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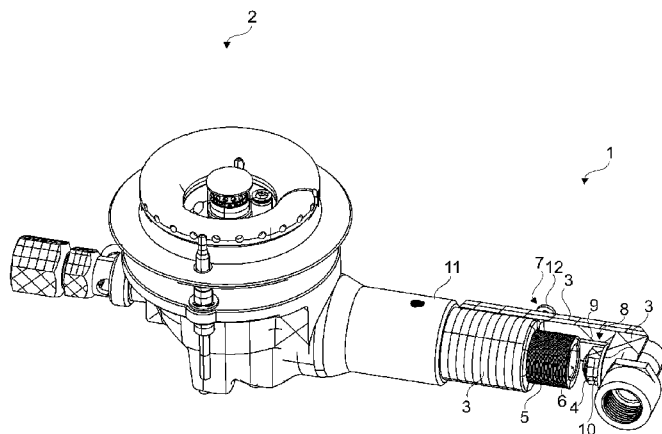
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(54) Title: GAS/AIR MIXER ASSEMBLY FOR USE IN A GAS BURNER

Fig. 2



(57) Abstract: The present invention relates to a gas/air mixer assembly (1) for use in a gas burner (2). The mixer assembly (1) comprises a main body (3); a nozzle device (4) for ejecting gas; a gas/air mixing tube (5), wherein the tube (5) comprises: an outlet for discharging the mixture to the gas burner (2) and an inlet (6) for jointly admitting the air and the ejected gas, wherein the tube (5) is axially slidably disposed onto the main body (3) so as to vary an axial distance between the inlet (6) and the nozzle device (4) and a fixing device (7) for securing the tube (5). An adjustment device (8) is provided for adjusting a mixing ratio of the gas and the ambient air by way of blocking a forward movement of the tube (5) at a predetermined axial distance between the inlet (6) and the nozzle device (4).

Description**GAS/AIR MIXER ASSEMBLY FOR USE IN A GAS BURNER**

- [0001] The present invention relates to a mixer assembly for mixing gas and ambient air for use in the gas burner of a gas cooking appliance.
- [0002] Flammable gases such as liquefied petroleum gas (butane, propane) or natural gas (methane) have different number of hydrogen and carbon atoms. Therefore, these gases release different amount of energies when they are combusted. As a rule, the heavier the gas the more energy is released during the combustion. A minimum amount of oxygen is necessary for totally combusting a gas with ideally zero emission of residual pollutants. Therefore, the oxygen to gas (stoichiometric) ratio for the complete combustion differs for different type of gases. In a prior art gas cooking appliance generally a mixer assembly is utilized for mixing the inflowing gas with the correct amount of ambient air so as to obtain the proper mixture of gas and oxygen. To meet these requirements, the prior art gas cooking appliance is usually manufactured for operation with only one type of gas. However, some gas cooking appliances are also manufactured to allow conversion from one type of gas to the other type of gas provided that the necessary modifications are performed by a service person. Such modifications involve, among others, the adjustment of the mixer assembly.
- [0003] Fig. 1 shows a prior art gas burner (2') which has a mixer assembly (1') for mixing gas and ambient air. The prior art mixer assembly (1') comprises: a main body (3'); a nozzle device (4') for ejecting gas, wherein the nozzle device (4') is fixed to main body (3'); a tube (5') for mixing gas and ambient air, wherein the tube (5') comprises: an outlet for discharging the mixture of gas and ambient air to the gas burner (2') and an inlet (6') for jointly admitting the ambient air and the ejected gas into the tube (5'), wherein the tube (5') is axially slidably disposed onto the main body (3') so as to vary an axial distance between the inlet (6') and the nozzle device (4') and a fixing device (7') for securing the tube (5') to the main body (3'). In the prior art mixer assembly (1'), the axial distance between the inlet (6') and the nozzle device (4') is manually adjusted by the operator. In the

prior art mixer assembly (1'), the main body (3') and tube (5') have adjustment markings (not shown). For adjusting the mixing ratio of the gas and the ambient air, the operator moves the tube (5') until the markings coincide. Thereafter, the operator secures the tube (5') through the fixing device (7'), such as a fixing screw.

