



EUROPEAN PATENT APPLICATION

(43) Date of publication:
01.02.2017 Bulletin 2017/05

(51) Int Cl.:
B08B 9/34 (2006.01) B05B 15/06 (2006.01)

(21) Application number: **15179125.8**

(22) Date of filing: **30.07.2015**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
MA

• **COMPOSTA, Michele**
37139 VERONA (IT)
• **FASANI, Rino**
37139 VERONA (IT)

(74) Representative: **Eltzer, Thomas**
Gebo Packaging Solutions France
IP Central
5-7 rue du Commerce
ZI - CS 73445 REICHSTETT
67455 Mundolsheim Cedex (FR)

(71) Applicant: **Gebo Packaging Solutions Italy SRL**
43126 Parma (IT)

(72) Inventors:
• **BERZAGHI, Claudio**
37139 VERONA (IT)

(54) **SPRINKLING DEVICE AND CORRESPONDING WASHING UNIT**

(57) A sprinkling device (1) comprising a pressure pipe (2) in which the rinsing fluid flows, a rotating shaft (3) extending along the pressure pipe (2), and at least one sprinkling means comprised of an aperture of the pressure pipe (2), a nozzle (4), positioned in said aperture, between said pressure pipe (2) and said rotating shaft (3), and at least one radial bore (5) in the rotating shaft (3), located at the level of the nozzle (4), for receiving

the rinsing liquid from the nozzle (4). This sprinkling device is characterized in that the top end (6) of the at least one nozzle (4) and the rotating shaft (3) located thereon have globally complementary shapes, said top end (6) being provided with a clearance zone (7) at the interface with the rotating shaft (3).

A corresponding washing unit is provided.

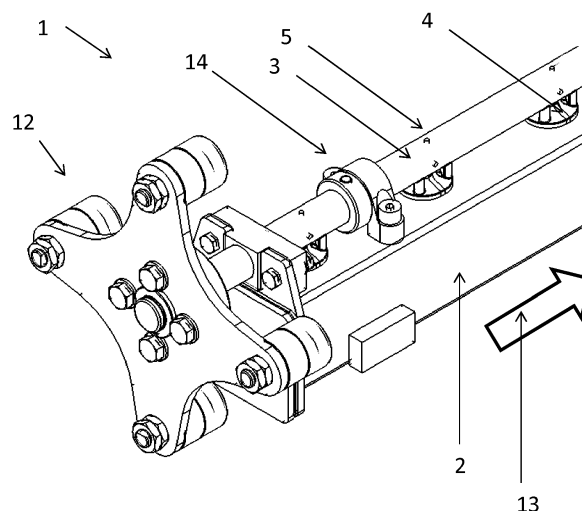


Fig. 1

Description

[0001] The current invention belongs to the domain of washing units for empty containers like bottles, comprising a washing tunnel in which the containers are conveyed through treatment zones, said containers being organized in successive lines perpendicular to the movement direction. The object of the present invention is a sprinkling device, for spraying a liquid, as well as a washing unit comprising such a sprinkling device.

[0002] In this domain, sprinkling devices are used to spray a liquid in or on containers, which are turned upside down. This sprinkling device is located under the conveying device, which moves the containers thanks to pockets of complementary shapes.

[0003] The sprinkling device normally comprises a pressure pipe, in which the liquid is fed under pressure, as well as a rotating shaft, provided on the top of and along said pressure pipe. The rotating shaft is provided with radial bores, through which said liquid is received from the pressure pipe and sprayed to the containers.

[0004] Hollow nozzles are provided as interfaces between the pressure pipe and the rotating shaft. The top end of the nozzle has a shape which is complementary to the rotating shaft, and the opposite end is fixed in the pressure pipe.

[0005] A special focus on these nozzles is given in this invention.

[0006] US5092356 discloses nozzles as a tubular extension or sleeve, extending from the pressure pipe.

[0007] EP1728565 discloses a pressure pipe having radial extensions, on the top of which an additional element is fixed, for interacting with the rotating shaft. The top end of this additional element is of a shape which is complementary to the rotating shaft.

[0008] DE4216665 discloses a nozzle as an additional piece, fixed to the pressure pipe, and made of two separate elements. The upper element interacts with the rotating shaft and has a top portion of strictly identical circular shape. A clamp presses the rotating shaft on the upper element, for liquid tightness purposes.

[0009] DE10315866 discloses a nozzle as a single additional piece, fixed to the pressure pipe and in which the rotating shaft is clipped.

[0010] A common problem of the existing art is that the working environment of this nozzle can be made of liquid comprising rigid and little particles, like sand. Such an unfiltered liquid can even flow through the nozzle. As the rotating shaft moves relative to the nozzles, these solid particles generate an excessive wear of said nozzles.

[0011] A consequence of an excessive wear is the shortening of the nozzle, leading to liquid tightness issues, either between the nozzle and the rotating shaft or even between the nozzle and the pressure pipe. Insufficient water tightness hinders a proper working condition for the sprinkling device. Also, an excessive wear leads to more frequent maintenance operations.

[0012] In this context, the invention aims at proposing

a sprinkling device which can sustain working conditions with unclean liquids, comprising solid particles.

[0013] In order to reach this, the invention proposes to provide cavities at the top end of the nozzle, at the rotating shaft side, for allowing a flow of liquid at said end, between the nozzle and the rotating shaft.

[0014] According to the invention, there is provided a sprinkling device for cleaning bottles in a bottle washing unit in which said bottles are moved by a conveyor through at least a washing zone, said sprinkling device comprising a pressure pipe in which a fluid flows, a rotating shaft extending along the pressure pipe, and at least one sprinkling means comprised of an aperture of the pressure pipe, a nozzle, positioned in said aperture, between said pressure pipe and said rotating shaft, and at least one radial bore in the rotating shaft, located at the level of the nozzle, for receiving the liquid from the nozzle.

[0015] This device is characterized in that the top end of the at least one nozzle and the rotating shaft located thereon have globally complementary shapes, said top end being provided with a clearance zone at the interface with the rotating shaft, so that a portion of the top end surface does not come into contact with the rotating shaft.

[0016] Another object of the present invention is a washing unit, for washing empty containers for liquid, like bottles or flasks, comprising a washing tunnel, in which containers are conveyed line by line in a conveying direction by an internal conveying means for being cleaned and further rinsed.

[0017] This washing unit is characterized in that it comprises, in the washing tunnel, at least one such sprinkling device, for spraying a liquid, the rotating shaft being transversal to the conveying direction, the washing unit further comprising means for synchronizing the rotation of the rotating shaft to the movement of the internal conveying means.

