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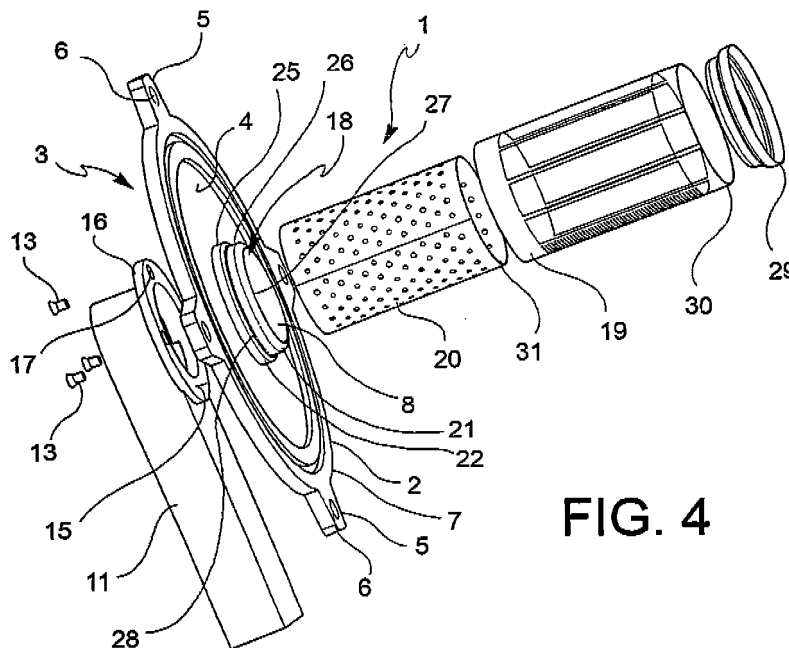
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(54) **Gas burner for boiler**

(57) A gas burner (1) for boiler comprises a support plate (2) with an outer side (3), and an inner side (4) opposite the outer side (3) and intended to face a combustion chamber, one or more first portions (5) in order to connect the support plate (2) to the combustion chamber, a passage opening (8), a second connection portion (10) formed on the outer side (4) and adapted to the con-

nection of a supply duct (11) to the support plate (2) in flow communication with the passage opening (8), a third connection portion (18) formed on the inner side (4) of the support plate (2) and configured for a direct connection of a diffuser wall (19) and/or a distributor wall (20) to the support plate (2) in flow communication with the passage opening (8), wherein the third connection portion (18) and the support plate (2) are formed as one piece.



**FIG. 4**

## Description

**[0001]** The present invention relates to a gas burner for a boiler.

**[0002]** Prior art gas boilers comprise a support plate which is connectable to a combustion chamber of the boiler in order to ensure the closing of the chamber and the positioning of the burner in relation to such combustion chamber. The support plate defines an opening for the passage of a premixed gas-air mixture from an outer side to an inner side of the same plate. At the outer side of the support plate, a duct for supplying the burner with the premixed gas-air mixture can be connected at the passage opening. The connection between the supply duct and the support plate is carried out by means of a plurality of screws and through the interposition of a gasket. The burner further comprises a diffuser through which the fuel-air premixed gas which determines a flame pattern for the generation of heat is conveyed. Typically, the diffuser comprises a wall provided with a plurality of small holes and having an inner side in flow connection with the supply duct, and an outer side on which the combustion takes place. Upstream the diffuser (in relation to the flow direction of the gas-air mixture) a distribution device can be further provided, typically a wall with a plurality of through holes, so configured as to distribute the gas-air mixture towards the diffuser wall in an essentially even manner or, however, in the desired manner.

**[0003]** The diffuser and the distributor are rigidly connected to the support plate, in particular on the inner side thereof, so that, once the burner has been assembled, the diffuser projects into the boiler combustion chamber, and the supply duct extends outside the latter.

**[0004]** For the connection of the diffuser and the distributor to the support plate, a so-called stainless steel connection flange is provided. The connection flange is manufactured independently from the support plate, and it is connectable thereto by means of a plurality of screws and through the interposition of a special high-temperature resistant gasket. The connection flange has a connection portion projecting into the combustion chamber, and which the diffuser and the distributor are locked to.