- [0004] A problem with the prior art mixer assembly (1') is that the adjustment during the manufacturing process or as the case may be during the maintenance is very time consuming and vulnerable to errors which are likely to be introduced by the operator or the service person. If the mixer assembly (1') is not properly adjusted, the combustion efficiency degrades and the amount of heat released by the gas burner (2') decreases. Moreover, in case of an incomplete combustion, the harmful emission of carbon monoxide and hydrocarbons such as soot increases. Such harmful emission pollutes the environment and poses a risk to the health of the customer, particularly when the emission limits are exceeded.
- [0005] An objective of the present invention is to provide a mixer assembly for mixing gas and ambient air for use in the gas burner of a gas cooking appliance which overcomes the aforementioned drawbacks of the prior art in a cost-effective way and which enables a quick and reliable adjustment of the desired mixing ratio of gas and ambient air and also a quick and reliable conversion from liquefied petroleum gas (LPG) to natural gas or vice versa.
- [0006] This objective has been achieved by the mixer assembly as defined in claim 1, the gas burner as defined in claim 5 and the gas cooking appliance as defined in claim 6. Further achievements have been attained by the subject-matters respectively defined in the dependent claims.
- [0007] The mixer assembly of the present invention comprises an adjustment device for adjusting a mixing ratio of the gas and the ambient air by way of blocking a forward movement of the tube at a predetermined axial distance between the inlet and the nozzle device.
- [0008] With the mixer assembly of the present invention, the use of the adjustment markings has been obviated and both the manufacturing process and the maintenance have been expedited. Thus, the error

introduced by the operator during the manufacturing process and the maintenance due to the manual adjustment involving the use of markings has been eliminated. With the mixer assembly of the present invention, the desired mixing ratio of the gas and the ambient air can be quickly and exactly adjusted. Thereby, the combustion efficiency has been improved and the harmful emission of carbon monoxide and hydrocarbons such as soot has been effectively reduced. Also the serviceability has been improved. Thus, the service person can quickly and reliably convert from LPG to natural gas or vice versa by performing the correct adjustment in accordance with the type of gas to be used.

[0009] In an embodiment, the forward movement of the tube is blocked by an abutment piece at said predetermined axial distance, which is fixed to the main body. In the present invention different abutment pieces can be utilized in accordance with the type of adjustment to be made.

[0010] In another embodiment, the abutment piece has an integral washer which is fixed between the joining surfaces of the threadably connected nozzle device and the main body respectively. Thereby, the abutment piece can be easily and quickly fixed to the main body. Thereby, also the nozzle device and the abutment piece can be easily exchanged or replaced.

[0011] In another embodiment, the nozzle device and the abutment piece, including the integral washer are respectively made from brass and Aluminum. The thermal expansion coefficient of Aluminum is higher than the thermal expansion coefficient of brass. And the hardness of brass is higher than the hardness of Aluminum. Thereby, when the gas burner is taken into operation and the ambient temperature increases, then the abutment piece, particularly the integral washer improves the gas tightness of the threaded connection between the nozzle device and the main body.

[0012] The present invention also provides a gas burner which has a mixer assembly according to present invention.

[0013] The present invention also provides a gas cooking appliance which has at least one gas burner according to present invention.

