(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 553 390 A2**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
16.10.2019 Bulletin 2019/42

(51) Int Cl.:
F24C 15/20 *(2006.01)*

(21) Application number: **19168148.5**

(22) Date of filing: **09.04.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **13.04.2018 IT 201800004471**

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(54) SUSPENDED MULTI-PURPOSE HOOD FOR DOMESTIC EXTRACTION WITH BUILT-IN PROJECTOR-IMAGE DETECTOR

(57) A suspended hood for domestic extraction (100) suitable for positioning above a hob comprises a body (1) having means (1A) to extract air containing fumes and/or vapours from the hob below, said extraction taking place through an extraction opening provided for in a portion (9) of said hood (100) facing said hob, provision being made for an image projector (30) associated with said body (1). The image projector (30) is inside body (1) of the hood (100) and is located in the portion (9) of the hood facing the hob.

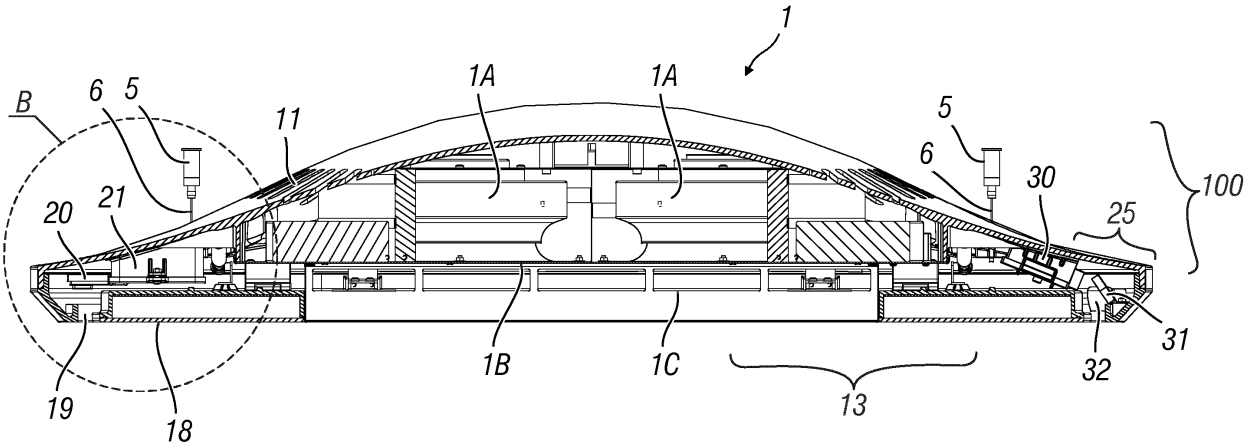

Fig. 3

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Description

[0001] The object of the present invention is a suspended hood for domestic extraction according to the precharacterising clause of the principal claim.

[0002] Different types of extractor hoods for residential kitchens are known, such as fixed hoods placed above a hob (and associated with an adjacent wall of the room where such hob is located or with a kitchen cabinet) or suspended or island hoods, of the fixed or mobile type.

[0003] By way example, reference will be made below to the specific type of hood commonly described as "island" or "suspended" or by the English term "ceiling", as for example described in EP2504628B1 in the name of the same applicant.

[0004] The essential purpose of island hoods is to ensure proper and efficient extraction of the vapours and/or fumes generated during the preparation of food placed on a hob under the hood; this is thanks to the particular "suspended" arrangement which allows for closer proximity to the hob, and therefore to the generation of fumes and odours, especially when configured within a work island located in a central area of a kitchen and not in the typical installation near a wall.

[0005] An island hood can therefore be placed at different heights from the hob.

[0006] In general, even more in recent years, hoods of this type have been developed in terms of increasingly important and sophisticated aesthetic variants, as well as the incorporation of new functions such as lighting of the surrounding environment as well as the worktop and the hob below.

[0007] Hoods of the type mentioned above include a body comprising at least one unit for the extraction of air from the hob through an extraction opening.

[0008] The use of image projection technology associated with extractor hoods is also known, as for example described in EP 1 512 914 A2 or EP 1 207 353 B1, as well as in WO 2017/134216 A1.

[0009] All these solutions have several limitations however.

[0010] For example, WO 2017/134216 A1 describes a cooker hood above a hob with a body containing an image projector which is prefitted by the manufacturer and allows the hob to be checked. However, introduction of the projection function has a rather important aesthetic and dimensional impact on the hood, with the consequence that it completely distorts the conventional configuration of the extraction element, inevitably affecting its efficiency.

[0011] With regard to the solutions described in EP 1 512 914 A2 and EP 1 207 353 B1, these documents describe extractor hoods fitted with a projector capable of projecting images onto a projection surface. In both of these prior documents the projector is an "external" element, projecting from the hood; this projector has the mere function of projecting "passive" images with information on the operating status of the hood itself or generic multimeans content. In addition to this, in the case of EP 1 207 353 B1 there is a need to use the vertical wall of the kitchen as a projection surface. All of the above solutions, however, relate to wall-mounted hoods in which the degree of freedom of the area occupied by the projection is rather limited. In addition, the projector is subject to possible shock because it is exposed.

[0012] Furthermore, the known solutions mentioned above only describe the possibility of projecting images onto a projection surface.

[0013] The object of the present invention is to provide an improved suspended hood.

[0014] In particular, the purpose of the present invention is to provide a suspended hood that overcomes the limitations present in solutions in the known art by incorporating new features that improve its performance and comfort during the process of preparing and cooking food.

[0015] Another object is to provide a hood of the type mentioned above which, despite being improved with functions not strictly related to air extraction, has optimal functionality in the extraction element, with its corresponding filters.

[0016] Another object is to provide an extractor hood of the type mentioned, which enables the user who is preparing food on the hob below to be appropriately informed about how to perform this preparation in the best possible way.

[0017] A further object is to provide a hood of the type mentioned that can also provide the above-mentioned user information about the ingredients being used for food preparation so as to assist this operation.

[0018] Another object of the invention is to provide an extractor hood of the type indicated above, in which the extractor unit can operate automatically according to the actual production conditions of the volatile organic substances from the hob that contribute to formation of the odours associated with the cooking process; this without the need to have rigid communication, based on a fixed protocol, between the hob and the extractor hood.

[0019] Another object is to provide a hood of the type mentioned in which the automatic extraction function can be performed by the hood regardless of the type of hob, which also comprises the possibility of working in combination with not only induction or electric hobs, but also gas.

[0020] Another object is to provide a hood of the type mentioned that also enables the quality of the air in the room or kitchen in general to be monitored in order to monitor the presence of particular pollutants, measure the temperature and humidity and consequently operate the hood in "air conditioning" mode, even when the process of food preparation is not in progress.

[0021] A further object is to provide an extractor hood of the type mentioned above that is also able to monitor the actual condition of typical cooking processes such as boiling water or frying or adding alcoholic substances, also identifying undesired cooking situations such as the

burning of fatty substances, together with the type of source of heat production used for the hob (whether gas or induction hob).

