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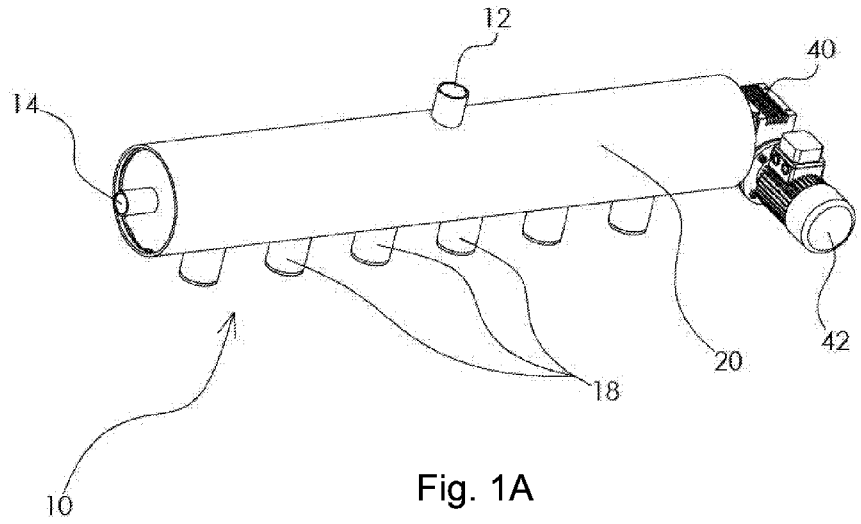

Fig. 1A

(57) Abstract: A filtering member is provided including a frame defining a fluid path between an outer face of the frame and an inner face thereof, the fluid path includes a first and a second protruding portions extending between the outer face and the inner face defining a filtering volume therebetween, at feast one of the first and a second protruding portions is tapered such that a cross section of the filtering volume increases towards the inlet face; a filtering media disposed in the filtering volume and configured such that when fluid flows from the outer face towards the inner face density of the filtering media is higher than density thereof when fluid flows from the inner face towards the outer face.

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Micronic Automatic Filter

FIELD OF INVENTION

The presently disclosed subject matter relates to a filtering apparatus, in general, and in particular to a filtering apparatus having a cleaning mechanism.

BACKGROUND

The present invention relates to self-cleaning filtration systems. There are known filtration screens configured to allow fluid flow therethrough while precluding flow of undesirable elements, such as sand, organic matter, etc.

An example of filtration screens is a wedge wire screen which is a welded steel structure, used for filtration and separation. The wedge wire includes a surface profiles, usually V-shaped, that are resistance welded onto support profiles. The distance between the surface profiles is controlled, as it forms the slot through which the filtrate flows.

The direction of the flow is determined by the position of the surface profiles in relation to the support profiles. Wedge wire screens are either flow-out-to-in (FOTI) or flow-in-to-out (FITO)

Cleaning of a filtration screen used for the filtration of water can be difficult. The lower the size of the pores in the filter the more difficult it is to remove the trapped suspended solids that have accumulated and imbedded on the filtration screen. Organic matter tends to stick to the filtration screen making removal especially difficult.

Some examples of attempts to increase the efficiency of cleaning a filtration screen include:

Nozzles that are fixed on the suction pipe collector at a preset distance from the filtration screen without an ability to move closer and further from the filtration screen.

Patent application WO 2006/008729 discloses "The nozzle 34 comprises a nozzle pipe 44 and nozzle cap 46 with an annular rim 47. The tubular basis 40 is closed by a cover 48. The nozzle pipe 44 is supported in the tubular basis 50 by an annular guide 50 and an opening in the cover 48 so as to form an axially movable telescope

joint. The cylinder spring 42 urges the nozzle pipe 44 axially towards the inlet surface of the mesh 20." Furthermore, "the telescope joint and the spring 42 are protected from the harmful particles by two tight sealing rings 52 and 54".

Patent application EP 1785178 discloses a "nozzle 230 moves along guide 210, or at least along upper portion 212, while extending towards the inner part of fine filter 40." Further, "During the backwash operation fluid flows through the final filtering chamber 30 toward the space defined within nozzle 240. Due to this flow the outer edge 242 of nozzle 240 is pushed away from the fine filter 40 while the inner edge is pushed towards the fine filter. Because the area of the inner edge 244 is larger than the area of the outer edge 242 of nozzle 240 the overall effect of the fluid flow is to push nozzle 240 towards the inner face of fine filter 40."

SUMMARY OF INVENTION

There is provided in accordance with an aspect of the presently disclosed subject matter a filtering member including a frame defining a fluid path between an outer face of the frame and an inner face thereof, the fluid path includes a first and a second protruding portions extending between the outer face and the inner face defining a filtering volume therebetween, at least one of the first and a second protruding portions is tapered such that a cross section of the filtering volume increases towards the inlet face; a filtering media disposed in the filtering volume and configured such that when fluid flows from the outer face towards the inner face density of the filtering media is higher than density thereof when fluid flows from the inner face towards the outer face.

The cross section can include a trapezoid shape having a short base disposed adjacent the inner face and a long base disposed adjacent the inlet face, such that the filtering volume expands towards the inlet face.

The filtering member can further include an elongated member having a circumferential wall defining an inner volume therein.

Each of the first and a second protruding portions can be a wedge member.

The frame can include a plurality of wedge members each of which defining a first and a second protruding portions coupled to one another and extending between the

outer face and the inner face such that each of the filtering volume can be delimited by a first protruding portion of one wedge member and a second protruding portion of an adjacent wedge member.

The wedge member can be a threaded wedge wire formed about the frame, being configured to allow winding elongated fibers inside the filtering area.

At least one of the first and a second protruding portions can be sloped in a direction between the outer face and the inner face of the filtering member.

The filtering volume can include a cross section having a trapezoid shape with a short base thereof disposed adjacent the inner face a long base thereof disposed adjacent the outer face, such that the filtering volume expands towards the outer face.

The filtering media can include a plurality of fibers winded around the filtering member, between the first protruding portions and the second protruding portion.

The filtering media can be so disposed inside the filtering volume, such that when the filtering media can be highly dense the filtering media does not occupy the entire filtering volume.

Filtering properties of the filtering media can be configured to vary depending on the density thereof inside said filtering volume.

A wall of the first protruding portion and the second protruding portion can include a rough surface configured to hinder fluid flow thereon.

The filtering member can be further configured to operate in an inlet state wherein pressure at said outer face can be higher than that at said inner face, such that said filtering media can be urged towards the inner face, and in an outlet state wherein pressure at the outer face can be lower than that at the inner face such that the filtering media can be urged towards the outer face allowing dirt particles inside the filtering volume to be washed out of the filtering volume.

A width of the fluid path at the inner face can be determined in accordance with the density of the filtering media required during the inlet state. A width of the fluid path at the outlet face can be determined in accordance with the density of the filtering media required during the outlet state.

