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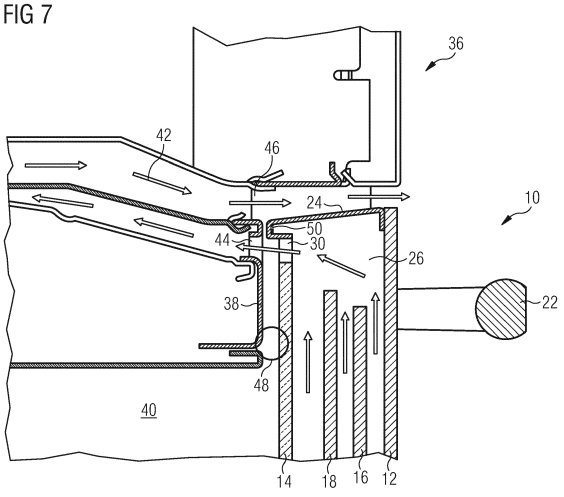
(54) OVEN DOOR FOR AN OVEN CAVITY OF A COOKING OVEN

(57) The present invention relates to an oven door (10) for an oven cavity (40) of a cooking oven (36). The oven door (10) comprises a first unit (12, 28) including a front panel (12) and at least two door columns (28) permanently attached at an inner side of said front panel (12) and a second unit including an inner glass panel (14) and a door frame (20) permanently attached at said inner glass panel (14). The door frame (20) includes an upper frame part (24) and two lateral frame parts (26), wherein the lateral frame parts (26) are permanently attached at an outer side of the inner glass panel (14) and the upper frame part (24) is permanently attached at upper ends of the lateral frame parts (26). The lateral frame parts (26) are connected or connectable to the door columns (28) in each case, so that the first unit (12, 28) and the second unit (14, 20) are detachably or permanently connected or connectable. A ventilation opening (30) is formed between the inner glass panel (14) and the upper frame part (24). The ventilation opening (30) is formed by a cut-out in the inner glass panel (14), so that a lower side and lateral sides of said ventilation opening (30) are bordered by the inner glass panel (14) and an upper side of said ventilation opening (30) is bordered by the upper frame part (24). An inner side of the upper frame part (24) is in the same plane as the inner side of the inner glass panel (14) or protrudes inwardly.

FIG 7



EP 3 118 525 A1

Description

[0001] The present invention relates to an oven door for an oven cavity of a cooking oven according to the preamble of claim 1. Further, the present invention relates to a cooking oven according to the preamble of claim 12. In particular, the present invention relates to an oven door and a cooking oven, respectively, for a domestic appliance.

[0002] For cooking ovens, several types of oven doors for closing the oven cavity are known in the prior art. An important aspect of the oven door is that the outer surface of said oven door is not heated-up too much during the cooking process. This improves the comfort of the cooking oven and decreases the risk of being burned. Another aspect of the oven door is that all components of the oven door have to withstand high temperatures. In particular, if a pyrolytic cleaning mode is activated, then temperatures up to 500°C occur in the oven cavity. For this purposes, an inner glass panel made of borosilicate glass is used as a first temperature protection shield. Further intermediate glass panels may be arranged inside the oven door. The glass panels are usually fixed at the oven door by a structure made of metal and/or plastics. Since standard plastic materials cannot withstand a very high temperature, the oven door has to be ventilated in order to cool down and to avoid the melting of plastic components.

[0003] EP 2 090 831 A1 discloses an oven door with a door frame made of steel. Said door frame surrounds at least partially the interior of the oven door. An inner plate is attached at an inner side of the door frame. An opening for ventilation is arranged between the inner glass panel and an upper frame part of the door frame.

[0004] In a closed state of the oven door, the opening for ventilation is connected to a suction area of an air channel of the oven.

[0005] It is an object of the present invention to provide an oven door with an improved heat resistance.

[0006] The object is achieved by the oven door according to claim 1.

[0007] According to the present invention the ventilation opening is formed by a cut-out in the inner glass panel, so that a lower side and lateral sides of said ventilation opening are bordered by the inner glass panel and an upper side of said ventilation opening is bordered by the upper frame part, wherein an inner side of the upper frame part is in the same plane as the inner side of the inner glass panel or the upper frame part protrudes inwardly.

[0008] The main idea of the present invention is the structure of the ventilation opening. Three sides of the ventilation opening are enclosed by one component, i.e. the inner glass panel, while the remaining side is bordered by the upper frame part. The inner side of the upper frame part is at least in the same plane as the inner side of the inner glass panel. Alternatively, the inner side of the upper frame part protrudes inwardly, i.e. into the direction of the air channel.

[0009] Preferably, the inner glass panel is made of borosilicate glass. The borosilicate glass has a heat resistance sufficient for pyrolytic cleaning.

[0010] In particular, the lateral frame parts are made of metal, preferably of stainless steel. Metal and glass have substantially the same thermal expansion coefficient.

[0011] According to one embodiment, the upper frame part is made of metal, preferably of stainless steel.

[0012] According to another embodiment, the upper frame part is made of borosilicate glass. In this case, the ventilation opening is completely bordered by glass.

[0013] Further, the lateral frame parts may be glued at an outer side of the inner glass panel.

[0014] Moreover, the upper frame part may be glued on upper ends of the lateral frame parts.

[0015] In a similar way, the door columns are glued at the inner side of the front panel.

[0016] Additionally, at least one intermediate glass panel may be arranged or arrangeable between the inner glass panel and the front panel. Said intermediate glass panel may be arranged or arrangeable between the lateral frame parts and/or between the door columns.

[0017] Preferably, the first unit and the second unit are detachably connected or connectable to each other and form the oven door. This allows an easy cleaning of the oven door by the user.

[0018] Furthermore, the lateral frame part is connected or connectable to the corresponding door column by at least one snap-in mechanism, wherein preferably the lateral frame part includes at least one notch and the corresponding door column includes at least one snapping hook.

[0019] The oven door may comprise a door handle attached detachably or permanently at an outer side of the front panel.