[0022] A further object of the invention is to provide a hood of the type mentioned that "communicates" with the hob so that it can automatically adjust the heating power of the individual heating elements of such hob in a closed loop in order to keep the entire cooking process under control.

[0023] A further object of the invention is to provide an extractor hood that can be connected to the internet.

[0024] These and other objects which will be evident to those skilled in the area are accomplished through a suspended hood for domestic extraction according to the principal claim.

[0025] For a better understanding of the present invention there are appended purely by way of nonlimiting example the following drawings, in which:

Figure 1 shows a front perspective view of a hood according to the invention;
Figure 2 shows a perspective view of the hood in Figure 1 from below;
Figure 3 shows a cross-section according to line 3-3 in Figure 2;
Figures 4 and 5 show the parts shown with A and B in Figure 3, respectively enlarged;
Figure 6 shows a perspective view from below of the hood in Figure 1 with an open portion of it;
Figure 7 shows, enlarged, the part indicated by C in Figure 6;
Figure 8 shows a view similar to that in Figure 6, but with a different portion of the hood in transverse cross-section; and
Figure 9 shows an enlarged view of the part indicated by D in Figure 8.

[0026] With reference to the above figures, an extractor hood 100 according to the invention comprises an extractor body 1 containing the usual known functional components (such as an extraction unit with at least one fan 1A, one or more filters 1B, at least one grille in Figure 1C, etc.) capable of drawing air from a hob 2 (shown as an example in Figure 1), said air containing fumes and/or vapours generated by the preparation of food placed in corresponding containers (not shown) on top of heating elements 3 of said hob 2. These heating elements may be of any type, such as gas, electric or induction.

[0027] Hood 100 is installed suspended above hob 2 and a worktop 4 adjacent to hob 2 (see Figure 1). In particular, body 1 of hood 100 is attached to a ceiling in the room where surfaces 2 and 4 are located by means of fixing elements 5 and corresponding cables 6 (usually made of steel).

[0028] More specifically, body 1 has a first portion 8 containing, in the case described, two fans (extraction elements) 1A and a second element 9 to act as a mobile support for the grille (extraction element) 1C that delimits an extraction opening 10. On first portion 8 there is a grille for discharge of the filtered air.

[0029] Opening 10 and grille 1C are provided in a main capture and filtration area 13 of hood 100 which is also equipped with a panel for diffused light 18. This is surrounded by a secondary extraction opening 19.

[0030] Within body 1 of the hood, at secondary extraction opening 19 (which in the example is annular and continuous), there is at least one sensor 20 for monitoring airborne substances connected to a corresponding control unit 21, preferably a microprocessor.

[0031] The location is specifically chosen in order to make the sensor interact with only air drawn in perimetrically by each fan 1A so that this sensor 20 is not affected by the direct extraction flow that normally passes through the main capture area 13. This location makes the sensor readings more reliable over time as they is not directly affected by the fatty substances and oils present in the extracted air that might cause deterioration of the sensor itself.

[0032] The or each sensor provided is able to monitor different categories of substances in the air such as: VOC (volatile organic compounds), CO, CO_2, NOx, CH_4 and solid particles. It is also able to monitor environmental parameters such as temperature and relative humidity.

[0033] Such a sensor provides an overall air quality index that takes into account all the measurable parameters by assigning a specific weighting to the various pollutants and also averaging its value with respect to comfort parameters such as temperature and humidity.

[0034] Even when the hood is not in use for the specific object of extracting the vapours and odours generated by the cooking process, each sensor 20 monitoring airborne substances is able to monitor the quality of the ambient air (that is, of the kitchen) and if placed in "auto" mode is able to activate automatically when particular pollutant thresholds that bring the overall index below ideal values are exceeded.

[0035] The (microprocessor) control unit 21 associated with each sensor or, alternatively, each sensor (if equipped with its own microprocessor unit) is able to aggregate the various substances monitored into specific recognition "patterns" for the cooking process, such as the curve for boiling water or frying with oil, and also recognises appropriate cooking thresholds avoiding the typical burning of food or over-high frying temperatures. This high sensitivity ensures that the hood functions automatically according to the actual amount of "odours" that are being generated, consequently adjusting the correct extraction capacity, regardless of the type of hob that is being used, and not requiring a connection of any kind between hob and hood.

[0036] However, as an additional feature, when the hob and hood are connected hood 100 can automatically generate a feedback signal to a standard hob control unit on the basis of the recognised cooking patterns, to adjust the heating performance of each active heating element and prevent unsuitable cooking processes such as over-

heating when frying that generates undesirable substances or typical burning, as well as, for example, indicating that the boiling threshold has been reached.

[0037] This same air quality information as well as information relating to other operating states of the hood can be conveyed by means of images projected onto worktop 4 by projecting images 25 present in hood 1. In particular, these means are such as to project images onto said worktop, but they also enable images to be taken of objects placed on worktop 4 or hob 2, as will be described below. These means 25 will then be referred to as recognition and projection means.

[0038] Recognition and projection means 25 preferably comprise a pointing self-focussing laser pico-projector 30, a highly reflecting mirror 31 and a depth or 3D type video camera 32. These means 25 are placed at the secondary perimetral extraction opening 19 so that a recognition cone 33 and a projection cone can escape via this opening 19. These cones preferably overlap.

[0039] The system is fully integrated and miniaturised.

[0040] Of course both sensor 20 which detects air quality and recognition and projection means 25 can be installed "flexibly" in any area of the perimeter of the hood as long as they are inside its body 1 and near opening 19. This allows for maximum flexibility in installation and positioning of the projected area relative to worktop 4.

[0041] The combination of projection and recognition through the 3D video camera provides the possibility of creating new and very useful features. Two possible scenarios deriving from the use of sensor 20 and means 25 are described below.

[0042] A first scenario provides for the use of projection to take advantage of various multimeans content including videos, images that might also affect the process of food preparation, such as tutorials and video-recipes; such content may also come from the internet to which the hood is connected through an appropriate wi-fi module (not shown) or Bluetooth. At the same time 3D video camera 32 can recognize some simple gestures made by the user that permit navigation through such content, such as: change images, start or pause videos, etc.

[0043] A second scenario is that of being able to automatically assist the user in particular food preparation processes. For example by placing some raw materials such as vegetables, pasta, flour, sugar, etc., on worktop 4 in the area defined by the projection cone 33 corresponding to a recognition area it will be possible to automatically recognize the type of food via video camera 32, calculate its relative volume and through the average specific weight (stored in a memory unit, containing the possible types of food that can be used) provide the end user with an indication of the weight of that food, in practice performing the function of "virtual scale". This evaluation can even be performed by unit 21 to which recognition and projection means 25 and this memory unit are connected. Since the hood is connected to the internet, on the basis of the foods recognised and weighed, unit 21 can search a database relating to the preparation of foods and suggest possible recipes that can be performed with those ingredients and quantities to the user.