There is provided in accordance with a further aspect of the presently disclosed subject matter a filtering apparatus having housing in fluid communication with an inlet port and an outlet port. The apparatus includes a filtering member disposed inside the

housing and including a frame defining a fluid path between an outer face of the frame and an inner face thereof, the fluid path includes a first and a second protruding portions extending between the outer face and the inner face defining a filtering volume therebetween, at least one of the first and a second protruding portions can be tapered such that a cross section of the filtering volume increases towards the inlet face; and a filtering media disposed in the filtering volume and configured such that when fluid flows from the outer face towards the inner face density of the filtering media can be higher than density thereof when fluid flows from the inner face towards the outer face, wherein the filtering member can be so disposed inside the housing such configured to allow fluid flow from the inlet port through the outer face of the filtering member towards the inner face thereof and to the outlet port.

The filtering member can be an elongated member having a circumferential wall defining an inner volume the filtering member can be so disposed inside the housing such that fluid from the inlet port flows through the circumferential wall into the inner volume.

The filtering apparatus can further include a drive configured for rotating the filtering member inside the housing.

The filtering apparatus can further include at least one cleaning valve mounted on the housing, wherein the filtering member can be so disposed inside the housing such that fluid can flow from the inner volume of the filtering member through the inner face and the outer face into the cleaning valve, such that dirt inside the filtering volume can be urged towards the cleaning valves.

The at least one cleaning valve can include a plurality of cleaning valves mounted along the length of the housing.

The at least one cleaning valve can include a tube coupled to a pressure sink at a distal side thereof, a nozzle, and a resilient element which couples the nozzle to a proximal side of the tube, and a deformable housing which bridges a gap between the proximal side of the tube and the nozzle.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to understand the disclosure 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. 1A is a perspective view of a filtering apparatus in accordance with an example of the presently disclosed subject matter;

Fig. 1B is a side view of a filtering apparatus of Fig. 1A;

Fig. 1C is a side sectional view of a filtering apparatus of Fig. 1A, taken along line A-A;

Fig. 1D is a side partially cutaway view of a filtering apparatus of Fig. 1A;

Fig. 2A is a side view of a frame of a filtering member in accordance with an example of the presently disclosed subject matter;

Fig. 2B is a side view of a frame of a filtering member in accordance with another example of the presently disclosed subject matter;

Fig. 3A is a schematic diagram of a single filtering volume of the filtering member in accordance with an example of the presently disclosed subject matter, in the outlet state thereof;

Fig. 3B is a schematic diagram of a single filtering volume of the filtering member in accordance with an example of the presently disclosed subject matter in the inlet state thereof;

Fig. 4A is a side sectional view of the cleaning valves in accordance with an example of the presently disclosed subject matter, taken along lines A-A; and

Fig. 4B is an exploded view of the cleaning valves of Fig. 4A.

DETAILED DESCRIPTION OF EMBODIMENTS

Figs. 1A to 1D is a filtering apparatus **10** for filtering fluids flowing between an inlet port **12** and an outlet port **14**. The filtering apparatus **10** according to the illustrated example includes an elongated housing **20**, a filtering member **30** disposed in the housing **20** and at least one cleaning valve **18**.

The filtering member **30** can be an elongated member having a circumferential wall **32**, defining an inner volume **34**. The filtering member **30** is so disposed inside the housing **20** such that fluid from the inlet port **12** flows through the circumferential wall **32** of filtering member **30** into the inner volume **34**.

Thus, the inlet port **12** is defined at the circumference of the housing **20**, such that fluid flow therethrough is directed towards the circumferential wall **32** of the filtering member **30**. The outlet port **14** on the other hand, is defined on a side face of the housing **20** such that filtered fluid from the inner volume **34** of the filtering member **30** can flow towards the outlet port **14**.

According to the illustrated example the housing **20** includes a cylindrical wall, the filtering member **30** includes a corresponding cylindrical wall having a diameter smaller than that of the housing **20**, such that the filtering member **30** can be disposed inside the housing and fluid from the inlet can enter the housing and flow in the space between an inner surface of the housing **20** and an outer face **36a** of the filtering member **30**.

The filter apparatus **10** can further includes a drive **40** configured for rotating the filtering member **30** inside the housing **20**. For example the drive **40** can include a shaft on which the filtering member **30** is mounted and being configured to rotate thereby rotate the filtering member **30** therewith. This way, the entire circumference of the circumferential wall **32** of filtering member **30** is active in filtering fluid from the inlet port **12**. The rotation of the filtering member **30** further facilitates the cleaning of the entire circumference of the circumferential wall **32**. The drive **40** can be provided with a motor **42**, which can be configured for continuous or monitored operation.

According to the illustrated example the apparatus **10** includes a plurality of cleaning valves **18** mounted on the circumferential wall of the housing **20**. The cleaning valves **18** are configured to allow fluid flow from the inner volume **34** of the filtering member **30** out of the apparatus **10**. The fluid flows from the inner volume **34** of the

filtering member **30** through the circumferential wall **32** thereof urges dirt accumulated on the filtering member **30** towards the cleaning valves **18**.

It is appreciated that the cleaning valves **18** can be mounted along the length of the housing **20** such that the entire length of the filtering member is cleaned. In addition, the rotation of the filtering member **30** by the drive **40** allows cleaning of the entire circumference of the circumferential wall **32**.

Attention is now made to Fig. 2A, the filtering member **30** can include a frame **35** having a plurality of wedge members **37** defining an outer face **36a** of the filtering member **30** and an inner face **36b** thereof. A filtering volume **52** is defined between a pair of wedge members **37** and is in fluid communication with the outer face **36a** of the filtering member **30** and an inner face **36b** thereof. This way wedge members **37** define a plurality of the fluid paths. Each wedge member **37** defines a first and a second protruding portions **38a** and **38b** coupled to one another and extending between the outer face **36a** and the inner face **36b**. Thus, each filtering volume **52** is delimited by a first protruding portion **38a** on one side thereof and second protruding portion **38b** on the opposing side thereof.

According to the present example the first and a second protruding portions **38a** and **38b** are sloped such that a cross section of said filtering volume increases towards the outer face **36a**. That is to say, the first and second protruding portions **38a** and **38b** are sloped in a direction towards the inner volume **34** of the filtering member **30**. Since the first protruding portions **38a** of each of the filtering volumes **52** is disposed opposite the second protruding portion **38b** of that filtering volume **52** the sloping direction of the first protruding portions **38a** is opposite the sloping direction of the second protruding portion **38b**. Accordingly, each filtering volume **52** includes a cross section having a trapezoid shape with a short base thereof disposed adjacent the inner face **36b** of the filtering member **30** and a long base thereof disposed adjacent the outer face **36a**, such that the filtering volume **52** expands towards the outer face **36a**.

The filtering member **30** further includes a filtering media (not shown) disposed in the filtering volume **52**, for example, a plurality of fibers winded around the filtering member **30**, between the first protruding portions **38a** and the second protruding portion **38b**. The filtering media is so disposed inside the filtering volume **52**, such that when the filtering media is highly dense the filtering media does not occupy the entire

filtering volume. This way, the filtering media can be scattered inside the filtering volume **52** with a relatively low density. This way, the filtering properties of the filtering media varies depending on the density of the filtering media inside the filtering volume **52**. In addition the varying density of the filtering media inside the filtering volume **52** allows particles to either be entrapped therein or otherwise be washed out as explained hereinafter in detail.

