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Description

Field of invention

[0001] This disclosure relates to a water boiler and in particular to the type of water boiler that is installed under a counter and provides an instantaneous heating of water through activation of a heating element within the boiler.

Background art

[0002] Water boilers and water heaters are well known to provide hot water. It is known to provide point of use water boilers to provide a source of hot water at a sink and known boilers include those that include a heating element and that is located under the sink or counter where the hot water is required. Such water boilers typically comprise a receptacle or water container into which cold water is introduced. The container comprises a heating element which when activated heats the water prior to it being dispensed through an outlet located over the counter.

[0003] In a manner similar to kettles or other point of use water boilers, such known boilers suffer from lime-scale formation on the inner surface of the water container, in particular on the heating element, which generally impairs the water quality and reduces the performance of the water boiler. Although such water boiler may have filter to stop the lime scale, it is important for the user of the water boiler to regularly clean the container. The cleaning is however a fastidious process.

[0004] There therefore continues to exist a need for improved water boilers.

Summary of the Invention

[0005] These and other needs are achieved by a water boiler in accordance with the present teaching. Such a boiler comprises a water container having side walls defining a sealed volume within which water may be received and heated, at least one of the side walls being removable to provide access to the volume, wherein the removable side wall is configured to receive and locate a heating element such that removal of the removable side wall effects a corresponding removal of the heating element, the heating element being a planar heating element extending substantially perpendicular to a major axis of the water container. In a preferred implementation the removable side wall defines the bottom surface of the container. Desirably the bottom surface is configured to receive and locate a heating element such that removal of the bottom surface effects a corresponding removal of the heating element. The heating element is desirably a planar heating element extending substantially parallel to a major axis of the removable side wall.

[0006] Advantageously, with a water boiler according to the present invention, once the removable side wall is removed, easy access to the volume of the water con-

tainer is provided, with the removal providing concurrent direct access to the heating element seated on the removable side wall of the water container, thereby greatly facilitating the cleaning of lime-scale deposited on the inner surface of the water container and the heating element. Part or all of the heating element may have a surface treatment to delay the onset of lime deposits and generally reduce lime scale deposits build up.

[0007] In a further development of the invention, the heating element extends up to at least one side wall of the water container.

[0008] In a further development of the invention, the removable side wall comprises a spray valve for introducing water in the water container.

[0009] In a further development of the invention, the water container further comprises at least one insert portion of side walls arranged to be inserted between the removable side wall and a lateral side wall of the water container.

[0010] In addition, the water boiler according to the invention advantageously requires low energy input thereby allowing for domestic plug.

[0011] According to a second aspect of the present invention there is provided an under-counter water storage comprising a water boiler according to the present invention.

[0012] In a further development of the invention, the under-counter water storage comprises a faucet for dispensing heated water from the water container and arranged to control water introduction in the water container

Brief description of drawings

[0013] A specific implementation of the present invention will now be described, by way of example only, and with reference to the accompanying drawings in which:

Figure 1 is a cross-sectional perspective view of a water boiler according to an implementation of the present invention;

Figure 2 is a partial perspective view of the water boiler of figure 1;

Figure 3 is an enlarged view of a lower portion of the water boiler of figure 1;

Figure 4 is a cross-sectional perspective view of an upper portion of the water boiler of figure 1;

Figure 5 is an enlarged cross-sectional perspective view of an upper portion of the water boiler of figure 1;

Figure 6 is an enlarged cross-sectional perspective view of a connection of the first and second portions of the water container of the water boiler of figure 1.

Figure 7 is a schematic view of an under-counter

water storage comprising a water boiler according to the present invention.

Detailed description of preferred embodiment of the invention

[0014] Referring to figure 1 a water boiler 1 is provided comprising a water container 2 having side walls defining a sealed volume V, defined by an inner surface of the side walls, within which water may be received and heated, at least one of the side walls 3 being removable to provide access to the volume V. Preferably, as shown in Figure 1, the removable side wall 3 defines a bottom surface 3a of the water container 2 and the side walls of the water container 2 comprise at least one lateral side wall 4 and an upper side wall 5. As will be described in more detail below, the removable side wall 3 is removably attached to an end 4a of the lateral side wall 4 opposite the upper side wall. The water container 2 has a container major axis and the lateral side walls 4 extend along the container major axis. The removable side wall 3 has a major axis A that extends substantially perpendicular to the container major axis of the water container 2. Preferably, while the removable side wall 3 of the water container 2 is removable from the lateral side wall 4, the lateral side wall 4 and the upper side wall 5 may be rigidly assembled in a bell-like structure. Advantageously, the water container 2 is tightly sealed when the removable side wall 3 is attached to the lateral side wall 4.

[0015] It will be appreciated that, any descriptive or orientation terms used herein, such as "upper", "lower", "bottom", etc. are to be understood as being descriptive of relative positions of various components of the water boiler 1. In particular, the water boiler 1 has an operating position, shown in Figure 1, in which the water container 2 is orientated with the bottom surface 3a lower than the upper side wall 5. In the operating position of water boiler 1 shown in Figure 1, the container major axis of the water container 2 and the lateral side walls 4 are substantially vertical, the major axis A of the removable side wall 3 is substantially horizontal. Accordingly, any descriptive or orientation terms used herein, such as "upper", "lower", "bottom", etc. refer to the water boiler 1 in the operating position. However it is understood that the water container 2 may have a different orientation, for example where the bottom surface 3a is located above or at a similar level as the upper side wall 5, for example during a delivery or installation of the water boiler 1.

