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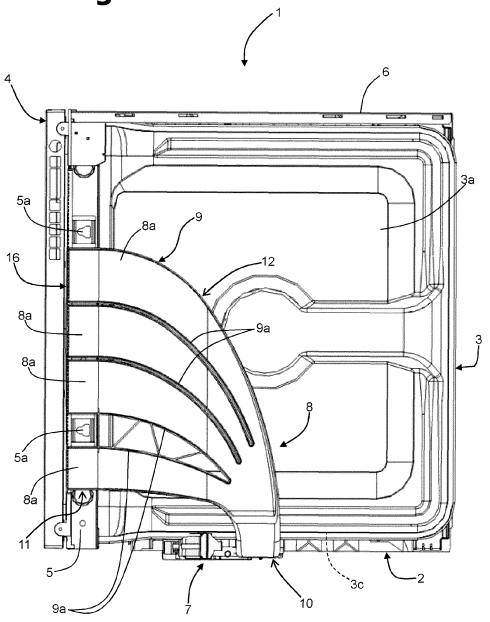
(54) HOUSEHOLD DISHWASHING MACHINE

(57) A dishwashing machine has a load-bearing structure that comprises a base supporting a washtub (3), there being articulated to the load-bearing structure a front door (4) of the washtub (3), the machine (1) moreover having a system for extraction of damp air from the tub (3), which comprises a fan (7) and a discharge duct (8) having a hollow body (9) with a width dimension and a height dimension. The fan (7) is a radial fan having a fan housing (7a), housed in which is a centrifugal impeller (7b), and the discharge duct (8) has an inlet portion (10) and an outlet portion (11). The intake mouth (7c) of the fan (7) is in fluid communication with an outlet opening (15) of the tub (3), the inlet portion (10) of the discharge duct (8) is in fluid communication with the delivery (7d) of the fan (7) and the outlet portion (11) of the discharge duct (8) is at the front of the machine (1). The discharge duct (8) has a portion (12) intermediate with respect to the inlet and outlet portions (10, 11) having a height (H) that decreases towards the outlet portion (11) and a width (W) that increases towards the outlet portion (11). At least the outlet portion (11) and the intermediate portion (12) of the discharge duct (8) extend over an upper wall (3a) of the tub (3), with the outlet portion (11) above an upper edge of the door (4). The outlet opening (15) is formed in one of the upper wall (3a) and a stationary side wall (3 c) of the tub (3), with the fan housing (7a) that is mounted on the aforesaid wall with the respective intake mouth (7c) that is at the outlet opening (15) and is substantially coaxial thereto. The damp air is drawn in from the outlet opening (15) substantially in the direction of the axis (A) of the impeller (7b) and forced in a radial direction into the discharge duct (8), and then expelled from the outlet portion (11) at the front of the machine (1) above the upper edge of the door (4).

Fig. 10



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Description

Field of the invention

[0001] The present invention relates to a dishwashing machine having an open-circuit drying system, according to the preamble of Claim 1.

Prior art

[0002] Drying systems that equip modern-day dishwashers are substantially of a closed-circuit or open-circuit type, the latter possibly being further divided into systems with natural or else forced circulation of air.

[0003] In dishwashers with a closed-circuit drying system a fan draws the damp air into the tub, and then reintroduces it into the tub following upon its dehumidification. For this purpose, between the outlet for the damp air of the tub and the intake mouth of the fan a condenser device or the like is provided, whereas between the delivery of the fan and the inlet for the air into the tub a heating resistance may be operative for rendering the drying process more efficient (see for example, FR-A-2491322).

[0004] In dishwashers with natural ventilation open-circuit, instead, between an inlet and an outlet of the tub a flow of air is induced in a non-forced way, i.e., without the aid of a fan, with the air coming from outside that replaces the damp air present in the tub (see for example EP-A-0752232). In the case of machines with forced ventilation open-circuit, instead, the outlet for the damp air is in fluid communication with the inlet of an aspirator, the outlet of which is instead in fluid communication with the environment external to the tub by way of a duct, possibly shaped for performing functions of condenser. In these machines, the tub is also provided with at least one opening aimed at enabling air change, i.e., non-forced entry into the tub of air coming from the external environment (see for example EP-A-0556773).

[0005] The outlet for the damp air extracted from the tub may be defined at the front of the machine, for example in the case of built-in machines or free-standing machines, the backs of which have to be set up against a wall of the premises. In these solutions, the system for extraction of the damp air from the tub, which usually includes a radial fan with centrifugal impeller, is located in the door of the machine (see for example EP-A-0721762). These solutions generally complicate the construction of the machine.

[0006] Document US 2008/0202557 discloses an industrial dishwasher. The dishwasher has a main blower for generating an airflow along an air path, the air path extends through the treatment chamber to an air outlet. Downstream of the air outlet, a drying channel extends from the air outlet to a machine outlet in the form of a blowing-out opening arranged on the front side of the machine. The drying channel extends above the treatment chamber and beneath a dishwasher top.

Aim and summary of the invention

[0007] In view of what has been set forth above, the main aim of the present invention is basically to provide a dishwasher having a system for drying the dishes with open circuit for the air that is simple and inexpensive to produce, as well as compact. This aim is achieved, according to the present invention, by a dishwashing machine having the characteristics specified in Claim 1. Preferred characteristics of the invention are specified in the dependent claims. The claims form an integral part of the technical teaching provided herein in relation to the invention.

Brief description of the drawings

[0008] Further aims, characteristics, and advantages of the invention will emerge clearly from the ensuing detailed description of an embodiment that is provided purely by way of explanatory and non-limiting example, with reference to the annexed drawings, wherein:

- Figure 1 is a partial and schematic perspective view of a dishwashing machine according to a possible embodiment of the invention;
- Figure 2 is a schematic perspective view of a top portion of the machine of Figure 1;
- Figure 3 is a partially exploded view of the machine of Figure 1;
- Figure 4 is a schematic perspective view of an extraction assembly of the machine of Figures 1-3, in the assembled condition;
- Figure 5 is an exploded view of the extraction assembly of Figure 4;
- Figure 6 is a schematic cross-sectional view of the machine of Figure 1, according to a horizontal plane passing through the aforesaid extraction assembly;
- Figure 7 is a schematic cross-sectional view of the machine of Figure 1, according to a vertical plane passing through the aforesaid extraction assembly; and
- Figures 8, 9, and 10 illustrate, with views similar to those of Figures 1, 3 and 6, a dishwashing machine according to a further embodiment of the invention.

Description of preferred embodiments of the invention

[0009] Reference to *"an embodiment"* or *"one embodiment"* in the framework of the present description is intended to indicate that a particular configuration, structure, or characteristic described in relation to the embod-

iment is comprised in at least one embodiment. Hence, phrases such as *"in an embodiment"* or *"in one embodiment"* and the like that may be present in various points of the present description do not necessarily all refer to one and the same embodiment. Furthermore, the particular configurations, structures, or characteristics may be combined in any adequate way in one or more embodiments. The references used in what follows are provided merely for convenience and do not define the sphere of protection or the scope of the embodiments.

[0010] It is moreover pointed out that in the sequel of the present description only the elements useful for an understanding of the invention will be described, it being taken for granted, for example, that the machine according to the invention comprises all the elements in themselves known for operation of a dishwashing machine, including a possible external cabinet thereof, a user interface, a control system, pumps, level sensors, resistances, a sprinkling system, etc.

[0011] Represented schematically in Figure 1 is a dishwashing machine 1 having a system for drying dishes according to the invention. The machine 1 is illustrated limitedly to the parts of immediate interest for an understanding of the present invention.

[0012] The machine 1 has a load-bearing structure, which comprises a base 2 supporting a washtub 3. The base 2, which is made, for example, of injection-moulded thermoplastic material, defines a housing space within which various functional components of the machine 1 are positioned, amongst which, for example, a washing pump, a discharge pump, a pressure switch, a sump for collecting the washing liquid, etc., which are not visible. The washtub 3, which is visible partially also in Figure 2, is of a conception as a whole known and hence comprises a lower wall, an upper wall, and four side walls. Appearing in Figure 2 are only the upper wall 3a and the three stationary side walls of the tub 3, i.e., the rear wall 3b and the right-hand and left-hand walls, designated by 3c; the fourth side wall of the tub 3, i.e., its front wall, is constituted by an internal shell of the door of the machine, designated by 4 in Figure 1, which is articulated to the load-bearing structure of the machine, for example to its base 2. In the example, the load-bearing structure also includes upright and traverse metal elements, amongst which an upper cross member 5, which extends substantially parallel above the upper edge of the door 4 (when this is closed), in a position recessed with respect thereto. Designated by 6 are two side walls of a body of the machine 1, fixed, in an upper area thereof, to the cross member 5. The walls 6 can be fixed in their lower part to the base 2. The side walls 6 may be omitted in the case of built-in machines.

