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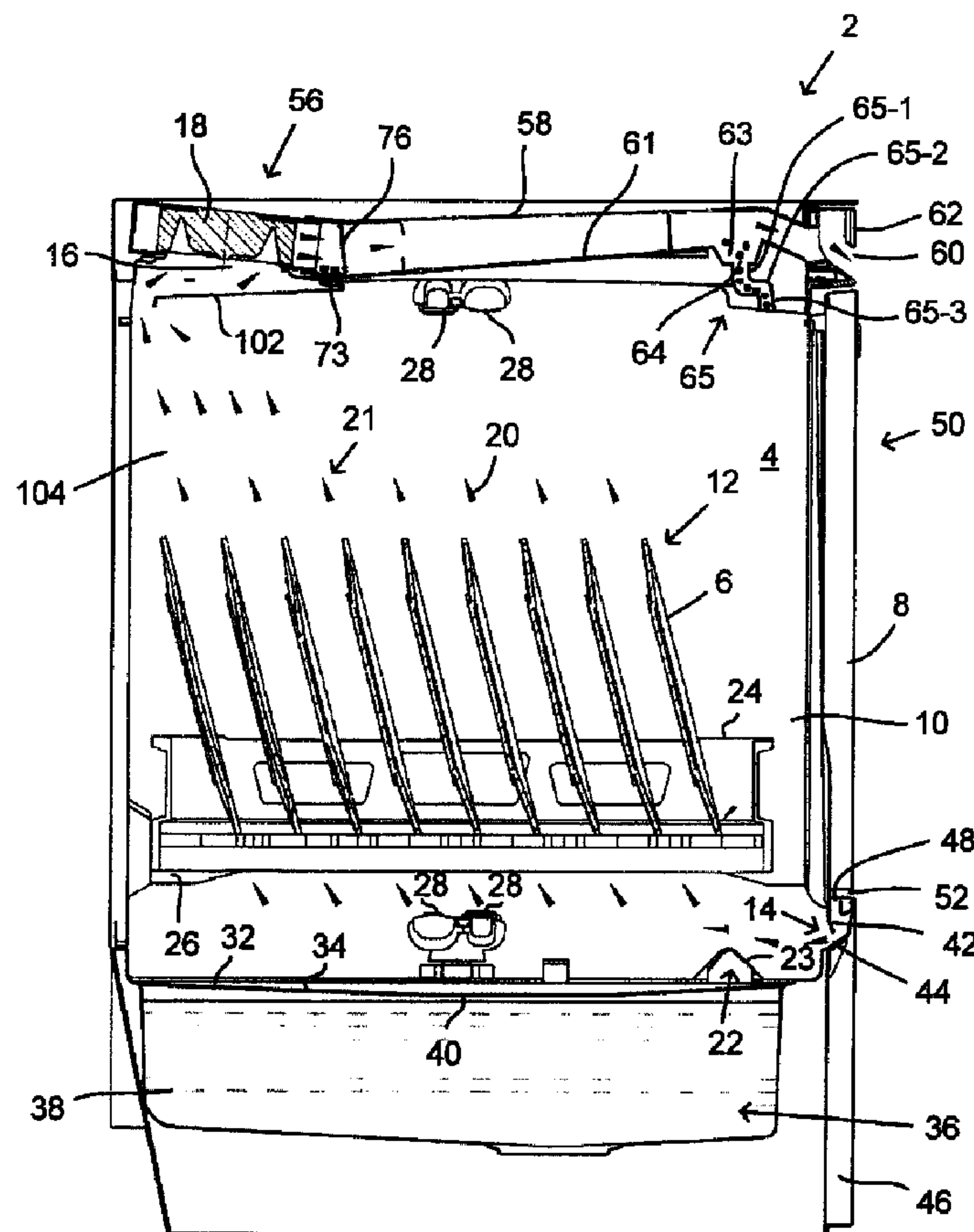
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(54) Title: INDUSTRIAL DISHWASHER



(57) Abrégé/Abstract:

Industrial dishwasher with a main blower (18) and an additional blower (77) and a drying channel (58), wherein, in the base, the drying channel (58) has a drainage means (63) which runs transversely to the channel base (61) and has a drainage opening (64), the channel base (61) sloping up in the direction of the drainage means (63).

Abstract

Industrial dishwasher with a main blower (18) and an additional blower (77) and a drying channel (58), wherein, in the base, the drying channel (58) has a drainage means (63) which runs transversely to the channel base (61) and has a drainage opening (64), the channel base (61) sloping up in the direction of the drainage means (63).