[0018] Further features and advantages of the present invention will be better understood from the description of possible features and preferred embodiments, which is given below by way of a non-limiting illustration, with reference to the accompanying drawings, in which:

- figure 1 shows an end of a sprinkling device according to the invention;
- figure 2 focuses on the design of a nozzle;
- figure 3 is a cut-out section of the nozzle of figure 2;
- figure 4 is a front section of a nozzle and the rotating shaft;
- figure 5 and 6 show a section of the sprinkling device.

[0019] As said above, a first object of the present invention is a sprinkling device 1 for cleaning bottles in a bottle washing unit in which said bottles are moved by a conveyor through at least a washing zone, said sprinkling device 1 comprising a pressure pipe 2 in which a fluid flows, a rotating shaft 3 extending along the pressure pipe 2, and at least one sprinkling means comprised of

an aperture of the pressure pipe 2, a nozzle 4, positioned in said aperture, between said pressure pipe 2 and said rotating shaft 3, and at least one radial bore 5 in the rotating shaft 3, located at the level of the nozzle 4, for receiving the liquid from the nozzle 4.

[0020] The bottles are conveyed in the bottle washing unit thanks to a conveyor having pockets, each dedicated to receive a bottle. Bottles are arranged aside each other, along a transversal direction 13, perpendicular to the direction of the movement of the conveyor in the washing unit. The rotating shaft 3 extends on the top of the pressure pipe 2, at a little distance thereof, and is parallel to said pipe 2. The liquid is fed to the pressure pipe 2, and flows in it. This liquid can be a rinsing liquid, a cleaning liquid, with or without chemical agents like detergents, etc. The pressure pipe 2 has at least one aperture in its top surface, and a nozzle 4 is inserted in each said aperture, between the pressure pipe 2 and the rotating shaft 3, for leading the liquid out of the pressure pipe 2, thanks to the central hole 9 of said nozzle 4.

[0021] The sprinkling device 1 is to spray liquid onto the bottles. For this purpose, the rotating shaft 3 is provided with radial bores 5, at the level of the nozzle 4. When the radial bore 5 faces the top end of the nozzle 4, the cleaning or rinsing liquid, under pressure in the pressure pipe 2, flows through the central hole 9 of the nozzle 4, through the radial bore 5, and is projected onto the bottle.

[0022] According to the invention, the top end 6 of the at least one nozzle 4 and the rotating shaft 3 located thereon have globally complementary shapes, said top end 6 being provided with a clearance zone 7 at the interface with the rotating shaft 3, so that a portion of the top end 6 surface does not come into contact with the rotating shaft 3, for allowing a free flow of liquid between the rotating shaft 3 and the nozzle 4 at the top end 6 thereof.

[0023] The rotating shaft 3 lies on the top end 6 of the nozzle 4, and rotates in it. Therefore, at least a part of the top end 6 of the nozzle 4 is a cylindrical concavity, complementary to the circular rotating shaft 3. The fact that the shapes are complementary allows the rotating shaft 3 to be supported on the nozzle 4 and freely rotate on it.

[0024] Despite the fact that the top end 6 has an overall cylindrical concave shape, a certain zone of it is further offset, so that channels are created between the rotating shaft 3 and the nozzle 4, named clearance zone 7. This offset can be for example of a couple of millimeters, and in any case, of a high enough value for obtaining of free flow of liquid, even of a dirty liquid with solid particles like sand. This clearance zone 7 reaches the side periphery of the nozzle 4, in order to allow liquid to flow out from the top end 6. The cylindrical concavity of the top end 6, on which the rotating shaft 3 rests, can be obtained with curved surfaces or only supporting points. It is understood that, for tightness purposes, the mouth of the central hole 9 is part of the cylindrical concavity, so as to

reach a good contact between the nozzle 4 and the rotating shaft 3, avoiding any leakage. The contact surface of said mouth can be reduced down to a minimum value, contributing to reducing its friction wear and maintaining water tightness for a longer time.

[0025] Having a mouth surface of a reduced contact area with the rotating shaft 3 also reduces the tangential friction forces, which otherwise tend to create an inclination of the nozzle 4, leading to liquid leakages.

[0026] Thanks to the clearance zone 7, created by the offset zone of the concave cylindrical portion of the top end 6, liquid and particles are not stuck between the rotating shaft 3 and the nozzle 4, but can easily flow out of the interface zone between them. The damages to which the nozzle 4 and the rotating shaft 3 are subjected because of particles between them are then removed from the hydraulic seal area, between the mouth of the central hole 9 and the rotating shaft 3. As will be described later on, the flow of particles is also made easier by the fact that the supporting pillars 10 are far away from the mouth of the central hole 9.

[0027] According to another possible feature, the at least one nozzle 4 comprises a support base 8, resting on the pressure pipe 2. This allows a proper stand and stable position of the nozzle 4 on the pressure pipe 2. The interaction between the pressure pipe 2 and the nozzle 4 is achieved at the level of said support base 8. This support base 8 extends from the bottom of the nozzle 4, but does not reach the rotating shaft 3, for the purposes of obtaining a clearance zone 7, see figures 4 and 5. As already introduced, in some embodiments, the at least one nozzle 4 comprises a central hole 9, through which the liquid flows from the pressure pipe 2 to the rotating shaft 3, as well as pillars 10, located around said central hole 9, for contacting the rotating shaft 3. The cylindrical concavity of the top end 6 of the nozzle 4 is therefore achieved by, on the one hand, the mouth of the central hole 9, and, on the other hand, the ends of the pillars 10. The clearance zone 7 is obtained between said pillars 10, as well as between the mouth of the central hole 9 and each pillar 10.

[0028] The pillars 10 create the required guidance and mechanical support for the rotating shaft 3. The rotating shaft 3 is urged against the nozzle 4, and the corresponding force is mainly supported by said pillars 10, thereby reducing the friction force and corresponding wear at the mouth of the central hole 9, corresponding to the zone of required liquid tightness. The two functions, liquid flowing to the rotating shaft 3 and rotating shaft 3 mechanical supporting, are well separated in space and achieved by different elements: the central hole 9 and corresponding mouth on one side, and the pillars 10 on the other side. This helps in limiting the wear of the nozzle 4 in the water tight requirements area.