[0013] In one embodiment, one of the side walls 3c of the tub 3 (for example, the left-hand wall 3c) is provided with an opening (not visible), in the area of which - on the outside of the tub - a known multifunction device is mounted, which can integrate the so-called *air-break,* through which the water coming from the water mains is delivered into the tub, according to modalities in themselves known. This device, which is also in itself known and hence not represented, is pre-arranged for setting the inside of the tub 3 in air communication with the external environment: this function is provided for venting reasons in order to prevent, during operation of the machine 1, overpressures possibly being set up inside the tub 3 and for enabling air change within the tub 3 during a step of forced extraction of damp air from the tub itself, as described hereinafter.

[0014] Alternatively, air change in the tub during drying may be guaranteed via a tubular flue, which extends through a corresponding passage provided in the lower wall of the tub 3, preferably in a corner area thereof, with interposition of sealing means and fixing means. Such a flue, which is also of a type in itself known and hence not represented, has an upper end and a lower end, which open out onto opposite sides of the lower wall of the tub, with the upper end that is located at a greater height than the maximum level that can be reached by the water during the operations of washing or rinsing carried out by the machine 1. Associated to the upper end of the flue is a cap or lid, which defines a substantially shielded or labyrinthine path, whilst the lower end of the flue is open in the area of the space circumscribed by the base 2 of the machine, for setting the tub 3 in air communication with the outside.

[0015] With reference also to Figures 3-7, the drying arrangement of the machine 1 includes a system for extraction of damp air or steam from the tub 3, which comprises a radial fan 7 and a discharge duct 8. The fan 7 has a fan housing 7a, housed in which is a centrifugal impeller 7b, visible in Figures 6 and 7. As may be seen in particular in Figures 4-5, the discharge duct 8 comprises a hollow body 9 with a generally flattened shape, having an inlet portion 10 and an outlet portion 11. The dimension of width and the dimension of height of the duct 8, or of the hollow body 9, are designated by W and H, respectively, in Figures 4 and 5.

[0016] At the portions 10 and 11, the duct 8, and in particular its hollow body 9, define an inlet 13 and an outlet, respectively. Preferentially, this outlet extends substantially all along the front of the portion 11. As will be seen hereinafter, in a preferred embodiment, the aforesaid outlet, designated as a whole by 14 in Figure 5, is divided into a plurality of suboutlets 14a. The suboutlets 14a can be defined by intermediate walls or formations provided only at the portion 11 or a part thereof, in particular the terminal part. These walls also perform a structural function, rendering the duct 8 less vulnerable to deformation that over time could cause an undesirable variation of its geometry.

[0017] The housing 7a of the fan 7 has an intake mouth, designated by 7c in Figures 2 and 7, which is preferably circular and is in fluid communication with an outlet opening of the tub 3, which, in a preferred embodiment of the invention, is located in the upper wall 3a of the tub, this outlet opening being designated by 15 in Figures 3 and

7. The outlet opening 15 preferentially consists of a substantially circular hole, here defined in the upper wall 3a. The inlet 13 of the discharge duct 8 is in fluid communication with the delivery of the fan 7, designated by 7d in Figures 5-7, whereas the portion 11 of the discharge duct 8 is located at the front of the machine 1, with its outlet 14 above an upper edge of the door 4. The duct 8 is preferably supported by the tub 3, here by its upper wall 3a.

[0018] In a preferred embodiment, the housing 7a of the fan 7 is mounted on the upper wall 3a of the tub 3, with the respective intake mouth 7c that is set in a position corresponding to the outlet opening 15 and is substantially coaxial thereto. The arrangement is such that, during operation of the fan 7, the damp air is drawn in from the outlet opening 15 of the upper wall 3a of the tub 3 substantially in the direction of the axis - designated by A in Figure 7 - of the impeller 7b and forced in a radial direction into the discharge duct 8 and then expelled from the outlet portion 11 at the front of the machine 1.

[0019] According to the invention, the discharge duct 8 has a portion 12 that is intermediate with respect to the inlet and outlet portions 10 and 11, this intermediate portion 12 having a height H that decreases, preferably in a substantially progressive way, towards the outlet portion 11 and a width W that increases, preferably in a substantially progressive way, towards the outlet portion 11.

[0020] Once again according to the invention, at least the outlet portion 11 and the intermediate portion 12 of the discharge duct 8 (or a prevalent part of the intermediate portion) extend over the upper wall 3a of the tub 3, with the outlet portion 11 above the upper edge of the door 4. In the embodiment of Figures 1-7 also the inlet portion of the duct 8 extends over the upper wall 3a of the tub 3.

[0021] The arrangement indicated for the fan 7 ensures a practically direct draught of the damp air to be expelled from the tub. This direct draught, in addition to enabling improved extraction of the damp air, also guarantees a constancy of volume of the air drawn in from the tub, also with an outlet opening 15 having a diameter smaller than the openings usually provided in the solutions where an intake channelling extends between the intake mouth of the fan and the outlet opening for the damp air from the tub, thereby enabling a greater flexibility in sizing according to design requirements. The efficiency of extraction of the damp air consequently also improves air change in the tub.

[0022] The particular shape of the intermediate portion of the duct 8, which is tapered in height from the inlet portion 10 to the outlet portion 11 and tapered in width from the outlet portion 11 to the inlet portion 10, is very compact. By way of indication, the inlet portion 10 of the duct 8 may have a height of between 20 and 30 mm, whereas the outlet portion 11 may have a height of less than 1 cm, for example approximately 3-5 mm. On the other hand, since the area corresponding to the upper wall 3a of the tub is very wide, the width of the duct 8 may be of some tens of centimetres, for example between 20 and 50 cm. This sort of sizing enables installation of the air-extraction system described on machines of standard size, also when they are provided with a corresponding cabinet having an upper top. The outlet of the duct 8, which is comparatively much wider and much short in height than its inlet, in any case enables the values of flow rate of the fan 7 to be achieved, without creating significant head losses, and guarantees that the rate of flow of air leaving the duct 8 is sufficiently high as to prevent condensation of the steam in the vicinity of the outlet 14. In this perspective, the duct 8 does not necessarily have to be provided with a discharge for condensate. The shape suggested for the duct 8 also makes it possible to provide, at the outlet 14, a sort of very thin and very wide *air blade,* with effects that are not particularly troublesome as regards outlet of damp air.

[0023] In the embodiment exemplified in Figures 1-7, the outlet portion 11 of the discharge duct 8 has a width at least equal to half the width of the door 4. A width of this sort, or even greater, enables maximization of the efficiency of extraction and at the same time containment of the encumbrance in height of the duct 8. However, in possible variant embodiments, the width of the portion 11 may be smaller, in particular when the height of the outlet section is larger than the one represented.

[0024] In one embodiment, such as the one exemplified, the air-extraction system of the machine 1 further comprises a grid-like insert, designated by 16 in the figures, which is mounted on the load-bearing structure of the machine at the front of the outlet portion 11 of the duct 8, above the upper edge of the door 4. The insert 16 has a width at least equal to the width of the outlet portion 11 of the discharge duct 8, or even larger, and preferably has an array of through openings only in an upper part thereof, as in the case illustrated. The presence of the insert 16 is preferable for reasons of styling and safety, for deflecting the flow at outlet above the upper edge of the door 4 and for preventing intrusion of any possible contaminants from outside into the duct 8. As has been mentioned, the rate of the air at outlet from the duct 8 is sufficiently high, and this also prevents any significant condensation of steam on the insert 16. In a preferred embodiment, the insert 16 has a recess 16a along its lower profile (see Figures 5 and 6) so as not to constitute a hindrance to an engagement element of the system for closing the door 4 (such an engagement element is designated by 4a in Figure 2).

[0025] The presence of the insert 16 is to be understood as optional in so far as in embodiments alternative to the one represented its functions are performed directly by the duct 8, the outlet section of which may be purposely shaped, for example so as to define itself a grid or the like. Irrespective of the presence of the insert 16, which as has been said may be absent, the position of the duct 8 is hard to reach from outside, and is hence in a protected position.

[0026] In one embodiment, the hollow body 9 of the

duct 8 is configured for dividing the flow forced by the fan 7 into a plurality of partial flows. This characteristic may prove convenient for enabling better management of the air flow rate exiting from the duct 8. For this purpose, in one embodiment, the hollow body 9 includes a plurality of intermediate longitudinal walls (some of which are designated by 9a in Figure 6) for defining in the discharge duct 8 a plurality of channels generally set alongside one another (designated by 8a once again in Figure 6). In the case of the embodiment exemplified, each of the channels 8a has a respective inlet downstream of the inlet 13 of the duct 8 and at a distance therefrom, as well as a respective outlet corresponding to one of the suboutlets 14a of Figure 5.