[0016] Water coming from an inlet pipe 6a may be introduced in the water container 2 by a valve 6 and as heated water generally rises in the water container, heated water may be drawn from a top output port 8 and flow through an outlet pipe 8a. Preferably the valve 6 is located in a lower portion of the water container 2, preferably disposed on the removable side wall 3. In an aspect, the top output port 8 may be plug in conventional pipe connections, for example ¼ inch pipe connections, to connect a conventional water circuit.

[0017] In the embodiment shown in Figure 1, the water container 2 has a lateral side wall 4 substantially forming a cylinder and having a generally circular cross-section. However, it is understood that the water container 2 may generally have any cross-sectional shape and a plurality of side walls, for example a rectangular or square cross section respectively forming a cuboid or cubic water container.

[0018] Preferably, the end 4a of the lateral side wall 4 of the water container 2 has a diameter, or generally a cross sectional size, that is sensibly the same as a maximal diameter, or cross sectional size, of the lateral side wall 4 of the water container 2, so as to provide an easy access to the volume V when the removal side wall 3 is removed. In another aspect, the water container 2 may have a tapered longitudinal shape or any cross-sectional shape arrange to allow an easy access to the volume V when the removable side wall 3 is removed.

[0019] According to the invention, the removable side wall 3 is configured to receive and locate a heating element 9 such that removal of the removable side wall 3 effects a corresponding removal of the heating element 9. Hence, advantageously, the removal of the removable side wall 3 provides a direct access to the heating element 9, for cleaning or maintenance purposes for example, in addition to the direct access to the volume V of the water container 2. In an aspect of the invention, the heating element 9 is a planar heating element extending substantially parallel to the major axis A of the removable side wall 3. The planar heating element 9 is therefore extending substantially perpendicular to the container major axis of the water container 2. In the operating position of water boiler 1 shown in Figure 1, the heating element 9 is substantially horizontal.

[0020] Preferably the heating element 9 extends at least on an inner surface 7 of the removable side wall 3 peripherally defined by the lateral side wall 4. Preferably the heating element 9 extends up to the lateral side wall 4 of the water container 2. As will be described in more detail with reference with Figure 3, the heating element 9 may extends laterally beyond the inner surface 7 of the removable side wall 3. The heating element 9 may be connected to the removable side wall 3 so as to cover the surface of the removable side wall 3 to obtain an even temperature on the heating element 9, for example by crimping, preferably brazing or welding.

[0021] The heater element 9 may be made of copper or stainless steel. Advantageously part or all of the heating element 9 may have a surface treatment arranged to delay the onset of lime deposits and/or reduce lime scale deposits build up in the water container 2, for example a resistive coating. The water container 2 is preferably made, at least on the inner surface thereof, of a material on which the deposit of lime scale is low, preferably plastic material.

[0022] Preferably the valve 6 is located on the planar heating element 9 so as to bring the incoming water on the heating element 9. Advantageously the valve 6 may

be a spray valve arranged to spray incoming water on the heating element 9 to achieve a rapid heating of the water and avoid mixing the incoming, preferably cold water, with heated water, preferably hot water, at the top of the water container 2. In a specific aspect, the spray valve 6 is located on a diameter of the circular removable side wall 3.

[0023] The water container 2 may further comprise a blind pipe 12 extending outside the water container 2, preferably centrally located on the removable side wall 3, the blind pipe 12 providing a lowest point of the water container 2 for draining purposes and collecting any debris or cleaning residuals present in the water.

[0024] As seen on Figures 1 and 6, the water boiler 1 may also comprise a safety valve 13 disposed on an upper part of the water boiler 1, preferably on the upper side wall 5 of the water container 2, for releasing any excess pressure in the water container 2. The safety valve 13 may thus evacuate steam and expansion water that may be produced when water is heated in the water container 2. The water container 2 may further comprise a thermal sensor 14 for measuring the water temperature in the water container 2, preferably at a lower level in the water container 2, preferably at a depth from the upper side wall 5 of a quarter of the water container 2 height as better seen on Figure 5, for an accurate measurement of the water temperature that may be used to activate water heating. The thermal sensor 14 may cause the heating element 9 to heat water when the water temperature drops under a predetermined temperature threshold.

[0025] According to an implementation and as shown on Figure 1, the water container 2 comprises an upper portion 2a, comprising a first section of the lateral side wall 4, and a lower portion 2b, comprising a second section of the lateral side wall 4, the upper and lower portions 2a, 2b being demountably linked together as will be described in relation with Figure 6. The water container 2 according to this implementation of the invention may thus be disassembled, by disassembling the removable side wall 3 from the water container 2 and/or the lower portion 2b from the upper portion 2a, for providing easy and direct access to the volume V, for example for cleaning and removal of lime scale deposition. Advantageously the water container 2 according to this implementation of the invention may be enlarged by inserting at least one insert portion of side walls (not shown) between the upper portion 2a and the lower portion 2b to allow for a larger volume of water to be stored in the enlarged water container 2.

[0026] In another implementation, the water container 2 may comprise the upper side wall 5 and the lateral side wall 4 integrally linked together, the upper portion 2a and lower portions 2b being formed in a single integral piece. The water container 2 according to this implementation of the invention may thus be disassembled by disassembling the removable side wall 3 from the lateral side wall 4 of the water container 2 for providing easy and direct

access to the volume V, for example for cleaning and removal of lime scale deposition.

[0027] Figure 2 shows an outside view of the water boiler 1 showing the upper and lower portions 2a, 2b of the water container 2 linked together and the removable side wall 3 linked to the second portion 2b.

