

(19)



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(11)

EP 0 816 758 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
07.01.1998 Bulletin 1998/02

(51) Int Cl.⁶: **F23D 14/58**, F23D 14/46

(21) Application number: **97201744.6**

(22) Date of filing: **09.06.1997**

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**

Designated Extension States:
AL LT LV RO SI

(30) Priority: **10.06.1996 NL 1003311**

(71) Applicant: **N.V. RADSON-ALUTHERM
3530 Houthalen-Helchteren (BE)**

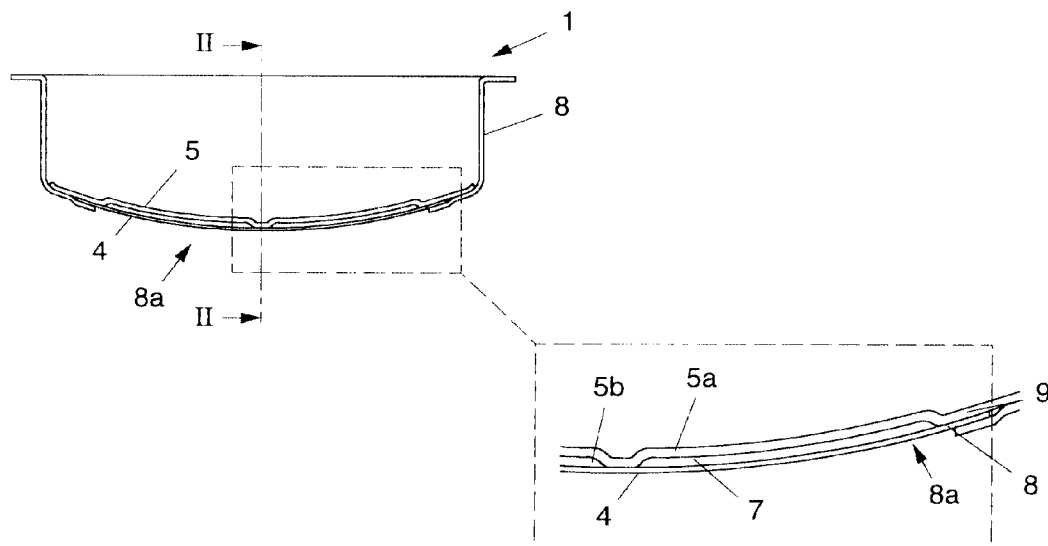
(72) Inventor: **Marijnen, Jacob Jozeph
3920 Lommel (BE)**

(74) Representative:
**Smulders, Theodorus A.H.J., Ir. et al
Vereenigde Octrooibureaux
Nieuwe Parklaan 97
2587 BN 's-Gravenhage (NL)**

(54) **Flame distributing device intended for a burner of a hot water appliance**

(57) A flame distributing device (1) intended for a burner (2) of a hot water appliance (3) for the purpose of water heating, which flame distributing device (1) comprises a burner deck (4) with a regular hole pattern and a distributing plate (5) with a specific hole pattern (6), the burner deck (4) and the distributing plate (5) ex-

tending substantially parallel to each other, with a space between the distributing plate (5) and the burner deck (4) being divided into a number of segment chambers (7), between which segment chambers (7) no flow or substantially no flow of fuel/air mixture is possible, while at each segment chamber (7) the distributing plate (5) has a specific hole pattern (6).

**FIG. 3****EP 0 816 758 A1**

Description

This invention relates to a flame distributing device intended for a burner of a hot water appliance for the purpose of water heating, which flame distributing device comprises a burner deck with a specific hole pattern and a distributing plate with a specific hole pattern, the burner deck and the distributing plate extending substantially parallel to each other.