[0029] According to another possible feature, the nozzle 4 is sloped from the central hole 9 to the support base 8, preferably from the top mouth of the central hole 9 down to the periphery of the support base 8. This slope

extends from the mouth of the central hole 9, at the top end 6 of the nozzle 4, from the circumference thereof. This slope reaches the periphery of the support base 8 and contributes to the easy flush of dirt or liquid with wearing particles which can otherwise stay between the nozzle 4 and the rotating shaft 3. This slope forms a part of the bottom of the clearance zone 7. Particles and liquid can easily flow off the interaction zone between the nozzle 4 and the rotating shaft 3, thanks to this slope.

[0030] According to another possible feature, the at least one nozzle 4 comprises four pillars 10 located at the corners of a rectangular configuration, the central hole 9 being approximately located at the center of said rectangular configuration. Furthermore, in some embodiments, the rectangular configuration of the four pillars 10 has a long pair of sides, extending along the direction of the axle of the rotating shaft 3, i.e. along the transversal direction 13.

[0031] The rotating shaft 3 can therefore be supported and even urged against the nozzle 4, because the contact force will be mainly driven by the pillars 10. It is necessary to have a certain force between the nozzle 4 and the rotating shaft 3, for ensuring a good guiding of the rotating shaft 3. According to said feature, this force is mainly exerted by the pillars 10, thereby reducing the friction at the level of the mouth of the central hole 9. The top of the pillars 10 has a curved shape corresponding to the cylindrical shape of the rotating shaft 3, thereby improving the quality of the contact with the nozzle 4. The ends of the pillars 10 are part of the cylindrical concave shape of the top end 6 of the nozzle 4, complementary to the cylindrical shape of the rotating shaft 3.

[0032] The fact that the distance between pillars 10 is higher in the transversal direction 13 than in its perpendicular direction leads to a better guiding of the rotating shaft 3, and also a better flow of material between the nozzle 4 and the rotating shaft 3. Due to the circular section of the rotating shaft 3, it is better to have a limited distance between pillars 10 in a direction perpendicular to the transversal direction 13, in order to have a better support from the pillars 10.

[0033] In some embodiments, wear indicating notches 11 are provided at the end of the pillars 10. Preferably, the notch 11 of one pillar 10 differs from the notch 11 of at least another pillar 10, so that it is possible to see the evolution of the wear.

[0034] According to another possible additional feature, the rotating shaft 3, on the one side, and both the top end of the pillars 10 and the top end of the central hole 9, on the other side, are of a complementary shape, a liquid passage of the clearance zone 7 being provided under the rotating shaft 3, between each pillar 10 and the central hole 9. The portion of the top end 6 of the nozzle 4 which is entirely complementary to the rotating shaft 3 is therefore composed of both the end of the central hole 9, i.e. its mouth, and the ends of the pillars 10. This is the portion in contact with the rotating shaft 3. Due to the clearance zone 7, the rest of the top end 6 is offset

from the rotating shaft 3 when it rests on the nozzle 4, allowing fluid and particles flow, as already explained. The lips of the mouth of the central hole 9 are brought to a minimum thickness, as it is dedicated to the liquid tightness only, the contact force being mainly exerted on the supporting pillars 10.

[0035] Furthermore, according to another possible additional feature, the pillars 10 extend from the support base 8. This means that the walls of the central hole 9 extend approximately from the center of the support base 8, and the pillars 10 extend approximately from the corners of a rectangle in said support base 8. Therefore, the nozzle 4 has a sort of cone, the top of which being formed by the mouth of the central hole 9, and the pillars 10 extending from the periphery of said cone.

[0036] A second object of the present invention is a washing unit, for washing empty containers for liquid, like bottles or flasks, comprising a washing tunnel, in which containers are conveyed line by line in a conveying direction by an internal conveying means for being cleaned and further rinsed. Bottles are conveyed upside down on said conveying means, which moves through the washing tunnel, in a direction which is perpendicular to the transversal direction 13.

[0037] According to this invention, the washing unit comprises, in the washing tunnel, at least one sprinkling device 1 as described before, for spraying a liquid, the rotating shaft 3 being transversal to the conveying direction, the washing unit further comprising means for synchronizing the rotation of the rotating shaft 3 to the movement of the internal conveying means, for example a mechanical cam 12. This mechanical cam is engaged by the conveying means and guarantees the coordination of the angle of the radial bore 5 of the rotating shaft 3, to make sure that the liquid, coming from the pressure pipe 2, is correctly directed onto the bottles. The rotating shaft 3 rotates on the nozzles 4, to the extent the conveying means is moving.

[0038] In the embodiment shown in the attached drawings, the sprinkling device 1 is mounted in a tunnel for cleaning and further rinsing bottles with jets of water or other liquid. The sprinkling device 1 is mounted underneath the bottles and liquid is sprayed upwardly. The bottles are positioned upside down, in a conveyor, which moves them along the tunnel cleaning and rinsing zones. The conveyor moves products in a longitudinal direction, and bottles are arranged in rows, extending in a transversal direction 13, which is perpendicular to said longitudinal direction.

[0039] The sprinkling device 1 is located in a cleaning or a rinsing zone, and sprays a liquid on or in the bottles. This liquid can serve as a cleaning liquid or as a rinsing liquid.

[0040] The sprinkling device 1 comprises a pressure pipe 2 in which the liquid is received from an external tank. The liquid is under pressure in said pressure pipe 2 so that the liquid will flow out of the pressure pipe 2 through any existing hole. The pressure pipe 2 extends

parallel to the transversal direction 13, for treating simultaneously each and every product of a row. The pressure pipe 2 can have a rectangular or circular base shape.

[0041] As can be seen from figure 1, the sprinkling device 1 is provided with a set of nozzle 4, positioned on the top surface of the pressure pipe 2. The pressure pipe 2 has a set of apertures, located next to each other in the transversal direction 13. Each nozzle 4 is inserted in one aperture, in a liquid tight relation, thanks to an o-ring seal, as seen in figures 4 and 5. The nozzle 4 has a support base 8 which rests on the external surface of the pressure pipe 2 and is therefore of a corresponding shape, preferably flat. Figure 5 shows a flat top surface of the pressure pipe 2, corresponding to a flat bottom surface of the support base 8.

[0042] The nozzle 4 and the aperture preferably have a corresponding circular shape, with a central symmetry axis. A seal is provided between the nozzle 4 and the pressure pipe 2, preferably as an O-ring.

[0043] The nozzle 4 has a central hole 9, in which the liquid flows out from the pressure pipe 2. As can be seen, the sprinkling device 1 also has a rotating shaft 3, parallel to the pressure pipe 2 and therefore extending along the transversal direction 13. This rotating shaft 3 has a circular shape and is fixed to the pressure pipe 2 by a set of clamps 14, allowing a free rotation of the rotating shaft 3.