[0020] Further, the present invention relates to a cooking oven comprising an oven cavity, an oven door for closing a front opening of said oven cavity and an air channel arranged above the oven cavity, wherein a suction hole of the air channel is arranged above the oven cavity, and wherein the an oven door includes a ventilation opening connected or connectable to the suction hole, wherein the cooking oven comprises an oven door mentioned above.

[0021] In particular, the inner glass panel covers completely the front opening of the oven cavity, when the oven door is in a closed state.

[0022] Further, the cooking oven may include an exhaust opening of the air channel, wherein said exhaust opening is arranged above the suction hole of the air channel.

[0023] Preferably, the appendix of the upper frame part is arranged between the suction hole and the exhaust opening of the air channel, when the oven door is in the closed state. This allows an improved separation between the suction hole and the exhaust opening of the

air channel.

[0024] Novel and inventive features of the present invention are set forth in the appended claims.

[0025] The present invention will be described in further detail with reference to the drawing, in which

FIG 1 illustrates a schematic perspective view of an oven door according to a first embodiment of the present invention,

FIG 2 illustrates a schematic exploded perspective view of the oven door according to the first embodiment of the present invention,

FIG 3 illustrates a schematic perspective view of the oven door according to a second embodiment of the present invention,

FIG 4 illustrates a schematic perspective view of an inner glass panel and a door frame for the oven door according to the second embodiment of the present invention,

FIG 5 illustrates a schematic exploded perspective view of the inner glass panel and the door frame for the oven door according to the second embodiment of the present invention,

FIG 6 illustrates a schematic sectional side view of an upper portion of the oven door according to the first embodiment of the present invention, and

FIG 7 illustrates a schematic sectional side view of the upper portion of the oven door according to a third embodiment of the present invention arranged at a cooking oven.

[0026] FIG 1 illustrates a schematic perspective view of an oven door 10 according to a first embodiment of the present invention. In particular, said oven door 10 is provided for closing and opening an oven cavity of a cooking oven. In this example, the oven door 10 is pivoting around a horizontal axis, wherein said horizontal axis is arranged below or in a lower portion of an opening of the oven cavity.

[0027] The oven door 10 comprises a front panel 12, an inner glass panel 14 and a door frame 20. The door frame 20 is substantially arranged between the inner glass panel 14 and the front panel 12. The door frame 20 includes an upper frame part 24 and two lateral frame parts 26. The height and width of the front panel 12 are bigger than the height and width of the inner glass panel 14. Further, the oven door 10 comprises a door handle 22 attached at an outer side of the front panel 12.

[0028] A ventilation opening 30 is formed as a cut-out in the upper portion of the inner glass panel 14. The ventilation opening 30 is formed as longitudinal cut-out extending along a horizontal direction. The ventilation opening 30 is formed as a gap between the inner glass panel 14 and the upper frame part 24 of the door frame 20.

[0029] The terms "outer", "inner", "upper", "horizontal" and they like relate to the mounted state and closed position of the oven door 10.

[0030] In the first embodiment, the upper frame part 24 and the two lateral frame parts 26 are made of metal. Preferably, the upper frame part 24 and the two lateral frame parts 26 are made of stainless steel. In this example, the inner glass panel 14 is made of borosilicate glass.

[0031] FIG 2 illustrates a schematic exploded perspective view of the oven door 10 according to the first embodiment of the present invention. The oven door 10 comprises the front panel 12, the inner glass panel 14 and the door frame 20. The door frame 20 includes the upper frame part 24 and the both lateral frame parts 26.

[0032] Two door columns 28 are attached at the inner side of the front panel 12. The door columns 28 extend vertically in the mounted and closed state of the oven door. Preferably, the door columns 28 are permanently attached at the front panel 12. The door frame 20 and the inner glass panel 14 form a first unit, which is attachable at the door columns 28. The front panel 12 and the door columns 28 form a second unit.

[0033] Each lateral frame part 26 includes at least one notch 32, while each door column 28 includes at least one corresponding snapping hook 34. In this example, each lateral frame part 26 includes one notch 32, and each door column 28 includes one snapping hook 34. The notch 32 of the lateral frame part 26 and the corresponding snapping hook 34 of the door column 28 form a snap-in mechanism. The first unit and the second unit are connectable by the snap-in mechanism.

[0034] Further, an outer intermediate glass panel 16 and an inner intermediate glass panel 18 are arranged between the inner glass panel 14 and the front panel 12. The outer intermediate glass panel 16 and the inner intermediate glass panel 18 are arranged between the door columns 28. Thus, the width of the inner glass panel 14 is bigger than the widths of the outer intermediate glass panel 16 and inner intermediate glass panel 18. In this example, the oven door comprises two intermediate glass panels 16 and 18. In general, the oven door may comprise one or more intermediate glass panels.

[0035] FIG 3 illustrates a schematic perspective view of the oven door 10 according to a second embodiment of the present invention. The oven door 10 according to the second embodiment is similar as the oven door 10 of the first embodiment.

[0036] The oven door 10 comprises the front panel 12, the inner glass panel 14 and the door frame 20. The door frame 20 is substantially arranged between the inner glass panel 14 and the front panel 12. The door frame 20 includes the upper frame part 24 and two lateral frame parts 26. The height and width of the front panel 12 are bigger than the height and width of the inner glass panel 14. Further, the oven door 10 comprises the door handle 22 attached at an outer side of the front panel 12.

[0037] The ventilation opening 30 is formed as the cut-out in the upper portion of the inner glass panel 14, wherein said ventilation opening 30 is formed as longitudinal cut-out extending along a horizontal direction. The ventilation opening 30 is formed as the gap between the inner glass panel 14 and the upper frame part 24 of the door frame 20.

[0038] In the second embodiment the upper frame part 24 of the glass frame 20 is made of glass, while the two lateral frame parts 26 are made of metal. In particular, the inner glass panel 14 and the upper frame part 24 are made of borosilicate glass. Preferably, the lateral frame parts 26 are made of stainless steel.

[0039] FIG 4 illustrates a schematic perspective view of the inner glass panel 14 and the door frame 20 for the oven door 10 according to the second embodiment of the present invention. The inner glass panel 14 and the door frame 20 form the first unit.