**[0005]** The heat which is generated by the combustion on the outer side of the diffuser wall is known to be conveyed, by the hot combustion gases, to a heat exchanger for the heating of a fluid, for example, water, which is then conveyed for an use, for example, a heating system of an industrial process, of living environments, or the like.

**[0006]** Prior art gas burners for boilers, while being satisfactory as regards operation and reliability, suffer from the drawback of having a complex structure with a number of pieces, the manufacturing and assembly of which are very burdensome in terms of the time and costs involved.

**[0007]** Therefore, the object of the present invention is to provide a gas burner for boiler having a simpler structure and which can be manufactured and assembled at a lower cost than the prior art burners.

**[0008]** This and other objects are achieved by a gas burner for boiler which can be supplied with a fuel and air mixture, comprising a support plate having:

- 5 - an outer side and an inner side opposite the outer side and intended to face a combustion chamber;
- one or more first connection portions for removably connecting the support plate to the combustion chamber,
- 10 - a passage opening for said fuel and air mixture to pass from said outer side to said inner side of the support plate,
- a second connection portion formed on said outer side and suitable for connecting a fuel-air supply duct to said support plate in flow communication with said passage opening,
- 15 - a third connection portion formed on the support plate inner side at said passage opening, and configured for directly connecting a diffusion wall to said support plate in flow communication with said passage opening,
- 20

in which said third connection portion and said support plate are formed as one piece.

- 25 **[0009]** Thanks to the manufacturing of the support plate and the third connection portion as one piece, it is possible to eliminate the connection flange, the relative securing screws, and the gasket interposed between the connection flange and the support plate. This results in a considerable reduction of the number of components and shortening of the assembly time. Furthermore, as it should be apparent from the following detailed description, thanks to the invention, the use of the expensive stainless steel can be reduced for connecting the diffuser and the distributor to the support plate.
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- 35 **[0010]** In order to better understand the invention and appreciate the advantages thereof, a description of some exemplary, non-limiting embodiments will be given herein below, with reference to the annexed Figures, in which:

- 40 - Fig. 1 is a sectional view of a gas burner for boilers of the prior art;
- Fig. 2 is a perspective view of the burner of the prior art;
- 45 - Fig. 3 is an exploded view of the burner of the prior art which illustrates the assembly complexity thereof, and the high number of individual pieces to be manufactured and assembled;
- Fig. 4 is an exploded view of a gas burner for boiler according to an embodiment of the invention;
- 50 - Fig. 5 is a sectional view of the burner in Fig. 4;
- Fig. 6 is a further sectional view of the burner in Fig. 4;
- Fig. 7 is a perspective view of the burner in Fig. 4;
- Fig. 8 is an enlarged sectional view of a support plate of the burner in Fig. 4.
- 55

**[0011]** With reference to the Figures, a gas burner for boilers, i.e. a burner for the generation of heat, in general

by means of the combustion of a fuel gas, or, in particular, of a pre-mixture of fuel gas and air is generally indicated with the reference numeral 1. The burner 1 comprises a support plate 2 with an outer side 3 and an inner side 4 opposite the outer side 3 and intended to face a combustion chamber (not shown). The support plate 2 is removably connectable to the combustion chamber through one or more first connection portions 5, preferably a plurality of through holes 6 obtained along a perimeter or outer edge 7 of the support plate 2 and intended to receive screws for the securing of the support plate 2 to the boiler combustion chamber.

**[0012]** The support plate 2 further defines a passage opening 8 for the passage of the fuel and air mixture 9 from the outer side 3 thereof to the inner side 4 thereof and, consequently, from the outer part of the combustion chamber to the inner part thereof.

**[0013]** In order to allow the supply of the fuel-air mixture to the burner 1, a second connection portion 10 formed on the outer side 3 of the support plate 2 and so configured as to connect a supply duct 11 in flow communication with the passage opening 8 is provided.

**[0014]** According to an embodiment, the second connection portion 10 comprises a plurality of holes 12, which are preferably blind, internally threaded and distributed around the passage opening 8. The holes 12 open onto the outer side 4 of the support plate 2, and are adapted to receive screws 13 for the securing of the supply duct 11. An essentially planar annular surface 14 is formed on the outer side 3 of the support plate 2, and extends all around the passage opening 8. Such annular surface 14 forms a sealing surface which a corresponding sealing surface 15 can abut against (with or without the interposition of a gasket) which is formed in a connection flange 16 of the supply duct 11. The connection flange 16 comprises a plurality of through holes 17 which are suitable to receive the screws 13 for the connection of the supply duct 11 to the support plate 2.