[0044] Obviously, instead of unit 21, hood 100 may have its own command and control unit (not shown) that is able to supervise all the functions of the hood according to the invention.

[0045] Through projection it is therefore possible to deliver supporting content such as video-recipes and, where possible, projection can deliver images to support the preparation process so that the user can be guided automatically during this process to operate in an optimum way, for example to perform a process of cutting vegetables or a process of plating correctly in an optimum way.

[0046] Finally, first portion 8 and second portion 9 of extraction body 1 are mechanically independent of each other, but are connected together by hinges 52 that allow rotary movement (see Figures 6 and 8) of second portion 9 with respect to first 8. Filter 1B can then be accessed for replacement. Hydraulic or pneumatic pistons 70 attach second portion 9 to 8 (in addition to the hinges 52) and guide their relative movement.

[0047] Thanks to this invention there is provided a suspended extraction hood for domestic use which is improved with respect to known extractor hoods and is capable of monitoring the extracted air and/or the air in the room in which it is placed, which among other things may also enable possible monitoring of the level of residual filtering capacity of the filter (s) of the extractor hood itself, evaluated on the basis of analysis of the extracted air made after the insertion of any clean filters at opening 19 in body 1 of the extractor hood.

[0048] In addition, thanks to the invention it is possible to monitor food preparation on hob 2 and also act on control of heating elements 3 of the hob itself without the need for special physical connections between the hood and hob. Control can be applied regardless of whether these elements are electric or gas (burners); in the latter case it is possible to act on the usual solenoid valve located in the gas pipe that supplies the burners to reduce the heating power (flame) delivered.

[0049] The invention make it possible to combine the function of projecting images (in itself known), a function of recognising images and "gestures" through the use of a video camera with depth recognition (3D camera). Combination of the two functions enables new functions that can automatically assist the user in the process of food preparation as described to be introduced. This function is performed through the recognition and projection means incorporated in the space inside hood 100 near the secondary perimeter extraction.

[0050] In this space there is also at least one airborne substances sensor in the vicinity of this secondary extraction to enable three main functions to be performed:

a) automatically setting the operating condition of the extraction unit (motor speed of each fan) according to the actual condition producing the volatile or-

ganic substances that help to form odours related to the cooking process. This overcomes the need for rigid communication based on a fixed protocol between the hob and the extractor hood. It will be noted that the automatic extraction function can be performed by the hood regardless of the type of hob so as therefore to also include the possibility of working in combination with gas hobs;

b) using the same sensor to monitor air quality in the kitchen in general, to monitor the presence of particular pollutants, measure the temperature and humidity and consequently operate the hood in "air conditioning" mode even when the food preparation process is not in progress;

c) through the same sensor it will be possible to monitor the actual condition of typical cooking processes such as boiling water or frying or adding alcoholic substances, etc. In addition it will be possible to identify some undesired cooking situations such as the burning of fatty substances and finally identify the type of source of heat production used for the hob (whether a gas or induction hob).

[0051] Advantageously, hood 100 is also able to communicate with the hob via a wireless system and based on the information collected by the sensor for airborne substances, to automatically adjust the heating power of the individual heating elements in a closed loop so as to keep the process of cooking food under control.

[0052] Finally, through the usual wireless electronic communication card (wi-fi or bluetooth), hood 100 can be connected to web services that can be made use of through recognition and projection means 25.

[0053] A preferred embodiment of the invention has been described. However, in a simplified embodiment hood 100 may not have a continuous type of secondary extraction opening 19, but may have a number of secondary extraction openings at which sensor 20 and the means 25 are placed so that they can operate according to the embodiment described.

[0054] According to another variant of the invention, sensor 20 can be located within a secondary extraction opening while detection and projection means 25 can be placed within a housing of body 1 of hood 100 opening towards underlying hob 2.

[0055] These variants of the invention also fall within the scope of the invention as defined by the following claims.

Claims

1. Suspended hood for domestic extraction (100) capable of being placed above a hob (2) inserted into a worktop (4) of a kitchen, said hood including a body (1) with means (1A) for extracting air containing fumes and/or vapours from the underlying hob (2), said extraction taking place through an extraction opening (10) provided for in a portion (9) of said hood (100) facing said hob (2), with the provision of an image projector (30) associated with such body (1), **characterised in that** the image projector (30) is inside the body (1) of the hood (100) and is placed at the portion (9) of the hood facing said hob (2).

2. Suspended hood according to claim 1, **characterised in that** there is also a depth video camera (32) inserted into the body (1) of the hood (100) facing the underlying hob (2) and worktop (4).

3. Suspended hood according to claim 2, **characterised in that** said image projector (30) and said depth video camera (32) define means for recognising and projecting images (25), said projector (30) and video camera (32) being placed within the same seat in the body (1) of the hood (100).

4. Suspended hood according to claim 1, **characterised in that** said projector (30) is a pointing self-focussing laser pico-projector.

5. Suspended hood according to claim 4, **characterised in that** it comprises a highly reflective mirror (31) able to receive the images generated by the projector (30) and to reflect them towards the underlying hobs (2) and worktop (4).

6. Suspended hood according to claim 2, **characterised in that** the projector (30) and the video camera (32) are inserted into the body (1) of the suspended hood (100) at a further air extraction opening (19) or secondary air extraction opening provided for in the portion (9) of the hood (100) facing the hob, said secondary air extraction opening (19) being located on one side of the primary air extraction opening (10) and being advantageously of a continuous annular shape.

7. Suspended hood according to claim 2, **characterised in that** said projector (30) and said video camera (32) are connected to a control unit preferably connected to the internet and capable of detecting the type of objects and/or food on the hob (2) or worktop (4) through what is recorded by the video camera and to control the projection of images useful for the preparation of food on the hob (2) through said projector (30).

8. Suspended hood according to claim 7, **characterised in that** the control unit is capable of determining the weight of each food item on the basis of its three-dimensional image taken by the camera (32).

9. Suspended hood according to claim 1, **characterised in that** it comprises sensor means (20) for monitoring airborne substances, said sensor means be-

ing within the body (1) of the hood and being arranged in such a way as not to be directly affected by the air drawn in by the extraction means (1A), said sensor means (20) being able to detect at least one characteristic of this extracted air or the air of the environment in which the hood is placed.

10. Suspended hood according to claims 6 and 9, **characterised in that** the air monitoring sensor means (20) are placed at secondary air extraction opening (19).

11. Suspended hood according to claims 7 and 9, **characterised in that** it comprises at least one of the following characteristics:

said airborne substances sensors (20) are capable of monitoring one or more of the following substances in the air: VOC, CO, CO_2, NOx, CH_4;
said airborne substances sensors (20) monitor parameters of the environment in which the hood (100) is placed, such as the temperature and humidity of that environment;
said airborne substances sensors (20) are connected to a control unit (21), preferably a microprocessor, said control unit (21) being connected to or coinciding with the control unit of the projector (30) and the video camera (32).