Such a flame distributing device is known from practice and is already being used by applicant in its central heating boilers and marketed. In the known flame distributing device the distributing plate is arranged at a very short distance from the burner deck. The distributing plate is primarily intended for regulating the supply of the fuel/air mixture to the burner deck. In order to prevent undesired resonances and vibrations, such as whistling and rumbling, the combustion load should not be uniform over the entire burner deck. In the known burner deck this is effected by making the hole pattern in the distributing plate of irregular design. In some areas of the distributing plate there are large holes spaced apart a short distance, while in other areas the distributing plate is provided with small holes spaced apart a large distance. What is thus accomplished is that the supply of the fuel/air mixture over the surface of the burner deck is non-uniform, so that the chance of resonances and vibrations is kept to a minimum. In order to obtain this effect in an optimum manner, it is necessary that the distributing plate be disposed at a very short distance from the burner deck. When the distance between the distributing plate and the burner deck is too large, the fuel/air mixture will spread in the space between the distributing plate and the burner deck, which will still result in a uniform fuel/air mixture outflow velocity over the entire burner deck surface and hence in a uniform combustion over the entire burner deck.

A requirement for preventing resonances and vibrations in the known flame distributing device is therefore a very short distance between the distributing plate and the burner deck. This slight distance, however, has a number of drawbacks. Firstly, a flame distributing device of such design constitutes a high flow resistance, so that a powerful fan is needed to force the fuel/air mixture through the flame distributing device. A second drawback is that from the point of view of manufacturing technique it is not easy to manufacture such a flame distributing device. In fact, the product tolerances require great precision, since a narrow gap across a large surface must be created.

Other functions of the distributing plate are cooling the burner deck and preventing flashback into the mixing chamber arranged upstream of the flame distributing device. Both functions are obtained in an effective manner only if between the burner deck and the distributing plate a gap is indeed present. Especially in the case of the very small gap width, there is a chance that the gap is sometimes partly lost and the distributing plate is in

abutment with the burner deck. Under those circumstances the two last-mentioned functions of the distributing plate are undone.

The object of the invention is to provide a flame distributing device which has a lower flow resistance and which requires less precision in terms of the product tolerances and with which further a variable combustion load over the surface of the burner deck is created.

To that end, the flame distributing device of the type described in the preamble is characterized in that a space between the distributing plate and the burner deck is divided into a number of segment chambers, between which segment chambers no flow or substantially no flow of fuel/air mixture is possible, and at each segment chamber the distributing plate has a specific hole pattern.

Owing to the space between the distributing plate and the burner deck being divided up into segment chambers, the distance between the burner deck and the distributing plate can be greater, and a flame distributing device with a lower flow resistance is obtained. Additionally, owing to the greater distance between the burner deck and the distributing plate, greater product tolerances will suffice, which enables a simpler manufacturing process. The only way out for the fuel/air mixture from a segment chamber is formed by the burner deck segment that covers the segment chamber in question. The combustion load of a relevant burner deck segment is therefore entirely dependent on the supply of the fuel/air mixture to the segment chamber associated with that burner deck segment. Thus a highly specific combustion load per segment can be chosen.

According to a further elaboration of the invention, the segment chambers can be formed by recesses in the distributing plate, the distributing plate being substantially in abutment with the burner deck apart from the distributing plate segments formed by the recesses, so that at each recess a segment chamber is formed between the burner deck and the distributing plate.

A flame distributing device of such design can be manufactured economically.

The walls bounding the recesses constitute only a small portion of the surface of the distributing plate and can therefore abut safely against the burner deck without the cooling function and the flashback prevention function being lost. These walls prevent fuel/air mixture from flowing from one segment chamber to another segment chamber.

According to a further elaboration of the invention, the respective specific hole patterns of at least a number of the various segment chambers differ from each other. As a consequence, for each segment chamber a specific combustion frequency is obtained, these frequencies being mutually different for at least a number of the various segment chambers. The presence of these different frequencies prevents the occurrence of resonances or vibrations and hence of phenomena such as whistling and rumbling.

According to a further elaboration of the invention, the hole patterns of two diametrically opposite segment chambers, which segment chambers are each disposed at a corner of the flame distributing device, correspond to each other, these hole patterns being chosen such that at that point a burner load is obtained which is suitable for ignition using a spark. A flame distributing device of such design can never be mounted incorrectly. That is, the hole pattern in the distributing plate that is suitable for ignition using a spark is located adjacent the spark generating element in both possible mounting positions of the flame distributing device.

