

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**08.10.2014 Bulletin 2014/41**

(51) Int Cl.:  
**E03C 1/04** (2006.01)

(21) Application number: **14162478.3**

(22) Date of filing: **28.03.2014**

(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**

(30) Priority: **01.04.2013 US 201361807011 P**

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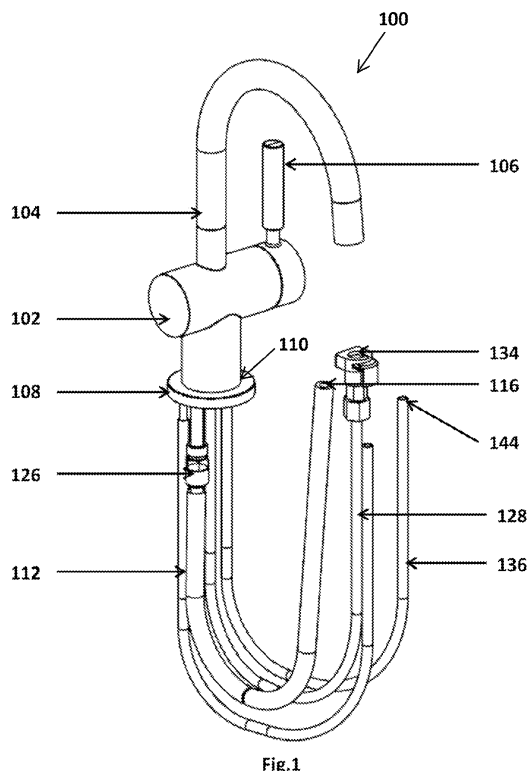
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(54) Hot water dispenser faucet with thermal barrier

(57) A faucet (100) for a hot water dispenser has a valve body (102) made of a metal having a thermal conductivity of 50 W/mK or more. A tube (304) extends through a passage (305) in the valve body and is coupled to a hot water line that extends into a hot water tank of the hot water dispenser and to a discharge outlet coupled to a discharge line that extends through a discharge spout (104). There is an air gap (306) between a surface (308) of the valve body surrounding the passage and the tube. The tube in conjunction with the air gap reduces heat transfer from the hot water flowing through the tube to the valve body. The tube can be a plastic tube. In a variation, there is no air gap between the plastic tube and the valve body.



## Description

### CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** This application claims the benefit of U.S. Provisional Application No. 61/807011, filed on April 1, 2013. The entire disclosure of the above application is incorporated herein by reference.

### FIELD

**[0002]** The present disclosure relates to instant hot water dispensers and faucet therefor.

### BACKGROUND

**[0003]** This section provides background information related to the present disclosure which is not necessarily prior art.

**[0004]** Instant hot water dispensers typically have a small electrically heated tank for heating and holding hot water and a faucet coupled to the tank for dispensing the hot water. The tank is typically disposed beneath a sink, such as in a below-sink cabinet and the faucet extends up from a top of the sink.

**[0005]** In some hot water dispensers, both cold and hot water flow through the faucet. The cold water flows through the faucet and the hot water flows out of the tank through the faucet and out of a dispensing spout. In these types of hot water dispensers, the faucet often has a valve for the cold water. Opening the faucet to dispense hot water opens the valve allowing cold water from a cold water source, such as a cold water supply line in a house, to flow through the faucet into the tank. This forces hot water in the tank to flow through a hot water dispensing line in the faucet to the dispensing spout.

**[0006]** Fig. 1 shows a prior art faucet 100 of the above described type available from the InSinkErator Division of Emerson Electric Co. designated the F3300 Faucet. Fig. 2 is a cross-section of a portion of faucet 100 showing in particular a cross-section of valve body 102 of the faucet of Fig. 1 and showing internal water flow through the valve body 102. Faucet 100 includes valve body 102, dispensing spout 104 extending upwardly from valve body 102 and handle lever 106 for opening and closing faucet 100, such as opening and closing a valve of a valve cartridge (not shown) disposed within valve body 102. A trim ring 108 is secured at a bottom 110 of valve body 102, such as with screws (not shown). Trim ring 108 may, for example, rest on a top surface, such as a top surface of a sink (not shown), when faucet 100 is installed. A hot water line 112 extends downwardly from valve body 102 into a hot water tank (not shown) and has an inlet 116 typically disposed at a top of the hot water tank and an outlet 118 (Fig. 2) coupled to an inlet port 120 (Fig. 2) of a hot water passage 122 (Fig. 2) extending through valve body 102 to a hot water discharge port 124 (Fig. 2) that is coupled to dispensing line 125 (Fig. 2) that