[0014] Additional advantages of the mixer assembly of the present invention will

become apparent with the detailed description of the embodiments with reference to the accompanying drawings in which:

- [0015] Figure 1 – is a schematic perspective view of a gas burner which has a mixer assembly according to the prior art;
- [0016] Figure 2 – is a schematic perspective view of a gas burner which has a mixer assembly according to an embodiment of the present invention;
- [0017] Figure 3 – is a schematic enlarged partial perspective view of the gas burner which has the mixer assembly according to an embodiment of the present invention;
- [0018] Figure 4 – is a schematic enlarged perspective view of an adjustment device which is used in the mixer assembly according to an embodiment of the present invention;
- [0019] Figure 5 – is a schematic enlarged partial perspective view of the gas burner which has the mixer assembly according to an embodiment of the present invention, prior to mounting the tube, the adjustment device and the nozzle device;
- [0020] Figure 6 – is a schematic enlarged partial perspective view of the gas burner which has the mixer assembly according to an embodiment of the present invention, prior to mounting the nozzle device, wherein the tube has been omitted for ease of illustration;
- [0021] Figure 7 – is a schematic enlarged partial perspective view of the gas burner which has the mixer assembly according to an embodiment of the present invention, after having mounted the adjustment device and the nozzle device, wherein the tube has been omitted for ease of illustration.
- [0022] The reference signs appearing on the drawings relate to the following technical features.
 - 1. Mixer assembly
 - 2. Gas burner
 - 3. Main body
 - 4. Nozzle device
 - 5. Tube
 - 6. Inlet
 - 7. Fixing device

8. Adjustment device

9. Abutment piece

10. Washer

11. Intake

12. Screw

[0023] The mixer assembly (1) is suitable for mixing gas and ambient air for use in the gas burner (2) of a gas cooking appliance (not shown).

[0024] The mixer assembly (1) comprises: a main body (3); a nozzle device (4) for ejecting gas, wherein the nozzle device (4) is fixed to main body (3); a tube (5) for mixing the gas and the ambient air, wherein the tube (5) comprises: an outlet (not shown) for discharging the mixture of the gas and the ambient air to the gas burner (2) and an inlet (6) for jointly admitting the ambient air and the ejected gas into the tube (5), wherein the tube (5) is axially slidably disposed onto the main body (3) so as to vary an axial distance between the inlet (6) and the nozzle device (4) and a fixing device (7) for securing the tube (5) to the main body (3) (Fig. 2 to 7).

[0025] The mixer assembly (1) of the present invention further comprises an adjustment device (8) for adjusting a mixing ratio of the gas and the ambient air by way of blocking a forward movement of the tube (5) at a predetermined axial distance between the inlet (6) and the nozzle device (4).

[0026] The gas burner (2) of the present invention comprises the mixer assembly (1). The mixer assembly (1) is assembled with the gas burner (2) such that the outlet of the mixer assembly (1) is fluidly connected to the intake (11) of the gas burner (2).

[0027] The gas cooking appliance of the present invention comprises one or more than one gas burner (2).

[0028] In an embodiment, the adjustment device (8) comprises an abutment piece (9) which blocks the forward movement of the tube (5) at said predetermined axial distance. The abutment piece (9) is fixed to the main body (3).

[0029] In another embodiment, the nozzle device (4) is fixed to the main body (3) by means of a threaded connection. In this embodiment, the abutment

piece (9) has an integral washer (10) which is fixed between the joining surfaces of the nozzle device (4) and the main body (3) respectively.

[0030] In another embodiment, the nozzle device (4) is made from brass. And the abutment piece (9), including the integral washer (10) is made from Aluminum.

[0031] In another embodiment, the fixing device (7) comprises a fixing screw (12) for fixing the tube (5) to main body (3) after the adjustment operation.