[0040] Preferably, the door frame 20 is permanently attached at the inner glass panel 14. The lateral frame parts 26 are attached at the outer side of the inner glass panel 14. The upper frame part 24 is attached at the upper ends of said lateral frame parts 26.

[0041] The ventilation opening 30 is formed as the cut-out in the upper portion of the inner glass panel 14. The ventilation opening 30 extends over the central upper portion of the inner glass panel 14. The width of the ventilation opening 30 is marginally smaller than the width of the inner glass panel 14. Thus, the lateral portions of the inner glass panel 14 have the full height of said inner glass panel 14. In contrast, the central portion of the inner glass panel 14 has a reduced height of said inner glass panel 14.

[0042] FIG 5 illustrates a schematic exploded perspective view of the inner glass panel 14 and the door frame 20 for the oven door 10 according to the second embodiment of the present invention.

[0043] The lateral frame parts 26 are attached at the outer side of the inner glass panel 14. Preferably, the lateral frame parts 26 are glued on the outer side of the inner glass panel 14. The upper frame part 24 is attached at the upper ends of said lateral frame parts 26. For example, the upper frame part 24 is glued on the upper ends of the lateral frame parts 26. The longitudinal ventilation opening 30 extend horizontally between the inner glass panel 14 and the upper frame part 24. The ventilation opening 30 extends over the central upper portion of the first unit. The width of the ventilation opening 30 is marginally smaller than the widths of the inner glass panel 14 and the upper frame part 26. The lateral portions of the inner glass panel 14 have the full height of said inner glass panel 14, while the central portion of the inner glass panel 14 has a reduced height of said inner glass panel 14.

[0044] FIG 6 illustrates a schematic sectional side view of an upper portion of the oven door 10 according to the first embodiment of the present invention.

[0045] The door handle 22 is attached at the outer side of the front panel 12. The door columns 28 are attached at the inner side of the front panel 12. The front panel 12 and the door columns 28 form the first unit. The lateral frame parts 26 are attached at the outer side of the inner glass panel 14. In turn, the upper frame part 24 is attached at the upper ends of said lateral frame parts 26. The inner glass panel 14 and the door frame 20 including the upper frame part 24 and the lateral frame parts 26 form the second unit. The first unit and second unit are connected by the snap-in mechanism between the lateral frame part 26 and door columns 28.

[0046] FIG 6 clarifies that the inner side of the upper frame part 24 is in the same plane as the inner side of the inner glass panel 14.

[0047] FIG 7 illustrates a schematic sectional side view of the upper portion of the oven door 10 according to a third embodiment of the present invention arranged at the cooking oven 36. The oven door 10 is in the closed state.

[0048] The oven door 10 comprises the front panel 12, the inner glass panel 14 and the door frame 20. The door frame 20 includes the upper frame part 24 and the two lateral frame parts 26. The height and width of the front panel 12 are bigger than the height and width of the inner glass panel 14. The oven door 10 comprises the door handle 22 attached at the outer side of the front panel 12. The outer intermediate glass panel 16 and the inner intermediate glass panel 18 are arranged between the inner glass panel 14 and the front panel 12. The ventilation opening 30 is arranged between the inner glass panel 14 and the upper frame part 24.

[0049] The oven door 10 is attached at the cooking oven 36. The oven door 10 is in the closed state. The cooking oven 36 comprises the oven cavity 40, a front frame 38 and an air channel 42. The front frame 38 encloses the front opening of the oven cavity 40. The air channel 42 is arranged above the oven cavity 40. The air channel 42 includes a suction hole 44 and an exhaust opening 46.

[0050] The ventilation opening 30 of the oven door 10 is arranged in front of the suction hole 44 of the air channel 42. Thus, the inner space of the oven door is connected to the air channel 42. The air channel 42 effects an air stream inside the oven door 10. In particular, the front panel 12 is cooled-down by said air stream. In the closed state of the oven door 10, the oven cavity 40 on the one hand and the air channel 42, the suction hole 44, the exhaust opening 48 and the ventilation opening 30 on the other hand are separated by a gasket 48.

[0051] The oven door 10 according to the third embodiment is similar as the oven door 10 of the first embodiment. The oven door 10 of the third embodiment differs from that of the first embodiment in that the upper frame part 24 protrudes at the inner side of the oven door 10. Thus, the inner side of the upper frame part 24 is closer to the front frame 38 of the cooking oven 36 as the inner glass panel 14. The upper frame part 24 includes an appendix 50. Said appendix 50 forms the innermost part of

the upper portion of the oven door 10. The appendix 50 improves the spatial separation between the suction hole 44 and the exhaust opening 46. This avoids a bypass between the suction hole 44 and the exhaust opening 46.

[0052] The oven door 10 according to the present invention is suitable for pyrolytic cleanings. The inner glass panel 14 is made of a sufficiently heat resistant material, in particular borosilicate glass. The lower side and the lateral sides of the ventilation opening 30 are bordered by the inner glass panel 14 made of heat resistant material. The upper side of the ventilation opening 30 is bordered by the upper frame part 24 of the door frame 20. The upper frame part 24 is made of steel or glass, preferably stainless steel or borosilicate glass, respectively. According to the first and second embodiments, the inner side of the upper frame part 24 is in the same plane as the inner side of the inner glass panel 14. According to the third embodiment, the inner side of the upper frame part 24 protrudes and includes the appendix 50.

[0053] Metal and glass, in particular stainless steel and borosilicate glass have similar thermal expansion coefficients. The contact between the inner glass panel 14 and the metallic parts of the door frame 20 allows a substantially uniform heat distribution at the inner glass panel 14, so that a bending of the inner glass panel 14 is avoided.

[0054] Although illustrative embodiments of the present invention have been described herein with reference to the accompanying drawing, it is to be understood that the present invention is not limited to those precise embodiments, and that various other changes and modifications may be affected therein by one skilled in the art without departing from the scope or spirit of the invention. All such changes and modifications are intended to be included within the scope of the invention as defined by the appended claims.