[0027] To enable proper positioning on the upper wall 3a of the tub 3 it is preferable for at least one part of one of the major walls of the duct 8, in particular its lower wall, to be generally plane or only slightly inclined so as to favour evacuation of any possible condensate, whereas the other major wall, in particular the upper wall, is generally inclined from the inlet portion 10 towards the outlet portion 11; such a preferred embodiment is illustrated, for example, in Figure 7.

[0028] According to a preferred embodiment, the outlet portion 11 of the duct 8 extends over the structural cross member 5 and includes at least two stretches generally set side by side and at a distance from one another, designated for example by 11a and 11b in Figures 4 and 5. In this way, notwithstanding the presence of the duct 8, at least a portion of the upper face of the structural cross member 5 can remain accessible. This measure is particularly advantageous when the cross member is provided with coupling means, for example in the form of eyelets, for engagement of a upper worktop or "top" of a cabinet of the dishwasher, when this is of a free-standing type. The characteristic indicated may be appreciated, for example in Figures 1, 3 and 6, where designated by 5a are two engagement eyelets defined in the cross member 5, one of which is accessible in the area of the gap (G, Figures 4-5) defined between the stretches (11a and 11b, Figures 4-5) set side by side and at a distance apart of the outlet portion 11 of the duct 8.

[0029] Figures 8, 9, and 10 illustrate a further embodiment of the invention. In these figures, the reference numbers of Figures 1-7 are used to designate elements that are technically equivalent to those already described above. Moreover, the representation of the side wall 6 of the body of the machine 1 has been omitted, for reasons of greater clarity.

[0030] In the machine 1 of Figures 8-10, the fan 7 is mounted on one of the stationary side walls of the tub 3 (here the right-hand wall 3c) in the area of the outlet opening, designated by 15 in Figure 9. Preferentially, the opening 15 is formed in an upper area of the wall in question, at a point above one half of its height. The duct 8 is preferably supported by the upper wall 3a of the tub and by the fan 7.

[0031] Also in this embodiment, the outlet portion 11 and the intermediate portion 12, or at least a prevalent part thereof, of the discharge duct 8 extend over the upper wall 3a of the tub 3, with the outlet portion 11 above the upper edge of the door 4. Unlike the embodiment of Figures 1-7, instead, the inlet portion 10 of the duct 8 extends at least in part on the outside of the wall 3c, from the housing of the fan 7 to the upper wall 3a. In the case exemplified, the inlet portion 10 and the intermediate portion 12 define between them a generally curved region of transition, as is clearly visible, for example, in Figure 9. Preferentially, the portions 10 and 12 extend in length substantially orthogonal to one another. Also in an embodiment of this type, the hollow body 9 may include a plurality of intermediate walls 9a, as exemplified in Figure 10, for defining a plurality of channels 8a and/or suboutlets 14a in the duct 8 (see also Figure 9).

[0032] Operation of the machine 1 of Figures 8-10 is practically similar to what has been described previously with reference to the machine of Figures 1-7.

[0033] In a preferred embodiment, the generally flattened hollow body 9 of the duct 8 of Figures 1-10 is made of a single piece of thermoplastic material, even though not ruled out is the possibility of it being made up of a number of axially hollow parts coupled together longitudinally. A hollow body 9 made of a single piece may be obtained, for example, via blow-moulding, this manufacturing technique being advantageously usable also in the case where the body 9 includes the intermediate walls 9a previously referred to. The body 9 may in any case be obtained using other known techniques, for example making it in the form of two shells of thermoplastic material, which are then joined together, for example by hot-blade welding.

[0034] Preferentially, the fan 7 used is a fan with small vertical dimensions. For this purpose, in one embodiment, the fan has an electric motor that is set concentrically with respect to the impeller 7b, i.e., with the impeller that surrounds the motor. In such a case, the motor is preferentially a motor protected from the hygroscopic standpoint. Alternatively, the motor may be mounted in a position side by side with respect to the impeller 7b, with the shaft of the motor connected to the shaft of the impeller via a suitable transmission, for example a belt transmission. In the case illustrated in the figures, for example, such a motor may be housed in the part of the housing of the fan designated by 7e in Figure 4.

[0035] In a preferred embodiment, the air-extraction system 7-8 comprises a valve arrangement, which includes an open/close member driven by a corresponding actuator, for example a thermal-actuator, for enabling or preventing passage of damp air into the duct when the fan 7 is active or inactive, respectively. Such a valve is useful for preventing any dispersion of heat and/or of damp air during hot phases of the treatment cycle (prewashing, washing, rinsing), which precede the drying phase, in order to improve the energy efficiency of the machine and prevent any condensation of damp air that could naturally flow in the duct. The aforesaid open/close

member may be operative in the area of the intake branch 7c of the fan 7 (for example, in the form of an open/close member with rotating disk or vertically displaceable disk), or else in the area of its delivery 7d (for example, in the form of a reclinable and raisable movable partition).

[0036] In a particularly advantageous embodiment, in which the above valve arrangement is provided, it is moreover possible to equip the fan housing or the corresponding valve arrangement with an additional intake passage, aimed at enabling pre-mixing of the damp air extracted from the tub 3 with air present above the tub 3, when the fan 7 is in operation. This measure may prove useful for reducing the relative humidity of the air extracted from the tub, in order to prevent any risk of condensation.

[0037] From the foregoing description there the characteristics and advantages of the present invention emerge clearly, these being mainly represented by the simple, inexpensive, and compact structure of the air-extractor system described.

[0038] It is clear that, for the man skilled in the art, numerous variations may be made to the dishwashing machine described herein by way of example, without thereby departing from the scope of the invention as defined in the appended claims.

[0039] The fan 7 may be driven at a constant speed throughout the drying phase or, advantageously, at a speed that may vary so that the flow of damp air evacuated is higher in an initial period of this drying step and lower thereafter. For instance, there may be hypothesised a control of the speed of the fan motor such that its impeller turns faster in the first 10 minutes of the drying step and more slowly thereafter. In this way, significant benefits are obtained from the energy standpoint in so far as the speed of the fan may be slower in the second part of the drying step, where the amount of damp air to be drawn out from the tub is reduced.

[0040] The duct 8 or its body 9 may be provided with a discharge path for possible condensate of water in an appropriate position, for example in its lowest point in the case of the embodiment of Figures 1-7 or in the lowest point of the portion 11 or 12 in the case of the embodiment of Figures 8-10.

[0041] Possibly, the outlet opening 15 could be defined on one of the stationary side walls of the tub with a fan, different from the one described, set in an intermediate position of the duct 8 and in the area of the top wall of the tub.

Claims

1. A dishwashing machine having a load-bearing structure (2, 5) and a washtub (3), there being articulated to the load-bearing structure (2, 5) a front door (4) of the tub (3), the machine (1) moreover having a system for extraction of damp air from the tub (3), which comprises a fan (7) and a discharge duct (8) having a hollow body (9) with a width dimension of and a height dimension,

   wherein the fan (7) is a radial fan having a fan housing (7a) housed in which is a centrifugal impeller (7b), the fan housing (7a) having an intake mouth (7c) and a delivery (7d),
   wherein the discharge duct (8) has an inlet portion (10) and an outlet portion (11), the intake mouth (7c) of the fan housing (7a) being in fluid communication with an outlet opening (15) of the tub (3), the inlet portion (10) of the discharge duct (8) being in fluid communication with the delivery (7d) of the fan housing (7a), and the outlet portion (11) of the discharge duct (8) being at the front of the machine (1),
   wherein at least the outlet portion (11) and the intermediate portion (12) of the discharge duct (8) extend above an upper wall (3a) of the tub (3), with the outlet portion (11) above an upper edge of the door (4),
   wherein the outlet opening (15) is formed in one of the upper wall (3a) and a stationary side wall (3c) of the tub (3), with the fan housing (7a), which is mounted on said wall (3a; 3c) with the respective intake mouth (7c) at the outlet opening (15) and set substantially coaxial thereto, in such a way that damp air is drawn in from the outlet opening (15) substantially in the direction of the axis (A) of the impeller (7b) and forced in a radial direction into the discharge duct (8), and then expelled from the outlet portion (11) at the front of the machine (1) above the upper edge of the door (4),
   the dishwashing machine (1) being **characterized in that** the discharge duct (8) has a portion (12) intermediate with respect to the inlet and outlet portions (10, 11), the height (H) of which decreases in a substantially progressive way towards the outlet portion (11) and the width (W) of which increases in a substantially progressive way towards the outlet portion (11) and
   in that the outlet portion (11) of the discharge duct (8) comprises an outlet (14) divided into a plurality of suboutlets (14a).