[0044] The rotating shaft 3 has a set of radial bores 5, through which liquid flows from one end to the other. Thanks to these radial bores 5 the liquid can go through the rotating shaft 3. The rotating shaft 3 is positioned so that the open end of each radial bore 5 can face the open end of the central hole 9 of the nozzle 4.

[0045] The rotating shaft 3 is moved for a rotation to its own axis, corresponding to a rotation around the transversal direction 13. When the rotation of the rotating shaft 3 is such that an open end of the radial bore 5 faces the open end of the central hole 9 of the corresponding nozzle 4, the liquid under pressure in the pressure pipe 2 can flow through the nozzle 4 and then through the radial bore 5, to the opposite end of said radial bore 5. The liquid is then sprayed to the bottle.

[0046] A mechanical cam 12 is provided at an end of the rotating shaft 3, said cam 12 being engaged directly or indirectly by the conveyor, in order to ensure that the liquid jet, coming from the radial bore 5 and directed thereby, reaches the bottles moved by said conveyor.

[0047] It is understood that the nozzles 4 are blocked between, on the one hand, the pressure pipe 2, and, on the other hand, the rotating shaft 3. The top end of the nozzles 4 is therefore adapted to the rotating shaft 3. The end surface of the nozzles 4 is then of a circular profile, at least for a part of its geometry.

[0048] The fact that the shape of the end of the nozzle 4 and the shape of the rotating shaft 3 are complementary helps in maintaining the position of the rotating shaft 3 along a predefined axis, and also in avoiding liquid leakages.

[0049] As best seen in figures 4 and 5, it is proposed that the top end of the nozzle 4 is provided with a clearance zone 7, in order to allow a liquid flow between the nozzle 4 and the rotating shaft 3. The bottom of the clearance zone 7 is offset from the rotating shaft 3, the rest of the top end 6 being in contact with the rotating shaft 3.

[0050] In other words, the top end of the nozzle 4 has two functional areas. First, a portion of the end of the nozzle 4 creates the mouth of the central hole 9, with a limited contact surface with the rotating shaft 3. This portion mainly ensures the liquid tightness with the rotating shaft 3. Second, another portion of the end of the nozzle 4 creates the mechanical support and positioning of the rotating shaft 3. The ends of these two portions are complementary to the rotating shaft 3. The shape of the rest of the end of the nozzle 4 has an offset to the rotating shaft 3, thereby creating the clearance zone 7. This clearance zone 7 forms a gap between the rotating shaft 3 and the nozzle 4 material, through which liquid can flow, thereby allowing solid particles to flow and avoiding obstruction and blockages, which would lead to excessive wear.

[0051] It should be noted here that the pressurized liquid inside the pressure pipe 2 creates a force pressing the nozzle 4 against the rotating shaft 3. This contributes to the stability of the sprinkling device 1 and to the proper guiding of the rotating shaft 3.

[0052] The main function of the mouth of the central hole 9 is therefore linked to liquid tightness and its surface contacting the rotating shaft 3 can be reduced, thereby facilitating the flow of liquid with solid particles. The mechanical function of the nozzle 4 is mainly not performed by the mouth of the central hole 9, but by another dedicated portion, which can then be sized for this mechanical function.

[0053] The ability, provided by the clearance zone 7, for the liquid to easily flow around the mouth reduces its wear, thereby improving the tightness over time. Also, the mechanical pressure needed to obtain a proper guiding of the rotating shaft 3 does not apply to the mouth area, further contributing to reduce the friction wear.

[0054] As can be seen from figure 2, the nozzle 4 has, at a certain distance from the central hole 9, supporting pillars 10 dedicated to the mechanical pressure to be exerted on the rotating shaft 3. The pressure of the liquid inside the pressure pipe 2 urges the nozzle 4 against the rotating shaft 3. The wear of the nozzle 4 is directly linked to the contact pressure between the nozzle 4 and the rotating shaft 3. It is proposed that the contact pressure between the nozzle 4 and the rotating shaft 3 is mainly concentrated on a portion of the top end of the nozzle 4 which is in fact dedicated to bearing this pressure and the corresponding friction. The top end of the nozzle 4 therefore has one pressure portion exerting pressure on the rotating shaft 3, and one tightness portion dedicated to the liquid tightness, passages being provided by the clearance zone 7 between said rotating shaft 3, and, on the one hand, the pressure portion, and, on the other

hand, the tightness portion.

[0055] The pressure portion is formed by a set of pillars 10, extending parallel to the central hole 9, from the support base 8. The shape of the top end of these pillars 10 is complementary to the circular rotating shaft 3. Therefore, the top end of a pillar 10 has a circular shape, fitting the shape of the rotating shaft 3. As the contact force is concentrated on said pillars 10, the wear is also concentrated on said pillars 10 and not at the mouth of the central hole 9.

[0056] The nozzle 4 preferably has four pillars 10, positioned with a rectangular configuration around the central hole 9. The central hole 9 is then approximately at the center of this rectangle. Preferably, the distance between two pillars 10 in the transversal direction 13 is higher than the distance between two pillars 10 in the perpendicular direction. With such a configuration, it is possible to have a satisfying space between the central hole 9 and each pillar 10, so that obstruction can be avoided between them.

[0057] Figure 3 shows that the pillars 10 are provided with notches 11 near their top end surface, normally in contact with the rotating shaft 3. These notches 11 help in assessing the wear of the pillars 10. The distance between the top surface and the notches 11 represents the level of wear. Ideally, the distance between the notch 11 and the top surface of one pillar 10 differs with the distance between the notch 11 and the top surface of at least another pillar 10. The level of wear can then be assessed by an easier comparison of the size of the notches, or by the number of notches 11 which are still visible.

[0058] As already explained, the risks of leakages due to the wear created by the rotation of the rotating shaft 3 in the nozzle 4 are reduced, on the one hand, thanks to the reduction of the contact pressure at the level of the central hole 9, and, on the other hand, thanks to the clearance zone 7, preventing solid particles from being blocked between the nozzle 4 and the rotating shaft 3.

[0059] The clearance zone 7 provided at the end of the nozzle 4 creates a passage for liquid and particles between the rotating shaft 3 and the nozzle 4 material. This flow is further enhanced by a slope on the nozzle 4 from the top end of the central hole 9 to the support base 8. The mouth of the central hole 9 is offset to the bottom of the support base 8, in the direction of the rotating shaft 3, and the nozzle 4 has a descending slope between said mouth and the periphery of the support base 8. Any particle, dirt, or even liquid, therefore tends to flow away from the mouth of the central hole 9, which is a sensitive area, the wear of which is directly influencing the liquid tightness.