List of reference numerals

[0055]

10 oven door
12 front panel
14 inner glass panel
16 outer intermediate glass panel
18 inner intermediate glass panel
20 door frame
22 door handle
24 upper frame part
26 lateral frame part
28 door column
30 ventilation opening
32 notch
34 snapping hook
36 cooking oven
38 front frame
40 oven cavity
42 air channel
44 suction hole
46 exhaust opening
48 gasket
50 appendix

Claims

1. An oven door (10) for an oven cavity (40) of a cooking oven (36), wherein

- the oven door (10) comprises a first unit (12, 28) and a second unit (14, 20),
- the first unit includes a front panel (12) and at least two door columns (28) permanently attached at an inner side of said front panel (12),
- the second unit includes an inner glass panel (14) and a door frame (20) permanently attached at said inner glass panel (14),
- the door frame (20) includes an upper frame part (24) and two lateral frame parts (26),
- the lateral frame parts (26) are permanently attached at an outer side of the inner glass panel (14),
- the upper frame part (24) is permanently attached at upper ends of the lateral frame parts (26),
- the lateral frame parts (26) are connected or connectable to the door columns (28) in each case, so that the first unit (12, 28) and the second unit (14, 20) are detachably or permanently connected or connectable, and
- a ventilation opening (30) is formed between the inner glass panel (14) and the upper frame part (24),

characterised in that
the ventilation opening (30) is formed by a cut-out in the inner glass panel (14), so that a lower side and lateral sides of said ventilation opening (30) are bordered by the inner glass panel (14) and an upper side of said ventilation opening (30) is bordered by the upper frame part (24), wherein an inner side of the upper frame part (24) is in the same plane as the inner side of the inner glass panel (14) or the upper frame part (24) protrudes inwardly.

2. The oven door according to claim 1,
characterised in that
the inner glass panel (14) in made of borosilicate glass.

3. The oven door according to claim 1 or 2,
characterised in that
the lateral frame parts (26) are made of metal, preferably of stainless steel.

4. The oven door according to any one of the preceding

claims,
characterised in that
the upper frame part (24) is made of metal, preferably of stainless steel.

5. The oven door according to any one of the claims 1 to 3,
characterised in that
the upper frame part (24) is made of borosilicate glass.

6. The oven door according to any one of the preceding claims,
characterised in that
the lateral frame parts (26) are glued at an outer side of the inner glass panel (14), wherein preferably the upper frame part (24) is glued on upper ends of the lateral frame parts (26).

7. The oven door according to any one of the preceding claims,
characterised in that
the door columns (28) are glued at the inner side of the front panel (12).

8. The oven door according to any one of the preceding claims,
characterised in that
at least one intermediate glass panel (16, 18) is arranged or arrangeable between the inner glass panel (14) and the front panel (12), wherein preferably the intermediate glass panel (16, 18) is arranged or arrangeable between the lateral frame parts (26) and/or between the door columns (28).

9. The oven door according to any one of the preceding claims,
characterised in that
the first unit (12, 28) and the second unit (14, 20) are detachably connected or connectable to each other and form the oven door (10).

10. The oven door according to claim 9,
characterised in that
the lateral frame part (26) is connected or connectable to the corresponding door column (28) by at least one snap-in mechanism, wherein preferably the lateral frame part (26) includes at least one notch (32) and the corresponding door column (28) includes at least one snapping hook.

11. The oven door according to any one of the preceding claims,
characterised in that
the oven door (10) comprises a door handle (22) attached detachably or permanently at an outer side of the front panel (12).

12. A cooking oven (36) comprising an oven cavity (40), an oven door (10) for closing a front opening of said oven cavity (40) and an air channel (42) arranged above the oven cavity (40), wherein a suction hole (44) of the air channel (42) is arranged above the oven cavity (40), and wherein the oven door (10) includes a ventilation opening (30) connected or connectable to the suction hole (44), and wherein at least one gasket (48) is arranged between the oven cavity (40) and the air channel (42),
characterised in that
the cooking oven (36) comprises an oven door (10) according to an one of the claim 1 to 11.

13. The cooking oven according to claim 12,
characterised in that
the inner glass panel (14) covers completely the front opening of the oven cavity (40), when the oven door (10) is in a closed state.

14. The cooking oven according to claim 12 or 13,
characterised in that
the cooking oven (36) includes an exhaust opening (46) of the air channel (42), wherein said exhaust opening (46) is arranged above the suction hole (44) of the air channel (42).

15. The cooking oven according to claim 14,
characterised in that
the appendix (50) of the upper frame part (24) is arranged between the suction hole (44) and the exhaust opening (46) of the air channel (42), when the oven door (10) is in the closed state.