Claims

1. A mixer assembly (1) for mixing gas and ambient air for use in a gas burner (2) of a gas cooking appliance, the mixer assembly (1) comprising a main body (3), a nozzle device (4) for ejecting gas, wherein the nozzle device (4) is fixed to main body (3), a tube (5) for mixing the gas and the ambient air, wherein the tube (5) comprising an outlet for discharging the mixture of gas and ambient air to the gas burner (2) and an inlet (6) for jointly admitting the ambient air and the ejected gas into the tube (5), wherein the tube (5) is axially slidably disposed onto the main body (3) so as to vary an axial distance between the inlet (6) and the nozzle device (4) and a fixing device (7) for securing the tube (5) to the main body (3), **characterized in that** an adjustment device (8) for adjusting a mixing ratio of the gas and the ambient air by way of blocking a forward movement of the tube (5) at a predetermined axial distance between the inlet (6) and the nozzle device (4).
2. The mixer assembly (1) according to claim 1, **characterized in that** the adjustment device (8) comprising an abutment piece (9) which blocks the forward movement of the tube (5) at said predetermined axial distance, wherein the abutment piece (9) is fixed to the main body (3).
3. The mixer assembly (1) according to claim 2, **characterized in that** the nozzle device (4) is fixed to the main body (3) by means of a threaded connection and wherein the abutment piece (9) has an integral washer (10) which is fixed between the joining surfaces of the nozzle device (4) and the main body (3) respectively.
4. The mixer assembly (1) according to claim 2 or 3, **characterized in that** the nozzle device (4) is made from brass and the abutment piece (9) is made from Aluminum.
5. A gas burner (2) **characterized in that** the mixer assembly (1) as defined in any one of claims 1 to 4, wherein the mixer assembly (1) is assembled with the gas burner (2).
6. A gas cooking appliance **characterized in that** one or more than one gas burner (2) as defined in claim 5.