Attention is now made to Figs. 3A and 3B, due to the trapezoid shaped cross section of the filtering volume **52**, when fluid flows from the outer face **36a** of the filtering member **30** towards the inner face **36b** thereof (Fig. 3B), the density of the filtering media **58** inside the filtering volume **52** is higher than the density thereof when fluid flows in the opposite direction i.e. from the inner face **36b** towards the outer face **36a** thereof (Fig. 3A).

That is to say, during the inlet state of the filter member **30**, when the pressure gradient across the filtering member **30** is positive i.e. the pressure at the outer face **36a** is higher than that at the inner face **36b**, the filtering media **58** is urged towards the inner face **36b** to the area of the filtering volume **52** where the cross section is narrow. As a result, the filtering media **58** is dense such that dirt particles in the fluid flow therethrough are entrapped thereby, for example by the fibers.

During the outlet state of the filter member **30**, on the other hand, when the pressure gradient across the filtering member **30** is negative i.e. the pressure at the outer face **36a** is lower than that at the inner face **36b**, the filtering media **58** is urged towards the outer face **36a** to the area of the filtering volume **52** where the cross section is relatively large. As a result, the filtering media **58** is scattered along a relatively larger area such that dirt particles entrapped between the filtering elements, such as the fibers, can be washed out of the filtering volume **52**.

According to an example the first protruding portion **38a** and the second protruding portion **38b** can include a rough surface, such as a plurality of grooves, and protrusions configured to hinder the fluid flow thereon. That is to say, the rough surface is configured such that the water flow through the filtering volume **52** generally tends to be directed through the filtering media as opposed to between the filtering media and the wall of the first or second protruding portions **38a** and **38b**. It is appreciated that the rough surface can include elements affixed to the wall of the first and second protruding

portions **38a** and **38b**, such as particles affixed thereto. As a result, the water is urged to flow through the filtering media and is thus filtered thereby. Reference is now made to Fig 2B, according to another example, the filtering member **60** can include a threaded wedge wire **62** having a sloped portions **68a** and an opposing sloped portion **68b** such that filtering volumes **64** are formed between adjacent portions of the threaded wedge wire **62**. Each portions of the threaded wedge wire **62** defines a sloped portions **68a** of one filtering volume **64** on one side thereof, and an opposing sloped portions **68b** of an adjacent filtering volume **64** on a second side thereof.

The operation of the filtering media (not shown in Fig. 2B) inside the filtering volumes **64** is the same as that of the filtering media **52** of Fig. 3A and 3B. It is appreciated however, that the threaded wedge wire **62** allows disposing elongated fibers on inside the filtering volumes **64** by disposing fibers, for example on a spool, on a filtering volumes **64** at the edge of the filtering member **60** and rotating the latter such that the fiber is winded about the filtering member.

It is appreciated that in order to form a filtering volume having a varying cross section, such that the density of the filtering media therein can vary, the filtering volume can have a trapezoid cross section as shown in Figs. 3A and 3B. It is appreciated however that according to an example only one side of the filtering volume is sloped while the other side is perpendicular to the outer face of the filtering member, such that a right trapezoid cross section is formed. In addition the cross section of the filtering volume can be acute trapezoid or obtuse trapezoid configured such that the cross sectional area of the filtering volume adjacent the outer face is larger than the cross sectional area of the filtering volume adjacent the outlet face. This way, the density of the filtering medium is higher when it is urged by fluid flow or by pressure towards the outlet face.

Although the filtering media as described hereinabove can include fibers winded over the frame **35**, according to other examples the filtering media can include filtering particle, such as charcoal etc., disposed inside the filtering volume. It is appreciated that in case the filtering media includes discrete particles the filtering volume can be provided with a suitable screen for maintaining the particles inside the filtering volume, as known. The varying cross sectional area of the filtering volume as disclosed herein

above allows controlling the density of the particles, and to thereby control the displacement of dirt particles entrapped therein.

As shown in Fig. 3B, the wedge member **37** can be configured in accordance with the desired required density of the filtering media. That is to say, the width (here denoted as *C*) of the fluid path formed between the wedge member **37** determines the density of the filtering media during the inlet state. The width (here denoted as *B*) of the base of each wedge portion **37** determines the active area of the filter member, i.e. the total area of the inner face **36b** through which fluid can enter flow. That is to say, the width (*B*) of the base of the wedge members **37** determines the area of the filter member through which fluid cannot flow into the inner volume **34** of the cylindrical filtering member **30**.

The distance between the edges of adjacent wedge members **37** (here denoted as *E*) at the outer face **36a** determines the area of the filtering volume **52** in which filtering media **58** can scatter, in the outlet state. Due to the sloped portion of the wedge members **37** between the inner face **36b** and the outer face **36a**, the height (here denoted as *A*) and the size of the angle (here denoted as *D*), of each of the wedge members **37** determine the difference between the width *C* and the width *E* and as a result the difference between the density at the inlet state and the density at the outlet state.

Reference is made again to Fig. 1B, the filtering member **30** is disposed inside the filtering apparatus **10**, such that in the inlet state, fluid flow from the inlet port **12** towards the inner volume **34** of the cylindrical filtering member **30** urges the filtering media inside the filtering volume **52** to the inlet state thereof. I.e. the filtering media is urged towards the inner face **36b** of the filtering member **30**. The relatively small area of the filtering volume at the inner face causes the filtering media to dense in close proximity to the inner face **36b** of the filtering member **30**. Thus, the dense filtering media allow efficient filtering to the fluid. Filtered fluid flow can than flow towards the outlet port **14**.

When one of the cleaning valves **18** is opened, the flow pressure therein urges fluid from the inner volume **34** of the filtering member **30** towards the cleaning valve **18**. Thus the negative pressure gradient across the respect portion of the filter member **30** urges the filtering media to the outlet state. I.e., the filtering media is urged towards the outer face **36a** of the filtering member **30**. Due to the relatively large cross sectional

area at the outer face **36a** of the filtering member **30** the density of the filtering media is reduced such that dirt particles inside the filtering media can be washed out of the filtering volume towards the cleaning valve **18**.

It is appreciated that different portions of the filtering member **30** can simultaneously operate in different state. That is to say, a portion of the filtering member **30** residing in close proximity to the inlet port **12**, can operate in the inlet state due to the positive pressure gradient between the inlet port **12** and the inner volume **34** of the filtering member **30**. On the other hand, however, a portion of the filtering member **30** residing in close proximity to the cleaning valve **18**, can operate in the outlet state due to the negative pressure gradient between the cleaning valve **18**and the inner volume **34** of the filtering member **30**.

Thus, the filtering apparatus **10** of the present application allows for continuous filtering operation of the filtering member **30** while the latter is cleaned. Accordingly, the filtering apparatus **10** allows an inlet flow from the inlet port **12** while the cleaning valve **18** are opened. The cleaning process of the filtering member **30** by using the cleaning valve **18** does not require a reverse flow, and can be carried while fluid enters the filtering apparatus **10** through the inlet port **12**.

It is further appreciated that cleaning valves **18** can be opened one after the other, as opposed to opening thereof at the same time. This way, the negative pressure gradient caused by opening thereof does not interfere with the flow of the fluid from the inner volume **34** of the filtering member **30** towards the outlet port **14**.