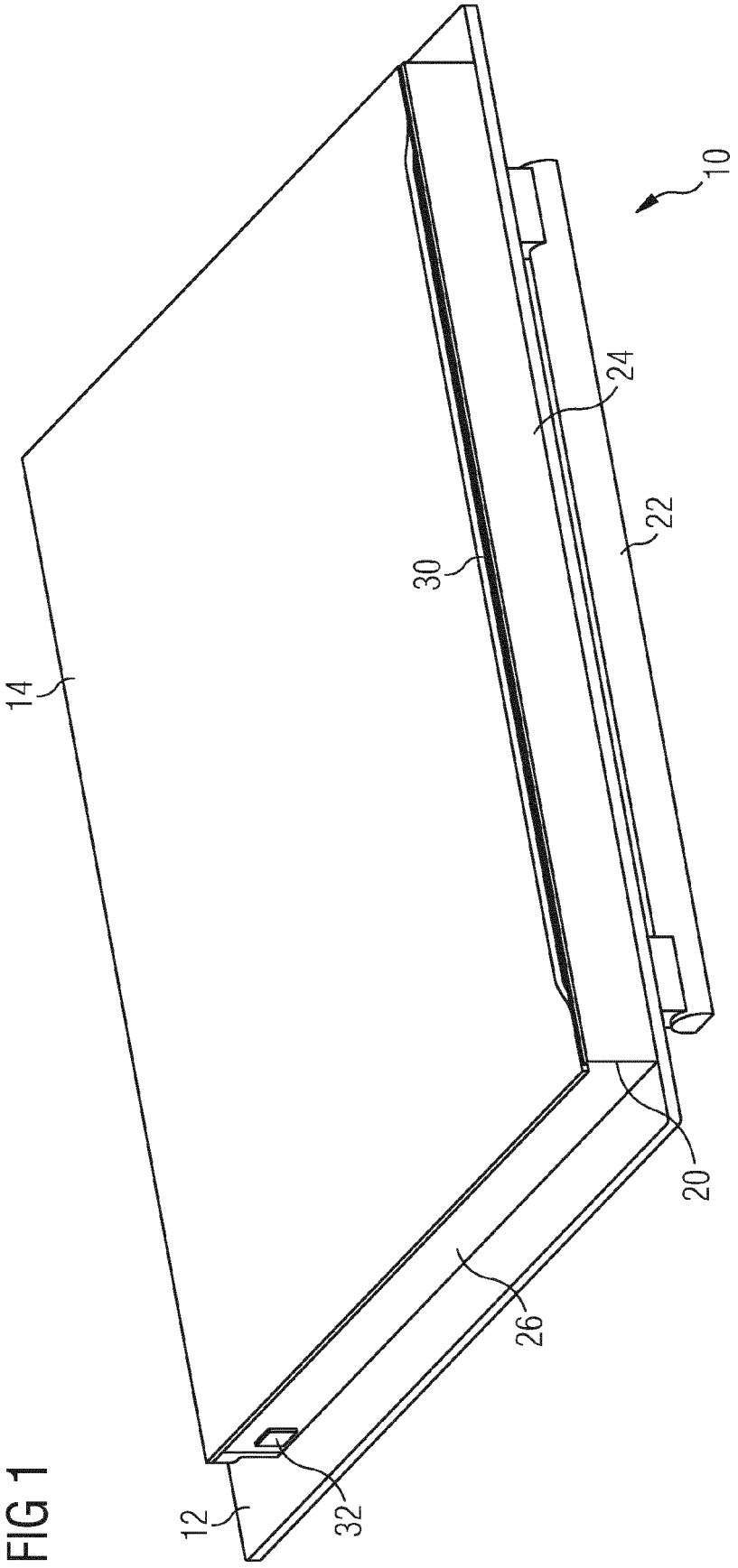


FIG 1

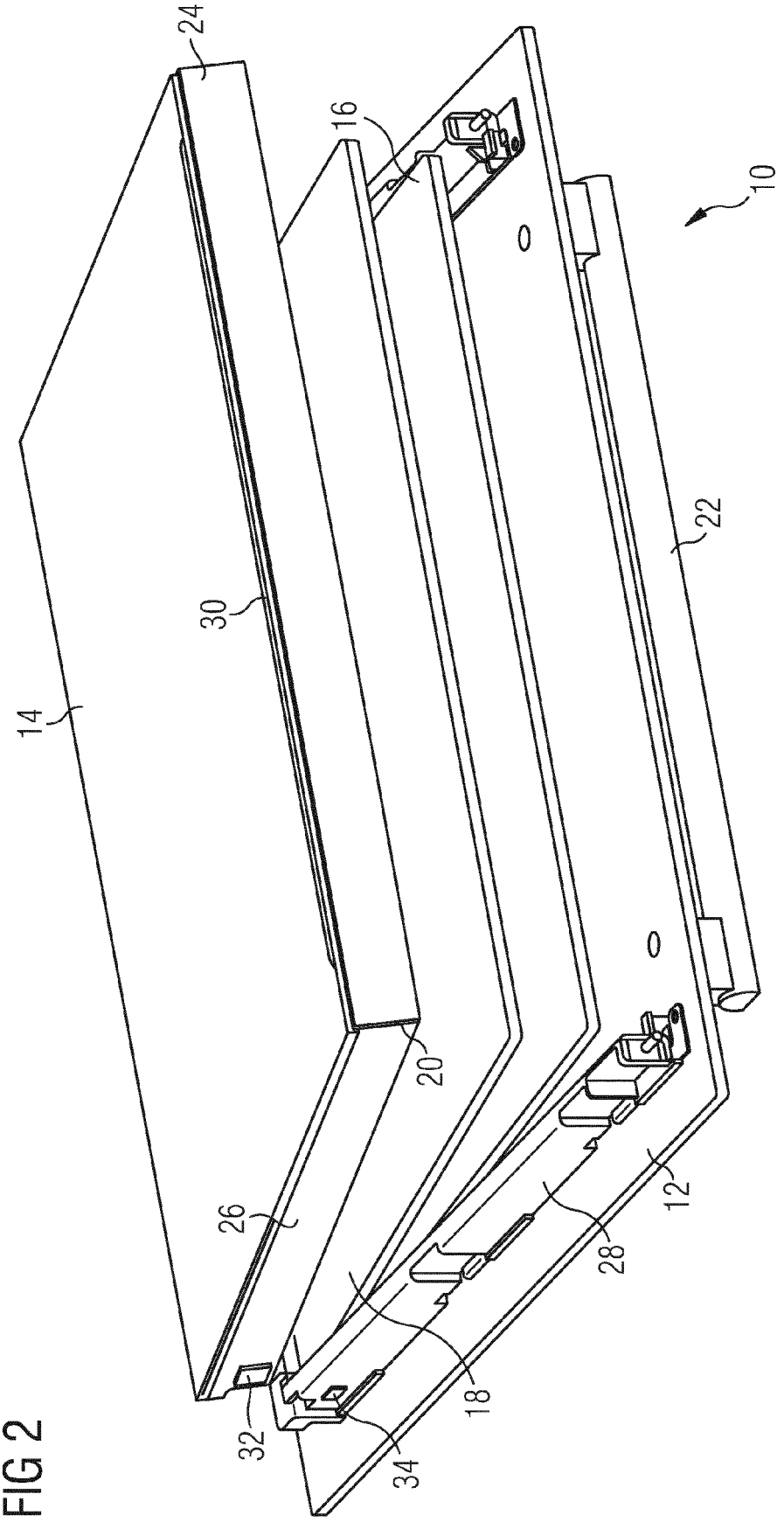