**[0015]** According to an embodiment, the aforementioned holes 12 are formed in the annular sealing surface 14, and the through holes 17 of the supply duct 11 flange 16 are also formed in the corresponding sealing surface 15.

**[0016]** The burner 1 further comprises a third connection portion 18, which is formed on the inner side 4 of the support plate 2 at the passage opening 8, and so configured as to allow a direct connection of a diffusion wall 19 and/or a distribution wall 20 to the support plate 2, so that such diffusion and/or distribution walls are arranged in flow communication with the passage opening 8. According to an aspect of the present invention, the third connection portion 18 and the support plate 2 are formed as one piece, preferably by aluminium die-casting. This allows completely eliminating the connection flange, which is essential in prior art burners, and achieving a material and manufacturing and assembly cost saving.

**[0017]** According to an embodiment, the third connection portion 18 forms a distributor seat 21 which is es-

entially annular and so configured as to receive the distributor wall 20, as well as a separate diffuser seat 22 which is essentially annular and so configured as to receive the diffuser wall 19.

5 **[0018]** According to an alternative embodiment, the third connection portion 18 only forms a distributor seat 21 in order to receive and lock the distribution wall 20, while the diffuser gets to be connected to the distributor wall. Similarly, the embodiment has been contemplated  
10 according to which the third connection portion 18 only forms a diffuser seat 22 in order to receive and lock the diffusion wall 19, while the distributor can be connected to the diffuser wall, or it can be even omitted.

15 **[0019]** In accordance with an embodiment, the diffuser 19 is essentially cylindrical or frusto-conical, and the distributor 20 is essentially cylindrical or frusto-conical and arranged in a co-axial manner inside the diffuser 19 (see Fig. 5). In such a case, the diffuser 22 and the distributor 21 seats can also be essentially circular and co-axial.

20 **[0020]** In accordance with an aspect of the present invention, the third connection portion 18 projects from the support plate 2 and has an essentially tubular shape, with an inner surface 23 defining the passage opening 8, and an outer surface 24 constituting the diffuser seat 22  
25 and/or the distributor seat 21.

**[0021]** Advantageously, such outer surface 24 comprises a first circumferential partial surface 25, adjacent to the support plate 2 plate-like body, and a second circumferential partial surface 26, arranged between a free  
30 end 27 of the third connection portion 18 and the first partial surface 25.

**[0022]** The first partial surface 25 has a diameter which is greater than the second partial surface 26 diameter, and it is divided from the latter by a circumferential step  
35 28.

**[0023]** This allows an easy insertion (for example, by means of press-fit) of the distributor wall 20 base on the second partial surface 26 which acts as a distributor seat 21, and a successive or concomitant insertion (for example, also by means of press-fit) of the diffuser wall 19  
40 base on the first partial surface 26 which acts as a diffuser seat 22.

**[0024]** The direct connection between the diffuser wall 19 and the third connection portion 18 is preferably  
45 achievable through an interference coupling, locking by means of screws, or locking by means of permanent set by plastic deformation.

**[0025]** Similarly, the direct connection between the distributor wall 20 and the third connection portion 18 is also  
50 preferably achievable through an interference coupling, locking by means of screws, or locking by means of permanent set by plastic deformation.

**[0026]** For the sake of completeness, the proper positioning of the distributor wall 20 in relation to the diffuser wall 19 is advantageously ensured by an upper bottom  
55 wall 29 which is adapted to be connected to diffuser and distributor upper edges 30, 31 opposite the abovementioned bases which are received by the third connection portion

18.

**[0027]** The burner according to the present invention has a number of advantages. In particular, it has a reduced number of individual components and, in particular, stainless steel components, as well as an easily and quickly assemblable structure.

**[0028]** It shall be appreciated that those skilled in the art, to the aim of meeting specific, contingent needs, will be able to make further modifications and variations to the gas burner for boiler according to the present invention, all of which are also included in the protection scope of the invention, as defined by the following claims.

