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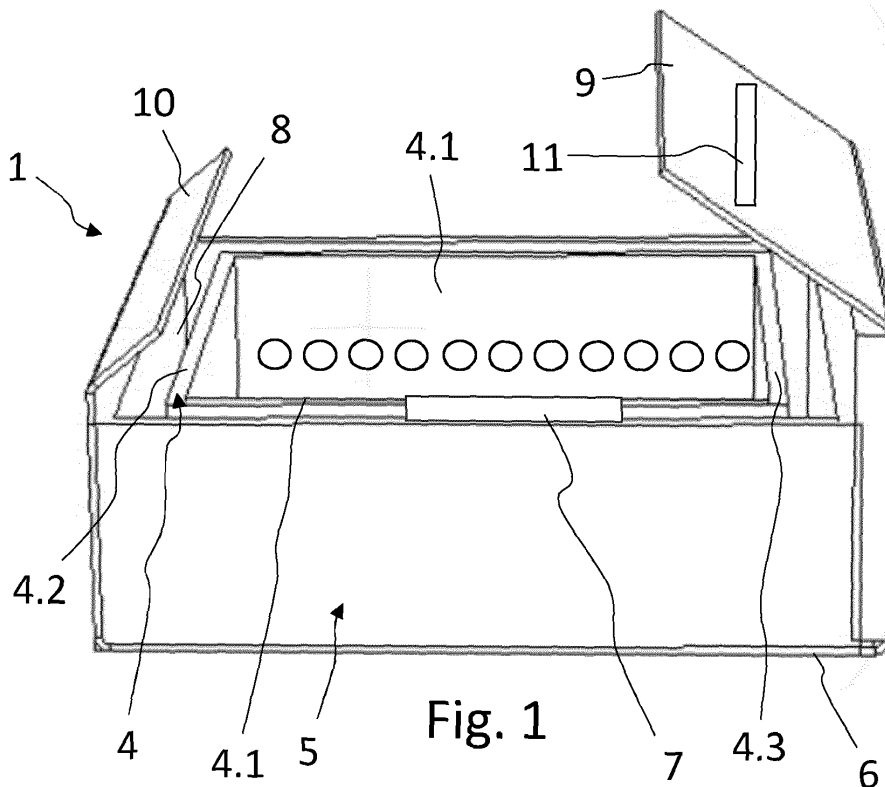
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(54) **BURNER FOR SOLID FUEL**

(57) A solid fuel burner (1) for use in a firebox, the solid fuel burner (1) comprising a perforated grate (2) having a grate area (3), on which the solid fuel to be combusted is arranged to be placed. The solid fuel burner (1) further comprises a perforated inner collar (4) completely encircling the grate area (3) and extending up-

wards from the grate (2), an outer collar (5) encircling the inner collar (4) and arranged at a distance from the inner collar (4), a perforated bottom plate (6), a top plate (7), and an air chamber (8) encircling the inner collar (4) and delimited by the inner collar (4), the outer collar (5), the bottom plate (6) and the top plate (7).



**Fig. 1**

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**Description****FIELD OF TECHNOLOGY**

[0001] The invention relates to a solid fuel burner, which is intended to be placed in a firebox of a fireplace. The burner is especially designed for burning pellets and briquettes.

**BACKGROUND**

[0002] Burning solid fuel, such as wood, wood chips, pellets and briquettes in a fireplace is inconvenient and impractical, because the fuel particles form a pile, the combustion of which is incomplete, and the fuel particles can easily clog the grate due to the small size of the combustible matter. For example, pellets may fall through the slits in the grate or stick to the slits. In general, a separate burner, which is placed in the firebox and where the combustion of the solid fuel occurs within a firebox, may be used for burning smaller size solid fuel. At its simplest, the burners may be basket shaped structures. However, a dense pellets and briquettes require a suitable burner to make good use of their excellent properties.

**OBJECT OF THE INVENTION**

[0003] The object of the invention is to provide a new solid fuel burner with improved air supply.

**SUMMARY**

[0004] The object of the invention can be achieved by the solid fuel burner according to claim 1.