FIG 2

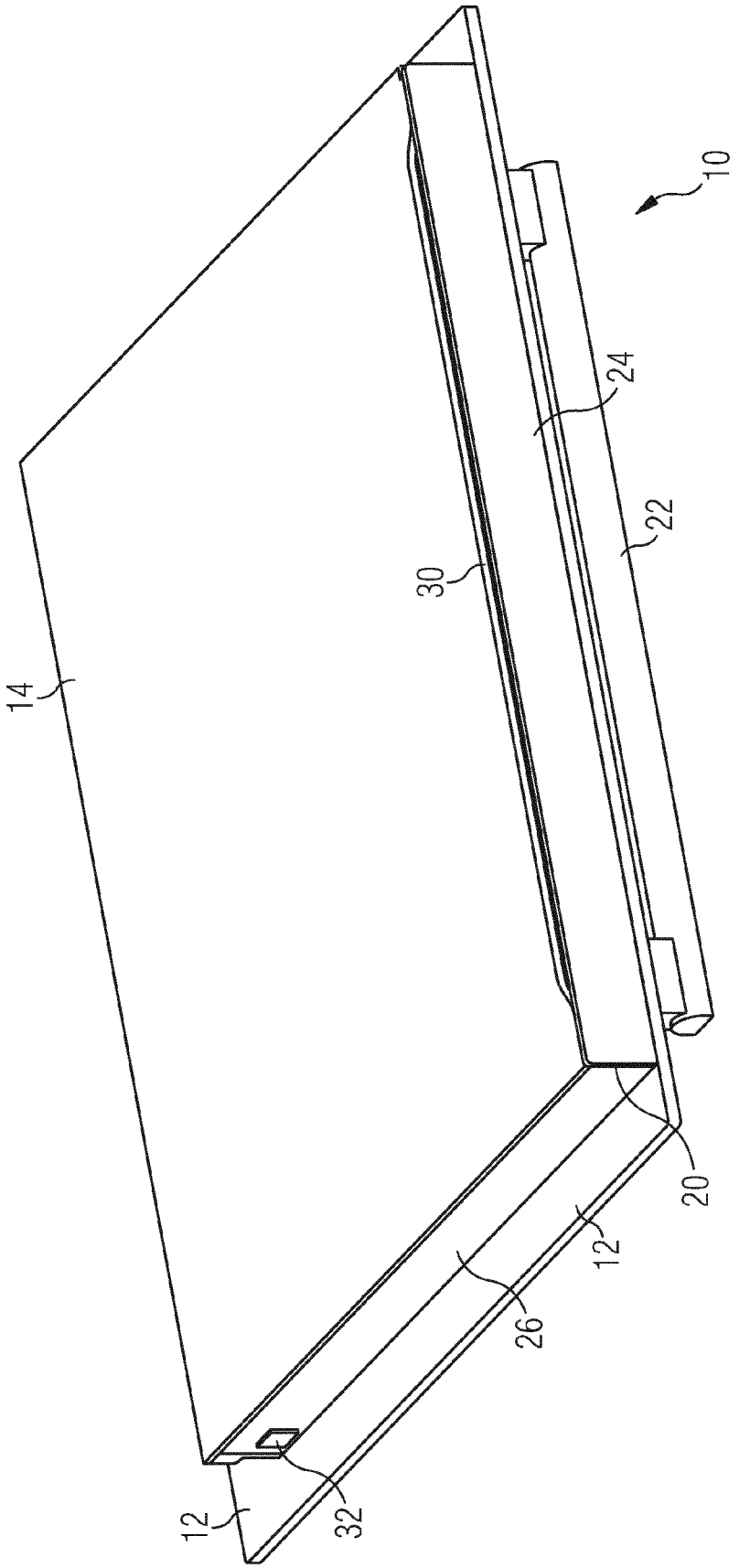


FIG 3

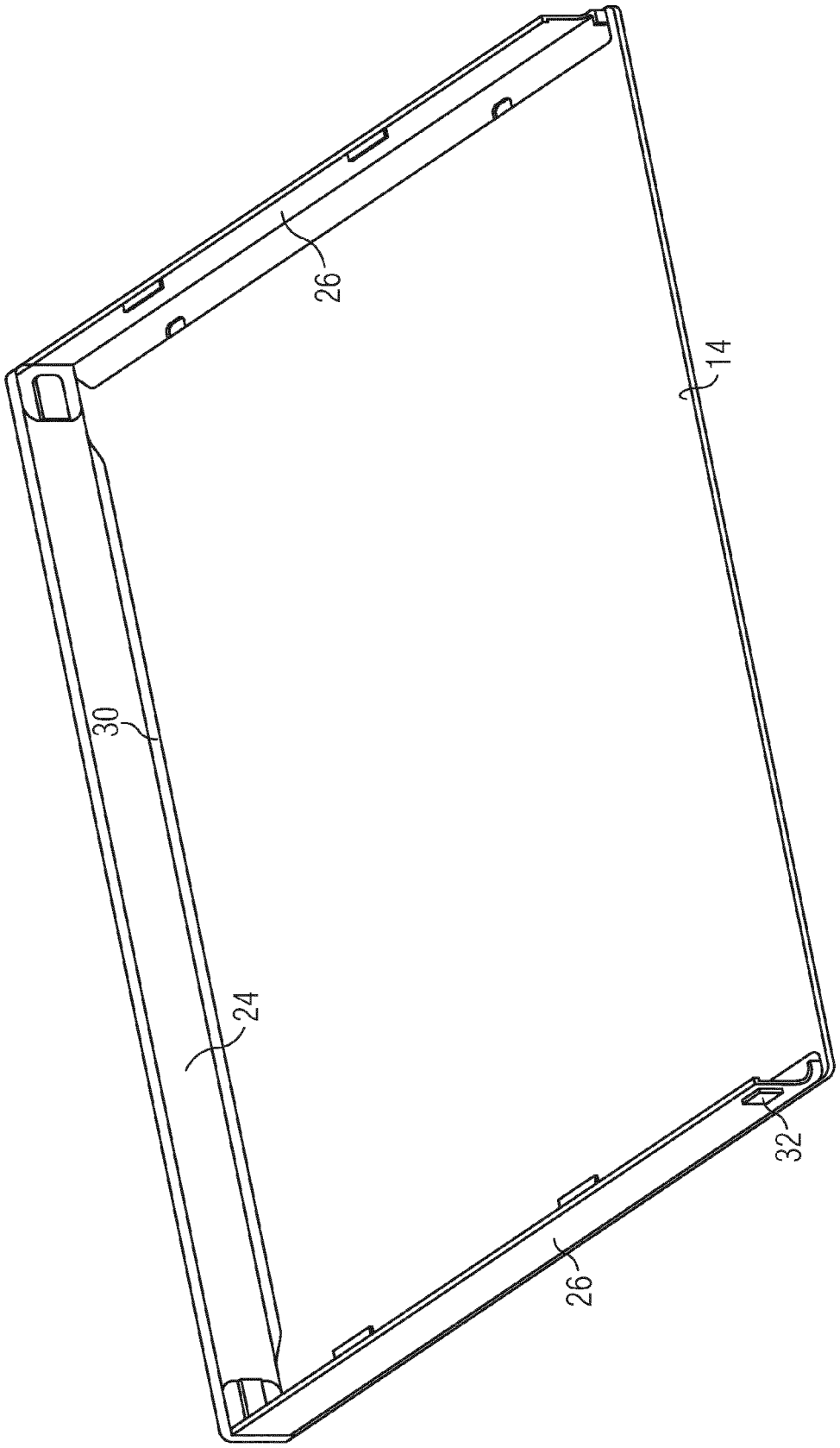