Preferably, the flame distributing device comprises a housing with a distributing plate mounting opening, which distributing plate mounting opening is covered up by the distributing plate which has been connected to the housing by welding so as to form a gap, in which gap the edges of the burner deck are slidably received so that the burner deck can expand and shrink freely. A flame distributing device of such design can be manufactured economically and is particularly durable in that the burner deck does not undergo any particular stresses resulting from expansion or shrinkage.

The invention will be further clarified on the basis of an exemplary embodiment which is hereinafter with reference to the drawings.

Fig. 1 is a partial cross-sectional elevation of a hot water appliance comprising a flame distributing device according to the invention;

Fig. 2 is a longitudinal section taken on line II-II of Fig. 3, of an exemplary embodiment of a flame distributing device;

Fig. 3 is a cross-sectional elevation of the exemplary embodiment shown in Fig. 2, taken along line III-III in Fig. 2;

Fig. 4 shows a top plan view of an exemplary embodiment of a distributing plate; and

Fig. 5 shows a cross-sectional elevation of the distributing plate represented in Fig. 4, taken on line V-V in Fig. 4.

Fig. 1 shows a partial cross-sectional elevation of a hot water appliance 3 comprising a heat exchanger 10 which includes a burner 2. The heat exchanger 10 comprises flue ducts 11 and water-conveying channels 12. The burner 2, which comprises a fuel/air mixture chamber 13, is supplied with air and fuel, in the present case gas, by means of a fan 16. The air is sucked in via an air suction channel 14 and the gas is supplied via a gas supply channel 15. The gas/air mixture formed in the fan 16 is blown into the mixture chamber 13 of the burner 2 via the gas/air mixture supply pipe 17. Then the gas/air mixture passes the flame distributing device 1 which is represented in detail in Figs. 2 and 3.

Fig. 2 shows a longitudinal section of the flame distributing device 1 and Fig. 3 shows a transverse section of the flame distributing device 1 as well as a detail

thereof. The flame distributing device 1 comprises a housing 8, a distributing plate 5 and a burner deck 4. The distributing plate 5 is provided with recesses 5a which, together with the burner deck 4, define segment chambers 7. The recesses 5a are separated from each other by walls 5b which substantially abut against the burner deck 4. The walls 5b form the boundaries of the segment chambers 7. In the present exemplary embodiment the burner deck 4 is provided with a regular hole pattern which ensures a good combustion of the gas/air mixture.

The distributing plate 5, however, has a specifically designed hole pattern 6 for each segment chamber 7. The specific hole patterns 6 in the distributing plate 5 of at least a number of the various segment chambers 7 differ from each other. Thus a different combustion load over the surface of the burner deck 4 is obtained, so that different combustion frequencies occur over the burner deck 4. This prevents the occurrence of resonances and vibrations which cause whistling or rumbling.

The differently designed hole patterns in the distributing plate are clearly depicted in the top plan view of the distributing plate shown in Fig. 4. At some segment chambers 7, the distributing plate has many large holes and few small holes, while at other segment chambers 7, by contrast, it has many small holes and few large holes. It is clear that it is also possible to choose more than two different diameters for the hole pattern or to choose holes of different shapes and/or dimensions.

In the present exemplary embodiment, the hole patterns 6' and 6" of two diametrically opposite segment chambers 7', 7", which segment chambers 7', 7" are each located in a corner of the distributing plate 5, are of equal design and chosen so as to yield a burner load that is suitable for ignition using a spark. As a consequence, the flame distributing device can never be assembled incorrectly, since in both assembly positions the hole pattern that is desired for ignition is located adjacent the spark generating element.

As is clearly represented in the detail in Fig. 3, the housing 8 is provided with a distributing plate mounting opening 8a. The distributing plate mounting opening 8a is covered up by the distributing plate 5 which has been connected to the housing 8 by welding so as to form a gap 9. In this gap 9 the edges of the burner deck 4 are slidably received, so that the burner deck can freely expand and shrink. This prevents the occurrence of undesired stresses in the burner deck 4 resulting from expansion or shrinkage due to temperature fluctuations.