12. Suspended hood according to claim 11, **characterised in that** said control unit is connected to a control unit for the hob (2) so as to control the power generated by each heating element (3) of such hob (2) according to the characteristics of the monitored and detected air, said power control making it possible to control the process of cooking a food placed on such hob (2) on said heating element (3).

13. Suspended hood according to claims 1 and 9, **characterised in that** the extraction means (1A) to drawing the air from the hob (2) operate according to the characteristics of the detected air.

14. Suspended hood assembly for domestic extraction (100) according to claim 1 and a hob (2) having a number of heating elements (3), said suspended hood (100) including sensor means (20) for monitoring airborne substances and a control unit to which such sensor means are connected, **characterised in that** said control unit is also capable of controlling the operation of said heating elements (3) of the hob (2) on the basis of the monitoring of airborne substances performed by said sensor means (20).

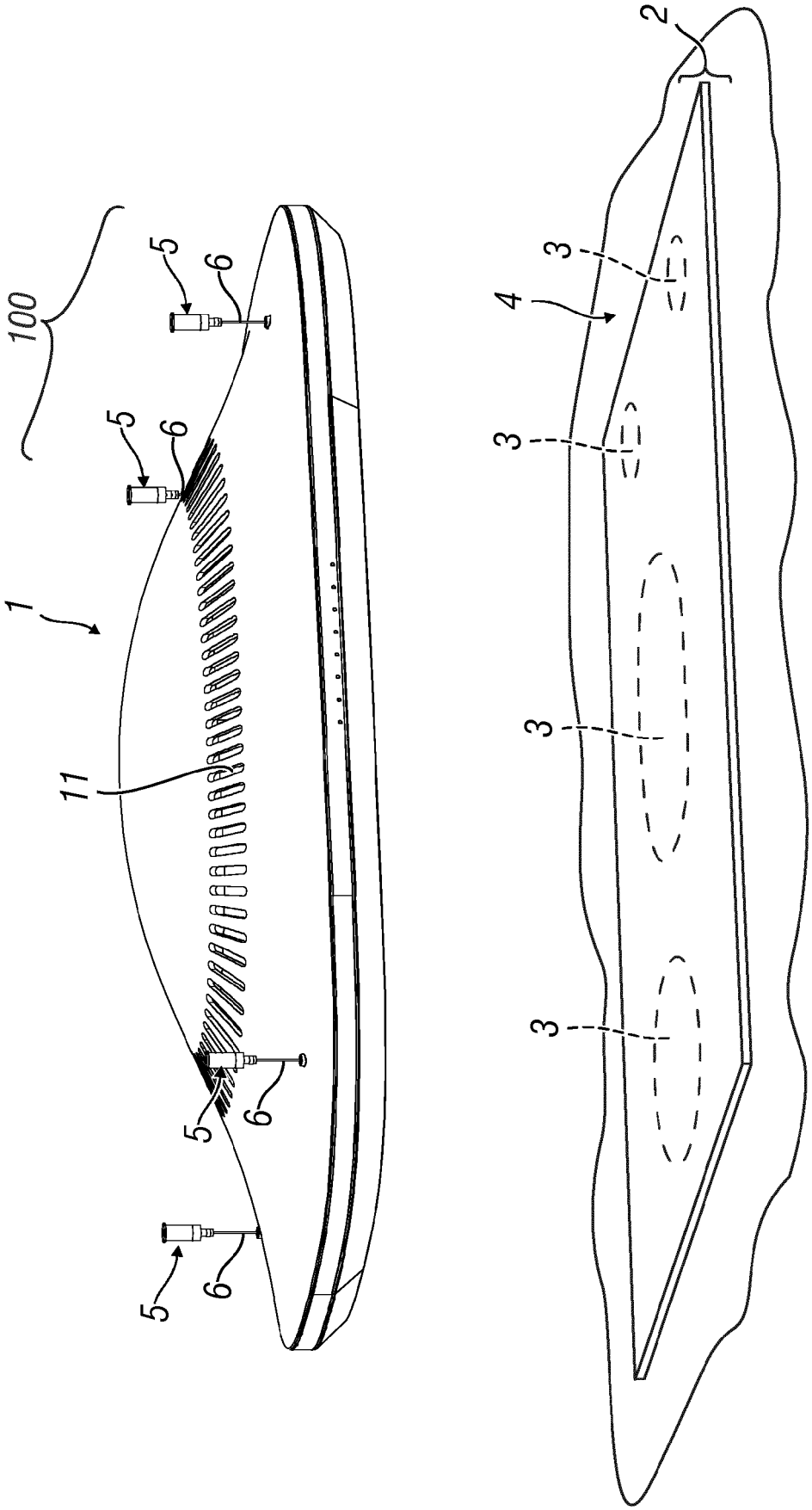

Fig. 1

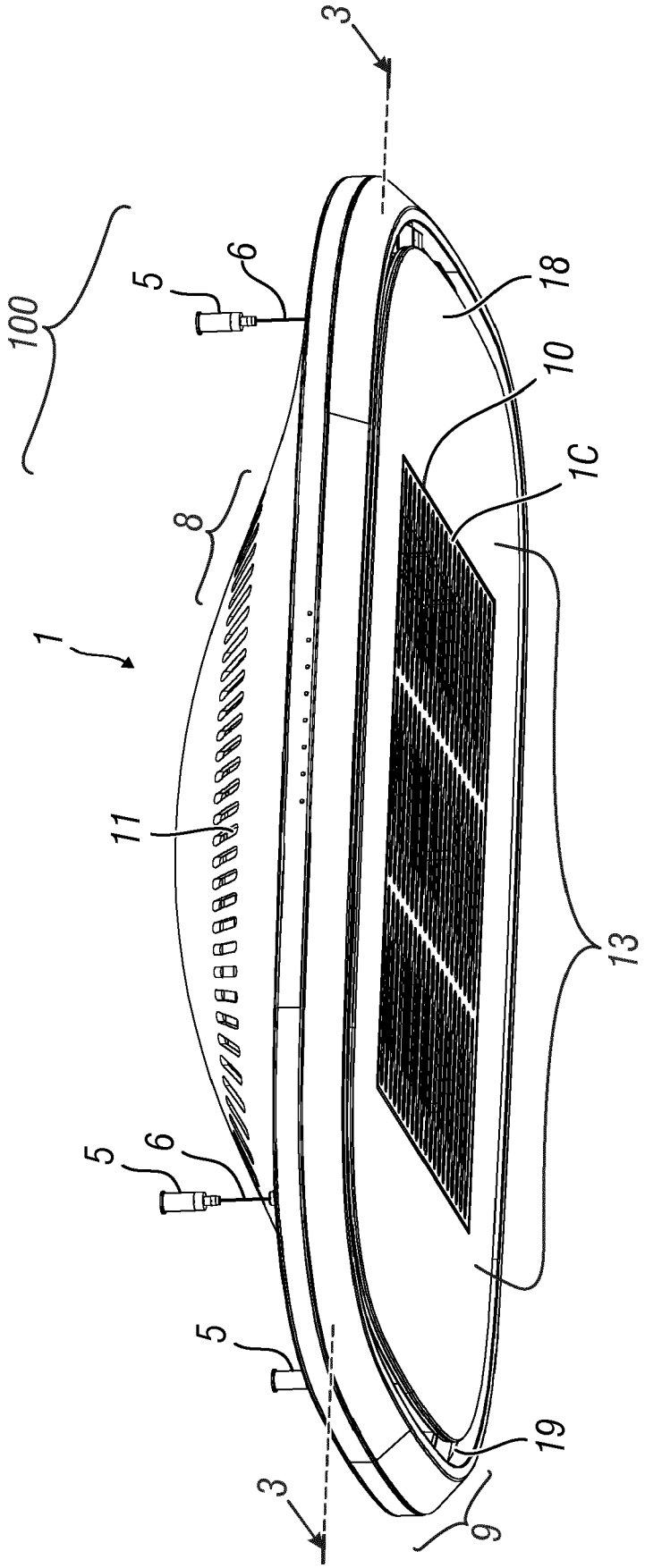

Fig. 2

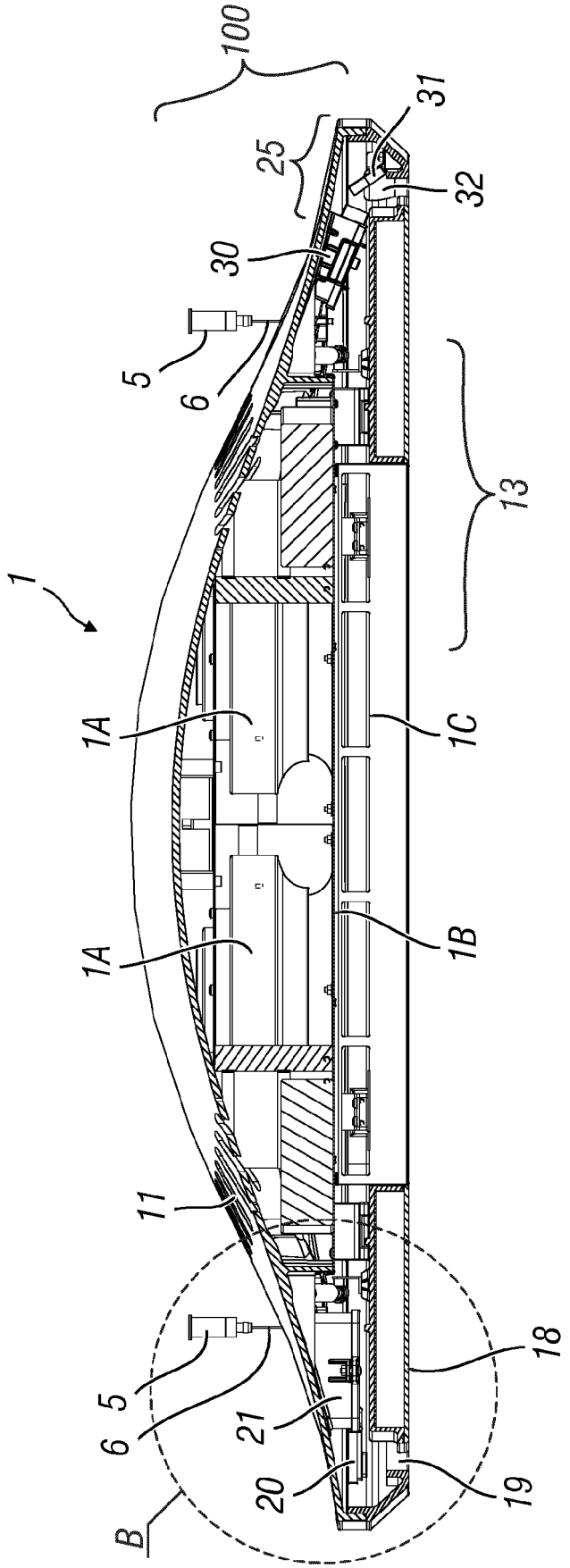

Fig. 3

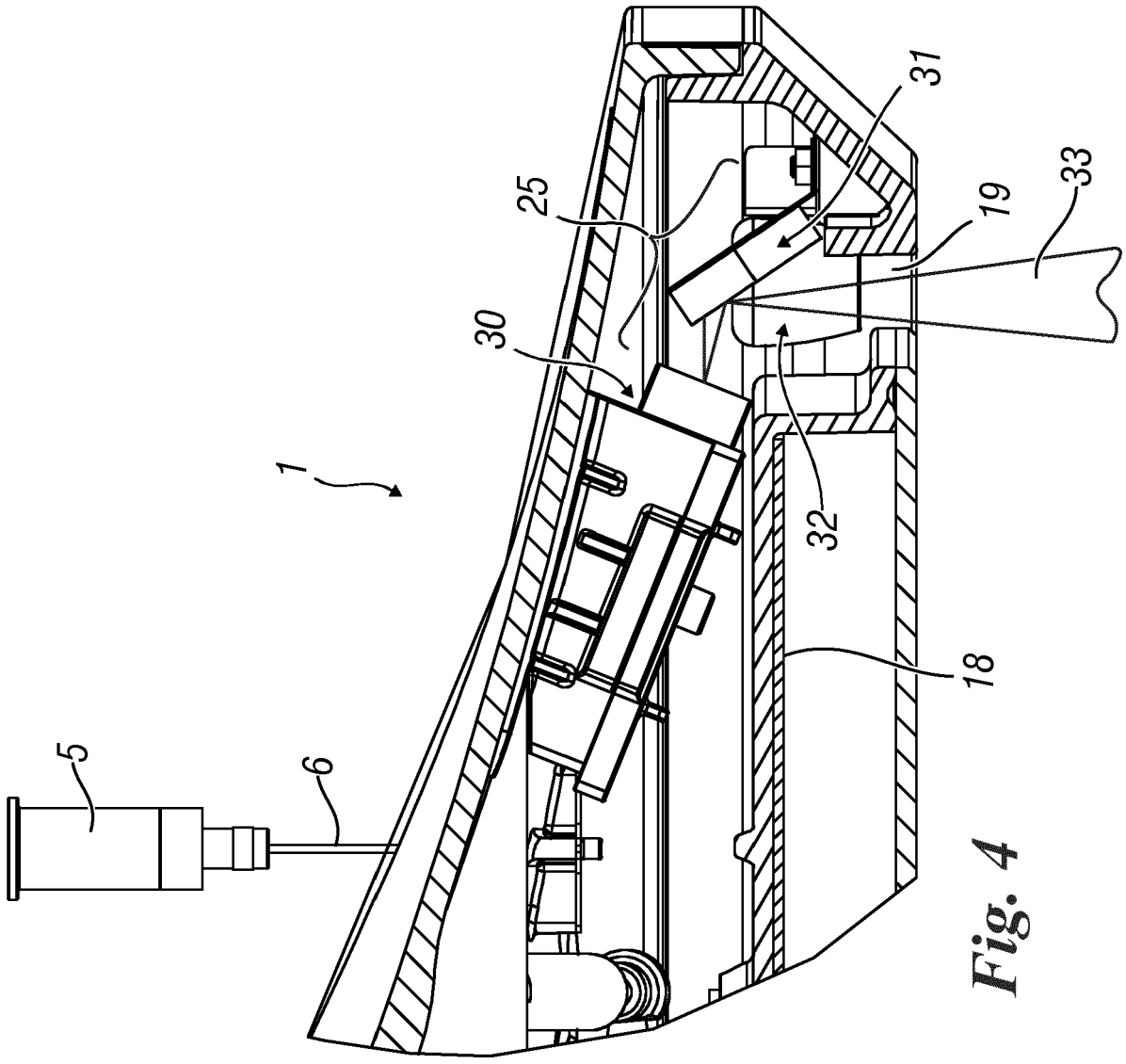

Fig. 4