FIG 4

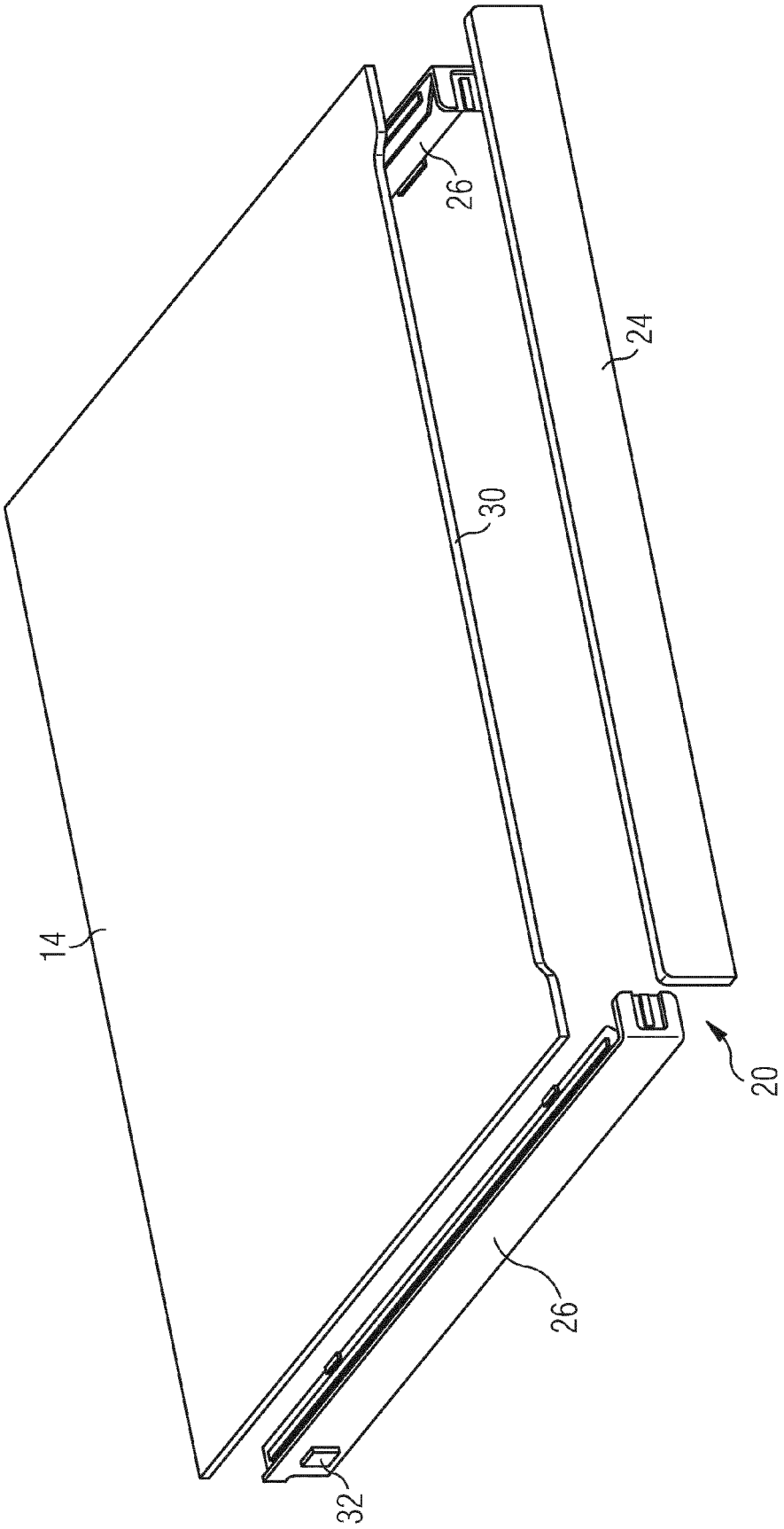
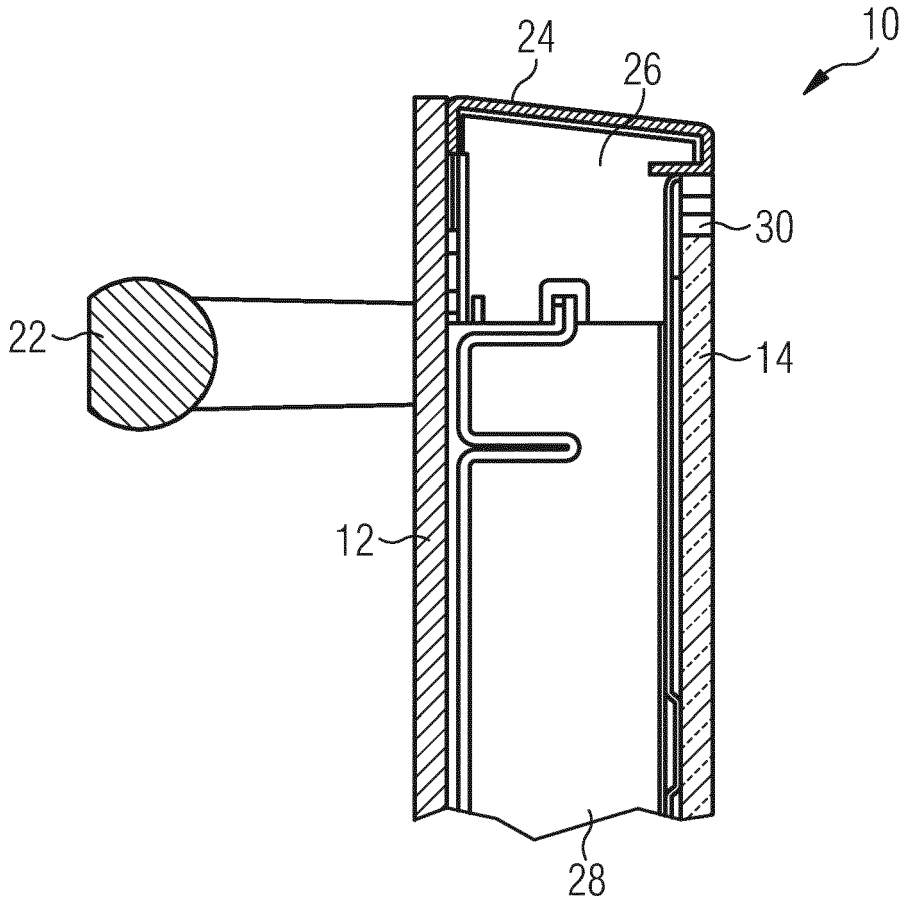