runs through dispensing spout 104 (Fig. 1). A check valve 126 (Fig. 1) is disposed in hot water line 112. A cold water supply line 136 has an outlet 130 (Fig. 2) coupled to a cold water supply inlet port 132 (Fig. 2) of valve body 102 and an inlet 144 (Fig. 1) coupled to a source of cold water (not shown). A cold water tank supply line 128 has an inlet 138 (Fig. 2) coupled to an outlet port 140 (Fig. 2) of a cold water passage 142 (Fig. 2) in valve body 102 and an outlet 134 (Fig. 1) disposed in the hot water tank, typically at a top of the hot water tank.

**[0007]** As shown in Fig. 2, when faucet 100 is opened, cold water flows through cold water passage 142 into cold water tank supply line 128 and through cold water tank supply line 128 into the hot water tank. This forces hot water to flow out of the hot water tank through hot water line 112 into hot water passage 122 in valve body 102 and through hot water passage 122 to hot water discharge port 124.

**[0008]** Valve body 102 may be made of metal having a thermal conductivity of 50 W/mK or more, such as brass that has a thermal conductivity of 109 W/mK. Since cold water passage 142 and hot water passage 122 are disposed in valve body 102 in close proximity to each other, there can be an appreciable heat transfer through the metal valve body 102 from the hot water flowing through hot water passage 122 to the cold water flowing through cold water passage 142 causing a temperature drop in the hot water flowing through hot water passage 122.

**[0009]** For hot water dispensers, it is important that the water temperature not drop significantly as the hot water passes through the faucet from the tank. In faucets of the type described above, preventing a significant temperature drop in the hot water as it flows through the metal valve body can be a challenge as the hot and cold water pass in close proximity through the faucet's metal valve body, which is may typically be a brass valve body.

### SUMMARY

**[0010]** This section provides a general summary of the disclosure, and is not a comprehensive disclosure of its full scope or all of its features.

**[0011]** In accordance with an aspect of the present disclosure, a faucet for a hot water dispenser has a valve body made of a metal having a thermal conductivity of 50 W/mK. A tube extends through a passage in the valve body and is coupled to a hot water line that extends into a hot water tank of the hot water dispenser and to a discharge outlet coupled to a discharge line that extends through a discharge spout. An outside diameter of the tube is less than a diameter of the passage so that there is an air gap between a surface of the valve body surrounding the passage and the tube. The tube in conjunction with the air gap reduces heat transfer from the hot water flowing through the tube to the valve body.

**[0012]** In an aspect, the tube is a plastic tube and the plastic tube acts as a primary thermal barrier to reduce heat transfer from the hot water flowing through the plas-

tic tube into the valve body and minimize any temperature drop in the hot water as it passes through the valve body. The air gap provides a secondary thermal barrier to further reduce heat transfer from the hot water flowing through the plastic tube into the valve body.

**[0013]** In an aspect, the plastic tube is made from a plastic having a thermal conductivity of 0.26 W/mK or less.

**[0014]** In an aspect, the inside diameter of the passage is about 8 mm and the gap is illustratively about 2 mm.

**[0015]** In a variation, the tube is a brass tube.

**[0016]** In another variation, there is no air gap between the plastic tube and the valve body.

**[0017]** Further areas of applicability will become apparent from the description provided herein. The description and specific examples in this summary are intended for purposes of illustration only and are not intended to limit the scope of the present disclosure.

## DRAWINGS

**[0018]** The drawings described herein are for illustrative purposes only of selected embodiments and not all possible implementations, and are not intended to limit the scope of the present disclosure.

Fig. 1 is a perspective view of a faucet for a prior art instant hot water dispenser;

Fig. 2 is a cross section view of a portion of the faucet of Fig. 1; and

Fig. 3 is a cross section view of a portion of a faucet for an instant hot water dispenser in accordance with the present disclosure.