[0005] The solid fuel burner according to the invention comprises a perforated grate having a grate area, on which the solid fuel to be combusted is arranged to be placed. The solid fuel burner further comprises a perforated inner collar completely encircling the grate area and extending upwards from the grate, an outer collar encircling the inner collar and arranged at a distance from the inner collar, a perforated bottom plate, a top plate, and an air chamber encircling the inner collar and delimited by the inner collar, the outer collar, the bottom plate and the top plate.

[0006] Significant advantages can be achieved by means of the invention. The solid fuel burner according to the invention enhances the combustion of solid fuel and reduces combustion losses and harmful emissions formed in the combustion. By means of the invention, a complete mixing of combustion air and combustion gases is obtained, with which complete clean combustion and minimum amount of combustion residue can be achieved. The burner is specifically designed for burning dense solid fuels, such as pellets and briquettes.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0007] The present disclosure will be better understood from the following detailed description read in light of the accompanying drawings, wherein:

Fig. 1 shows a solid fuel burner according to an embodiment of the invention as a side view,

FIGS. 2-4 show the solid fuel burner shown in fig. 1 as perspective views.

**DETAILED DESCRIPTION**

[0008] The drawings show a solid fuel burner 1 for burning solid fuel, such as wood, wood chips, and especially pellets and briquettes in a firebox of a fireplace. The solid fuel burner 1 is intended to be placed on a fire grate of the firebox.

[0009] The solid fuel burner 1 comprises a perforated plate grate 2 having a perforated grate area 3, on which the solid fuel to be combusted is placed. The entire grate area 3 may be perforated. Part of the combustion air is fed above the grate area 3 through the perforation holes in the grate 2/grate area 3. The grate 2 and/or the grate area 3 may be rectangular, square or round in shape. The solid fuel burner 1 further comprises a perforated inner collar 4 that encircles the perimeter of the grate area 3. The inner collar 4 completely encircles the perimeter of the grate area 3. The inner collar 4 extends upwards from the grate 2.

[0010] The solid fuel burner 1 further comprises an outer collar 5, a perforated bottom plate 6 and a top plate 7. The outer collar 5 encircles the inner collar 4 and is arranged at a distance from the inner collar 4. The outer collar 5 may completely encircle the inner collar 4. The outer collar 5 may be unperforated.

[0011] The bottom plate 6 extends from the lower part or end of the inner collar 4 to the lower part or end of the outer collar 5. The bottom plate 6 may completely cover the gap between the lower part or lower end of inner collar 4 and the lower part or lower end of the outer collar 5.

[0012] The bottom plate 6 may be integral with the grate 2 or the grate 2 may form the bottom plate 6. The outer collar 5 extends upwards from the bottom plate 6.

[0013] The top plate 7 extends from the upper part or end of the inner collar 4 to the upper part or end of the outer collar 5. The top plate 7 may completely cover the gap between the upper part or upper end of inner collar 4 and the upper part or upper end of the outer collar 5. For the sake of clarity, the top plate 7 is only partially shown in the drawings.

[0014] The solid fuel burner 1 comprises an air chamber 8, which encircles the inner collar 4. The air chamber 8 may completely encircle the inner collar 4. The air chamber 8 is located between the inner collar 4 and the outer collar 5. The air chamber 8 is delimited by the inner collar 4, the outer collar 5, the bottom plate 6

and the top plate 7. Combustion air is arranged to flow into the air chamber 8 through the perforation holes in the bottom plate 6. The combustion air is arranged to be discharged from the air chamber 8 to/above the grate area 3 through the perforation holes in the inner collar 4. As part of the combustion air is fed to/above the grate area 3 through the perforation holes in the inner collar 4 and part through the perforation holes in grate 2/grate area 3, more even distribution of combustion air may be achieved.

**[0015]** The top plate 7 may be unperforated or comprise additional air holes (not shown) through which additional combustion air is arranged to flow from the air chamber 8 above the grate area 3. The additional air holes may be located in the rear corners or in each corner of the top plate 7. The additional air holes may be square, rectangular or round in shape. The combustion air fed from additional air holes prevents the fire from being smothered when the fuel on the grate area 3 covers the perforation holes in the side plates 4.1, front plate 4.2 and/or the rear plate 4.3. The guide plate 9 and/or further guide plate 10 may direct the combustion air fed through the additional air holes above the grate area 3.