It will be clear that the invention is not limited to the exemplary embodiment described. The segment chambers which, in the embodiment described, are formed by the recesses in the distributing plate according to the invention can also be formed in a different manner. Thus, for instance, the burner deck can be provided with recesses and the distributing plate can have a substantially level surface. Another possibility is that between a distributing plate and a burner deck each having a sub-

stantially level surface, walls are included which extend substantially perpendicularly to the main surfaces of the burner deck and the distributing plate, which vertical walls bound a number of segment chambers.

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Claims

1. A flame distributing device (1) intended for a burner (2) of a hot water appliance (3) for the purpose of water heating, which flame distributing device (1) comprises a burner deck (4) with a specific hole pattern (6) and a distributing plate (5) with a specific hole pattern (6), the burner deck (4) and the distributing plate (5) extending substantially parallel to each other, characterized in that a space between the distributing plate (5) and the burner deck (4) is divided into a number of segment chambers (7), between which segment chambers (7) no flow or substantially no flow of fuel/air mixture is possible, and at each segment chamber (7) the distributing plate (5) has a specific hole pattern (6). 10 15 20
2. A flame distributing device according to claim 1, characterized in that the segment chambers (7) are formed by recesses (5a) in the distributing plate (5), the distributing plate (5) being substantially in abutment with the burner deck (4) apart from the distributing plate segments (5a) formed by the recesses (5a), so that at each recess (5a) a said segment chamber (7) is formed between the burner deck (4) and the distributing plate (5). 25 30
3. A flame distributing device according to claim 1 or 2, characterized in that the specific hole patterns (6) in the distributing plate (5) of at least a number of the various segment chambers (7) differ from each other. 35
4. A flame distributing device according to any one of claims 1-3, characterized in that the hole patterns (6', 6'') in the distributing plate (5) of two diametrically opposite segment chambers (7', 7''), which segment chambers (7', 7'') are each disposed at a corner of the flame distributing device (1), correspond to each other, these hole patterns (6', 6'') being chosen such that at that point a burner load is obtained which is suitable for ignition using a spark. 40 45
5. A flame distributing device according to any one of claims 1-4, characterized by a housing (8) with a distributing plate mounting opening (8a), which distributing plate mounting opening (8a) is covered by the distributing plate (5) which has been connected to the housing by welding so as to form a gap (9), in which gap (9) the edges of the burner deck (4) are slidably received, so that the burner deck (4) can expand and shrink freely. 50 55