According to another example of the presently disclosed subject matter the filtering apparatus **10** can be cleaned by a backwash flow in which water or other fluid is fed through the outlet port **14** while the inlet port **12** is closed. The backwash flow enters the inner volume **34** towards the cleaning valve **18** through the filtering member **30**. This way, the fluid flow is directed from the inner face **36b** of the filter member towards the outer face **36a**. As a result the filtering media inside the filtering volume **52** is urged towards the outer face **36a** of the filtering member **30**. Due to the relatively low density of the filtering media around the outer face **36a**, dirt particles inside the filtering media can be washed out of the filtering volume towards the cleaning valve **18**.

It is further appreciated that the disposition of the cleaning valves **18**, at the bottom of the cylindrical wall of the housing **20** along the length thereof, allows

cleaning the entire length of the filtering member **30**. The inlet port **12**, on the other hand, is disposed on the opposing side of the filtering member **30**, such that the positive pressure gradient at the portion of the filtering member **30** in close proximity to the inlet port **12** does not interfere with the negative pressure gradient at the portion of the filtering member **30** in close proximity to the cleaning valve **18**.

According to an example, the filtering apparatus **10** can be utilized with varying filtering properties. That is to say since the pressure gradient across the filtering member **30** causes the filtering media inside the filtering volume **52** towards the inner face **36b** of the filtering member **30**, the density of the filtering media can be determined by setting a predetermined pressure gradient across the filtering member **30**. For example, if fine filtration is required, high pressure gradient can be formed across the filtering member **30** causing the filtering media to be highly dense at the inner face 36b, such that small undesirable particles are entrapped thereby. If on the other hand, the filtration required does not have to filter fine particles, a lower pressure gradient can be formed across the filtering member **30**, such that the density of the filtering media is relatively lower, and only somewhat larger undesirable particles are entrapped thereby. Attention is now made to Fig. 4A and 4B, the cleaning valves **18** can be configured as a proximity cleaning valve i.e. a valve which maintains constant engagement with the surface of the filtering member **30**. This way, the filtering member **30** can be rotated while the stationary cleaning valve maintains close engagement with the outer face **36a** thereof. For example the close proximity cleaning valve can include a suction nozzle assembly such as disclosed in WO 2011/058556 which is incorporated herein by reference. Thus the cleaning valve **18** can include tube **72** coupled to a pressure sink at a distal side thereof, a nozzle **73**, a resilient element **74** which couples the nozzle **73** to a proximal side of the tube **72** and a deformable housing which bridges a gap between the proximal side of the tube and the nozzle. Each cleaning valves **18** can be further provided with a housing **78** and a bottom cover **79**.

Accordingly, the cleaning valves **18** maintains a close engagement with the respective portion of the outer face **36a** of the filtering member **30**. That is to say, the rotation of the cylindrical filtering member **30** by the drive **40** allows the nozzle **73**, in each rotations, to contact the entire circumference of one location along the outer face **36a** of the filtering member **30**. The resilient element **74** allows the nozzle **73** to

maintain close engagement with the outer face **36a** of the filtering member **30** during the rotation thereof. This way, fluid flow from the inner volume **34** of the filtering member **30** is directed to the opening **84** of the nozzle **73**. Due to the shape of the filtering volume **52**, the fluid flow into the cleaning valves **18** urges dirt particles therewith.

As shown in Fig. 4B, the nozzle **73** of each cleaning valves **18** can be provided with a contacting member **80** mounted about the opening **84** of the nozzle **73**, such that while the edge of the nozzle **73** engages a portion of the outer face **36a** of the filtering member **30**, the contacting member **80** engages the sides of that location. The contacting member **80** can be an elongated member and includes a channel **82** extending from the sides thereof towards opening **84**. This way the contacting member **80** can be disposed along the length of the filtering member **30**, such that fluid from the portion of the outer face **36a** which are in contact with the contacting member **80** can flow through the channel **82** into the opening **84** of the nozzle **73**.

It is appreciated that the cleaning valves **18** can be disposed along the length of the housing **20** such that the nozzles **73** engage locations along the length of the outer face **36a** of the filtering member **30**. The contacting members **80** can be configured such that each contacting member is disposed immediately adjacent a contacting member **80** of an adjacent nozzles **73**. This way substantially the entire length of the filtering member **30** can be cleaned by fluid flow through the channels **82** and into the openings **84** of the nozzles **73**. The rotation of the filtering member **30** thus allow cleaning the entire outer surface **36a** thereof.

According to another example the cleaning valves can be configured as a static cleaning valve, i.e. without a resilient element. That is to say, the cleaning valve can be configured with a nozzle having a contacting member which is connected directly to a tube directing the fluid with the dirt practices out of the filter housing.

Those skilled in the art to which the presently disclosed subject matter pertains will readily appreciate that numerous changes, variations, and modifications can be made without departing from the scope of the invention, *mutatis mutandis*.

CLAIMS:

1. A filtering member comprising:

a frame defining a fluid path between an outer face of said frame and an inner face thereof, said fluid path includes a first and a second protruding portions extending between said outer face and said inner face defining a filtering volume therebetween, at least one of said first and a second protruding portions is tapered such that a cross section of said filtering volume increases towards said inlet face;

a filtering media disposed in said filtering volume and configured such that when fluid flows from said outer face towards said inner face density of said filtering media is higher than density thereof when fluid flows from said inner face towards said outer face.

2. The filtering member according to claim 1 wherein said cross section includes a trapezoid shape having a short base disposed adjacent said inner face and a long base disposed adjacent said inlet face, such that said filtering volume expands towards said inlet face.

3. The filtering member of Claim 1 further comprising an elongated member having a circumferential wall defining an inner volume therein.

4. The filtering member of Claim 1 wherein each of said first and a second protruding portions is a wedge member.

5. The filtering member of Claim 4 wherein said frame includes a plurality of wedge members each of which defining a first and a second protruding portions coupled to one another and extending between said outer face and said inner face such that each of said filtering volume is delimited by a first protruding portion of one wedge member and a second protruding portion of an adjacent wedge member.

6. The filtering member according to Claim 4 wherein said wedge member is a threaded wedge wire formed about said frame, being configured to allow winding elongated fibers inside said filtering.

7. The filtering member of Claim 1 wherein a wall of said first protruding portion and said second protruding portion includes a rough surface configured to hinder fluid flow thereon.

8. The filtering member of Claim 1 wherein said filtering volume includes a cross section having a trapezoid shape with a short base thereof disposed adjacent said inner face and a long base thereof disposed adjacent said outer face, such that said filtering volume expands towards said outer face.

9. The filtering member according to Claim 1 wherein said filtering media a plurality of fibers winded around said filtering member, between said first protruding portions and said second protruding portion.

10. The filtering member according to Claim 1 wherein said filtering media is so disposed inside said filtering volume, such that when said filtering media is highly dense said filtering media does not occupy the entire filtering volume.

11. The filtering member according to Claim 10 wherein filtering properties of said filtering media is configured to vary depending on the density thereof inside said filtering volume.