**[0019]** Corresponding reference numerals indicate corresponding parts throughout the several views of the drawings.

## DETAILED DESCRIPTION

**[0020]** Example embodiments will now be described more fully with reference to the accompanying drawings.

**[0021]** With reference to Fig. 3, a faucet 300 having a valve body 302 in accordance with an aspect of the present disclosure is shown. It should be understood that faucet 300 is the same as faucet 100 except for the differences discussed below. Valve body 302 includes a plastic tube 304 extending through passage 305 with an inside 303 of plastic tube 304 providing the hot water passage in valve body 302. Passage 305 may illustratively be the same as hot water passage 122 of valve body 102 with each having the same inside diameter. Plastic tube 304 may extend out through valve body 302 and couple to hot water line 112 outside valve body 302. An outer diameter of plastic tube 304 is less than an inside diameter of passage 305 so that there is an air gap 306 between a surface 308 of valve body 302 surrounding passage 305 and an outer surface 307 of plastic tube

304. Air gap 306 may illustratively be about 2 mm when the inside diameter of passage 305 is about 8 mm. Plastic tube may illustratively be made of a plastic having a low thermal conductivity of 0.26 W/mK or less, such as polysulfone. One or more O-rings 310 may be disposed around a top end 312 of plastic tube 304. O-rings 310 hold plastic tube 304 in place within valve body 302 by compression during assembly and also provide a water seal. Plastic tube 304 is assembled with valve body 302 by a transition fit in close proximity to trim ring 108. This positions plastic tube 304 relative to valve body 302 to ensure proper compression of O-rings 310. The tight fit provided by the transition fit also minimizes the amount of water leakage should the seal provided by O-rings 310 fail.

**[0022]** Plastic tube 304 in conjunction with air gap 306 reduces heat transfer from the hot water flowing through plastic tube 304 to valve body 302. Since the thermal conductivity of plastic tube 304 is substantially less than that of metal, particularly brass and copper, plastic tube 304 acts as a primary thermal barrier to reduce heat transfer from the hot water flowing through plastic tube 304 into valve body 302 and minimize any temperature drop in the hot water as it passes through valve body 302. Air gap 306 provides a secondary thermal barrier to further reduce heat transfer from the hot water flowing through plastic tube 304 into valve body 302. Coupling hot water line 112 to plastic tube 304 further reduces heat transfer since hot water line 112 is no longer in contact with a metal valve body.

**[0023]** In a variation, a brass tube is used instead of plastic tube 304.

**[0024]** In another variation, valve body 302 includes plastic tube 304 in hot water passage 122 without air gap 306. That is, the outside diameter of plastic tube 304 and the inside diameter of passage 305 are the same so that an outer surface of plastic tube 304 abuts the surface 308 of valve body 302 surrounding passage 305.

**[0025]** The foregoing description of the embodiments has been provided for purposes of illustration and description. It is not intended to be exhaustive or to limit the disclosure. Individual elements or features of a particular embodiment are generally not limited to that particular embodiment, but, where applicable, are interchangeable and can be used in a selected embodiment, even if not specifically shown or described. The same may also be varied in many ways. Such variations are not to be regarded as a departure from the disclosure, and all such modifications are intended to be included within the scope of the disclosure.

**[0026]** The terminology used herein is for the purpose of describing particular example embodiments only and is not intended to be limiting. As used herein, the singular forms "a," "an," and "the" may be intended to include the plural forms as well, unless the context clearly indicates otherwise. The terms "comprises," "comprising," "including," and "having," are inclusive and therefore specify the presence of stated features, integers, steps, operations,

elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. The method steps, processes, and operations described herein are not to be construed as necessarily requiring their performance in the particular order discussed or illustrated, unless specifically identified as an order of performance. It is also to be understood that additional or alternative steps may be employed.

**[0027]** When an element or layer is referred to as being "on," "engaged to," "connected to," or "coupled to" another element or layer, it may be directly on, engaged, connected or coupled to the other element or layer, or intervening elements or layers may be present. In contrast, when an element is referred to as being "directly on," "directly engaged to," "directly connected to," or "directly coupled to" another element or layer, there may be no intervening elements or layers present. Other words used to describe the relationship between elements should be interpreted in a like fashion (e.g., "between" versus "directly between," "adjacent" versus "directly adjacent," etc.). As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

**[0028]** Spatially relative terms, such as "inner," "outer," "beneath," "below," "lower," "above," "upper," and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. Spatially relative terms may be intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "below" or "beneath" other elements or features would then be oriented "above" the other elements or features. Thus, the example term "below" can encompass both an orientation of above and below. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

## Claims

### 1. A faucet for a hot water dispenser, comprising:

a metal valve body having a passage therein, the metal of the metal valve body having a thermal conductivity of 50 W/mK or more;  
a tube that extends through the passage in the valve body, the tube coupled to a hot water line that extends into a hot water tank of the hot water dispenser and to a discharge outlet that is coupled to a discharge line that extends through a discharge spout of the faucet; and  
an air gap between an outer surface of the tube and a surface of the valve body surrounding the passage and the tube.