[0060] While specific embodiments of the invention have been described in detail, it will be appreciated by those skilled in the art that various modifications and alternatives to those details, in addition to those discussed above, could be developed in light of the overall teachings of the disclosure. Accordingly, the particular arrange-

ments disclosed are meant to be illustrative only, and not limiting as to the scope of the invention which is to be given the full breadth of the claims appended in any and all equivalents thereof, including any combination of their features.

Claims

1. Sprinkling device (1) for cleaning bottles in a bottle washing unit in which said bottles are moved by a conveyor through at least a washing zone, said sprinkling device (1) comprising a pressure pipe (2) in which a fluid flows, a rotating shaft (3) extending along the pressure pipe (2), and at least one sprinkling means comprised of an aperture of the pressure pipe (2), a nozzle (4), positioned in said aperture, between said pressure pipe (2) and said rotating shaft (3), and at least one radial bore (5) in the rotating shaft (3), located at the level of the nozzle (4), for receiving the liquid from the nozzle (4),
characterized in that
the top end (6) of the at least one nozzle (4) and the rotating shaft (3) located thereon have globally complementary shapes, said top end (6) being provided with a clearance zone (7) at the interface with the rotating shaft (3), so that a portion of the top end (6) surface does not come into contact with the rotating shaft (3).
2. Sprinkling device (1) according to claim 1, wherein the at least one nozzle (4) comprises a support base (8), resting on the pressure pipe (2).
3. Sprinkling device (1) according to any of claims 1 to 2, wherein
the at least one nozzle (4) comprises a central hole (9), through which the liquid flows from the pressure pipe (2) to the rotating shaft (3), as well as pillars (10), located around said central hole (9), for contacting the rotating shaft (3).
4. Sprinkling device (1) according to both claim 2 and claim 3, wherein
the nozzle (4) is sloped from the central hole (9) to the support base (8), preferably from the top mouth of the central hole (9) down to the periphery of the support base (8).
5. Sprinkling device (1) according to any of claims 3 to 4, wherein
the at least one nozzle (4) comprises four pillars (10) located at the corners of a rectangular configuration, the central hole (9) being approximately located at the center of said rectangular configuration.
6. Sprinkling device (1) according to claim 5, wherein the rectangular configuration of the four pillars (10)

has a long pair of sides, extending along the direction of the axle of the rotating shaft (3).

7. Sprinkling device (1) according to any of claims 3 to 6, wherein
wear indicating notches (11) are provided at the end of the pillars (10). 5

8. Sprinkling device (1) according to any of claims 3 to 7, wherein
the rotating shaft (3), on the one side, and both the top end of the pillars (10) and the top end of the central hole (9), on the other side, are of a complementary shape, a liquid passage of the clearance zone (7) being provided under the rotating shaft (3), between each pillar (10) and the central hole (9). 10 15

9. Sprinkling device (1) according to claim 2 and any of claims 3 to 8, wherein
the pillars (10) extend from the support base (8). 20

10. Washing unit, for washing empty containers for liquid, like bottles or flasks, comprising a washing tunnel, in which containers are conveyed line by line in a conveying direction by an internal conveying means for being cleaned and further rinsed, 25
characterized in that
the washing unit comprises, in the washing tunnel, at least one sprinkling device (1) according to any of claims 1 to 9, for spraying a liquid, the rotating shaft (3) being transversal to the conveying direction, the washing unit further comprising means for synchronizing the rotation of the rotating shaft (3) to the movement of the internal conveying means. 30 35