## Claims

1. Gas burner (1) for boiler which can be supplied with a fuel and air mixture, comprising a support plate (2) having:

- an outer side (3), and an inner side (4) opposite the outer side (3) and intended to face a combustion chamber,
- one or more first connection portions (5) for a removable connection of the support plate (2) to the combustion chamber,
- a passage opening (8) for the passage of said fuel and air mixture from said outer side (3) to said inner side (4) of the support plate (2),
- a second connection portion (10) formed on said outer side (4), and adapted to the connection of a fuel-air supply duct (11) to said support plate (2) in flow communication with said passage opening (8),
- a third connection portion (18) formed on the inner side (4) of the support plate (2) at said passage opening (8), and configured for a direct connection of a diffuser wall (19) and/or a distributor wall (20) to said support plate (2) in flow communication with said passage opening (8), wherein said third connection portion (18) and said support plate (2) are formed as one piece.

2. The gas burner (1) for boiler according to the claim 1, wherein said third connection portion (18) forms an essentially annular distributor seat (21) so configured as to receive said distributor wall (20).

3. The gas burner (1) for boiler according to the claim 1 or 2, wherein said third connection portion (18) forms an essentially annular diffuser seat (22) so configured as to receive said diffuser wall (19).

4. The gas burner (1) for boiler according to the claim 3, wherein said diffuser seat (22) is essentially circular, and said distributor seat (21) is essentially circular and co-axial in relation to said diffuser seat (22).

5. The gas burner (1) for boiler according to any preceding claim, wherein said third connection portion (18) has an essentially tubular shape, projecting from said support plate (2), and having an inner surface (23) defining said passage opening (8), and an outer surface (24) defining said diffuser seat (22) and/or said distributor seat (21).

6. The gas burner (1) for boiler according to any preceding claim, wherein said outer surface (24) comprises:

- a circumferential first partial surface (25) adjacent to the support plate (2) plate-like body and forming said diffuser seat (22),
- a circumferential second partial surface (26) arranged between a free end (27) of the third connection portion (18) and said first partial surface (25), said second partial surface (26) forming said distributor seat (21),
- a circumferential step (28) formed between said first and said second partial surfaces,

wherein said first partial surface (25) has a diameter which is greater than said second partial surface (26) diameter.

7. The gas burner (1) for boiler according to any preceding claim, wherein said support plate (2) and said third connection portion (18) are formed as one piece by aluminium die-casting.

8. The gas burner (1) for boiler according to any preceding claim, comprising a diffuser with a diffuser wall (19) having a base which is received by said diffuser seat (22) of said third connection portion (18).

9. The gas burner (1) for boiler according to the preceding claim, wherein the direct connection between said diffuser wall (19) and said third connection portion (18) is selected from the group consisting of:

- interference couplings,
- locking by screws,
- locking by permanent set.

10. The gas burner (1) for boiler according to any claim 8 or 9, wherein said diffuser wall (19) is essentially cylindrical and interference locked to said diffuser seat (22).

11. The gas burner (1) for boiler according to any preceding claim, comprising a distributor with a distributor wall (20) having a base which is received by said distributor seat (21) of said third connection portion (18).

12. The gas burner (1) for boiler according to the preceding claim, wherein the direct connection between said distributor wall (20) and said third connection portion (18) is selected from the group consisting of:

5

- interference couplings,
- locking by screws,
- locking by permanent set.

13. The gas burner (1) for boiler according to any claim 11 or 12, wherein said distributor wall (20) is essentially cylindrical and interference locked to said distributor seat (21).

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14. The gas burner (1) for boiler according to any preceding claim, wherein said second connection portion (10) comprises:

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- a plurality of internally threaded blind holes (12) which are formed on the outer side (3) of the support plate (2) around the passage opening (8) and adapted to receive screws (13) for the securing of the supply duct (11),
- an annular sealing surface (14) which is essentially planar and extending around all the passage opening (8),

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wherein said blind holes (12) are formed in said annular sealing surface (14).

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15. The gas burner (1) for boiler according to any preceding claim, wherein said first connection portion (5) comprises a plurality of through holes (6), formed along an outer perimeter (7) of the support plate (2) and adapted to receive screws for the securing of the support plate (2) to the boiler combustion chamber.