**[0016]** The inner collar 4 may comprise two perforated side plates 4.1, a perforated rear plate 4.2 and a perforated front plate 4.3, which completely encircle the perimeter of grate area 3. The side plates 4.1 may be parallel. The front plate 4.2 and rear plate 4.3 may be parallel. The perforation holes are located in the upper part of the rear plate 4.3, in the middle part of the side plates 4.1, i.e. at a lower level than the perforation holes in the rear plate 4.3, and in the lower part of the front plate 4.2, i.e. at a lower level than the perforation holes in the side plates 4.1. The other parts of the side plates 4.1, the rear plate 4.3 and the front plate 4.2 may be unperforated. The perforated area in the side plates 4.1, the rear plate 4.3 and the front plate 4.2 may extend horizontally over the entire length of said plates.

**[0017]** As the side plates 4.1, rear plate 4.3 and the front plate 4.2 have perforation holes at three different heights, the combustion air supply takes place at different heights and locations as the combustion progresses. Thus, the combustion air can always be fed above the fuel on the grate area 3, which enhances the combustion process. Moreover, combustion air can be directed through the perforation holes to the ignition area when igniting the fuel.

**[0018]** The outer collar 5 may comprise two side plates, a rear plate and a front plate. The side plates may be parallel. The front plate and rear plate may be parallel.

**[0019]** The solid fuel burner 1 may further comprise a guide plate 9 placed at the rear part of the burner 1. The guide plate 9 extends upwards from the rear part of burner 1, e.g., from the rear plate of the outer collar 5 or the top plate 7, and obliquely towards the front part of the burner 1. Alternatively or additionally, the guide plate 9 may be curved. The rear part of the burner 1 faces the back wall of the firebox when the burner 1 has been

placed in the firebox. The guide plate 9 is configured to direct combustion air and combustion gases above the grate area 3. The guide plate 9 may comprise a guide opening 11 configured to direct part of the combustion air towards the back wall of the firebox. This prevents soot-  
ing of the rear well.

**[0020]** The inclination angle of the guide plate may be adjustable, e.g. the guide plate 9 may be hingedly mounted on the rear part of the burner 1. The guide plate 9 may extend over the entire width of the rear part of the burner 1.

**[0021]** The solid fuel burner 1 may comprise a further guide plate 10 placed at the front part of the solid fuel burner 1. The further guide plate 10 extends upwards from the front part of the burner 1, e.g. from the front plate of the outer collar 5 or the top plate 7, and obliquely towards the rear part of the burner 1. Alternatively or additionally, the further guide plate 10 may be curved.

**[0022]** The front part of the burner 1 faces the door of the fireplace when the burner 1 has been placed in the firebox. The further guide plate 10 is configured to direct combustion air and combustion gases above the grate area 3. The further guide plate 10 also directs combustion gases away from the door of the fireplace.

**[0023]** The inclination angle of the further guide plate 10 may be adjustable, e.g. the further guide plate 10 may be hingedly mounted on the front part of the burner 1. The further guide plate 10 may be lower than the guide plate 9. The further guide plate 10 may extend over the entire width of the front part of the burner 1.

**[0024]** The solid fuel burner 1 may comprise height adjustable legs attached to the bottom surface of the grate 2 or the bottom plate 6. Moreover, the angle of inclination of the grate 2 may be adjustable, for example, by adjusting the heights of the height adjustable legs. Thus, the rear part of the grate 2 may be arranged at a higher level than the front part of the grate 2. The angle of inclination of the grate 2 in relation to the inner collar 4 may be adjustable. This improves the flow of combustion air to the rear part of the burner 1.