Fig. 1

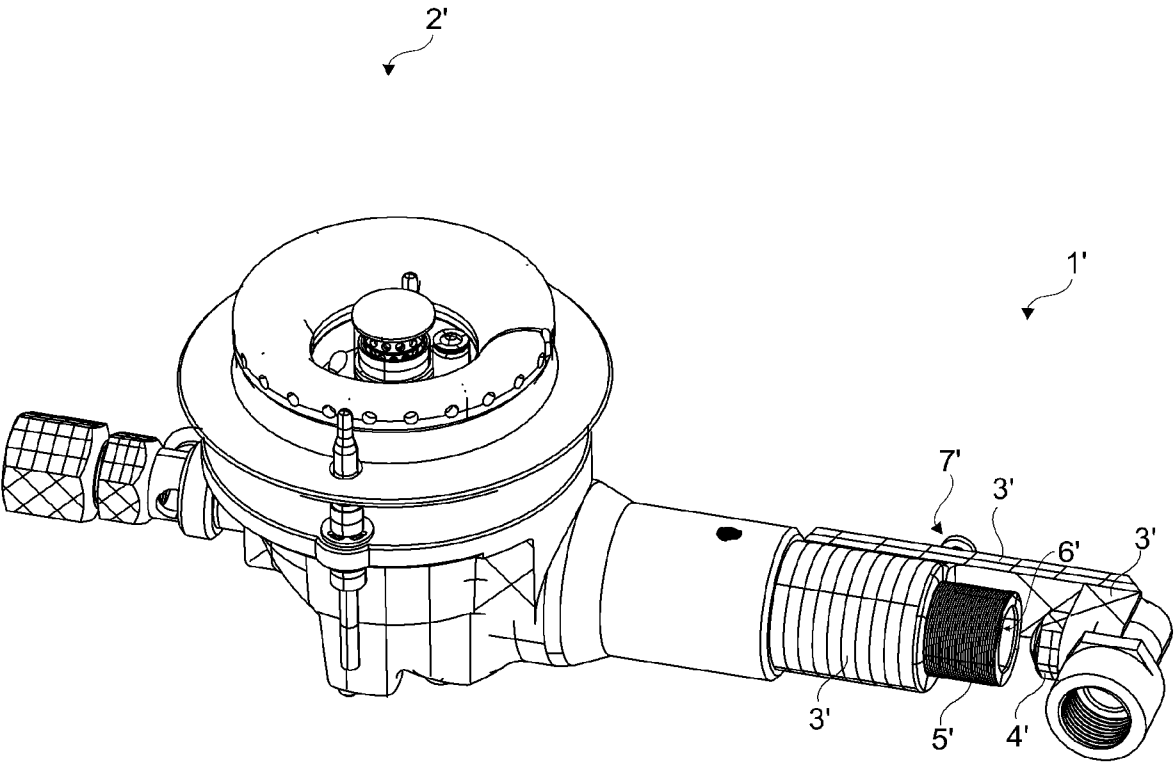


Fig. 2

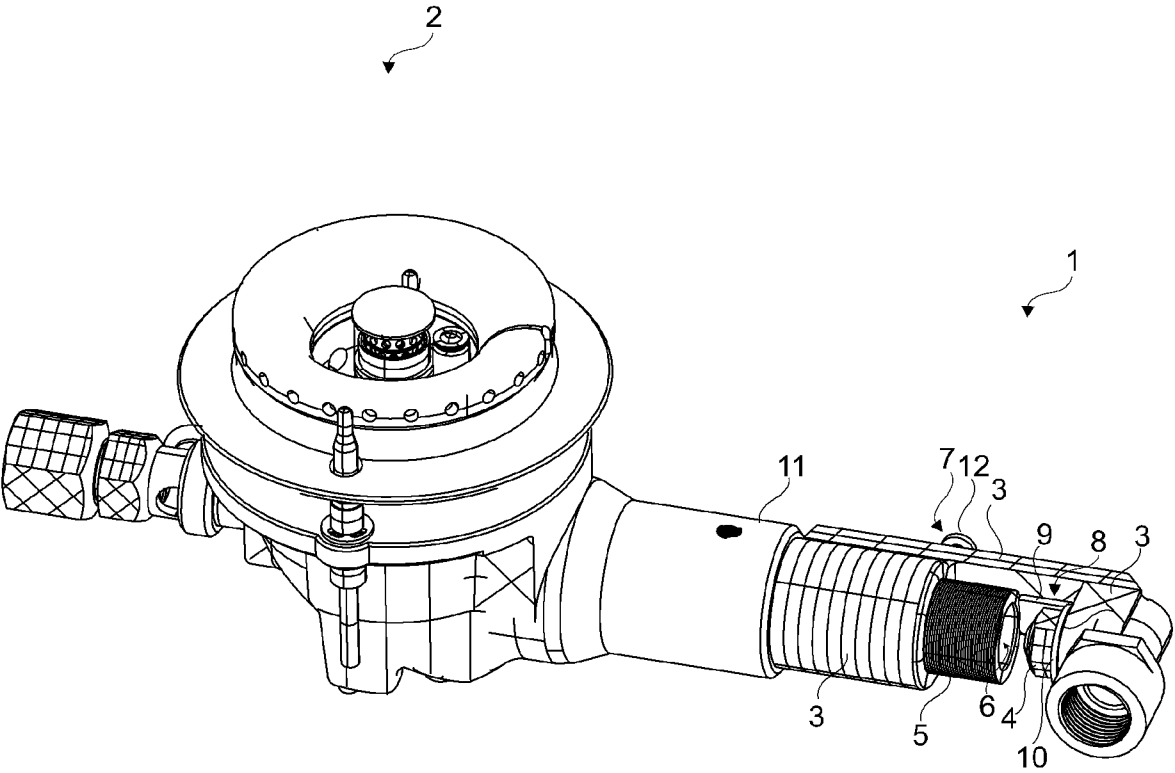


Fig. 3

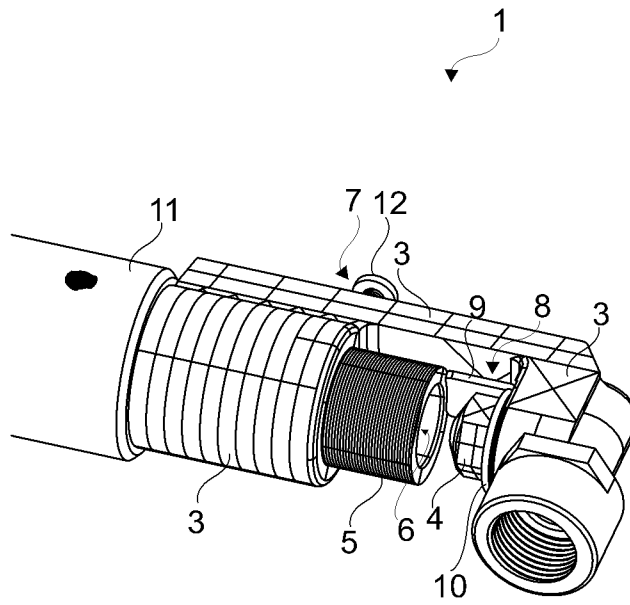


Fig. 4

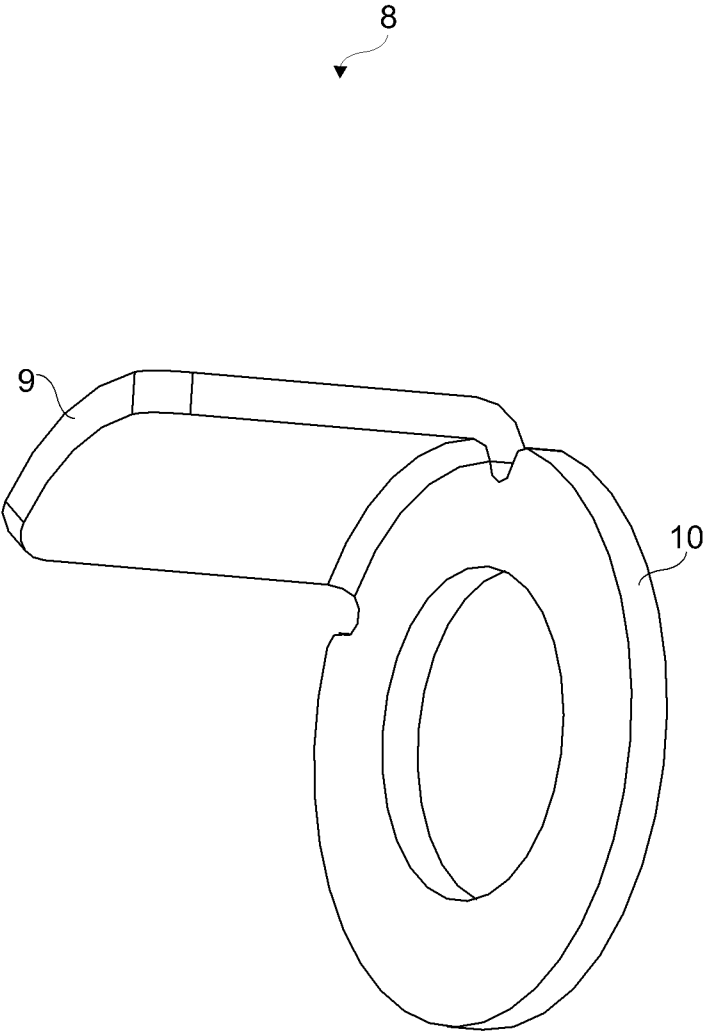


Fig. 5

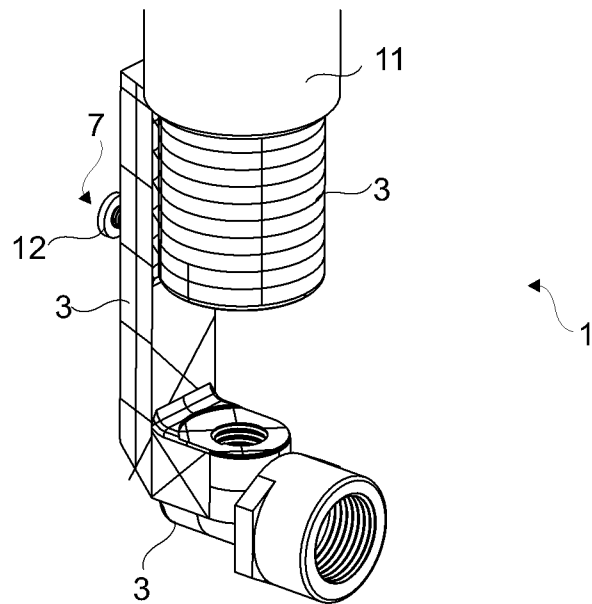


Fig. 6

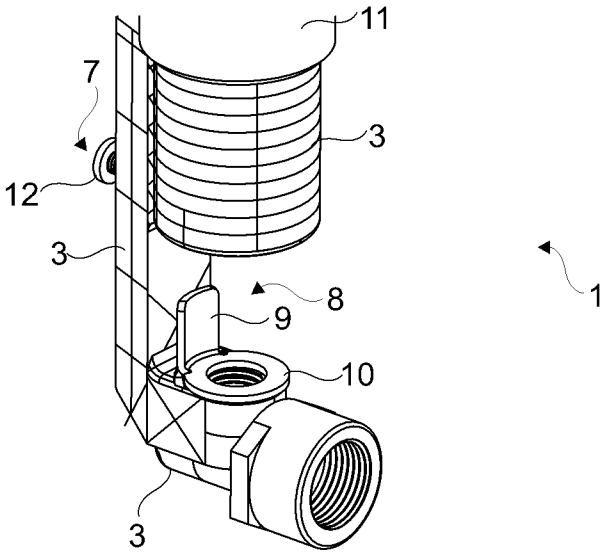
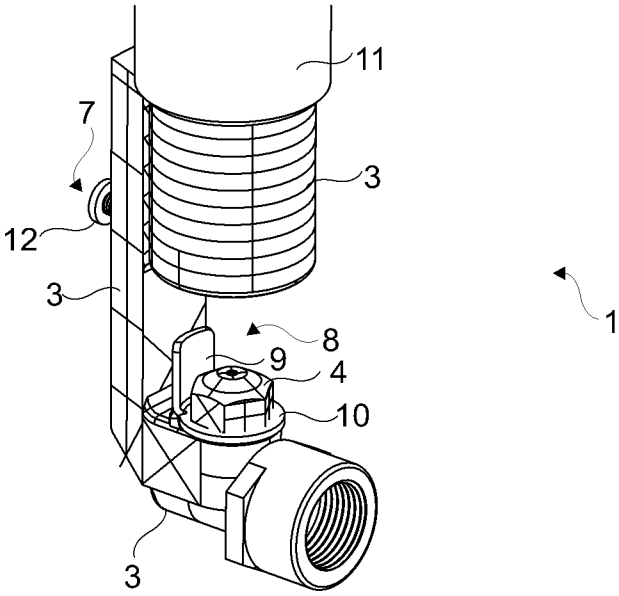


Fig. 7



INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
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ADD.

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)
F23D F23N B01F

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 1 189 375 A (BARIOZ) 2 October 1959 (1959-10-02)	1,2,5
Y	page 1, right-hand column, lines 14-41; figures	3,4
X	----- JP S54 26138 U (KURARI) 20 February 1979 (1979-02-20) figures 2-5	1,2,5,6
X	----- US 4 118 175 A (RIEHL FRED) 3 October 1978 (1978-10-03) column 3, line 63 - column 4, line 28; figures	1,5
X	----- DE 10 92 622 B (HOMANN WERKE) 10 November 1960 (1960-11-10) column 2, lines 26-29; figure 1 ----- -/-	1,5



Further documents are listed in the continuation of Box C.



See patent family annex.

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INTERNATIONAL SEARCH REPORT

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2014/207782 A1 (RINNAI KK [JP]) 31 December 2014 (2014-12-31) paragraphs [0021] - [0025]; figures 3-5 -----	3,4

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2015/051645

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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