40

45

50

55

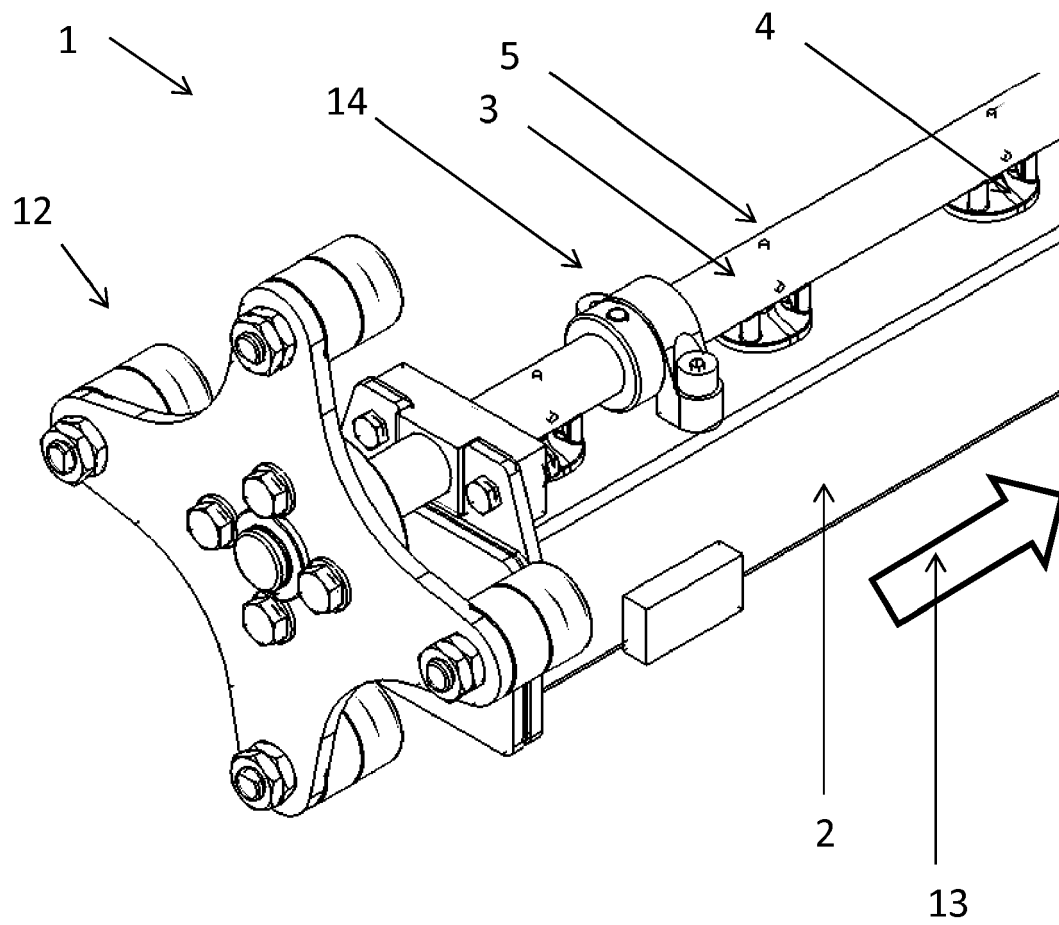


Fig. 1

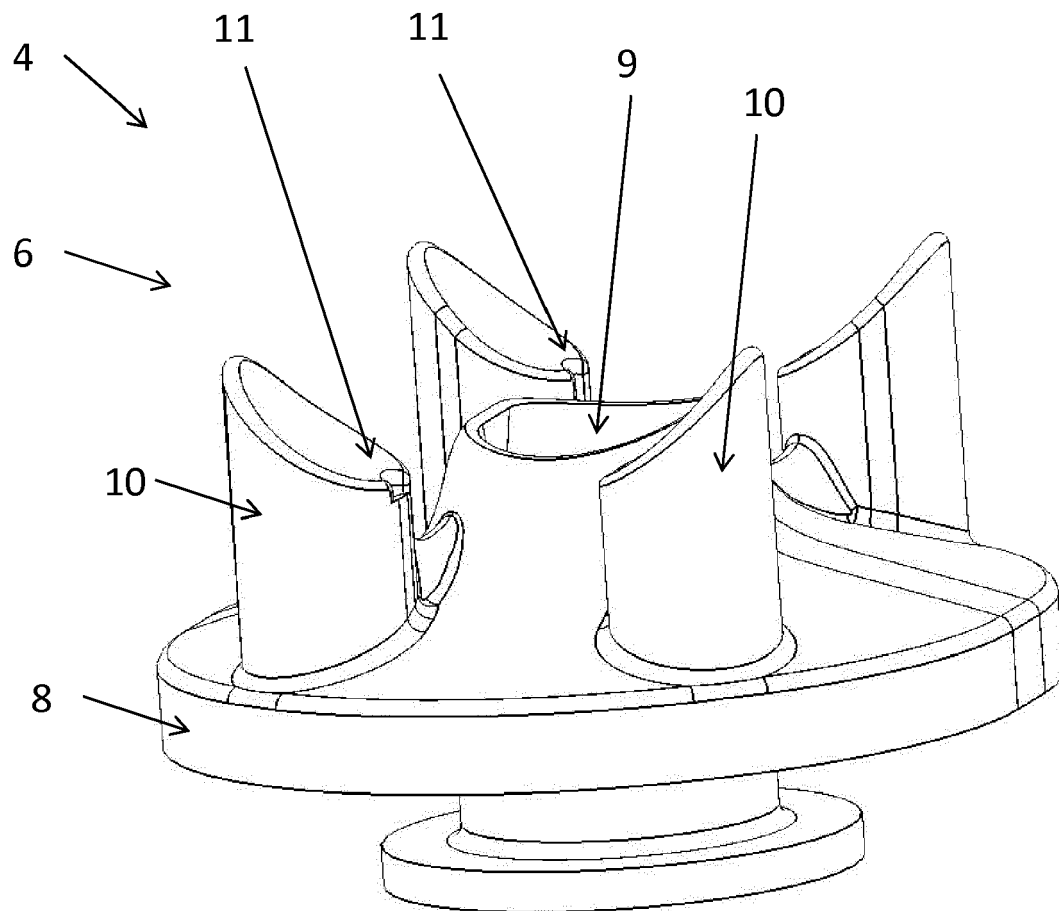


Fig. 2

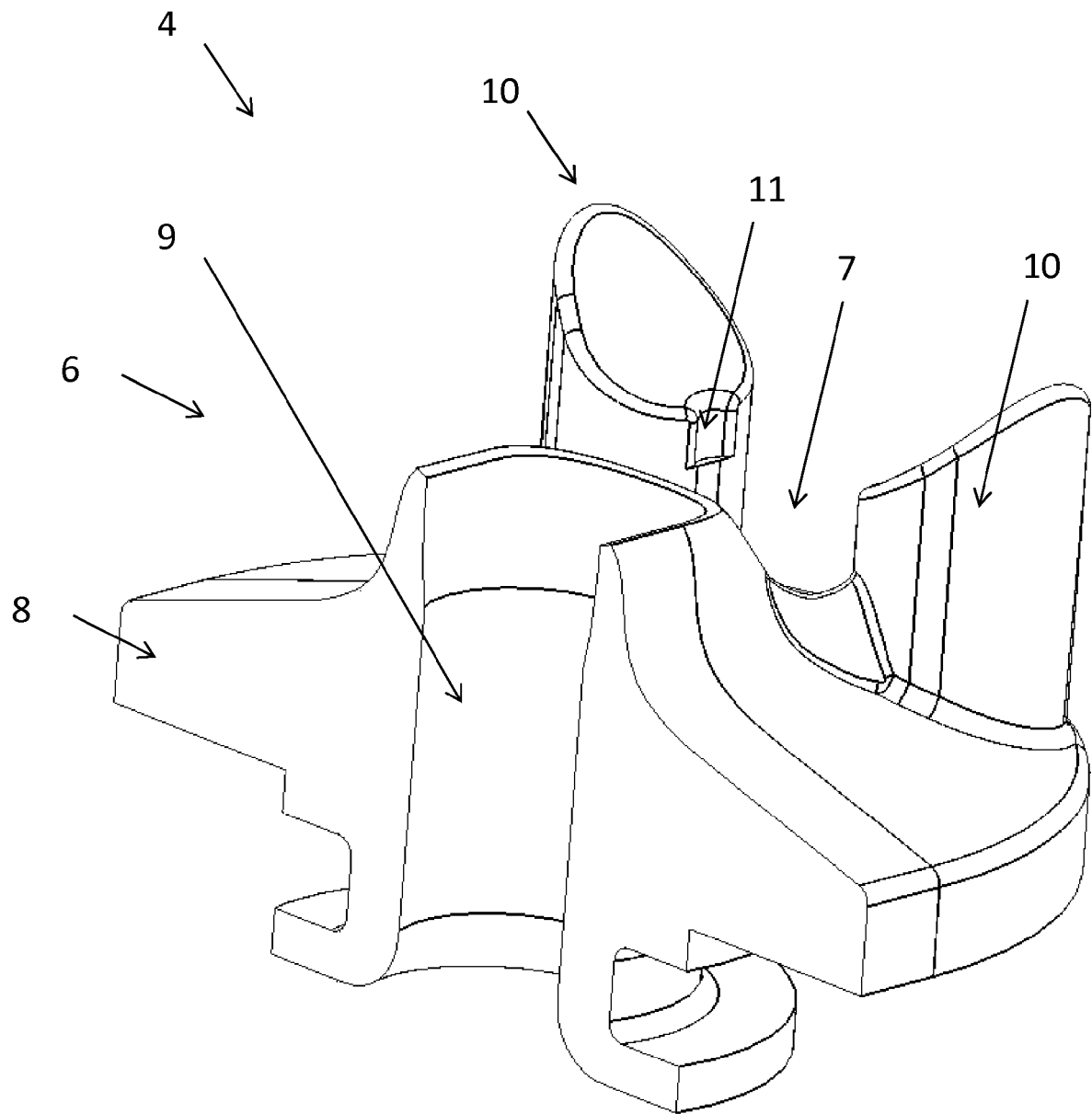


Fig. 3

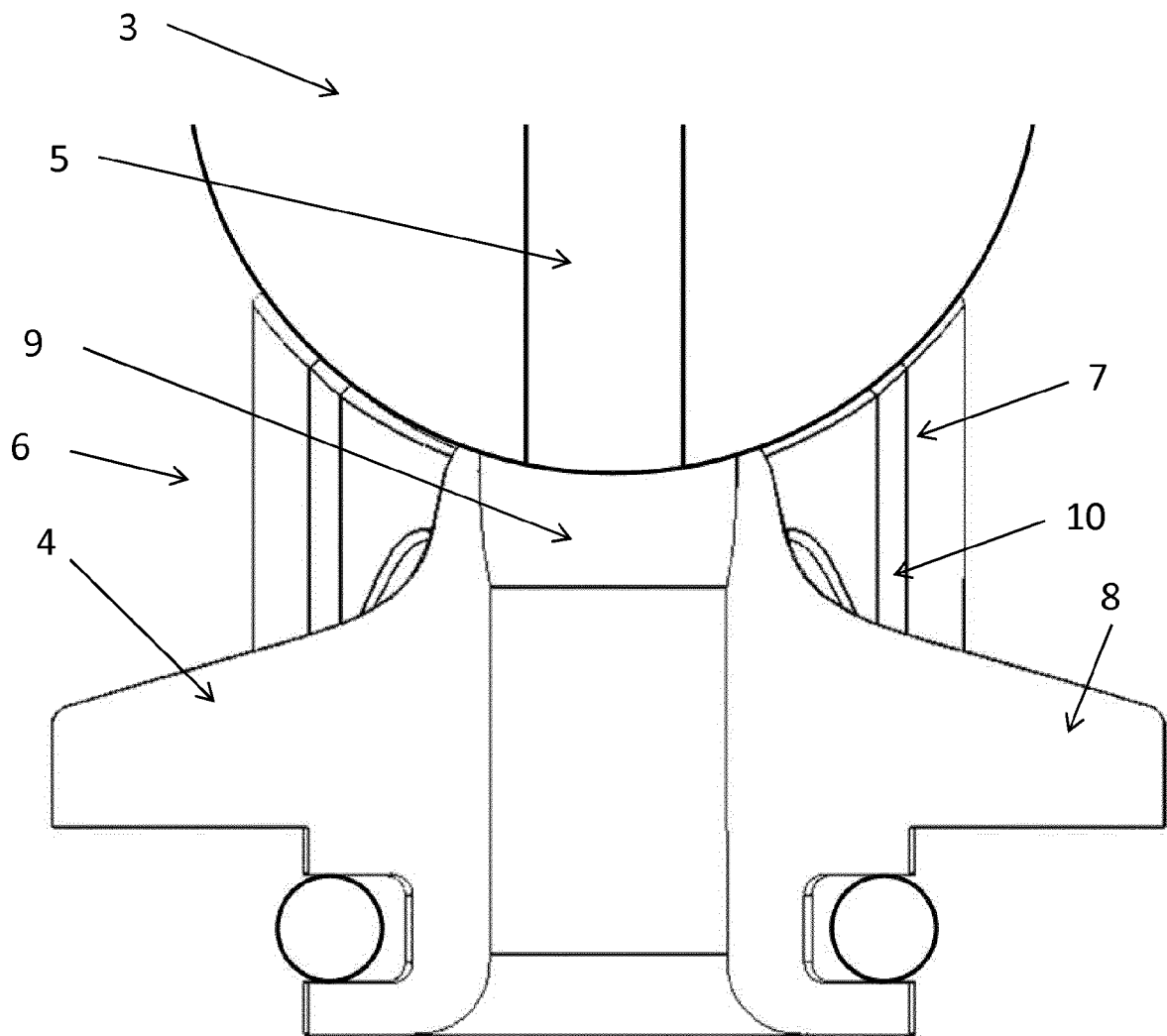


Fig. 4

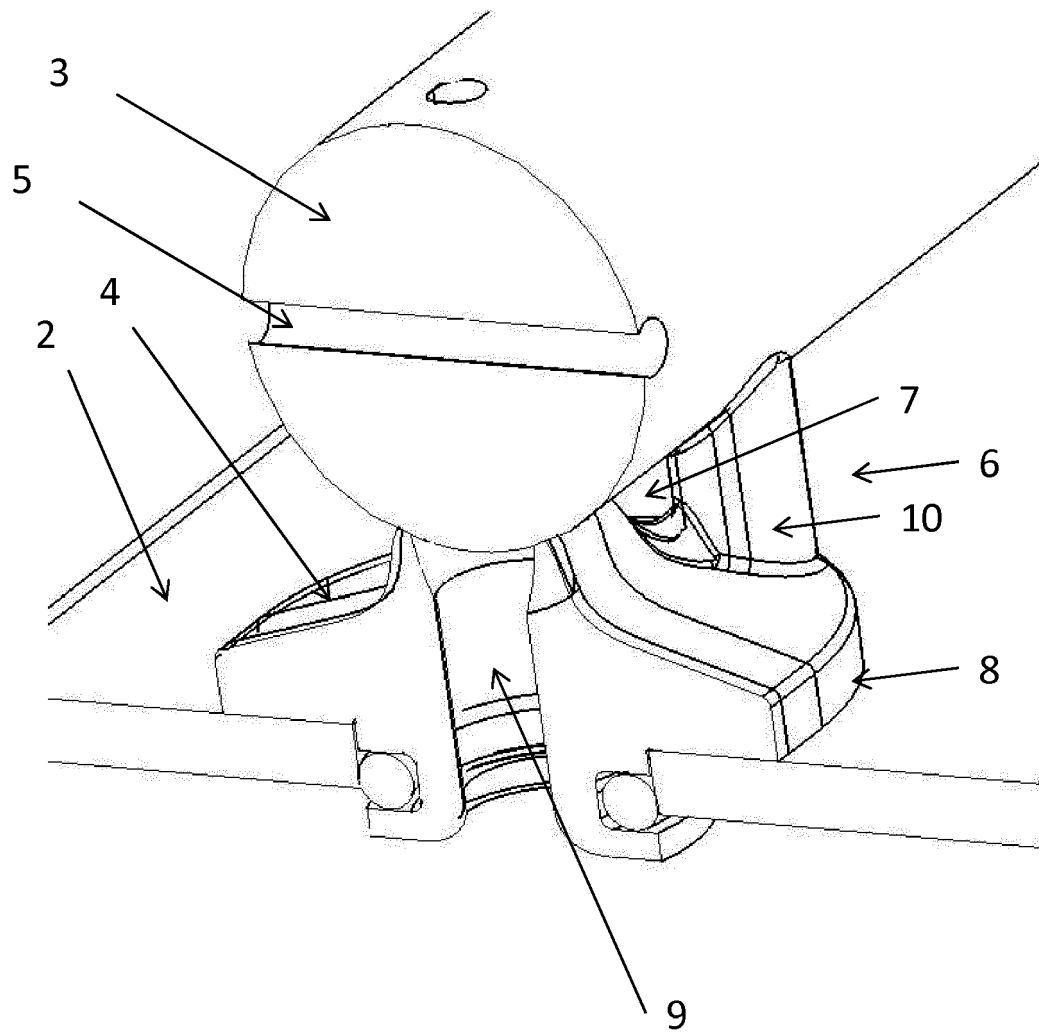


Fig. 5

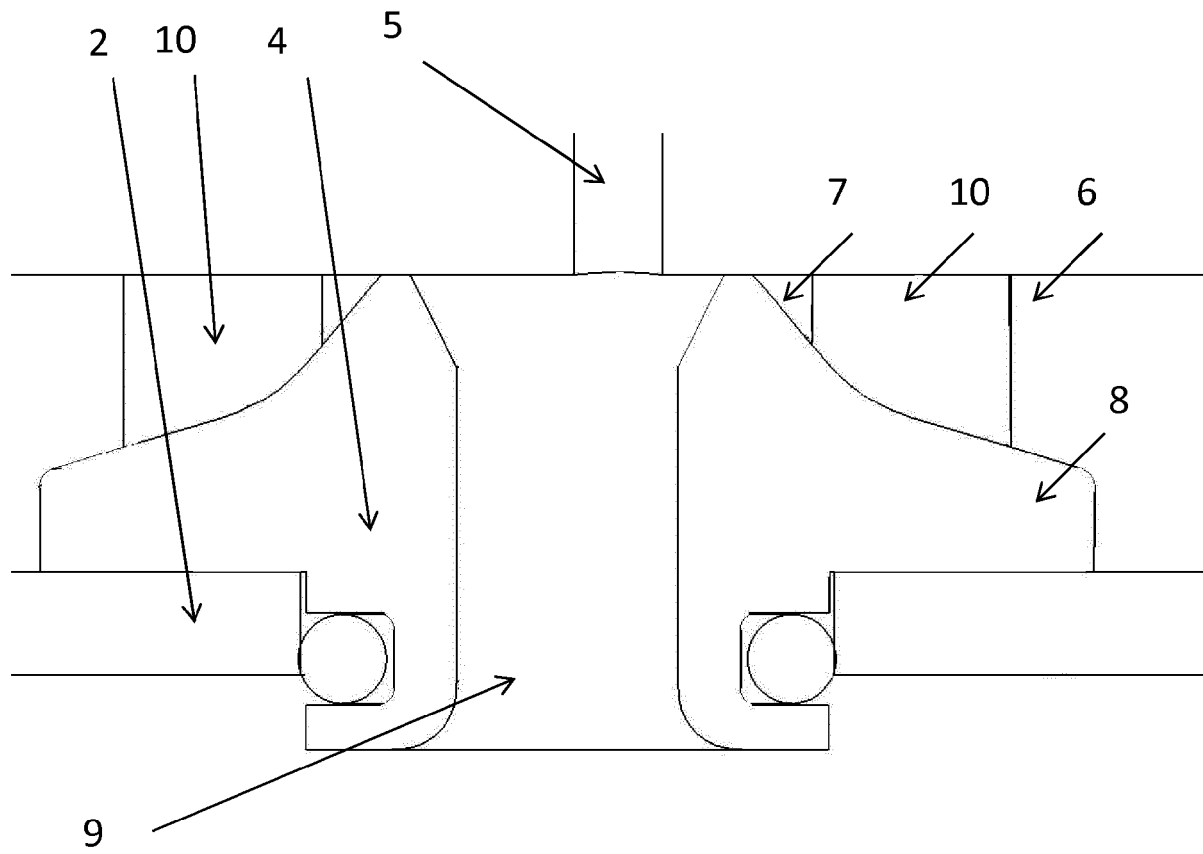


Fig. 6



EUROPEAN SEARCH REPORT

Application Number
EP 15 17 9125

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 2 724 793 A1 (SIDEL SPA CON SOCIO UNICO [IT]) 30 April 2014 (2014-04-30) * paragraph [0004] - paragraph [0012] * * paragraph [0018] - paragraph [0038]; claims 1-7; figures 1-3 *	1-10	INV. B08B9/34 B05B15/06
A,D	EP 1 728 565 A2 (BARDI S R L R [IT]) 6 December 2006 (2006-12-06) * paragraph [0002] - paragraph [0008] * * paragraph [0018] - paragraph [0022]; claim 1; figures 1-3 *	1-10	
			TECHNICAL FIELDS SEARCHED (IPC)
			B08B B05B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 30 November 2015	Examiner Lang, Xavier
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

 3
EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 17 9125

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

30-11-2015

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
	EP 2724793	A1	30-04-2014	NONE

15	EP 1728565	A2	06-12-2006	NONE

20				
25				
30				
35				
40				
45				
50				
55				

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 5092356 A [0006]
- EP 1728565 A [0007]
- DE 4216665 [0008]
- DE 10315866 [0009]