2. The dishwashing machine according to claim 1, wherein the hollow body (9) of the discharge duct (8) is configured for dividing the flow forced by the fan (7) into a plurality of partial flows.

3. The dishwashing machine according to claim 2, wherein the hollow body (9) includes a plurality of intermediate walls (9a) for defining in the discharge duct (8) a plurality of channels (8a) generally set side by side.

4. The dishwashing machine according to claim 3,

wherein each channel (8a) has a respective inlet downstream of an inlet (13) of the discharge duct (8) and spaced therefrom, and a respective outlet corresponding to one said suboutlet (14a).

5. A dishwashing machine having a load-bearing structure (2, 5) and a washtub (3), there being articulated to the load-bearing structure (2, 5) a front door (4) of the tub (3), the machine (1) moreover having a system for extraction of damp air from the tub (3), which comprises a fan (7) and a discharge duct (8) having a hollow body (9) with a width dimension of and a height dimension,

wherein the fan (7) is a radial fan having a fan housing (7a) housed in which is a centrifugal impeller (7b), the fan housing (7a) having an intake mouth (7c) and a delivery (7d),
wherein the discharge duct (8) has an inlet portion (10) and an outlet portion (11), the intake mouth (7c) of the fan housing (7a) being in fluid communication with an outlet opening (15) of the tub (3), the inlet portion (10) of the discharge duct (8) being in fluid communication with the delivery (7d) of the fan housing (7a), and the outlet portion (11) of the discharge duct (8) being at the front of the machine (1),
wherein at least the outlet portion (11) and the intermediate portion (12) of the discharge duct (8) extend above an upper wall (3a) of the tub (3), with the outlet portion (11) above an upper edge of the door (4),
wherein the outlet opening (15) is formed in one of the upper wall (3a) and a stationary side wall (3c) of the tub (3), with the fan housing (7a), which is mounted on said wall (3a; 3c) with the respective intake mouth (7c) at the outlet opening (15) and set substantially coaxial thereto, in such a way that damp air is drawn in from the outlet opening (15) substantially in the direction of the axis (A) of the impeller (7b) and forced in a radial direction into the discharge duct (8), and then expelled from the outlet portion (11) at the front of the machine (1) above the upper edge of the door (4),
the dishwashing machine (1) being **characterized in that** the discharge duct (8) has a portion (12) intermediate with respect to the inlet and outlet portions (10, 11), the height (H) of which decreases in a substantially progressive way towards the outlet portion (11) and the width (W) of which increases in a substantially progressive way towards the outlet portion (11), and
in that the hollow body (9) of the discharge duct (8) is configured for dividing the flow forced by the fan (7) into a plurality of partial flows.

6. The dishwashing machine according to claim 5, wherein the hollow body (9) includes a plurality of intermediate walls (9a) for defining in the discharge duct (8) a plurality of channels (8a) generally set side by side.

7. The dishwashing machine according to any one of the preceding claims, wherein the outlet opening (15) is formed in the upper wall (3a) of the tub (3) and the inlet portion (10) of the discharge duct (8) extends over the upper wall (3a) of the tub (3).

8. The dishwashing machine according to any one of claims 1 to 6, wherein the outlet opening (15) is formed in said stationary side wall (3c) of the tub (3) and the inlet portion (10) of the discharge duct (8) extends at least in part on the outside of said stationary side wall (3c), towards the upper wall (3a) of the tub (3).

9. The dishwashing machine according to any one of the preceding claims, wherein the outlet portion (11) of the discharge duct (8) comprises or has associated to it a grid or the like.

10. The dishwashing machine according to claim 9, wherein the system for extraction of air further comprises a grid-like insert (16), mounted on the load-bearing structure (2, 5) at the front of the outlet portion (11) of the discharge duct (8), above the upper edge of the door (4), the grid-like insert (16) having a width at least equal to the width of the outlet portion (11) of the discharge duct (8).

11. The dishwashing machine according to any one of the preceding claims, wherein the load-bearing structure (2, 5) includes an upper structural cross member (5) and wherein the outlet portion (11) of the discharge duct (8) extends over the structural cross member (5) and includes at least two stretches (11a, 11b) generally set side by side and spaced apart from each other, so as to leave a corresponding portion (5a) of the upper face of the structural cross member (5) exposed.

12. The dishwashing machine according to any one of the preceding claims, wherein the air-extraction system further comprises a valve arrangement controllable for enabling or preventing passage of damp air into the discharge duct (8) when the fan (7) is active or inactive, respectively.

13. The dishwashing machine according to claim 12, wherein the valve arrangement includes an open/close member, which is controlled by a corresponding actuator and is operative at one of the intake mouth (7c) and the delivery (7d) of the fan housing (7).

14. The dishwashing machine according to any one of the preceding claims, further comprising at least one additional intake passage, for enabling a pre-mixing of the damp air extracted from the tub (3) with air present outside the tub (3), when the fan (7) is in operation.

15. The dishwashing machine according to any one of the preceding claims, wherein at least one of an upper wall and a lower wall of the intermediate portion (12) of the discharge duct (8) is generally plane and set horizontally, whereas the other of the upper wall and the lower wall of the intermediate portion (12) is generally inclined starting from the inlet portion (10) of the discharge duct (8) towards its outlet portion (11).