12. The filtering member according to Claim 10 further configured to operate in an inlet state wherein pressure at said outer face is higher than that at said inner face, such that said filtering media is urged towards said inner face, and in an outlet state wherein pressure at said outer face is lower than that at said inner face such that said filtering media is urged towards said outer face allowing dirt particles inside said filtering volume to be washed out of said filtering volume.

13. The filtering member according to Claim 12 wherein a width of said fluid path at said inner face is determined in accordance with the density of the filtering media required during said inlet state.

14. The filtering member according to Claim 12 wherein a width of said fluid path at said outlet face is determined in accordance with the density of the filtering media required during said outlet state.

15. A filtering apparatus having housing in fluid communication with an inlet port and an outlet port, the apparatus comprising:

a filtering member disposed inside the housing and including a frame defining a fluid path between an outer face of said frame and an inner face thereof, said fluid path includes a first and a second protruding portions extending between said outer face and said inner face defining a filtering volume therebetween, at least one of said first and a second protruding portions is tapered such that a cross section of said filtering volume

increases towards said inlet face; and a filtering media disposed in said filtering volume and configured such that when fluid flows from said outer face towards said inner face density of said filtering media is higher than density thereof when fluid flows from said inner face towards said outer face,

wherein said filtering member is so disposed inside said housing such configured to allow fluid flow from said inlet port through said outer face of said filtering member towards said inner face thereof and to the outlet port.

16. The filtering apparatus according to Claim 15 wherein said filtering member is an elongated member having a circumferential wall defining an inner volume said filtering member is so disposed inside the housing such that fluid from the inlet port flows through said circumferential wall into said inner volume.

17. The filtering apparatus according to Claim 16 further comprising a drive configured for rotating said filtering member inside the housing.

18. The filtering apparatus according to Claim 16 further comprising at least one cleaning valve mounted on the housing, wherein said filtering member is so disposed inside the housing such that fluid can flow from said inner volume of said filtering member through said inner face and said outer face into said cleaning valve, such that dirt inside said filtering volume is urged towards said cleaning valve.

19. The filtering apparatus according to Claim 18 wherein said at least one cleaning valve includes a plurality of cleaning valves mounted along the length of the housing.

20. The filtering apparatus according to Claim 18 wherein said at least one cleaning valve includes a tube coupled to a pressure sink at a distal side thereof, a nozzle, and a resilient element which couples said nozzle to a proximal side of said tube, and a deformable housing which bridges a gap between said proximal side of said tube and said nozzle.

