluid treating system according to claim 1, wherein the fluid treating system is a liquid filter unit.
- 10 14. A fluid filter system comprising a housing configured with at least one fluid inlet port and at least one fluid outlet port, with at least one fluid treating chamber disposed between and being in flow communication with said at least one fluid inlet port and at least one fluid outlet port, and at least one intermediate chamber disposed between at least one inlet port and at least one of the fluid treating chamber and the at least one fluid outlet port; wherein the
15 at least one intermediate chamber is vented to the atmosphere or coupleable to a vacuum source.
- 15 15. A fluid filter system according to claim 14, wherein the arrangement is such that pressure at each respective inlet port P_{in} , and pressure at the fluid treating chamber P_{tc} or at the outlet pressure P_{out} is higher than pressure at the at least
20 one intermediate chamber P_s .
16. A fluid filter system according to claim 14, wherein the fluid inlet port extends into a raw fluid chamber and wherein at least one filtration module extends between the raw fluid chamber and the at least one fluid treating chamber.
- 25 17. A fluid filter system according to claim 16, wherein the at least one fluid treating chamber is separated from the raw fluid chamber by at least two partition walls.
18. A fluid filter system according to claim 17, wherein the at least two partition walls are substantially parallel to each other.
- 30 19. A fluid filter system according to claim 17, wherein the at least two partition walls define a space therebetween, thereby defining the at least one intermediate chamber.
20. A fluid system according to claim 16, wherein at least three partition walls are provided, defining therebetween at least two intermediate chambers.