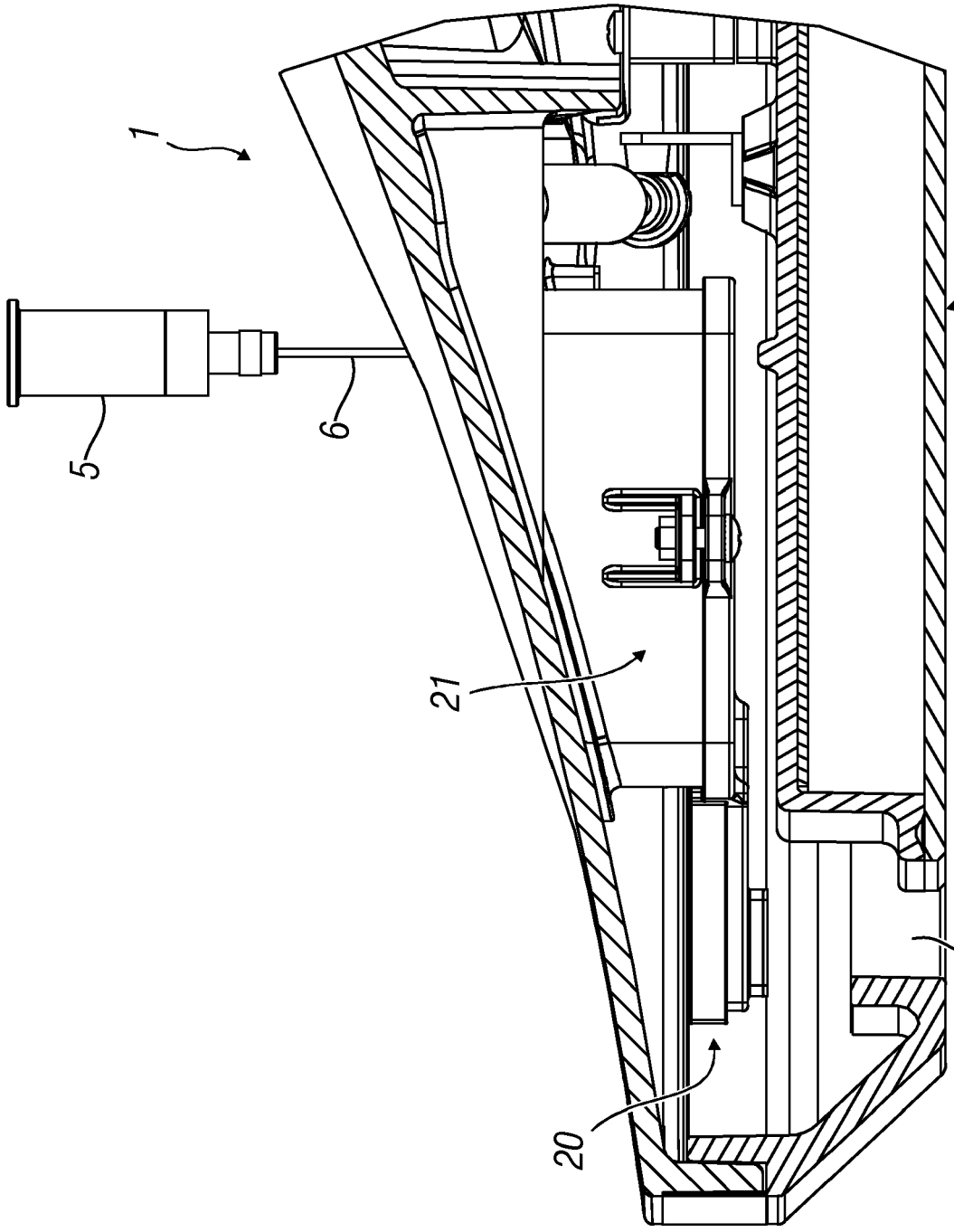

Fig. 5

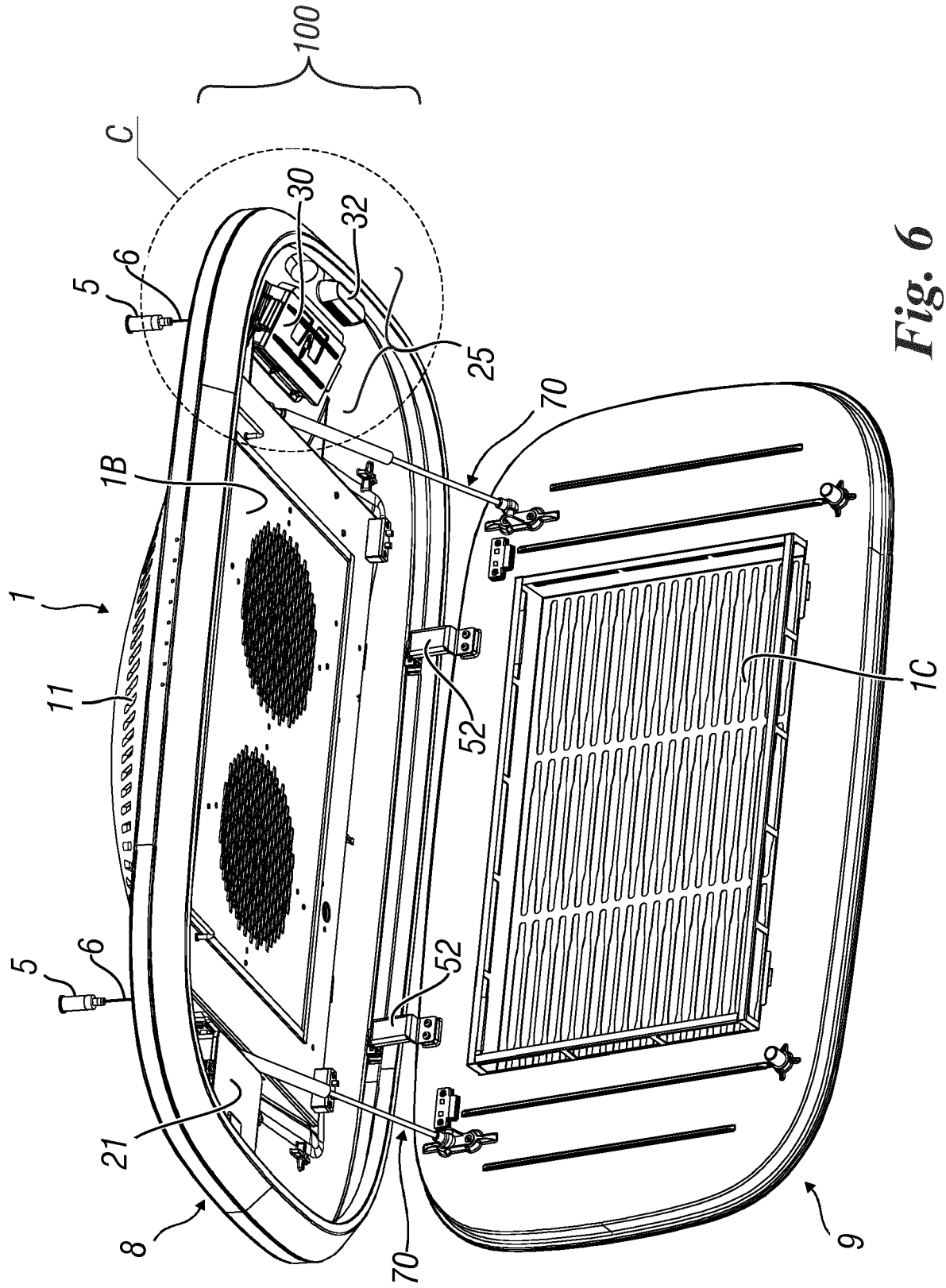

Fig. 6

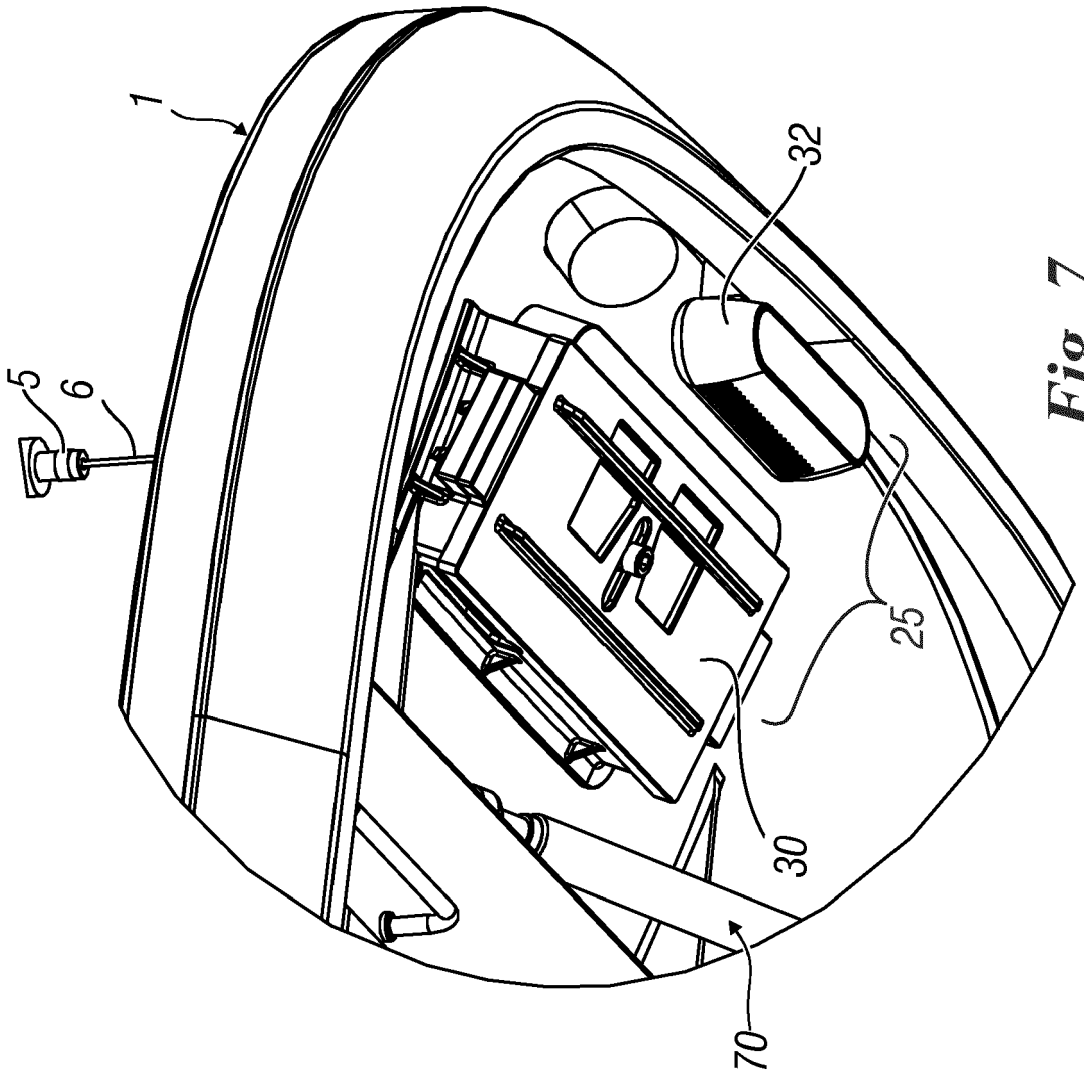

Fig. 7

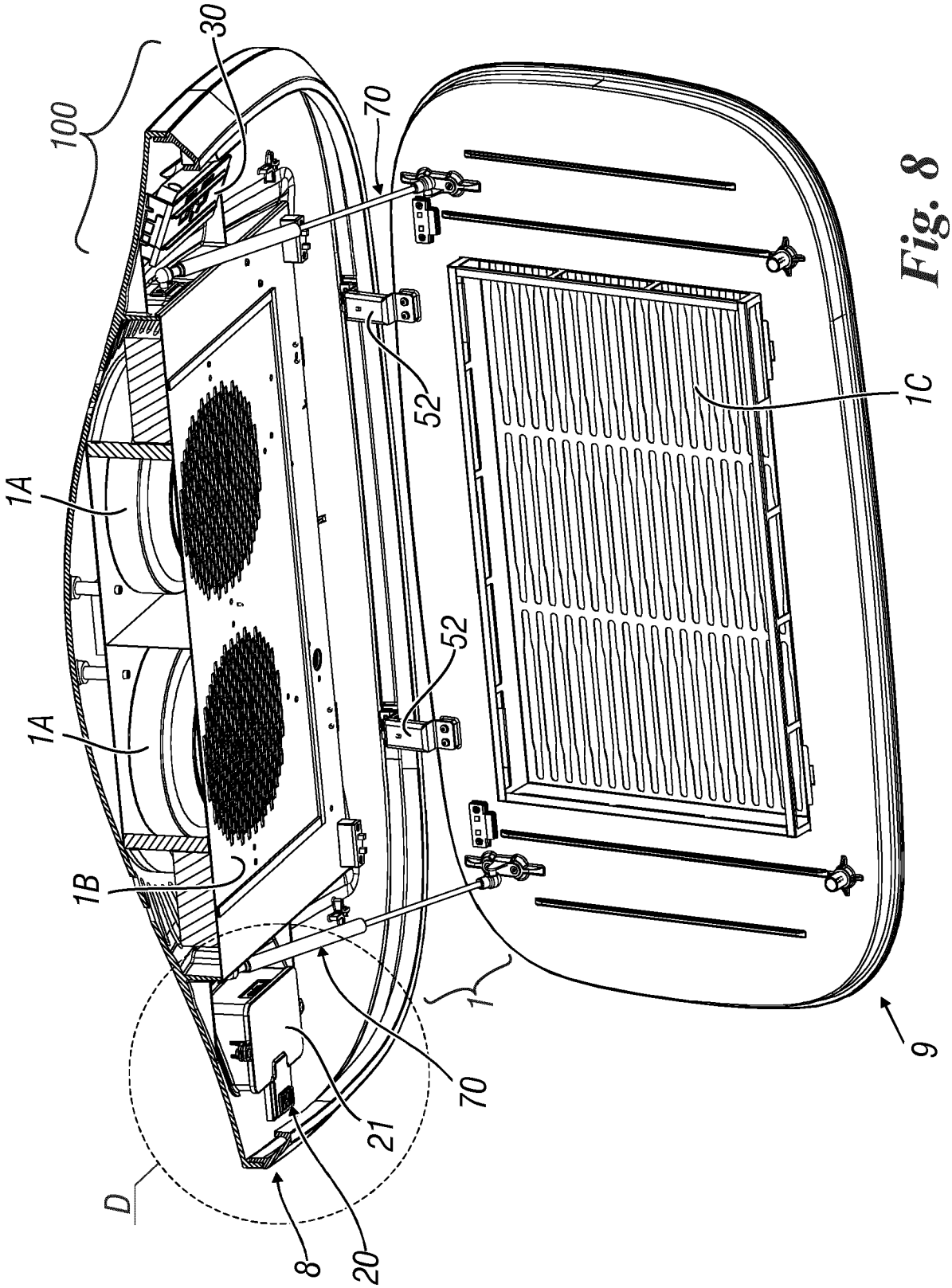

Fig. 8

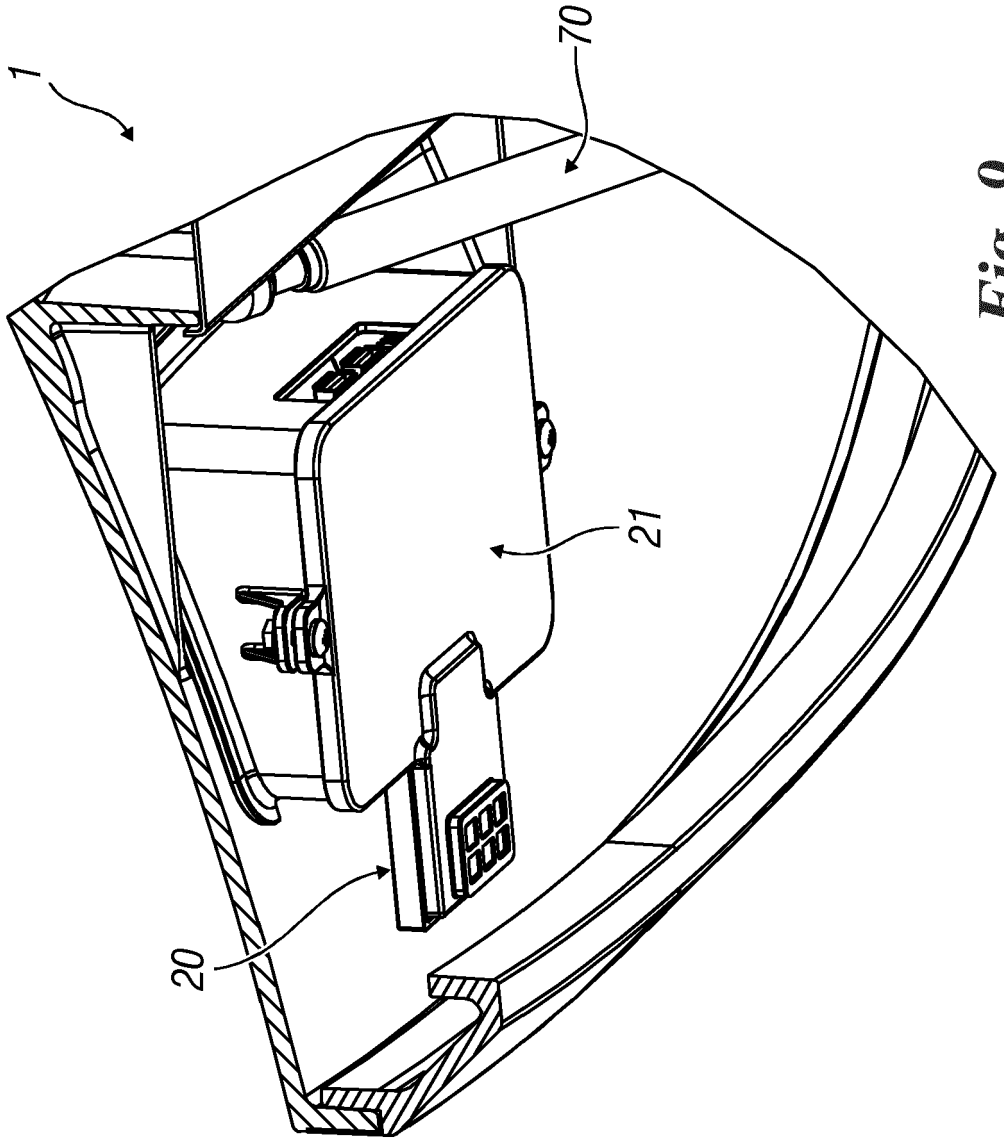

Fig. 9

REFERENCES CITED IN THE DESCRIPTION

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