Industrial dishwasher

The invention relates to an industrial dishwasher in the form of a batch dishwasher.

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A dishwasher of this type is known from DE 10 2005 023 428 A1. Further dishwashers are known from the following documents: US 3,807,420;
10 US 4,179,821; EP 0 978 250 A2, EP 0 711 528 A1, EP 0 378 836 A1 and DE 40 29 958 A1.

Industrial dishwashers which are designed for loading batches of wash ware into, and unloading the same from, a treatment chamber are available, in particular, in
15 the form of front-loader dishwashers or hood-type dishwashers. In the case of front-loader dishwashers, the wash ware is placed in a rack and the rack loaded with wash ware is positioned in the treatment chamber
20 through a front door and, following washing, removed through the front door again. In the case of hood-type dishwashers, the racks loaded with wash ware are pushed manually into the treatment chamber from an entry side and, following completion of a dishwashing program,
25 removed manually from the treatment chamber from an exit side. Front-loader dishwashers and hood-type dishwashers contain just a single treatment chamber for the treatment of the wash ware. The front-loader dishwashers may be under-counter dishwashers or
30 counter-top dishwashers. Wash ware is usually washed by at least one washing process, during which the wash ware is sprayed with a wash liquid, and at least one subsequent final rinse process, during which the wash ware is sprayed with final rinse liquid. The final
35 rinse liquid may be clean water or a mixture of clean water and rinse aid. Industrial dishwashers which are designed for batch loading are also referred to as batch dishwashers.

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Wash ware may be, in particular, crockery, glassware, cutlery, dishes, pots, trays, boxes, etc.

Mainly two drying methods are used in industrial dishwashers. In the first method, the wash ware, still hot following the final rinse process, is removed from the machine, where it then dries in the ambient air within four to ten minutes. In order for the wash ware to dry, in the method described above, it is usually left in the racks in which it has been arranged for washing purposes in the dishwasher. In the second method, air drying takes place in the dishwasher.

Fresh-air drying systems for industrial front-loader or under-counter dishwashers operate with a high volume flow of air in the region of 25 to 60 m³ per hour, in order for it to be possible to dry the crockery in a very short period of time. The high volume flows of air are necessitated by the brevity of the drying operation in the industrial sector. In comparison with conventional drying in a domestic dishwasher, the active drying time of an industrial dishwasher is many times shorter. Whereas the drying-program time in a domestic dishwasher is approximately 30 minutes to 2.5 hours, the drying-program time in the industrial sector is between 1.5 and 5 minutes. As a result of this much shorter drying operation, in particular as a result of the high volume flow of air, the condensation located in the drying channel is blown out through a blowing-out opening. In addition, relatively small quantities of wash and final rinse liquid may pass into the drying channel since the drying channel is connected to the interior of the dishwasher. In standby phases and when the machine is first started up or heated up each day, it is likewise possible for droplets of condensation to form in the drying channel.

If the drying operation is then started, the high air speeds cause the droplets of water which are located,

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or suspended, in the drying channel to be carried along and conveyed or blown out of the blowing-out opening of the dishwasher. Furthermore, as a result of the air flow, a film of water forming on the base of the drying channel is
5 also discharged, in part, through the blowing-out opening. This results, on the one hand, in individual droplets being slung out of the dishwasher into the surroundings and, on the other hand, in dripping water running out of the outlet on the front side of the machine. The total quantity of
10 water discharged in this way, the quantity varying depending on the mode of operation or cycle sequence, may be up to approximately 10 ml during a single drying phase.

The invention seeks to reduce the discharge of water from
15 an industrial dishwasher.

The invention makes it possible to reduce the quantity of water passing out, in particular during the drying operation (drying phase) as the dishwasher program is
20 running.

The invention, in a broad aspect, seeks to provide an industrial dishwasher in the form of a batch dishwasher, containing a treatment chamber for accommodating batches of
25 wash ware in a treatment region, a door for closing a loading and unloading opening of the treatment chamber, an air inlet into the treatment chamber, an air outlet out of the treatment chamber, and a main blower for generating an airflow along an air path which extends from the air inlet,
30 through the treatment chamber, to the air outlet, the airflow in the treatment chamber being channelled through the treatment region in order to dry the wash ware. A drying channel extends from the air outlet of the treatment chamber to a blowing-out opening of the dishwasher, for the
35 purpose of removing the airflow from the air outlet through a blowing-out opening. The drying channel has a drainage means which runs transversely to a base of the drying channel, and the drainage means has a drainage opening,

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the channel base sloping up in the direction of the drainage means. In the bottom region of the blowing out opening, an outflow barrier is formed by a protrusion which extends upwards from the channel base of the blowing-out opening.