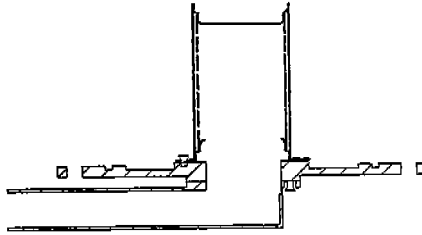
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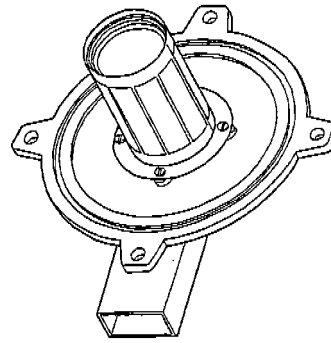
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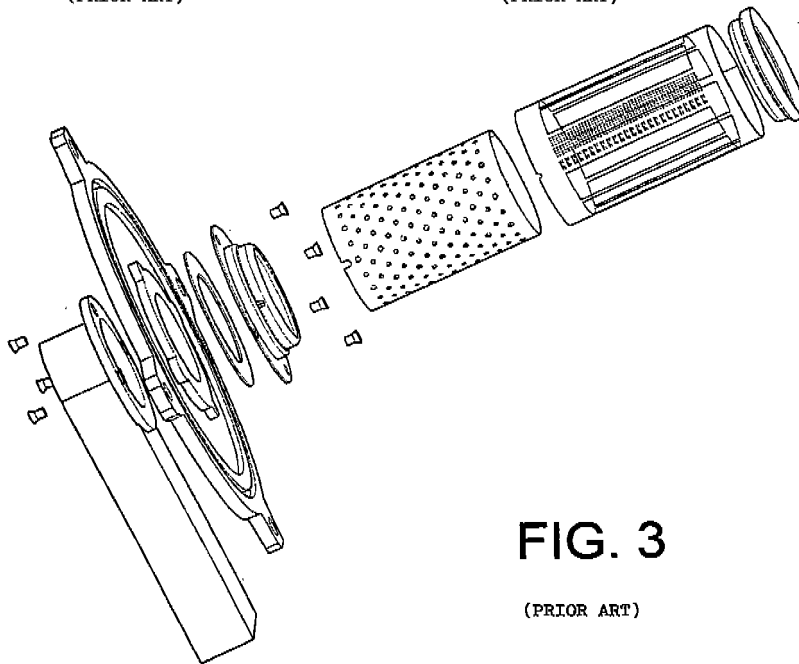
**FIG. 1**

(PRIOR ART)



**FIG. 2**

(PRIOR ART)



**FIG. 3**

(PRIOR ART)