Fig. 1

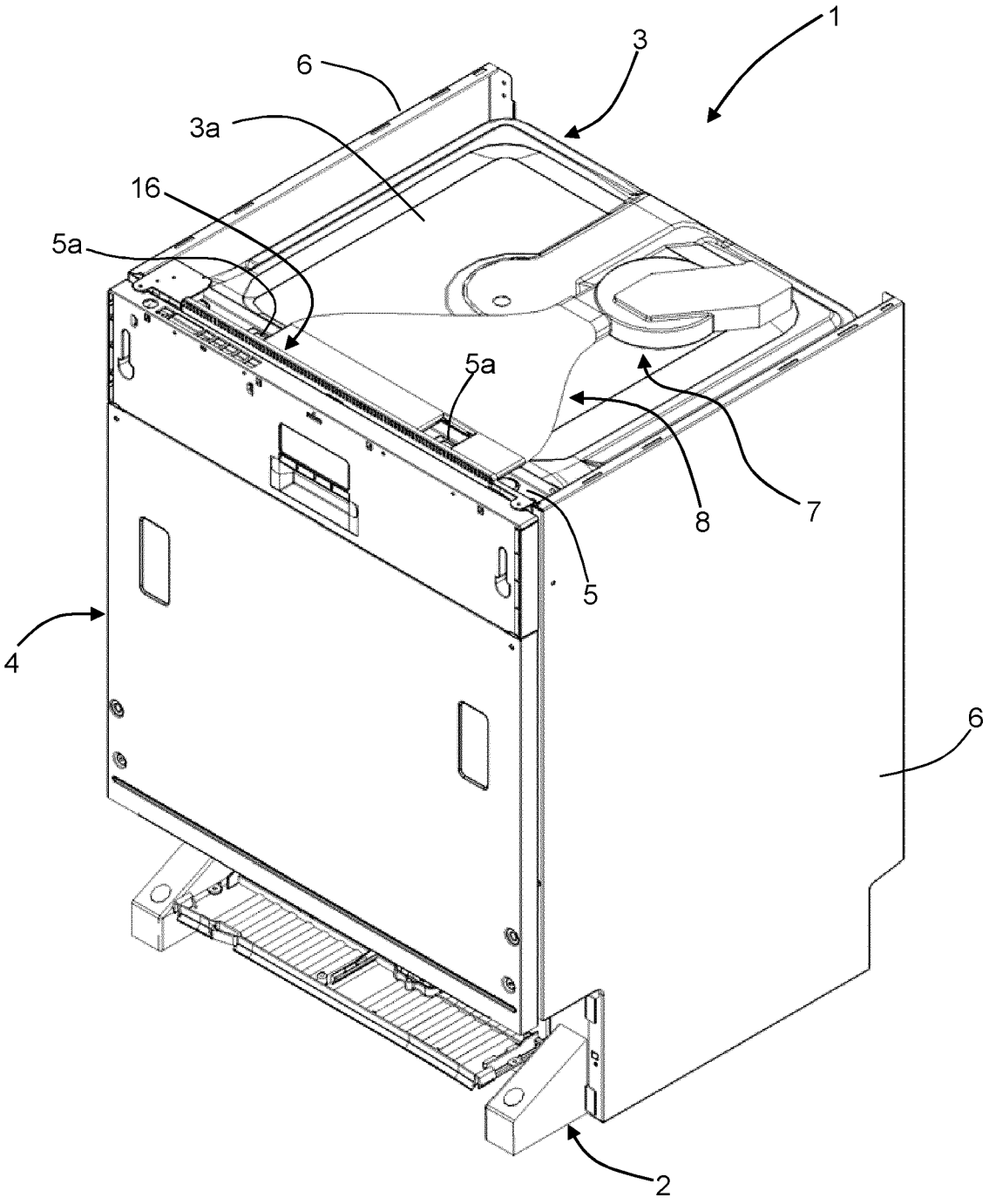


Fig. 2

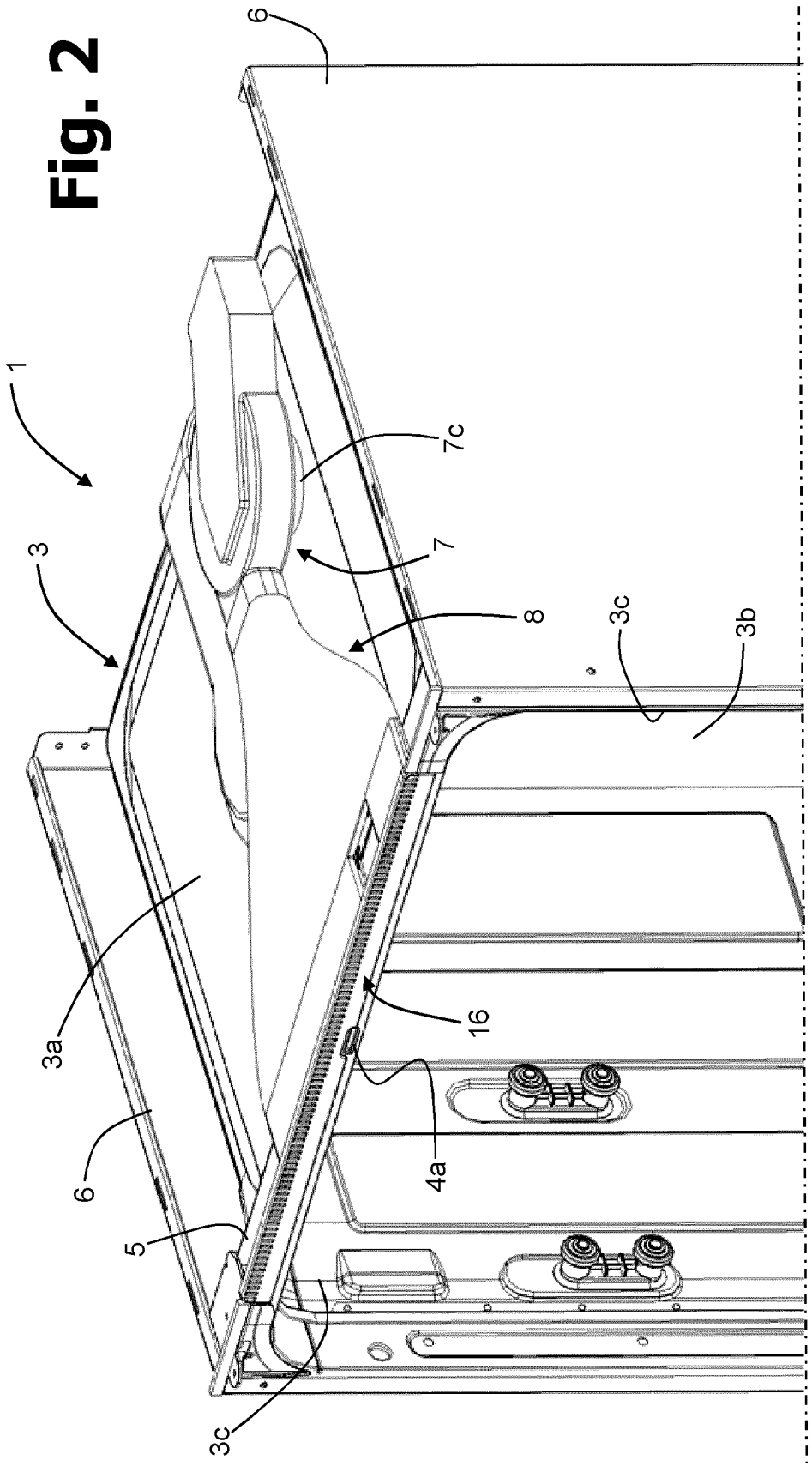


Fig. 3

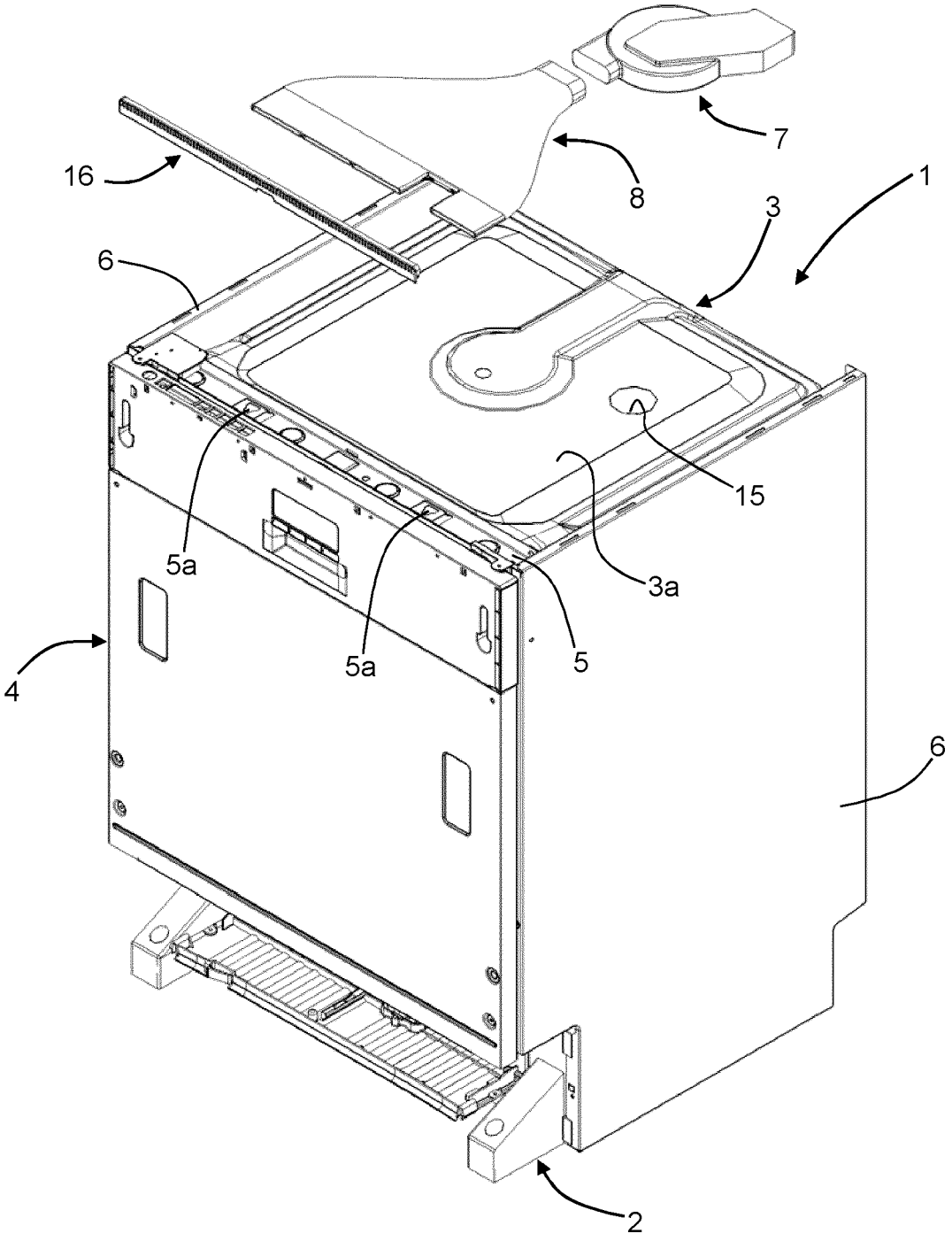


Fig. 4

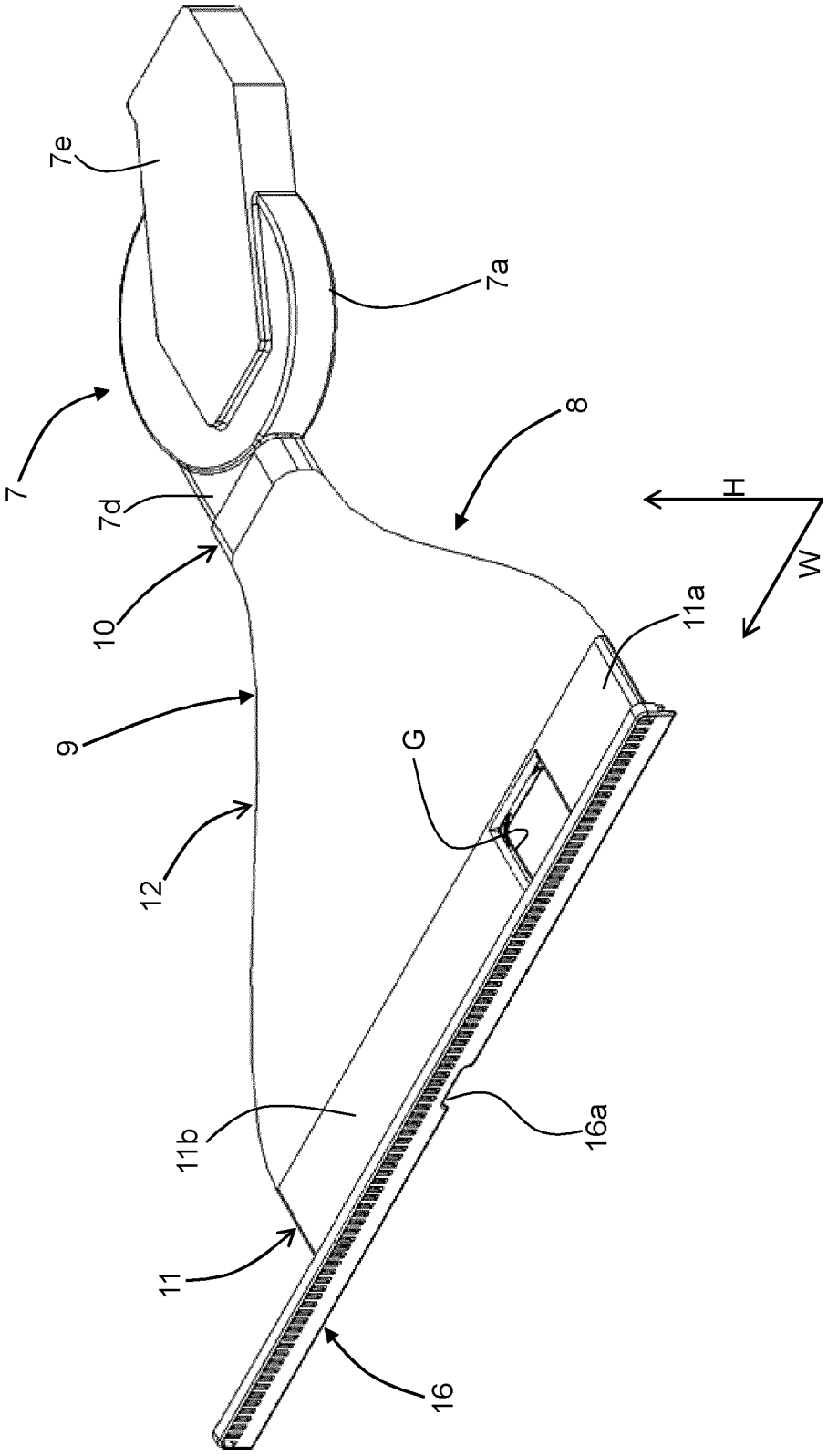