[0028] Referring to Figure 3, there is shown the lateral side wall 4, having at the end 4a a first flange 15 extending from a bottom rim 16 of the lateral side wall 4, and a corresponding second flange 17 arranged to be fixed to the first flange 15 so as to attach the removable side wall 3 to the lateral side wall 4. Preferably the heating element 9 extends beyond the inner surface 7 of the removable side wall 3 and may be clamped by the first and second flanges 15, 17 to attach the removable side wall 3 to the lateral side wall 4. The first and second flanges 15, 17 may be held together by means of a plurality of fixing means 18, and a sealing gasket 19 interposed between the first and second flanges 15, 17 for a tight seal of the water container 2. The sealing gasket 19 may be located in a peripheral recess 20 of the first flange 15 the sealing gasket 19 may be resting on the heating element 9 to provide a tight seal of the water container 2.

[0029] Preferably, the heating element 9 may comprise a planar surface 10 extending on the inner surface 7 up to the lateral side wall 4 and a peripheral portion 11 forming a Z-shaped recess arranged to be interposed between the first and second flanges 15, 17 for a better sealing of the water container 2. More precisely the peripheral portion 11 has a first part of the Z arranged to rest on the inner surface 7, a middle part of the Z providing an abutment surface for the lateral side wall 4 and a last part of the Z being interposed between the first flange 15 and the second flange 17. This arrangement of the heating element 9 in a Z shape, in addition to providing a locking surface of the removable side wall 3 onto the lateral side wall 4, allows to isolate the sealing gasket 19 from the water contained in the water container 2 thereby protecting the sealing gasket 19.

[0030] On Figure 4 illustrates how the upper and lower portions 2a, 2b of the water container 2 may be linked together. In an implementation of the invention, the lateral side wall 4 of the upper portion 2a has a third flange 21 at a bottom rim 22 and the lateral side wall 4 of the lower portion 2b has a corresponding fourth flange 23 at an upper rim 24, the third and fourth flanges 21, 23 being held together by means of a plurality of fixing means 25, and a sealing gasket 26 interposed between the third and fourth flanges 21, 23. The sealing gasket 26 may be located in a peripheral recess 27 of the third flange 23.

[0031] Figure 5 shows the output port 8 located on the upper side wall 5 and comprising closing means 28 having a first position arranged to close the output port 8 (as better seen shown on Figure 6) and a second position arranged to open the output port 8 and release the heated water from the water container 2 (not shown). Preferably the pressure and the introduction of water in the water container 2 may activate the closing means. Operation

of the water boiler 1 according to the invention may be achieved via displacement of water in the water container 2. In operation, when the water container 2 is tightly sealed, water introduced in the water container 2 by the valve 6 is heated by the heating element 9, causing the pressure inside the water container 2 to rise and the closing element 28 to move from the first position into the second position thereby releasing water through the output port 8.

[0032] As illustrated in Figure 7, the water boiler 1 may advantageously be linked to an under-counter water storage 100. The under-counter water storage 100 generally comprises a faucet 101 for dispensing heated water from the water container 2 and arranged to control water introduction in the water container 2. The faucet 101 may be located at a sink 102 and linked to the water boiler 1 and to a water inlet pipe 103, leading for example from a main water supply, preferably from a cold main water supply.

[0033] More precisely the faucet 101 is connected to the water boiler 1 at the valve 6 via the inlet pipe 6a and at the output port 8 via the outlet pipe 8a for dispensing heated water, preferably hot water, from the water container 2.

[0034] In operation, when the faucet 101 is opened, the heating element 9 is activated and water is introduced in the water container 2 via the inlet pipe 6a through the valve 6 and directed on the heating element 9 where the water is heated. Advantageously the valve 6 sprays water on the heating element 9 to accelerate the heating. Advantageously the spraying of the water introduced in the water container 2 by the valve 6 reduces mixing the water introduced in the water container 2, which is preferably cold, with the already heated water contained in the water container 2. The water is subsequently heated causing the pressure in the water container 2 to rise. The introduction of water in the water container 2 and the rising of the pressure activate the closing means 4, thereby opening the output port 8 to dispense heated, preferably hot, water at the faucet 101. Thus, a user of the water boiler 1 arranged in the under-counter water storage 100 according to the invention obtains instantaneous heated or hot water by simply opening the faucet 101.

[0035] For cleaning the water container 2 and in particular the heating element 9, the user may disconnect the fixing means 18 to remove the removable side wall 3 from the lateral side wall 4, effecting a corresponding removal of the heating element 9.

[0036] Advantageously the safety valve 13 of the container heater 1 is connected to the sink 102 to evacuate in the sink 102 steam and water produced in the water container 2 when water is heated in the water container 2. In an aspect of the invention, the faucet 101 linked to the water boiler 1 may be a secondary tap provided at a sink or counter in addition to a conventional tap.

[0037] In another aspect of the invention, the faucet 101 linked to the water boiler 1 may be a 3-way faucet providing both a control of conventional cold and warm

water flows and a control over the flow of water heated by the water boiler 1 at a sink or counter.

[0038] In both cases, the opening of the faucet linked to the water boiler 1 allows water, preferably from a cold water mains, to be introduced into the water container 2, heated and distributed via displacement of water as previously explained.

[0039] Changes to the water boiler can be made in light of the above detailed description. In general, in the following claims, the terms used should not be construed to limit the invention to the specific embodiments disclosed in the specification and the claims, but should be construed to include all water boilers in accordance with the appended claims.