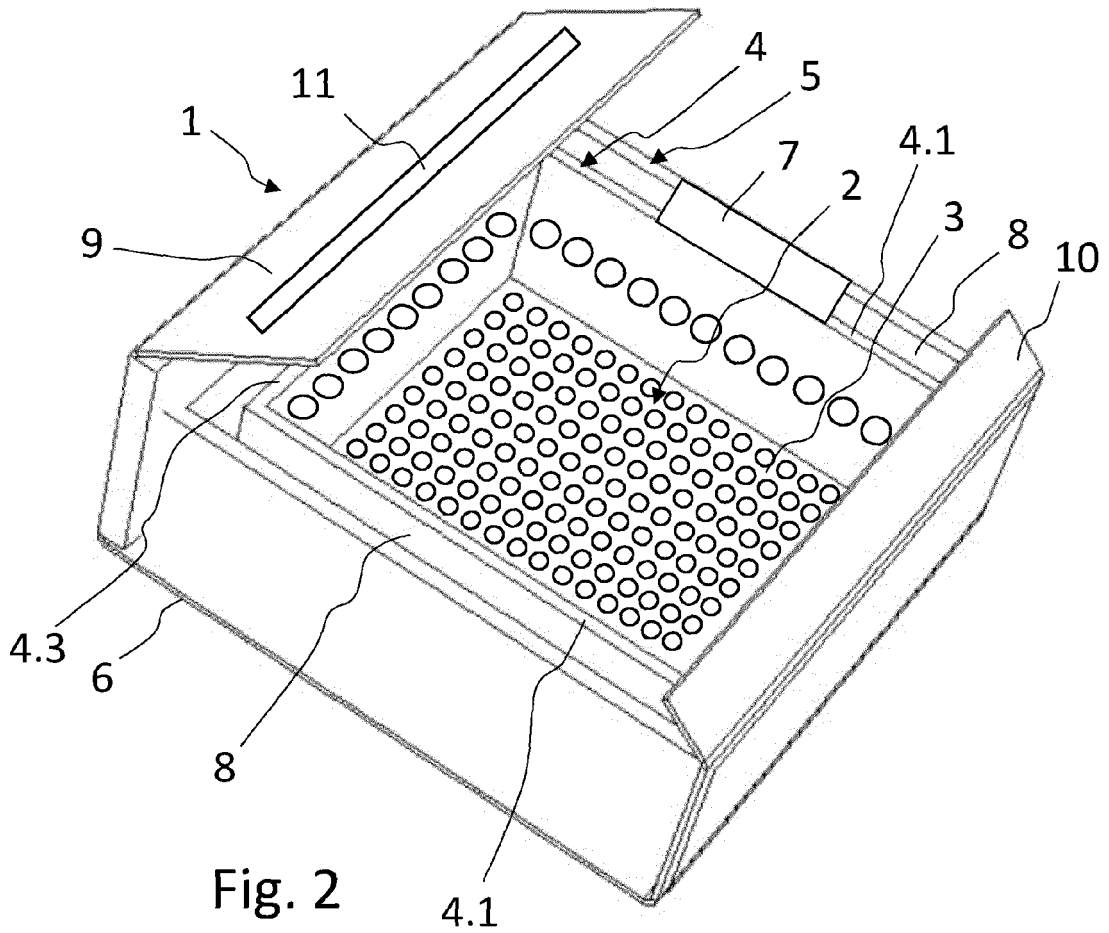
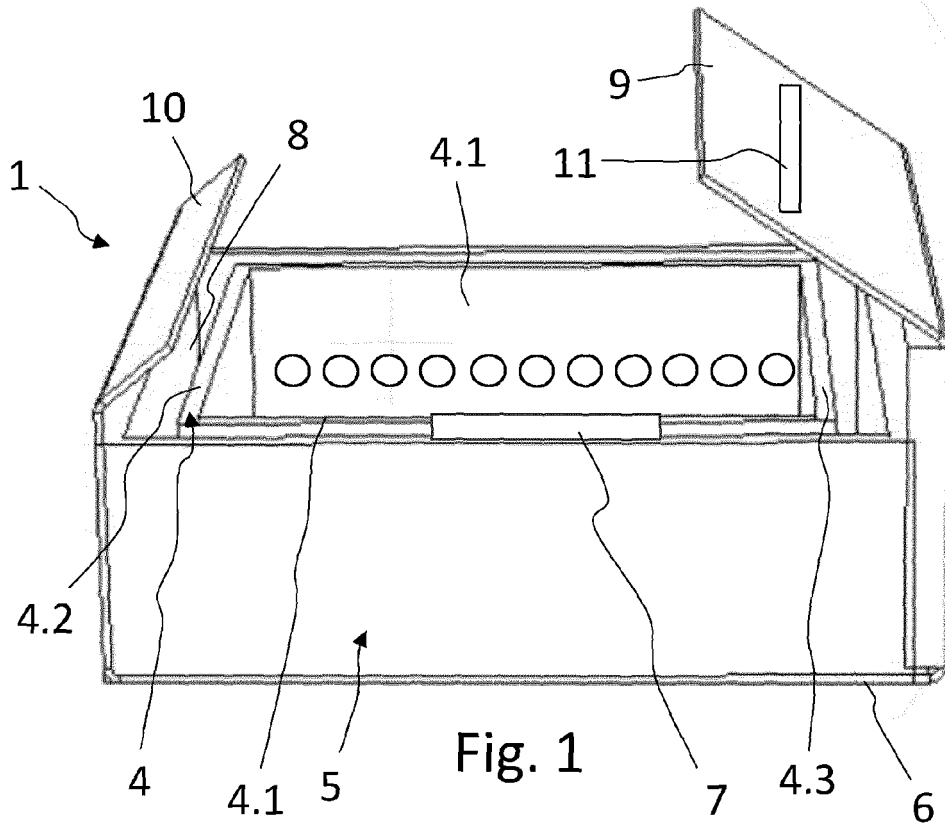
**[0025]** The width of the grate 2 and the grate area 3 may be adjustable. The grate 2 may comprise a main grate part and an auxiliary grate part arranged partially below or above the main grate part such that the auxiliary grate part is movable with respect to the main grate part in the width direction of grate 2.