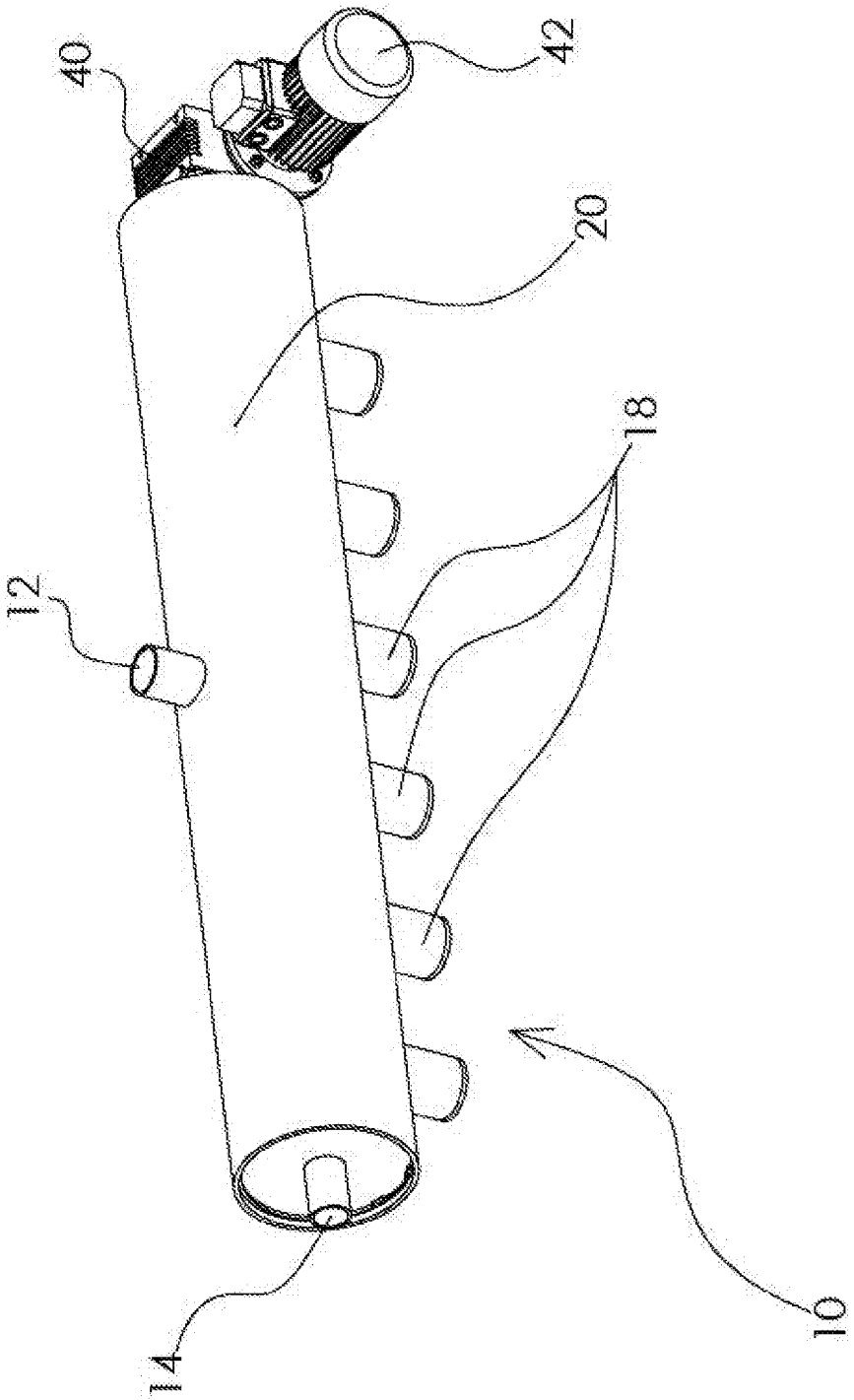


Fig. 1A

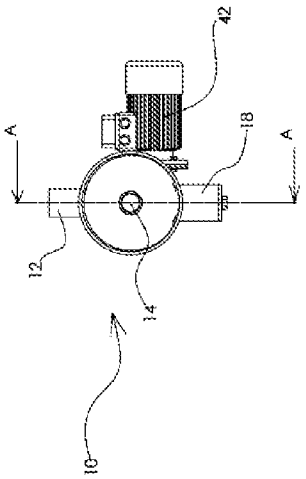


Fig. 1B

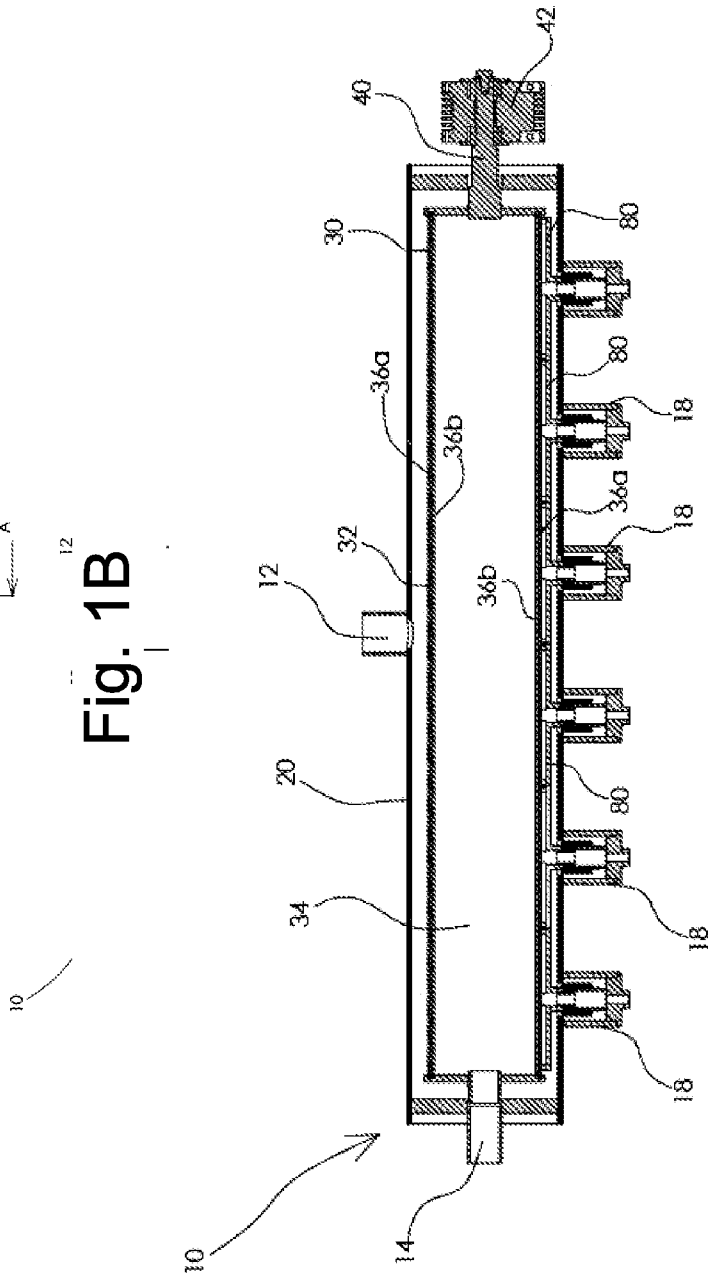


Fig. 1C

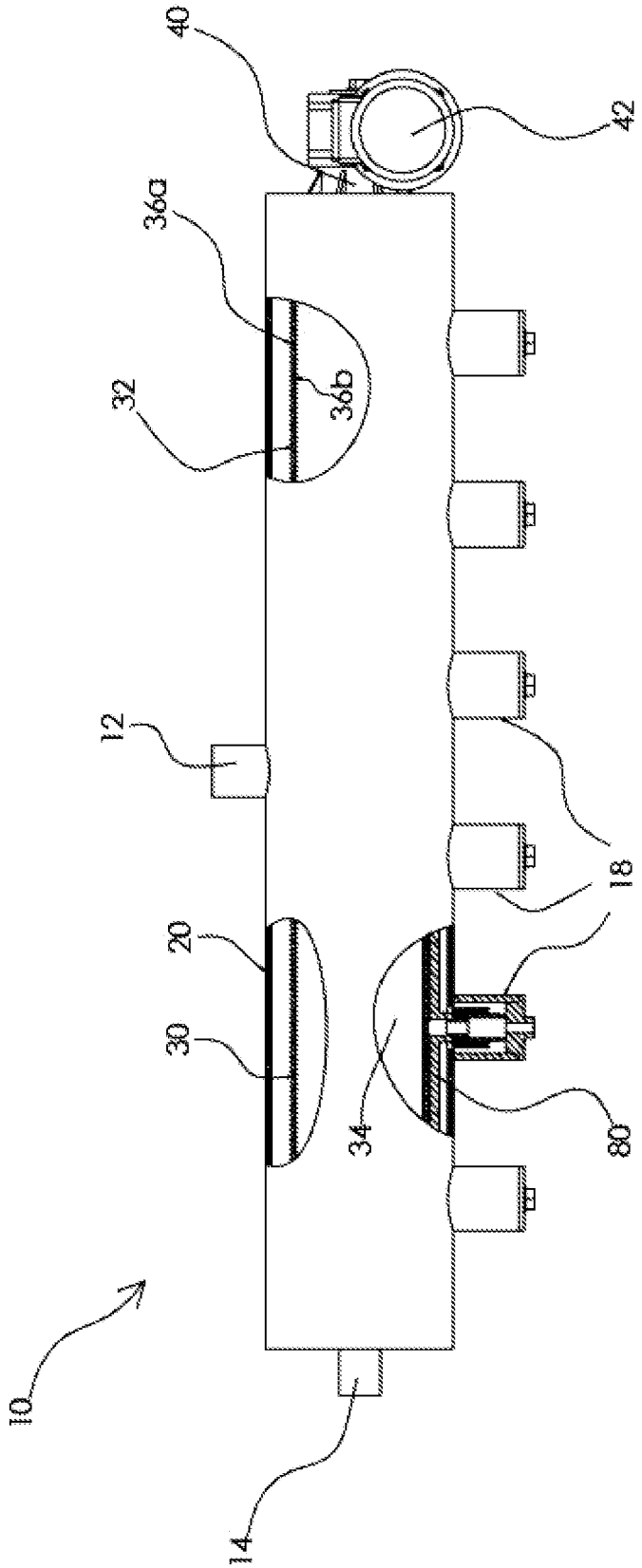
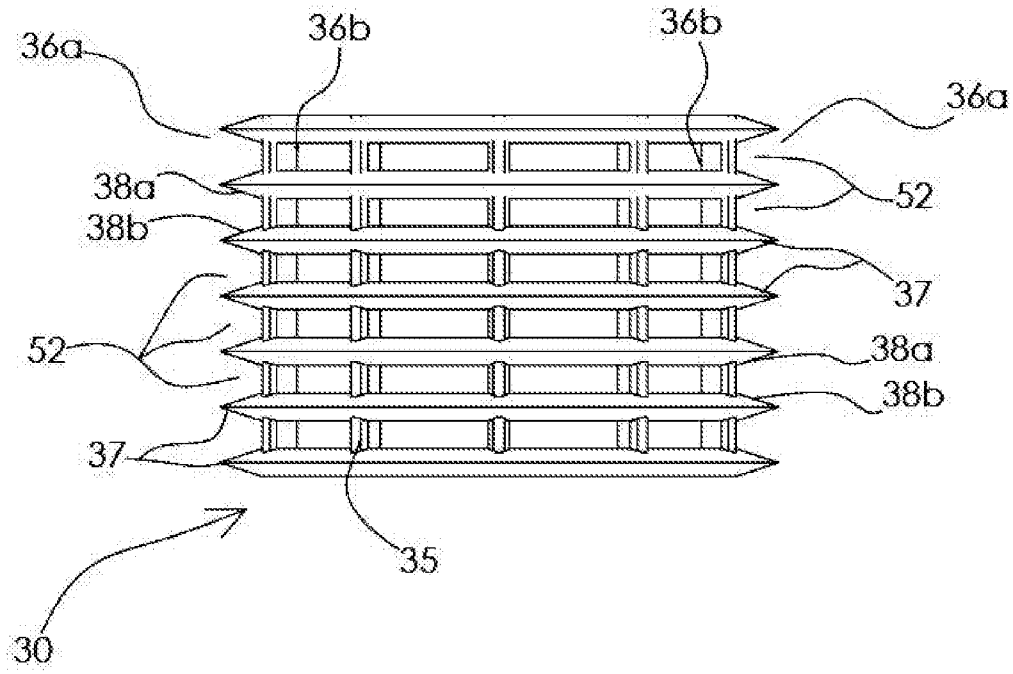