Claims

1. A water boiler (1) comprising a water container (2) having side walls defining a sealed volume (V) within which water may be received and heated, at least one of the side walls (3) being removable to provide access to the volume (V), wherein the removable side wall (3) is configured to receive and locate a heating element (9) such that removal of the removable side wall (3) effects a corresponding removal of the heating element (9), the heating element (9) being a planar heating element extending substantially perpendicular to a major axis of the water container (2).
2. The water boiler of claim 1, wherein the removable side wall (3) defines a bottom surface of the water container (2).
3. The water boiler of claim 1 or 2, wherein the planar heating element (9) extends substantially parallel to a major axis of the removable side wall (3).
4. The water boiler of any one of the preceding claims, wherein the heating element (9) extends up to at least one side wall (4) of the water container (2).
5. The water boiler of any one of the preceding claims, wherein the removable side wall (3) further comprises a spray valve (6) for introducing water in the water container (2).
6. The water boiler of any one of the preceding claims, wherein the water container (2) further comprises at least one insert portion of side walls arranged to be inserted between the removable side wall (3) and a lateral side wall (4) of the water container (2).
7. The water boiler of any one of the preceding claims, wherein the heating element (9) has a surface treatment arranged to reduce lime scale deposits.

8. An under-counter water storage (100) comprising a water boiler (1) as claimed in any one of the preceding claims.
9. The under-counter water storage of claim 8, further comprising a faucet (101) for dispensing heated water from the water container (2) and arranged to control water introduction in the water container (2).

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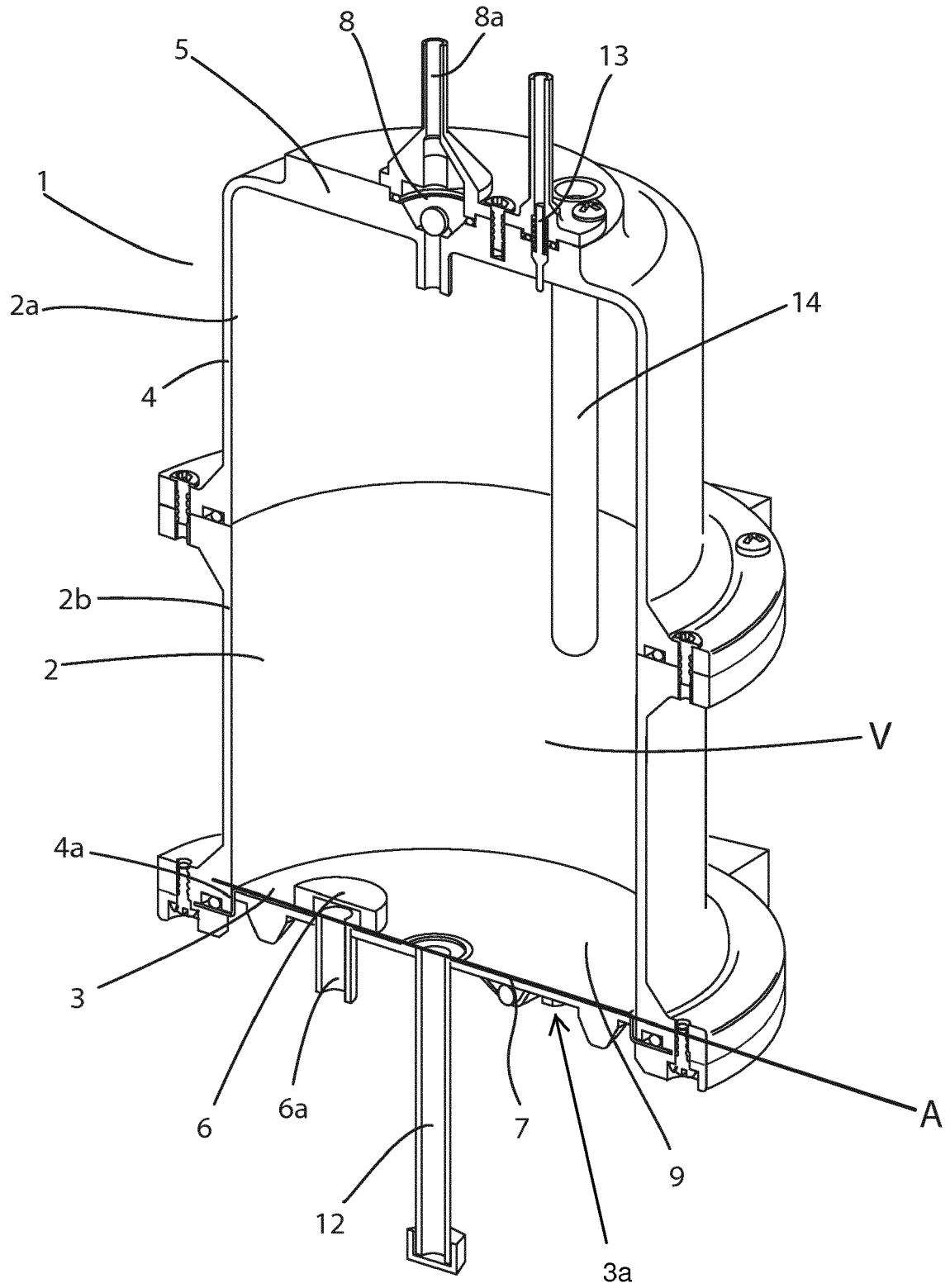