2. The faucet of claim 1 wherein the tube is a plastic tube, the plastic tube in conjunction with the air gap reducing heat transfer from the hot water flowing through plastic tube to the valve body wherein the plastic tube acts as a primary thermal barrier to reduce heat transfer from the hot water flowing through the plastic tube into the valve body and minimize any temperature drop in the hot water as it passes through the valve body and the air gap provides a secondary thermal barrier to further reduce heat transfer from the hot water flowing through the plastic tube into the valve body.

3. The faucet of claim 2 wherein the metal valve body is a brass valve body.

4. The faucet of claim 2 wherein the plastic tube is made from a plastic having a thermal conductivity of 0.26 W/mK or less.

5. The faucet of claim 2 wherein the inside diameter of the passage is about 8 mm and the gap is illustratively about 2 mm.

6. The faucet of claim 2 including at least one O-ring disposed around a top end of the plastic tube between the plastic tube and the valve body.

7. The faucet of claim 1 wherein the inside diameter of the passage is about 8 mm and the gap is illustratively about 2 mm.

8. The faucet of claim 1 wherein the tube is a brass tube.

9. The faucet of claim 1 wherein the valve body is a brass valve body.

10. A faucet for a hot water dispenser, comprising:

a metal valve body having a passage therein, the metal of the metal valve body having a thermal conductivity of 50 W/mK or more; and  
a plastic tube that extends through the passage in the valve body, the tube coupled to a hot water line that extends into a hot water tank of the hot water dispenser and to a discharge outlet that is coupled to a discharge line that extends through a discharge spout of the faucet.

11. The faucet of claim 10 wherein the plastic tube is made from a plastic having a thermal conductivity of 0.26 W/mK or less.