**[0026]** It is obvious to the person skilled in the art that the invention is not limited solely to the embodiments presented above, but that it can be varied within the scope of the claims presented below.

## Claims

1. A solid fuel burner (1) for use in a firebox, the solid fuel burner (1) comprising a perforated grate (2) having a grate area (3), on which the solid fuel to be combusted is arranged to be placed, **character-**

- ized in that** the solid fuel burner (1) comprises a perforated inner collar (4) completely encircling the grate area (3) and extending upwards from the grate (2), an outer collar (5) encircling the inner collar (4) and arranged at a distance from the inner collar (4), a perforated bottom plate (6), a top plate (7), and an air chamber (8) encircling the inner collar (4) and delimited by the inner collar (4), the outer collar (5), the bottom plate (6) and the top plate (7).
2. The solid fuel burner (1) according to claim 1, **characterized in that** combustion air is arranged to flow into the air chamber (8) through the perforation holes in the bottom plate (6), and combustion air is arranged to be discharged from the air chamber (8) through the perforation holes in the inner collar (4).
3. The solid fuel burner (1) according to claim 1 or 2, **characterized in that** the grate area (3) is rectangular or square in shape.
4. The solid fuel burner (1) according to any of the preceding claims, **characterized in that** the inner collar (4) comprises two perforated side plates (4.1), a perforated front plate (4.2) and a perforated rear plate (4.3).
5. The solid fuel burner (1) according to claim 4, **characterized in that** the perforation holes are located in the upper part of the rear plate (4.3), in the middle parts of the side plates (4.1) and in the lower part of the front plate (4.2).
6. The solid fuel burner (1) according to claim 5, **characterized in that** the perforation holes in the side plates (4.1) are located at a lower level than the perforation holes in the rear plate (4.3), and the perforation holes in the front plate (4.2) are located at a lower level than the perforation holes in the side plates (4.2).
7. The solid fuel burner (1) according any of the preceding claims, **characterized in that** the solid fuel burner (1) comprises a guide plate (9) placed at the rear part of the burner (1) and configured to direct combustion air and combustion gases above the grate area (3).
8. The solid fuel burner (1) according to claim 7, **characterized in that** the burner (1) further comprises a further guide plate (10) placed at the front part of the burner (1) and configured to direct combustion air and combustion gases above the grate area (3).
9. The solid fuel burner (1) according to any of the preceding claims, **characterized in that** the top plate (7) comprises additional air holes through which additional combustion air is arranged to flow from the air chamber (8) above the grate area (3).
10. The solid fuel burner according to claim 9, **characterized in that** the additional air holes are located in the corners of the top plate (7).
11. The solid fuel burner (1) according to any of the preceding claims, **characterized in that** bottom plate (6) is integral with the grate (2).
12. The solid fuel burner (1) according to claim 7, **characterized in that** the guide plate (9) comprises a guide opening (11) configured to direct part of the combustion air towards the back wall of the firebox.
13. The solid fuel burner (1) according to any of the preceding claims, **characterized in that** the angle of inclination of the grate (2) is adjustable.