Fig. 1B

Fig. 1D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52
38a
38b
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30

Fig. 2A

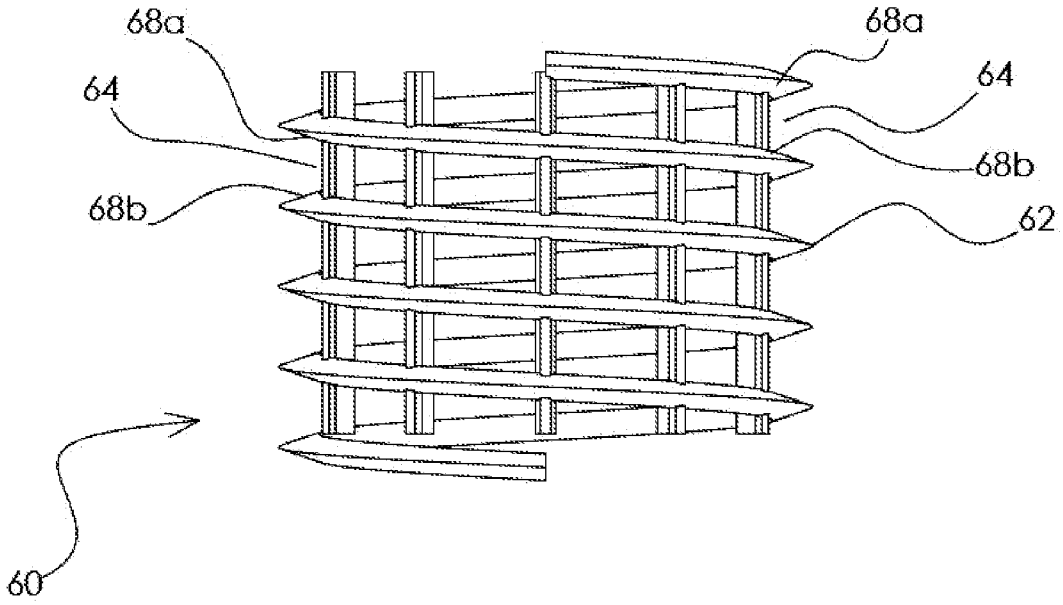
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Fig. 2B