Fig. 5

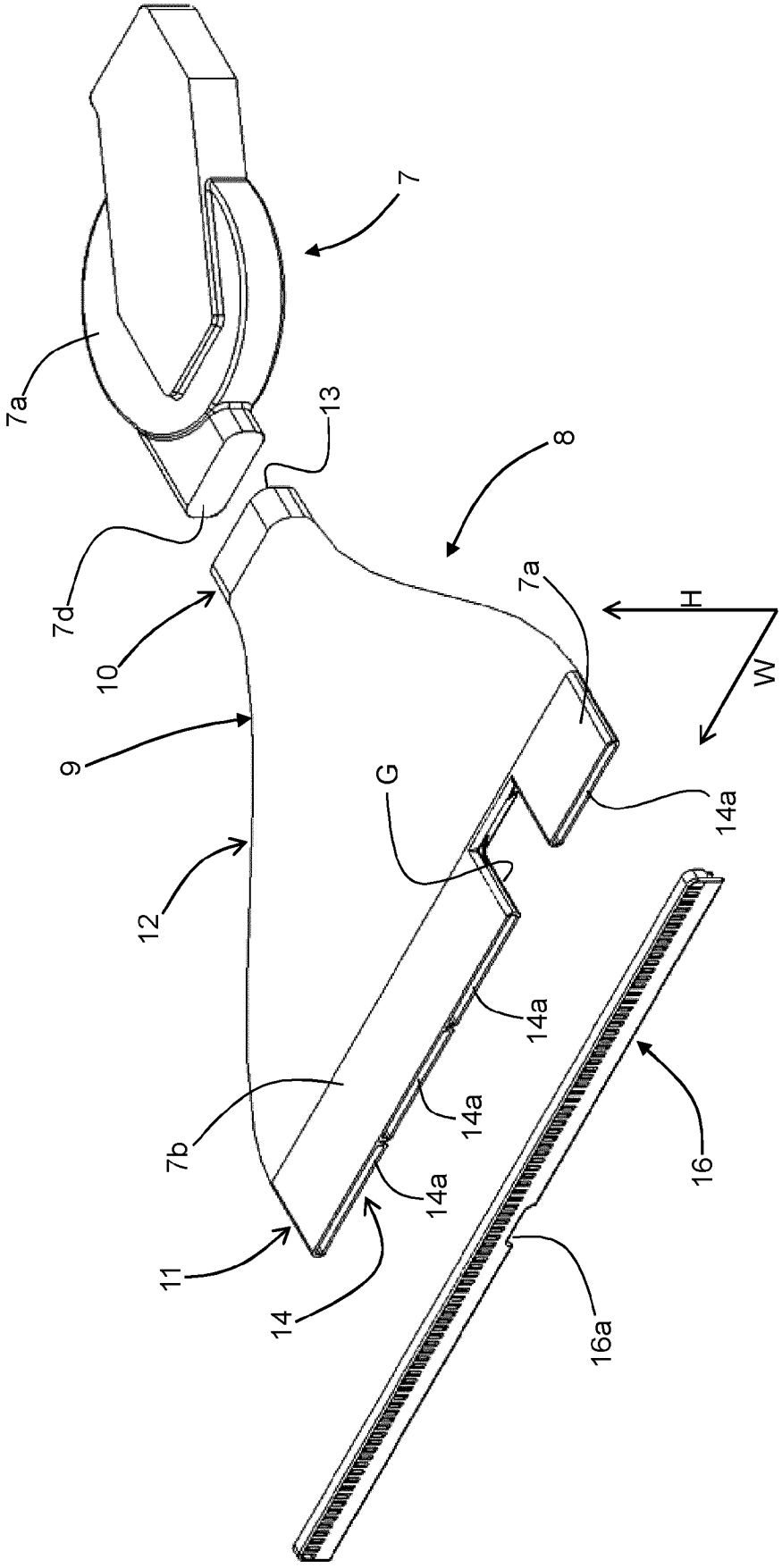


Fig. 6

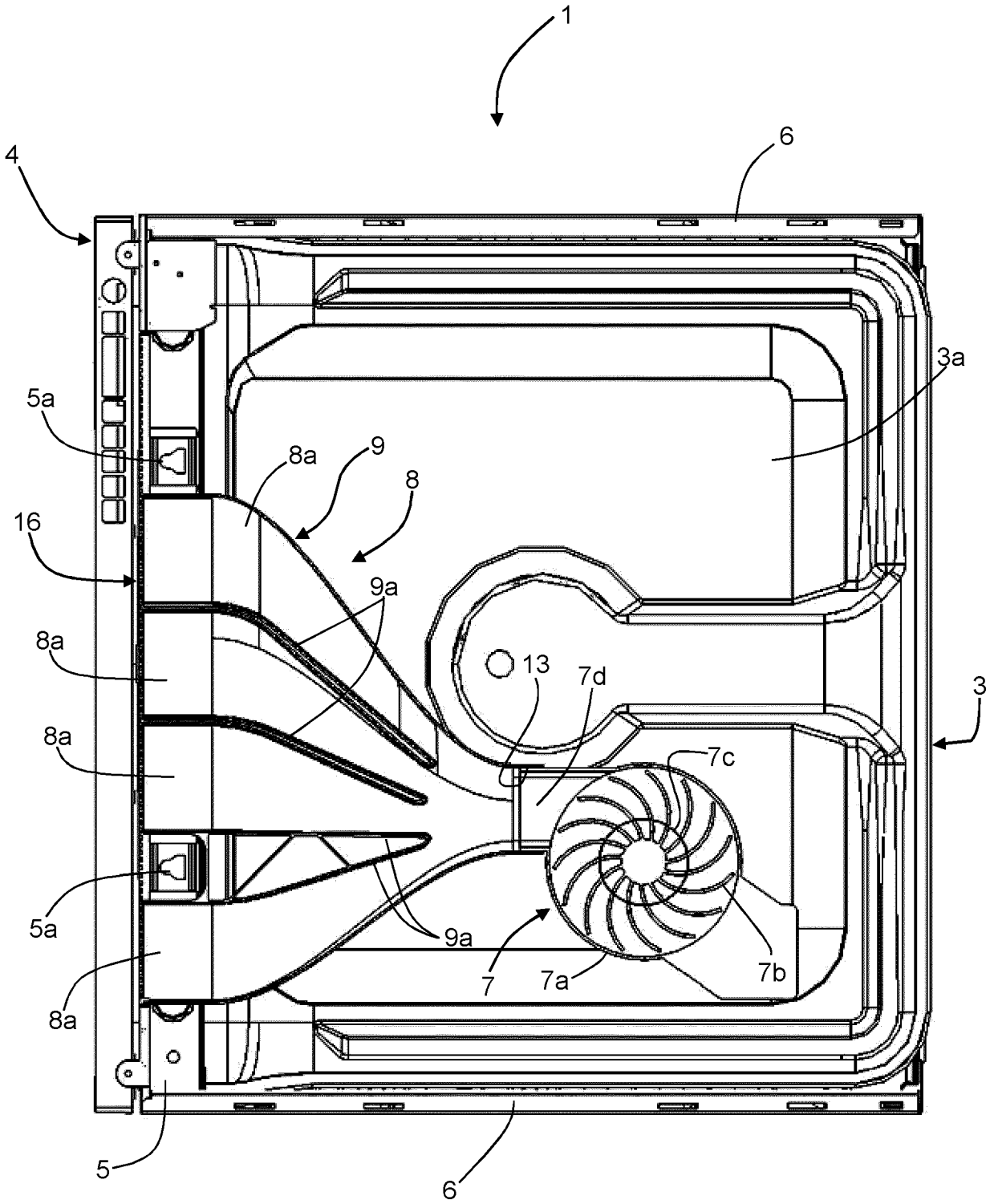


Fig. 7

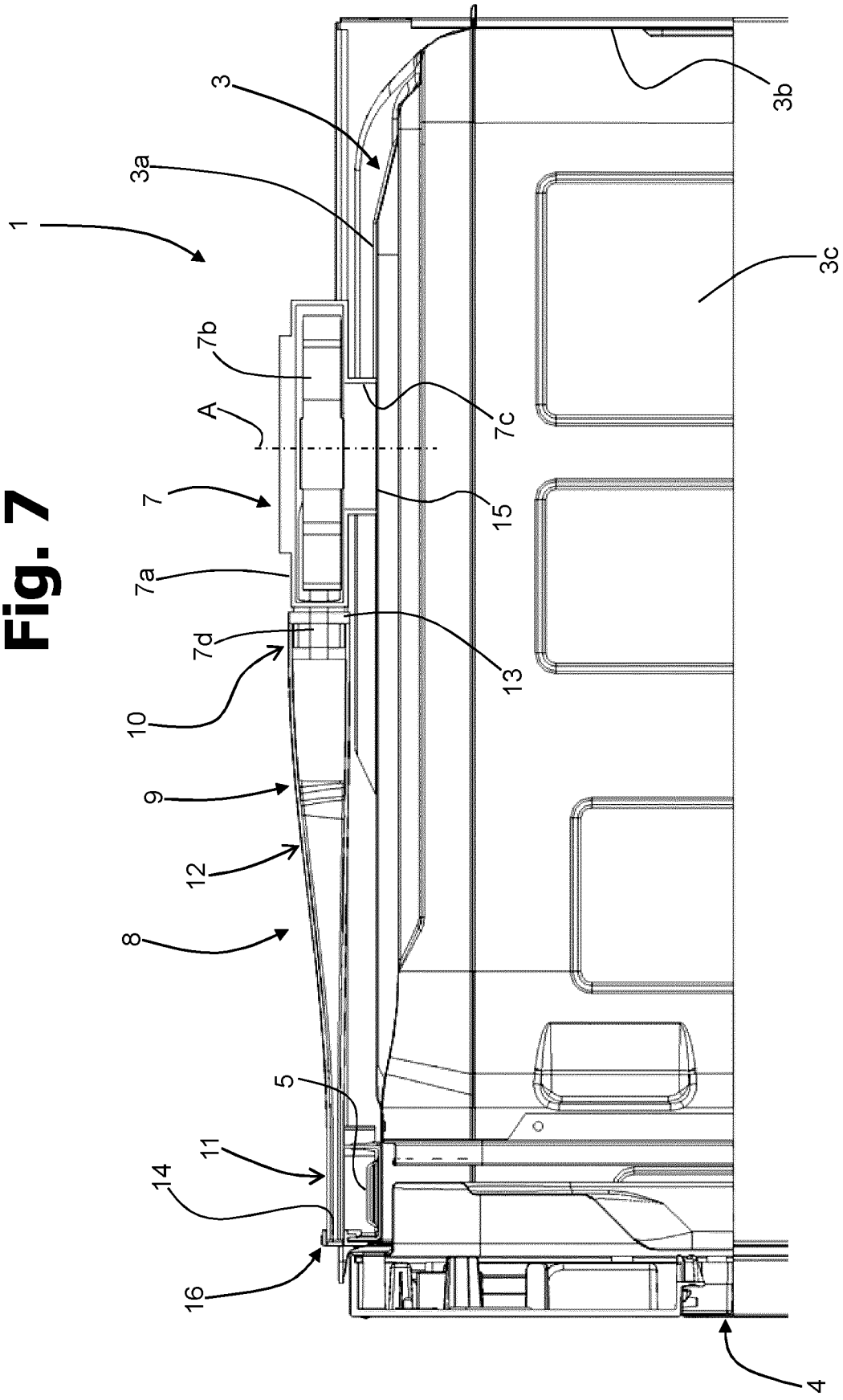


Fig. 8

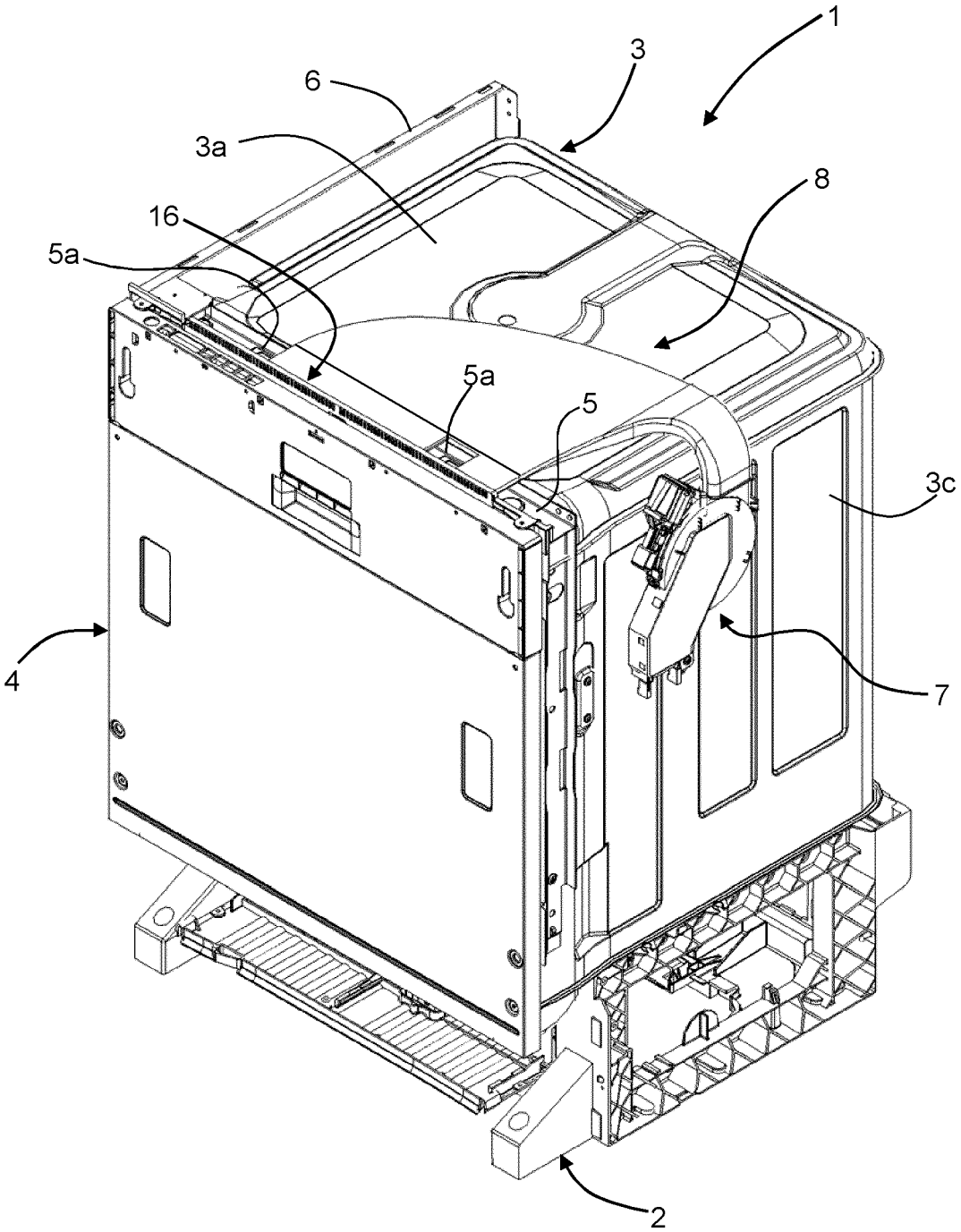