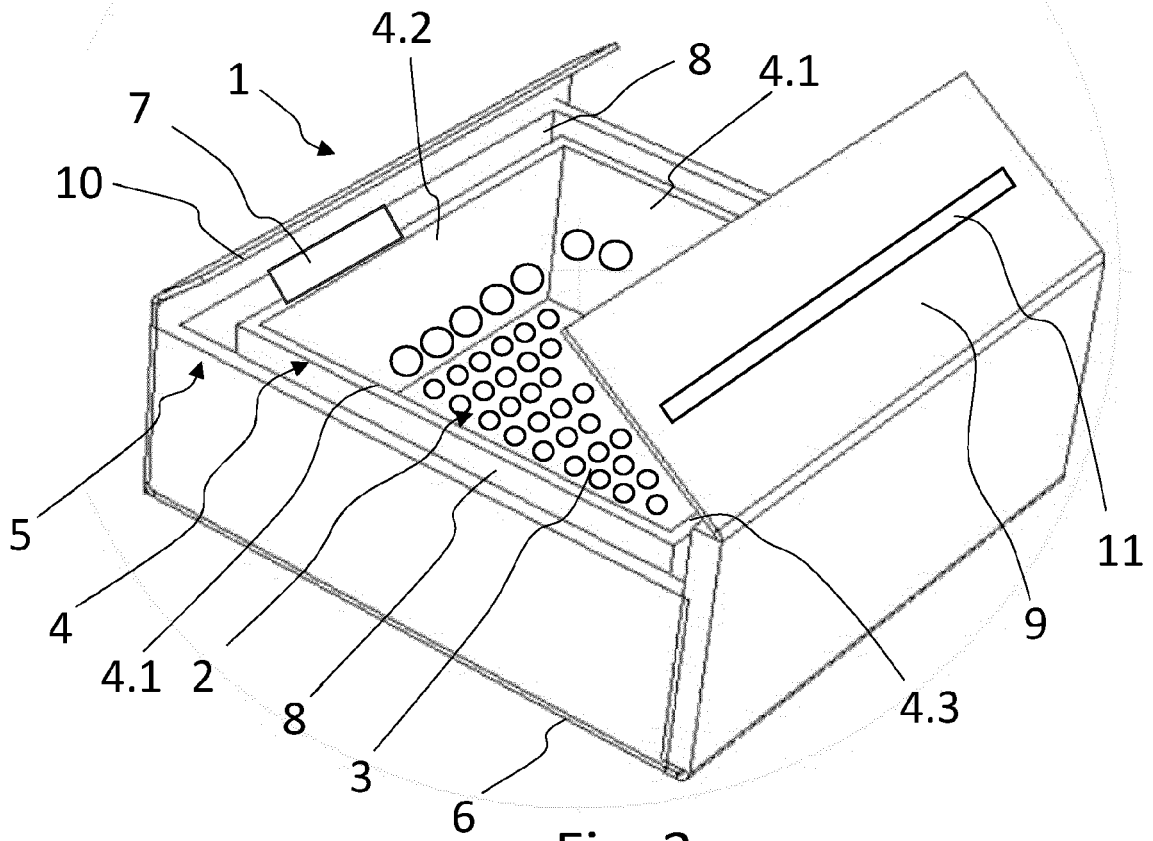


Fig. 3

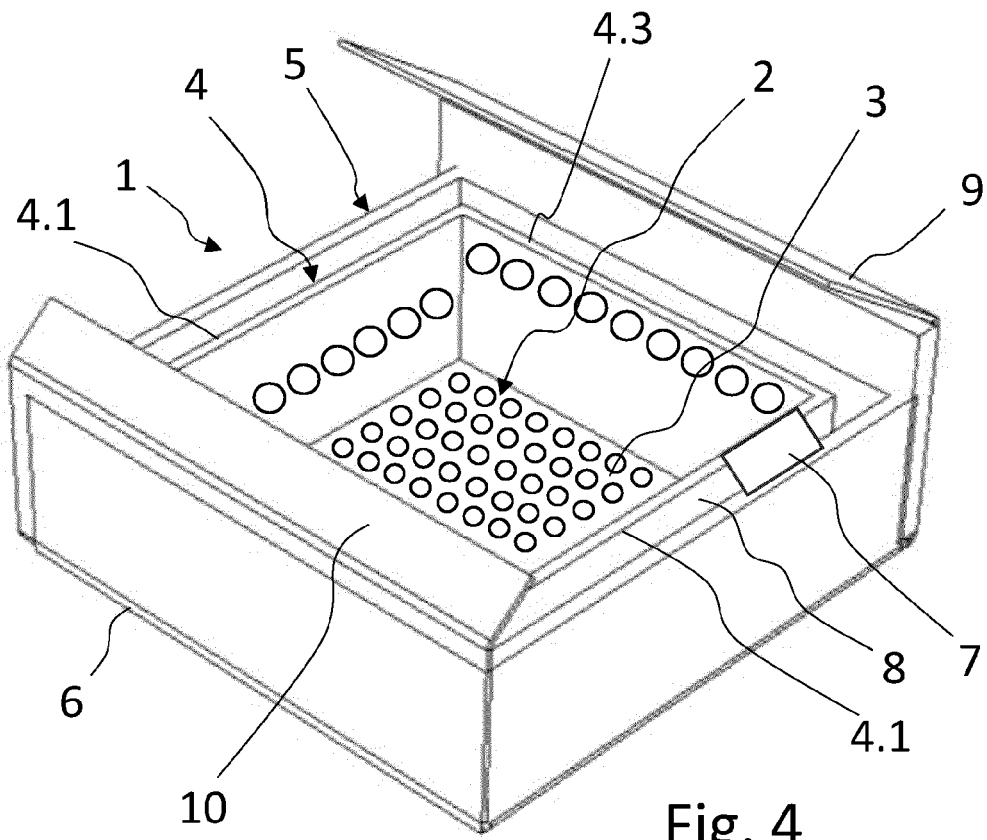


Fig. 4



EUROPEAN SEARCH REPORT

Application Number  
EP 23 19 6525

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Y	* column 3, paragraph 23 - column 4, paragraph 25 *	3-5	F23B60/02
A	* figure 4 *	6-10, 12, 13	F23G5/42 F23G7/10
Y	----- WO 01/23808 A1 (BUCKNER CARROL E [US]) 5 April 2001 (2001-04-05) * page 9, paragraph 3 - page 10, paragraph 2 * * figures 3, 6 *	3-5	
A	----- WO 2020/176883 A1 (BRADLEY W C CO [US]) 3 September 2020 (2020-09-03) * page 6, line 10 - page 8, line 16 * * figures 5, 6 *	1	
A	----- US 5 429 110 A (BURKE TERRENCE M [US] ET AL) 4 July 1995 (1995-07-04) * abstract; figure 2 *	1	
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			F23B F23G
The present search report has been drawn up for all claims			
Place of search <b>Munich</b>		Date of completion of the search <b>29 January 2024</b>	Examiner <b>Gavriliu, Costin</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		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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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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29-01-2024

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82