Figure 1

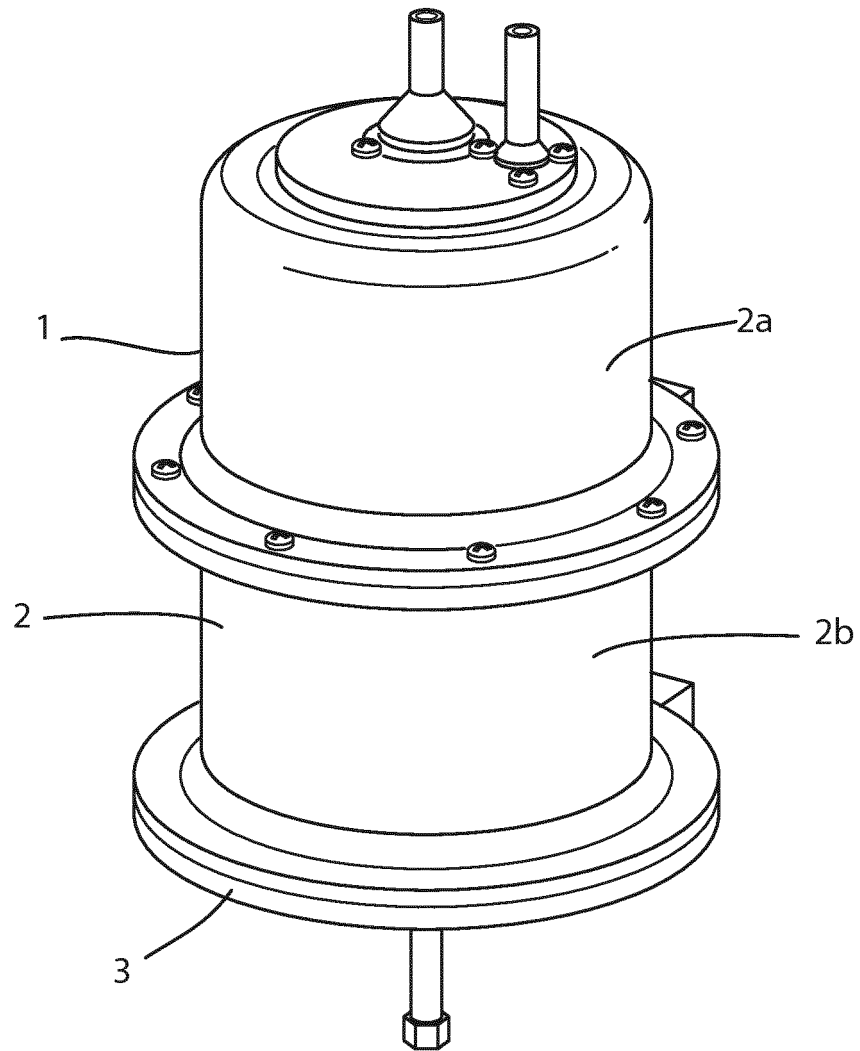


Figure 2

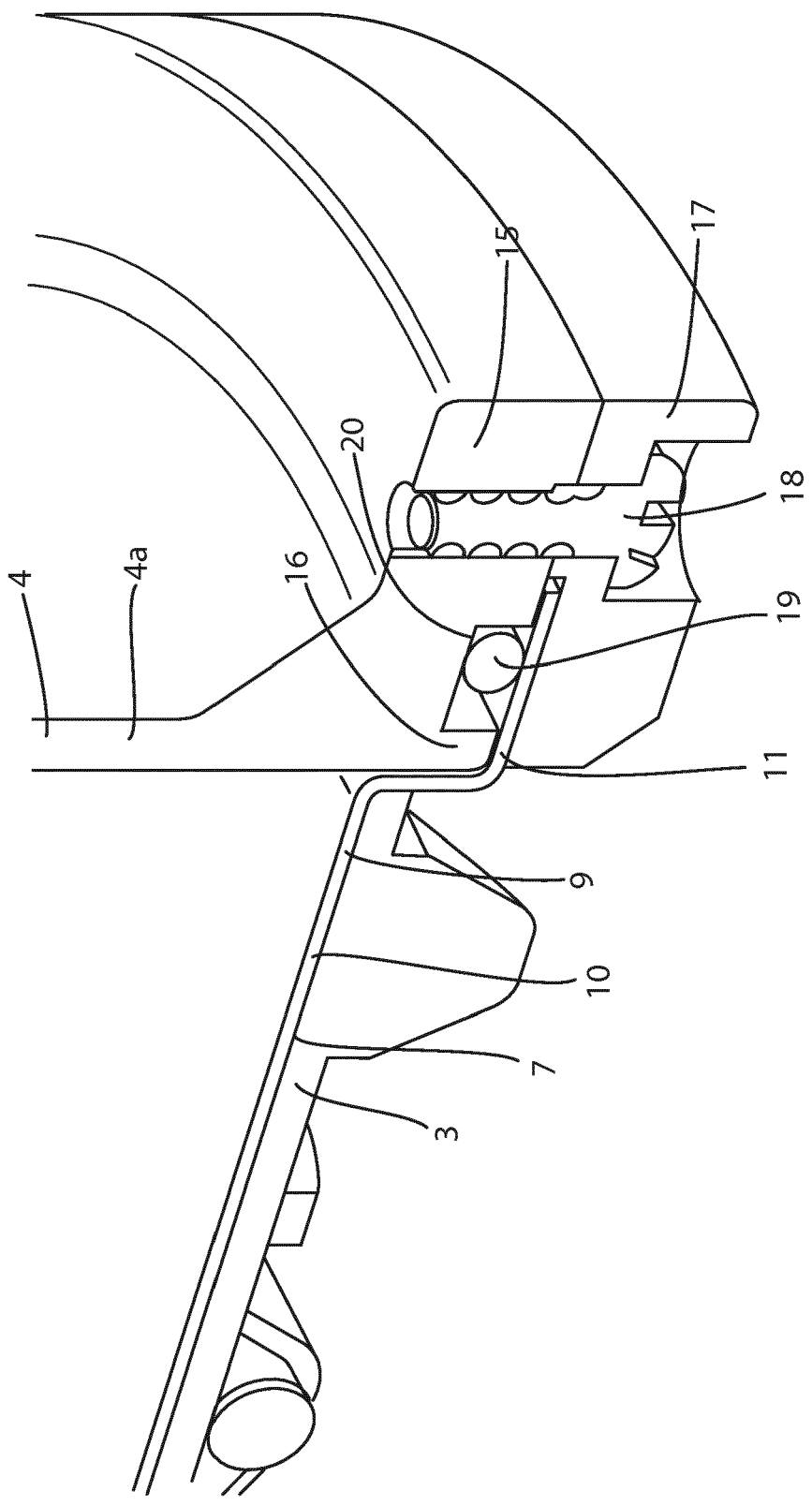


Figure 3

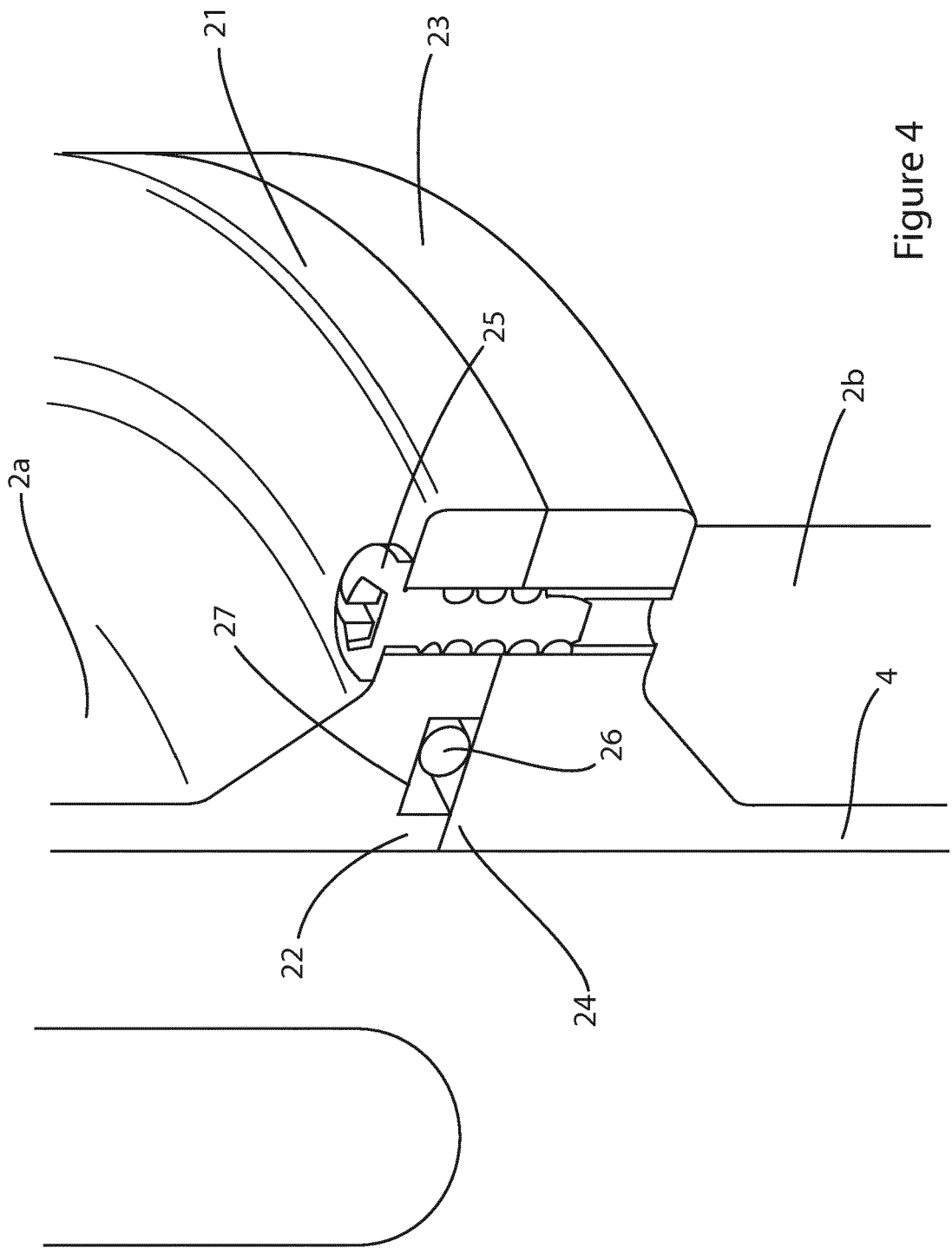


Figure 4

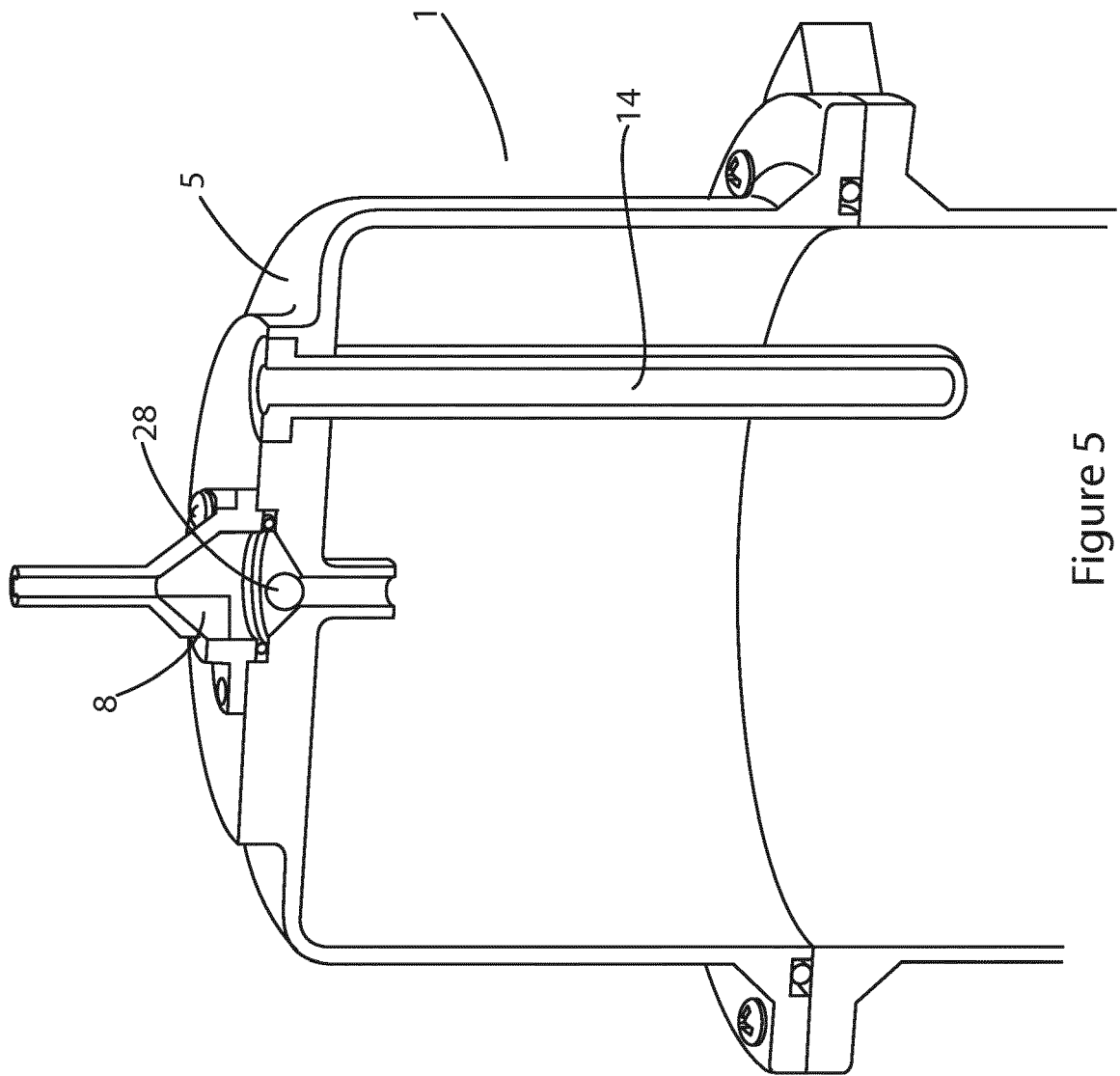