Fig. 9

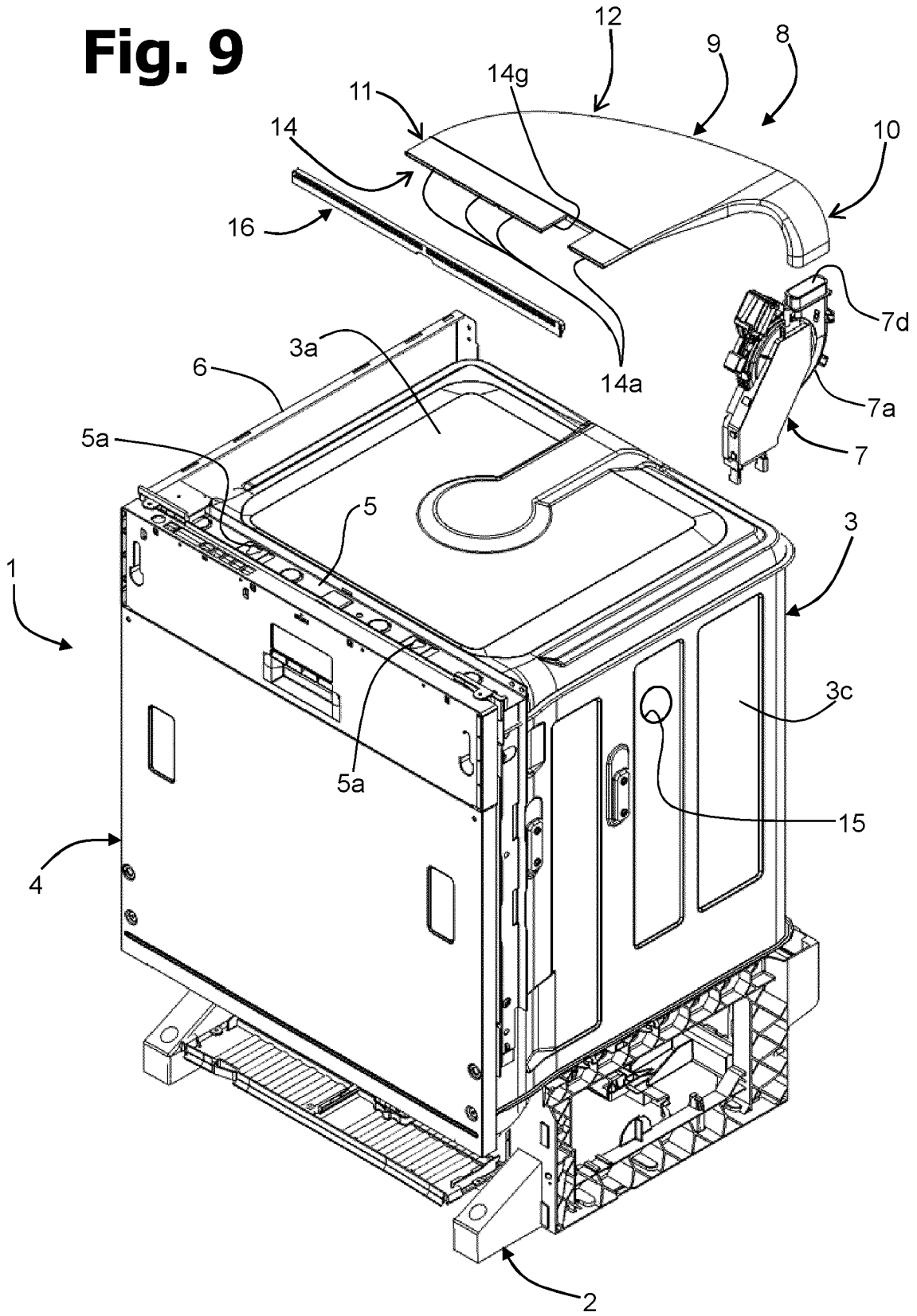
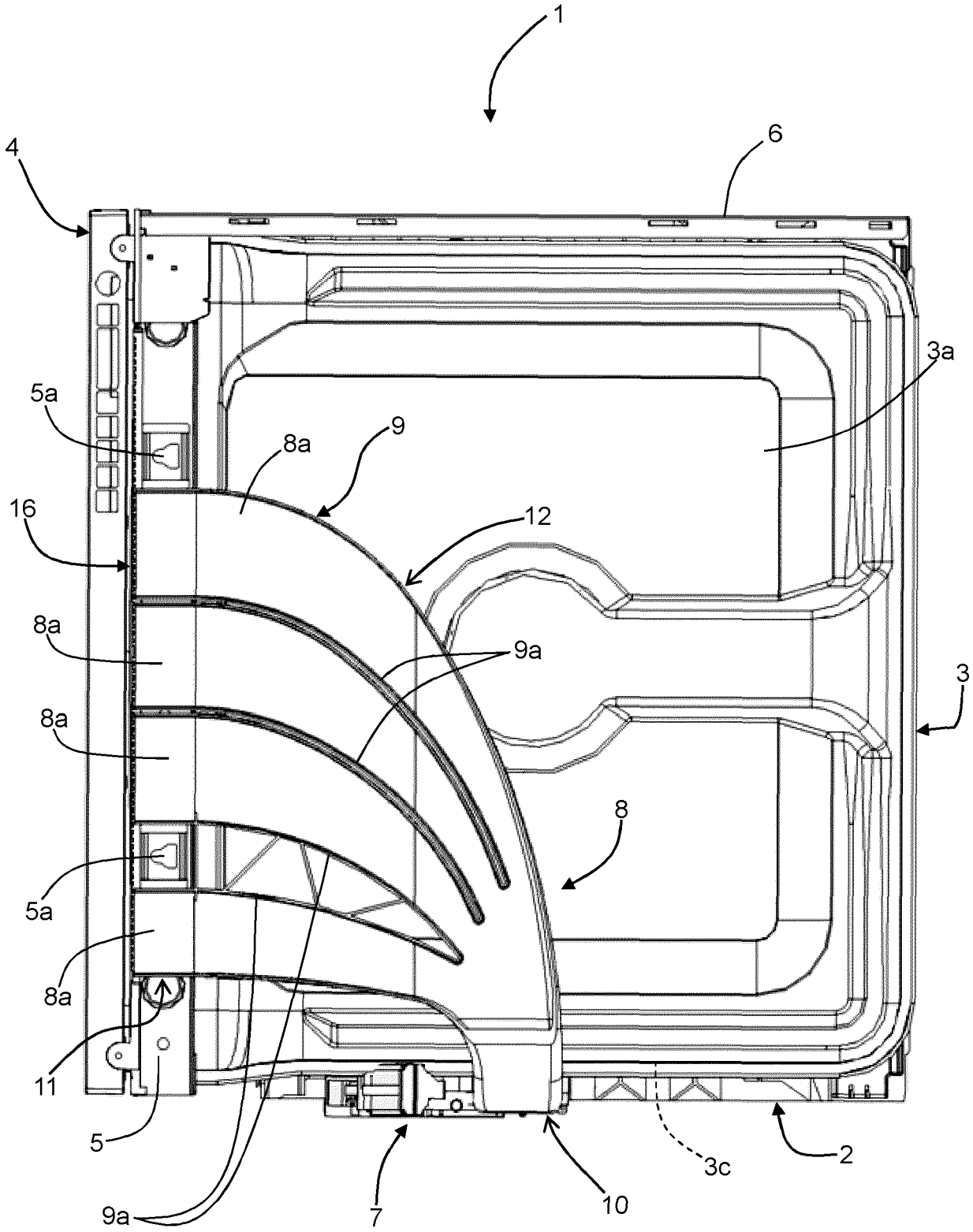


Fig. 10



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Application Number
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Place of search	Date of completion of the search	Examiner
The Hague	6 April 2022	Vermander, Wim

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