FIG 5

FIG 6



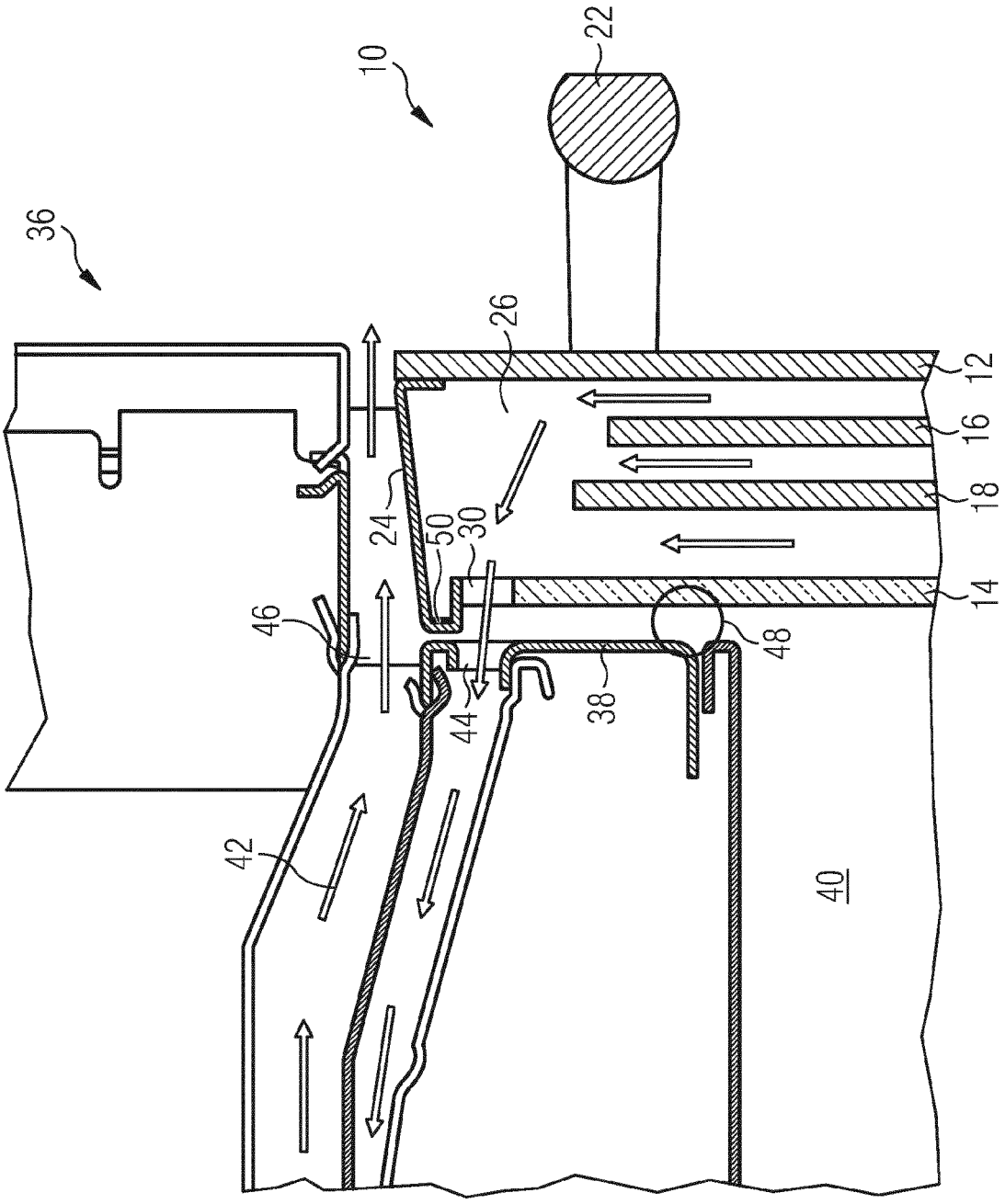


FIG 7

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EUROPEAN SEARCH REPORT

Application Number
EP 15 17 7181

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)
F24C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 November 2015	Makúch, Milan

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 17 7181

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12-11-2015

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 2090831 A1 **[0003]**