12. The faucet of claim 11 wherein the metal valve body is a brass valve body.

13. The faucet of claim 10 wherein the metal valve body is a brass valve body.

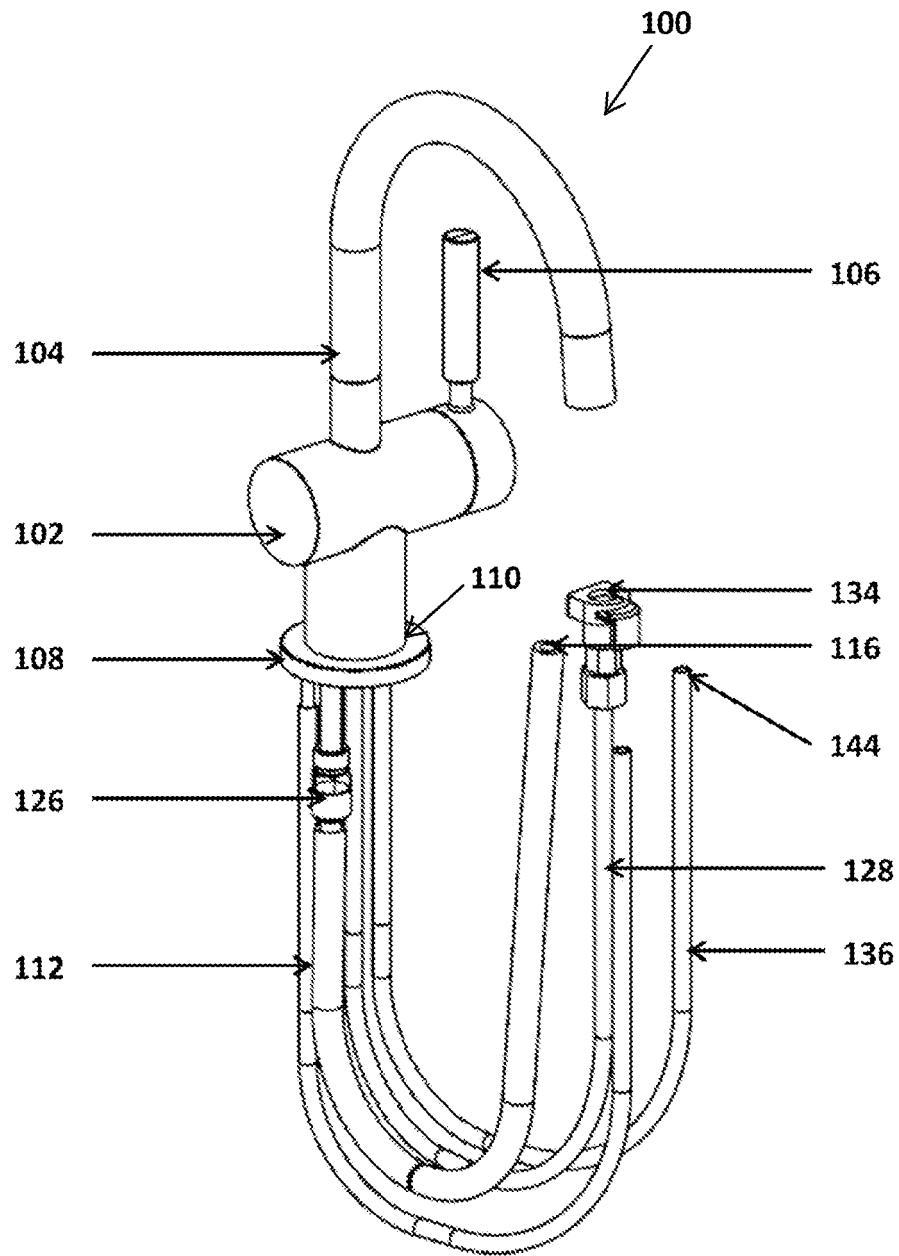


Fig.1

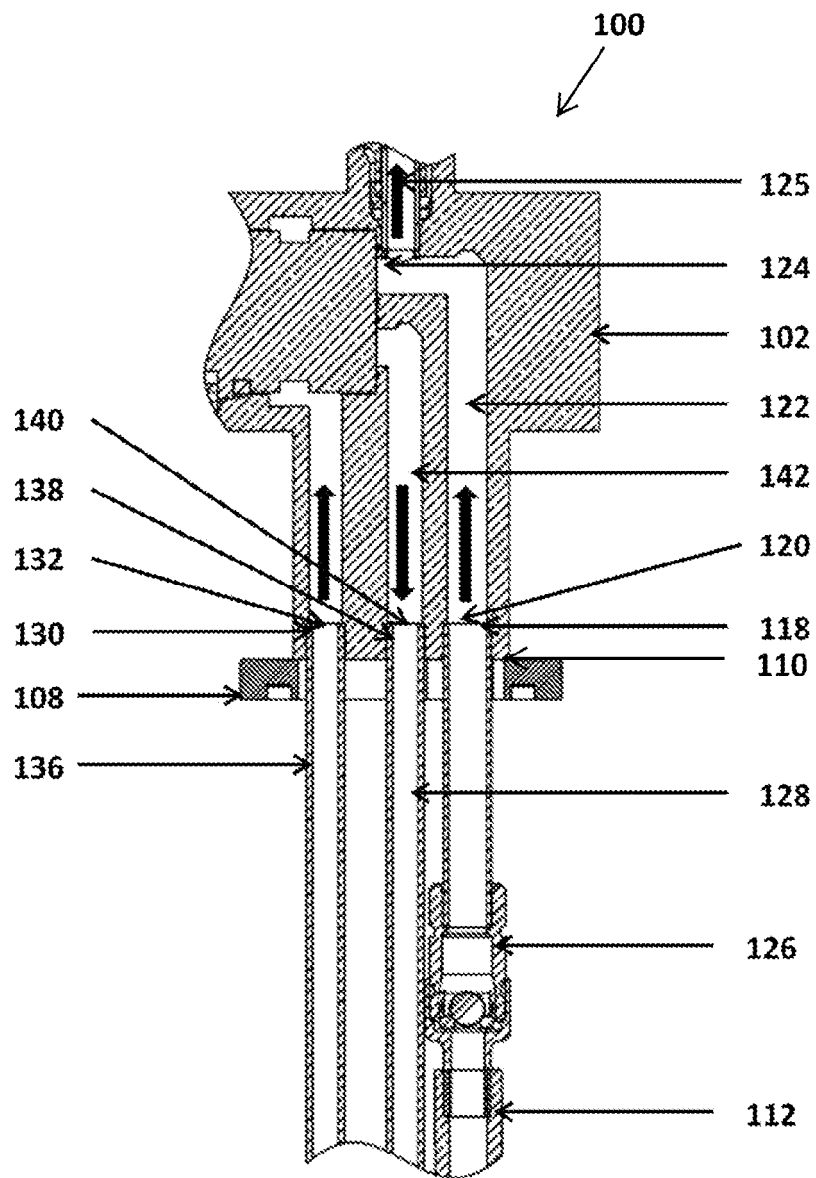


Fig.2

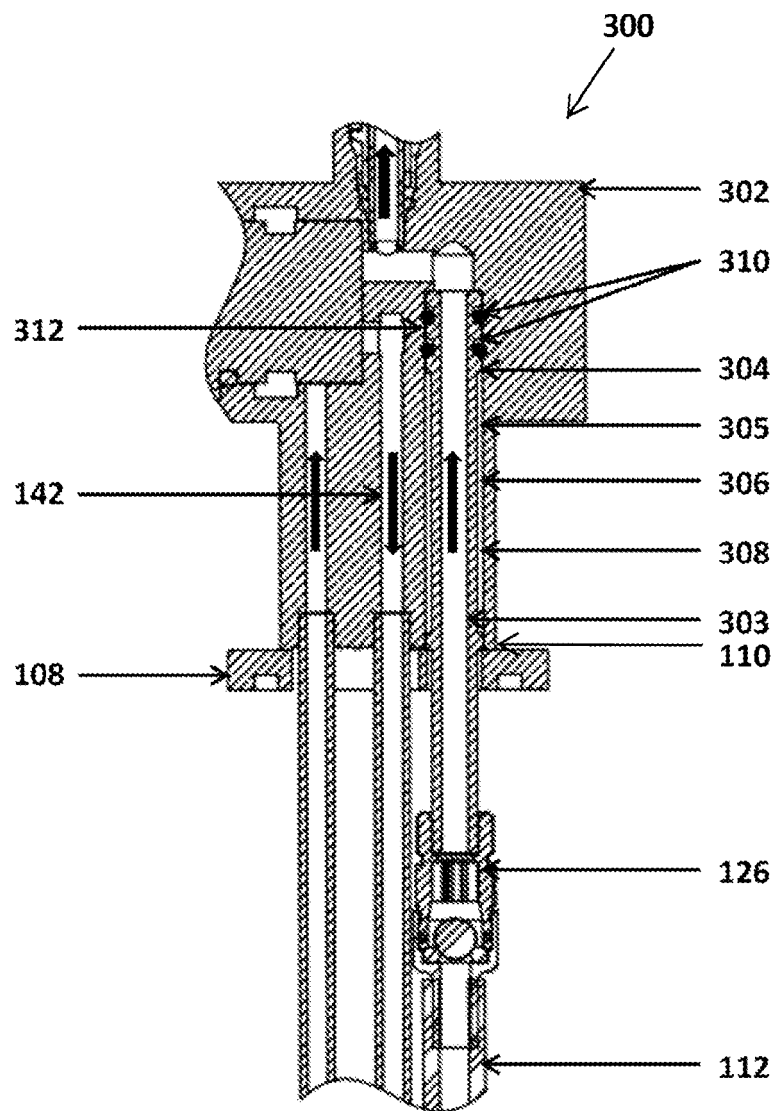


Fig.3



## EUROPEAN SEARCH REPORT

Application Number  
EP 14 16 2478

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| <p>X : particularly relevant if taken alone<br/> Y : particularly relevant if combined with another document of the same category<br/> A : technological background<br/> O : non-written disclosure<br/> P : intermediate document</p> <p>T : theory or principle underlying the invention<br/> E : earlier patent document, but published on, or after the filing date<br/> D : document cited in the application<br/> L : document cited for other reasons<br/> &amp; : member of the same patent family, corresponding document</p> |  |                                  |   |

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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24-06-2014

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**REFERENCES CITED IN THE DESCRIPTION**

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