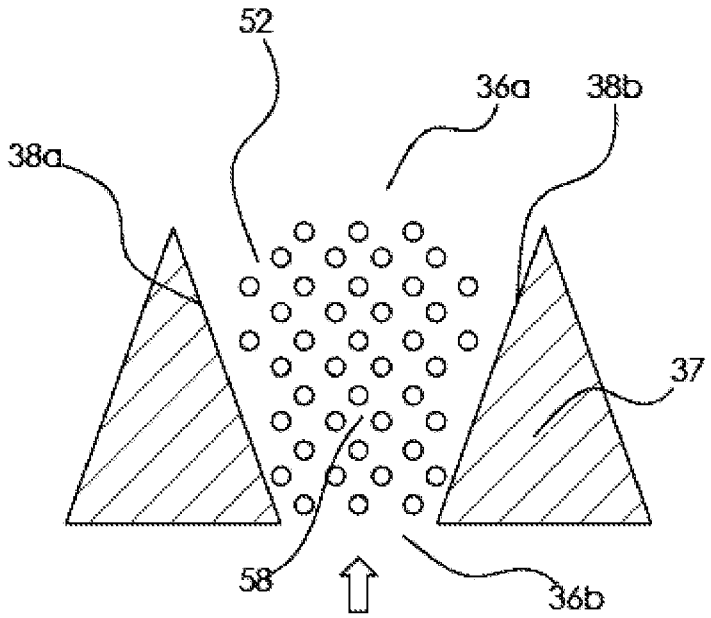

Fig. 3A

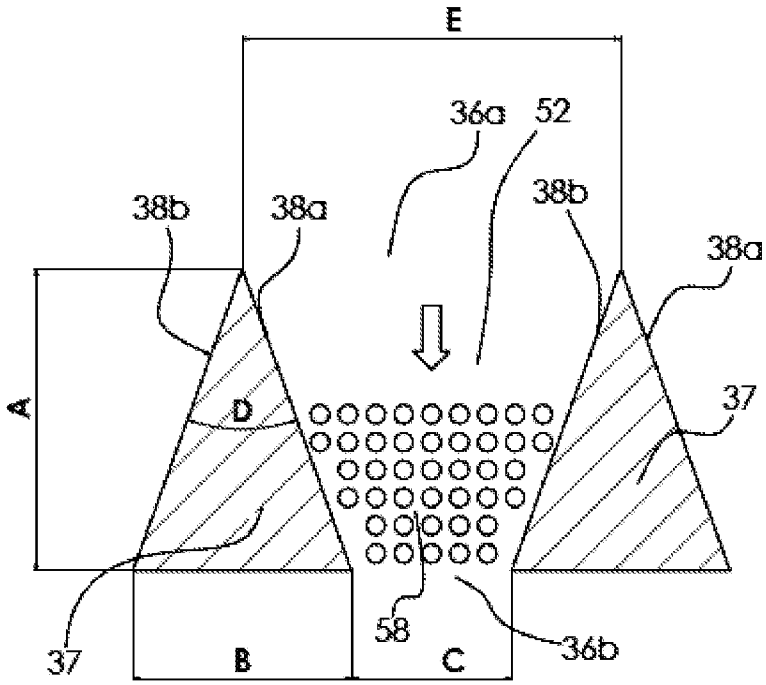

Fig. 3B

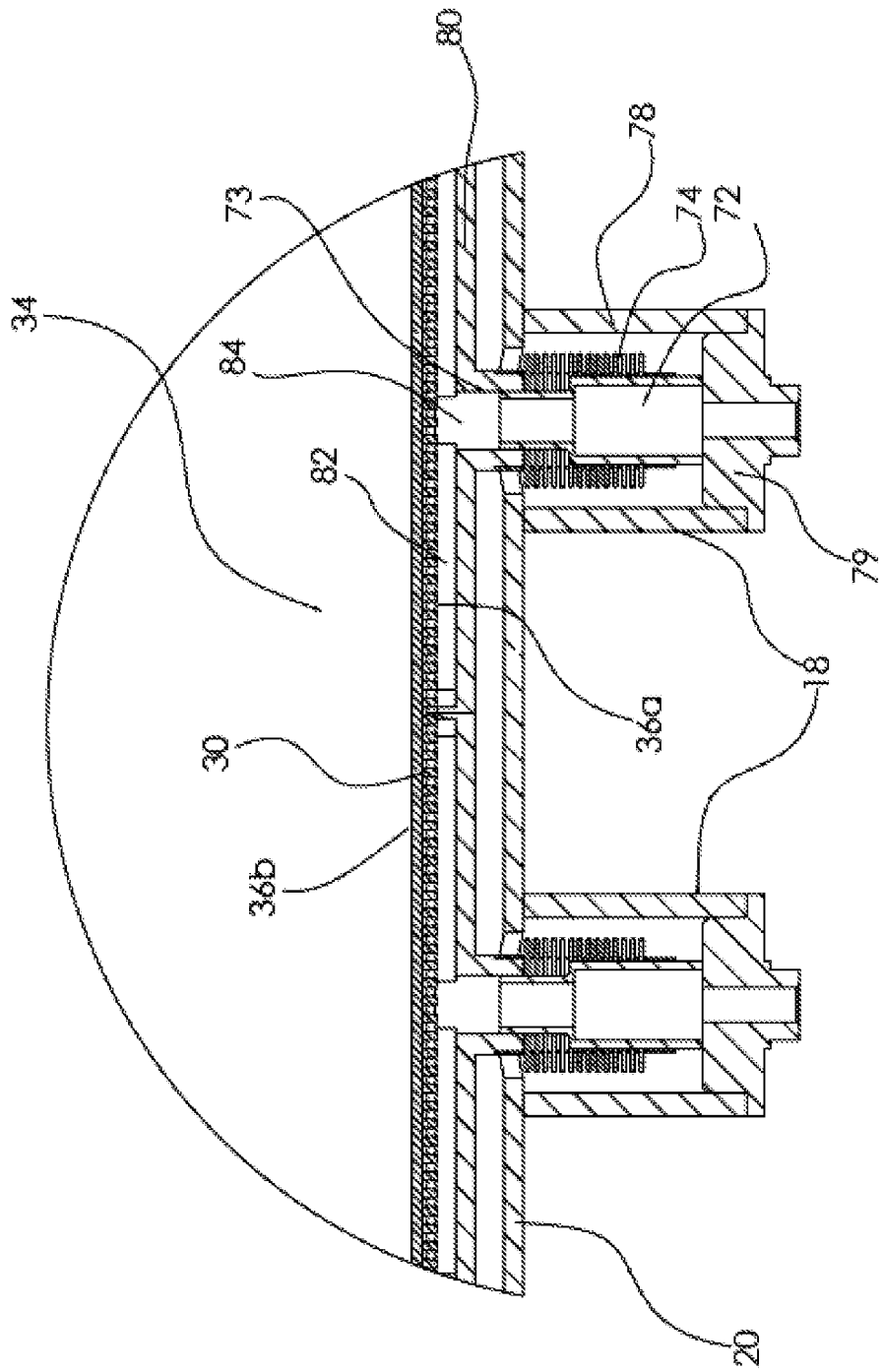

Fig. 4A

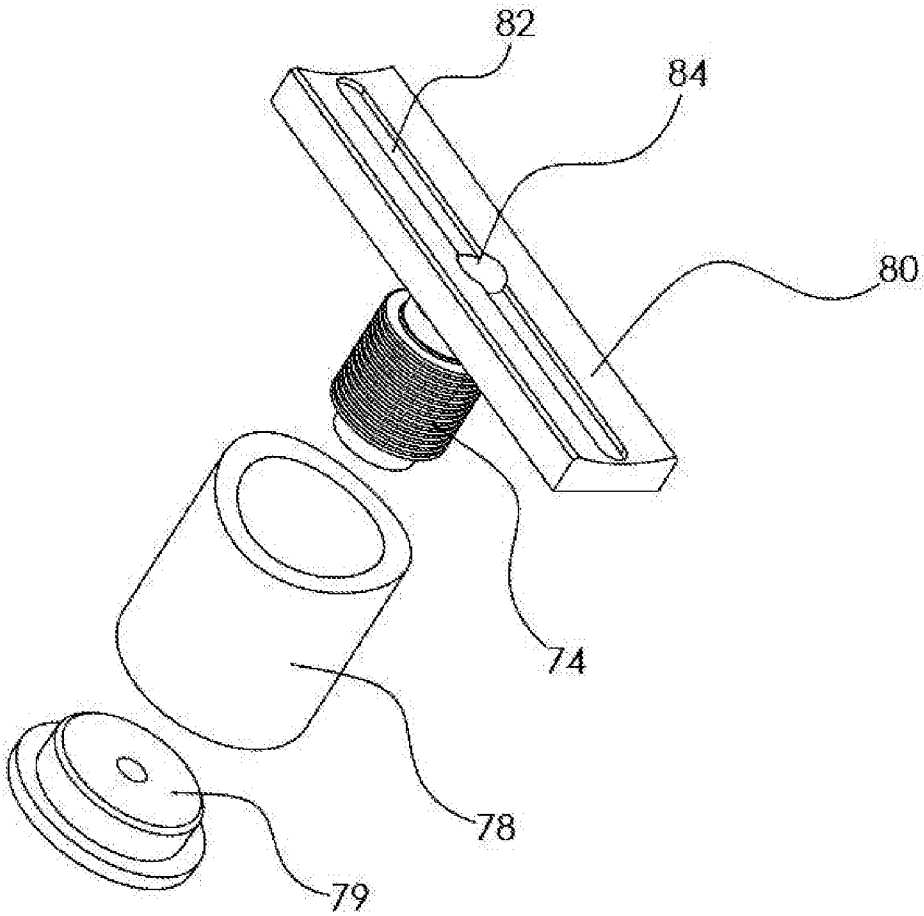

Fig. 4B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL2016/050568

A. CLASSIFICATION OF SUBJECT MATTER
IPC (2016.01) B01D 29/00, B01D 39/00

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) B01D 29/00, B01D 39/00

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: PATENTSCOPE, Esp@cenet, Google Patents, PatBase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2006231486 A MORGAN 19 Oct 2006 (2006/10/19) whole	1-20
A	US 5804075 B AIKAWA 08 Sep 1998 (1998/09/08) whole	1-20
A	US 20130008847 A ZUR 10 Jan 2013 (2013/01/10) whole	1-20
A	US 20070199885 A SHMUEL 30 Aug 2007 (2007/08/30) whole	1-20

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

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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
07 Sep 2016	11 Sep 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	GUTKIN Solomon Telephone No. 972-2-5651763

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IL2016/050568

Patent document cited search report	Publication date	Patent family member(s)	Publication Date
US 2006231486 A	19 Oct 2006	NONE	
US 5804075 B	08 Sep 1998	NONE	
US 20130008847 A	10 Jan 2013	NONE	
US 20070199885 A	30 Aug 2007	NONE	