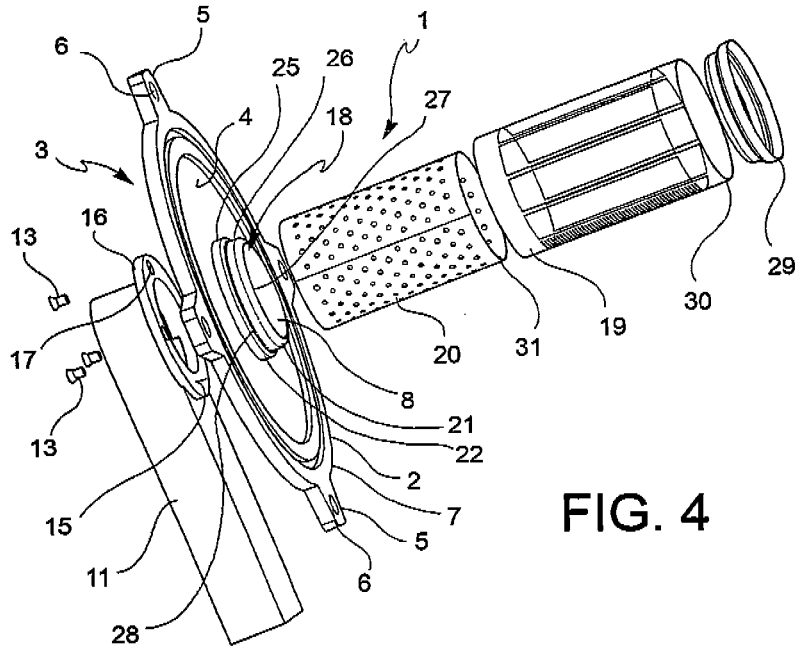


FIG. 4

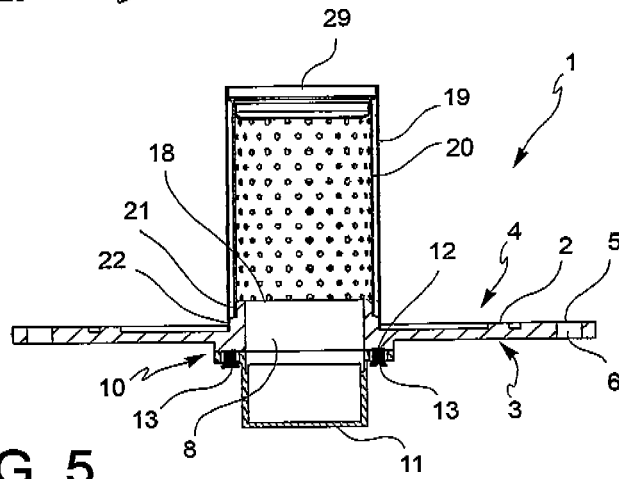


FIG. 5

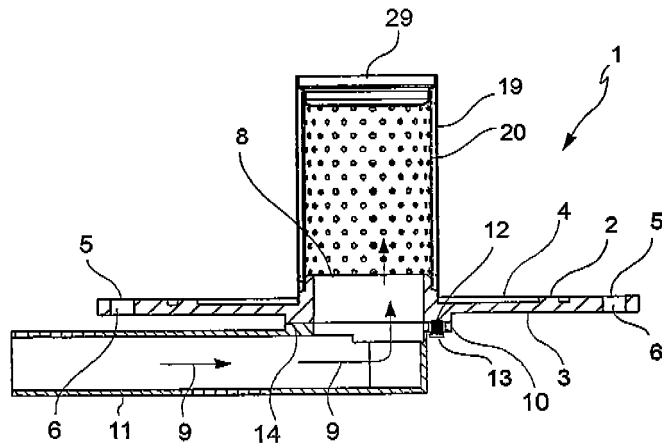


FIG. 6

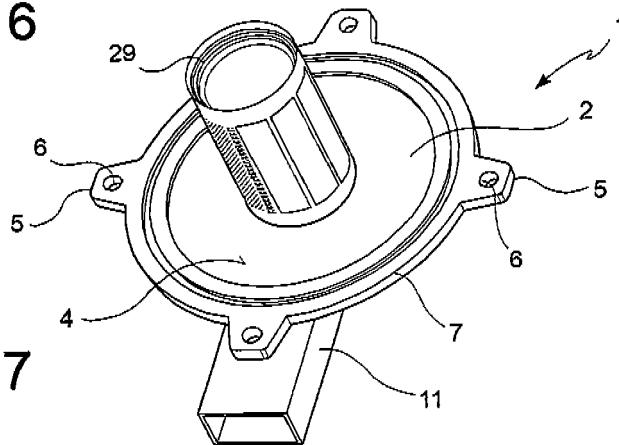


FIG. 7

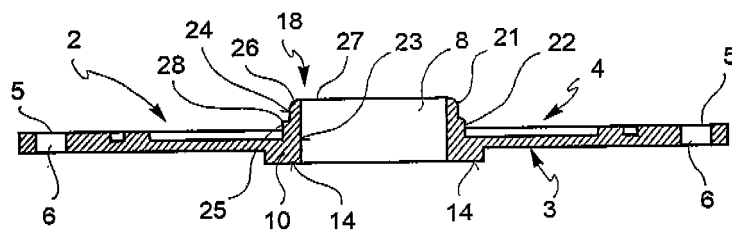


FIG. 8





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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
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Place of search		Date of completion of the search	Examiner
Munich		17 July 2008	Theis, Gilbert
CATEGORY OF CITED DOCUMENTS		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	
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ANNEX TO THE EUROPEAN SEARCH REPORT  
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