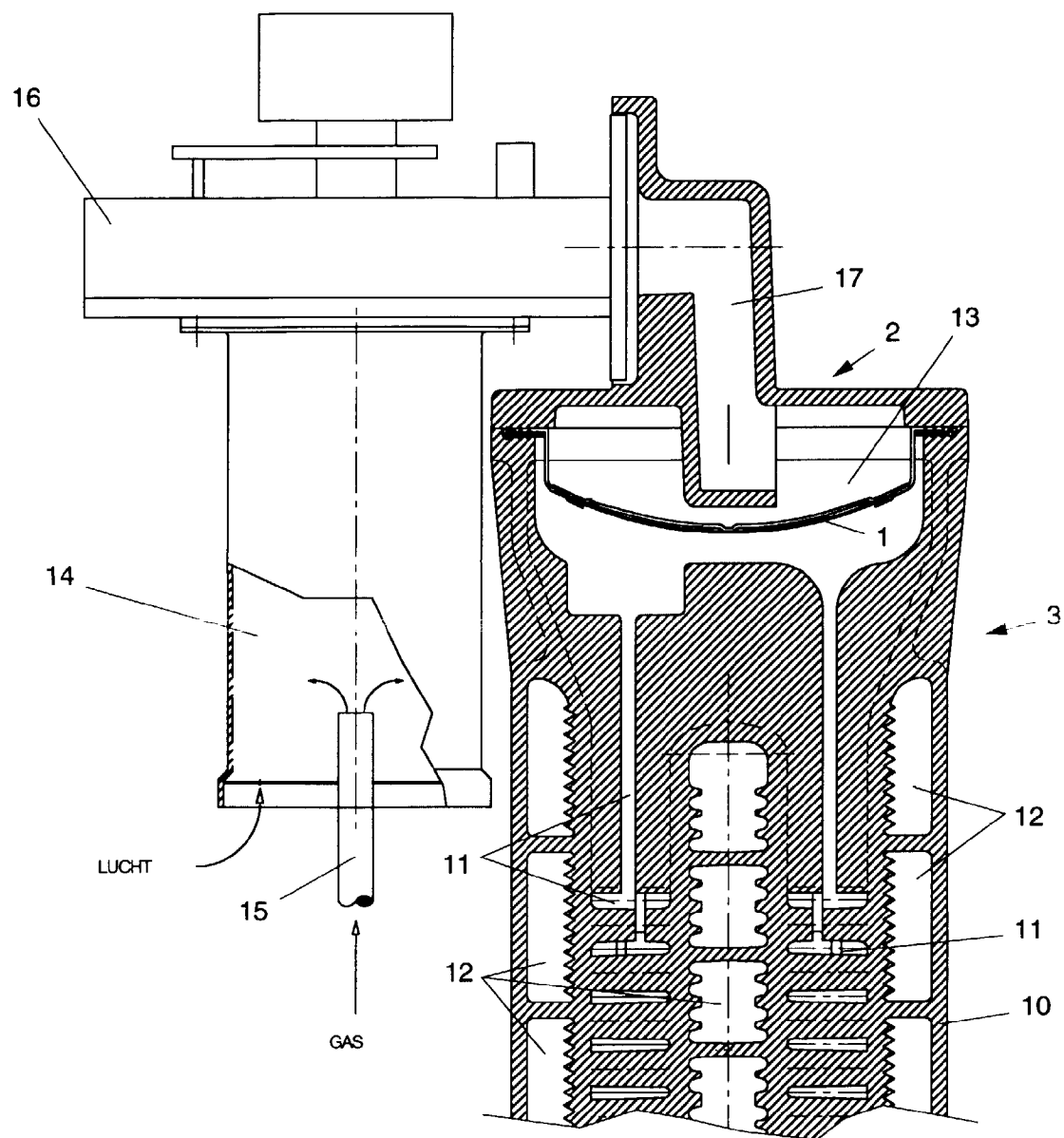


FIG. 1

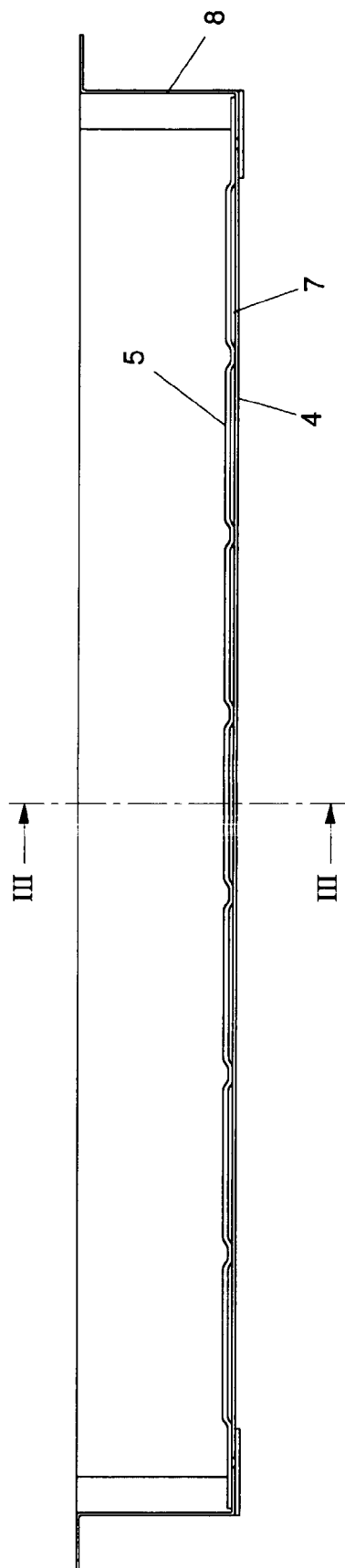


FIG. 2

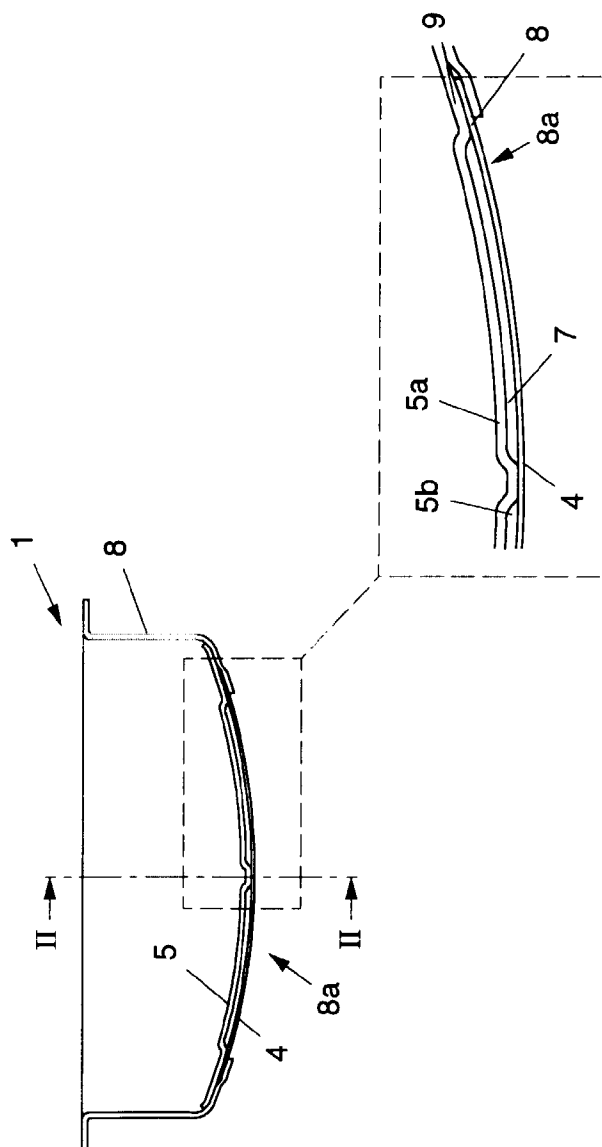
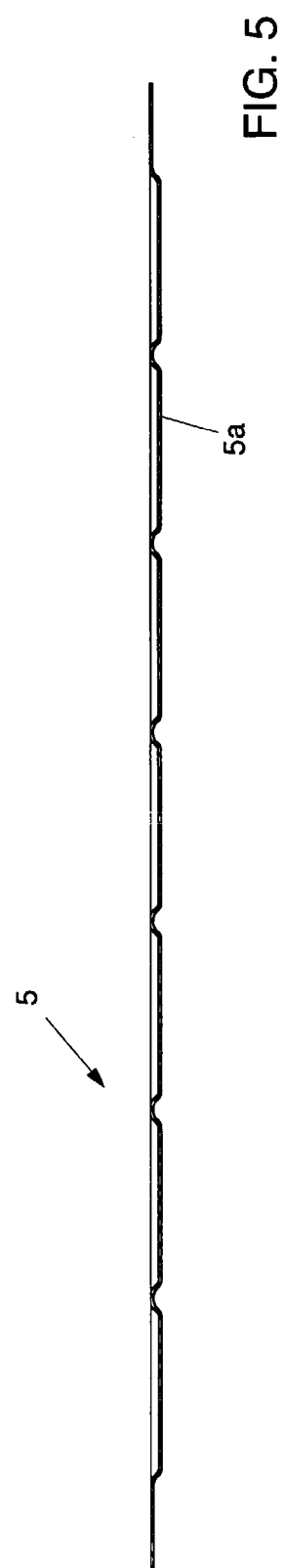
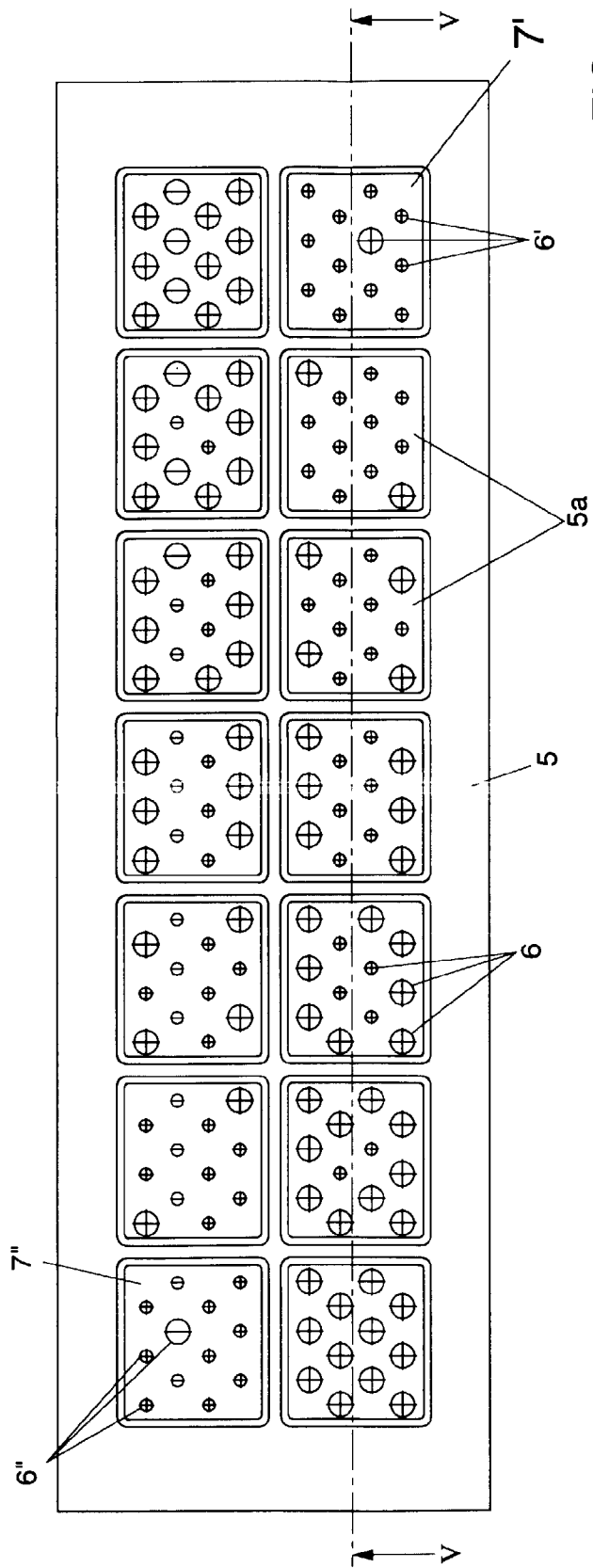


FIG. 3





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EUROPEAN SEARCH REPORT

Application Number
EP 97 20 1744

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	EP 0 698 766 A (CARADON IDEAL LTD) 28 February 1996 * column 1, line 3 - column 1, line 45 * * column 2, line 9 - column 2, line 29 * * column 3, line 45 - column 4, line 12 * * figures 1-7 *	1	F23D14/58 F23D14/46
A	WO 94 16269 A (LE MER) 21 July 1994 * page 13, line 22 - page 13, line 32 * * page 16, line 22 - page 16, line 27 * * figures 20,21 *	1,2	
A	EP 0 314 897 A (RUHRGAS AG) 10 May 1989		
A	US 5 520 536 A (RODGERS) 28 May 1996		
A	EP 0 472 270 A (FURIGAS) 26 February 1992		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			F23D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28 August 1997	Examiner Phoa, Y
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