Figure 5

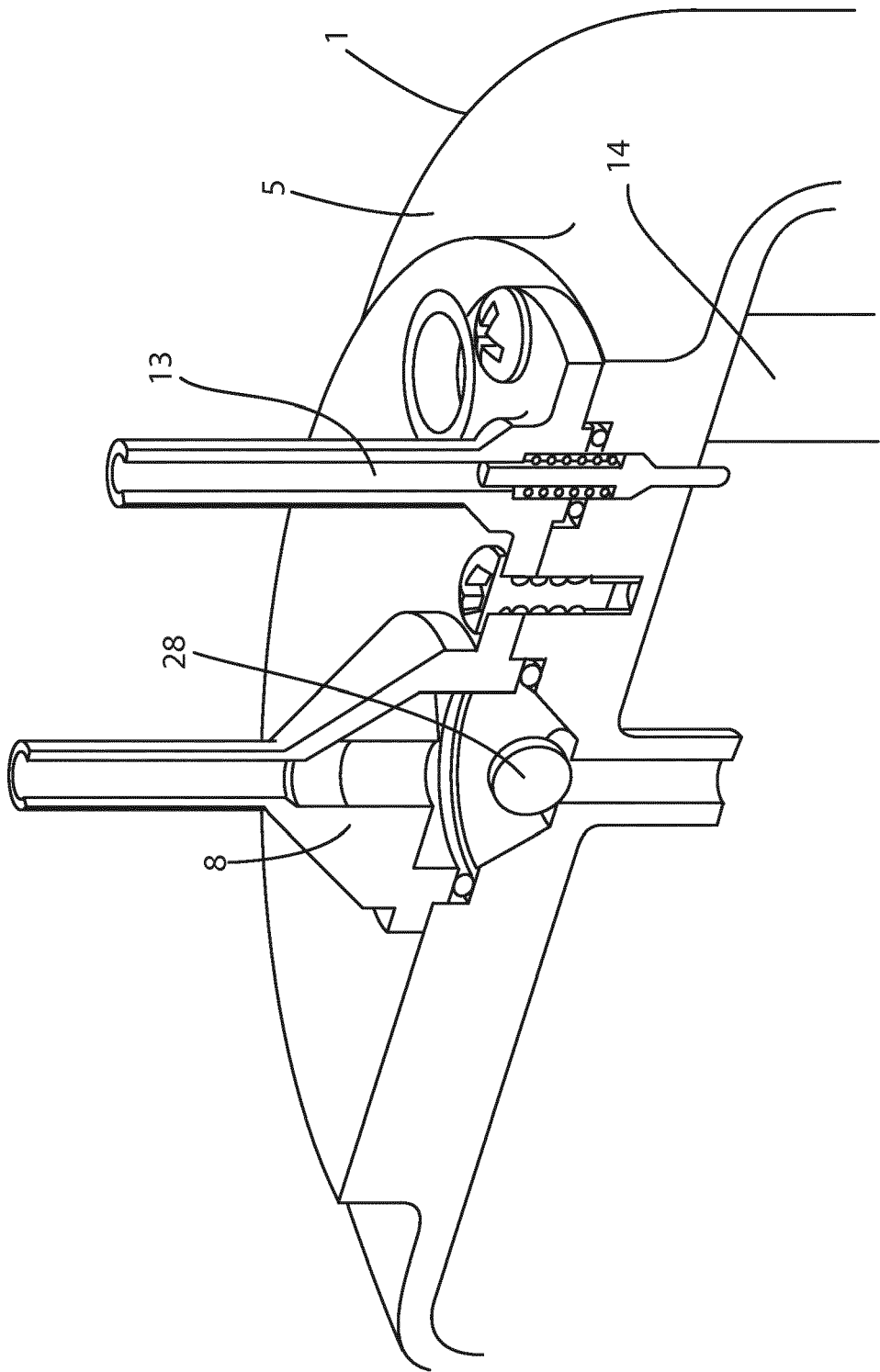


Figure 6

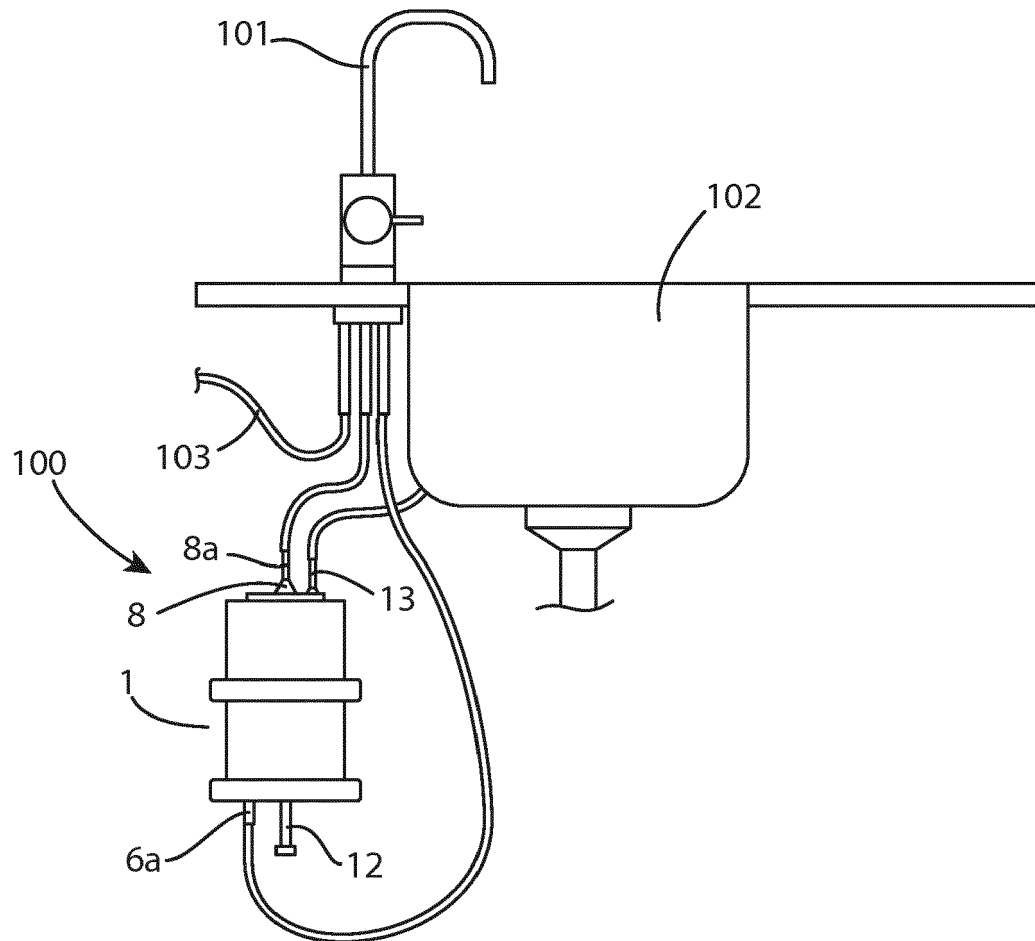


Figure 7



EUROPEAN SEARCH REPORT

Application Number
EP 16 18 6586

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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			F24H F24D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 January 2017	Examiner Ast, Gabor
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EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 16 18 6586

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
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