The invention is described hereinbelow using preferred embodiments as examples and with reference to the drawings, in which:

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Figure 1 shows a lateral sectional view of a first embodiment according to the invention of an industrial dishwasher;

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Figure 2 shows a perspective view of the industrial dishwasher from Figure 1;

Figure 3 shows a lateral sectional view of a second embodiment of an industrial dishwasher according to the invention;

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Figure 4 shows a sectional view of part of the second embodiment;

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Figure 5 shows a further sectional view of part of the second embodiment of the dishwasher according to the invention; and

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Figure 6 shows a sectional view of part of the dishwasher according to Figures 1 and 3 in plan view.

Figures 1 and 3 show a longitudinal section through an industrial dishwasher 2 having a treatment chamber 4 for accommodating wash ware 6 and a door 8 for closing a loading and unloading opening 10. The dishwasher 2 is designed for loading batches of the wash ware 6 into, and unloading the same from, a treatment region 12 in the treatment chamber 4. An air inlet 14 into the treatment chamber 4 is arranged beneath the door 8, at a lower level than the treatment region 12. An air outlet 16 out of the treatment chamber 4 is arranged at a higher level than the air inlet 14 and the treatment region 12. The dishwasher 2 has a main blower 18 for generating an airflow 20 along an air path 21, the air path 21 extending from the air inlet 14, through the treatment chamber 4, to the air outlet 16. The airflow 20 in the treatment chamber 4 is channelled through the treatment region 12 in order to dry the wash ware 6. A deflector device 22 with at least one deflector 23 is provided and designed for the purpose of acting on the airflow 20 passing into the treatment chamber 4 through the air inlet 14, and it causes the airflow to pass into the treatment region 12 from beneath in a uniformly distributed manner.

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The treatment chamber 4 has, for example, a volume of between 60 l and 280 l.

- 5 The term "wash ware" 6 covers, in particular, crockery, glassware, cutlery, pots, containers, boxes, trays, etc.

10 The treatment region 12 is a region in the treatment chamber 4 in which the wash ware 6 is positioned in order to be washed. The wash ware 6 here is preferably arranged in a rack 24. The treatment chamber 4 may contain one or more rack mounts, for example, as illustrated, a single rack mount 26, on which a
15 respective rack 24 can be, or has been, positioned. As an alternative, it is possible to arrange, for example, two rack mounts one above the other.

The treatment chamber 4 contains a multiplicity of
20 spray nozzles 28 to spray liquid 38, for example wash liquid or final rinse liquid, onto the wash ware 6. Separate spray nozzles 28 may be provided in each case for spraying wash liquid and final rinse liquid. The spray nozzles 28 may be formed in particular, as
25 illustrated, on rotatable spray tubes, on stationary spray tubes or in a treatment-chamber wall. In the case of the embodiments illustrated, the loading and unloading opening 10 is arranged on the front side 50 of the treatment chamber 4. A treatment-chamber base 32
30 has a through-opening 34 into a tank 36 or into a reservoir, which is provided for accommodating liquid 38. The through-opening 34 in the treatment-chamber base 32 is preferably covered by a tank screen 40. The dishwasher 2 is set up preferably for at least
35 partially reusing the liquid 38 in the tank 36 for a further dishwashing program, i.e. for a new batch of wash ware 6.

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The operating temperature of the liquid 38 in the tank 36 is preferably between 55°C and 65°C and is kept at the operating temperature by a suitable temperature-control device. It is possible to provide a temperature-control device for a final rinse liquid (not illustrated), for example outside the treatment chamber 4, which keeps the temperature of the final rinse liquid preferably between 63°C and 85°C.

According to the embodiments which are illustrated in Figures 1 and 3, the air inlet 14 is formed between directing elements 42, 44 which are connected to a machine housing 46 or are formed by the same. A top directing element 42 and a bottom directing element 44 here form at least one gap or slot. The bottom directing element 44 is preferably inclined downwards in the direction of the treatment chamber 4. The top directing element 42 is preferably inclined away from the treatment chamber 4.

20

The air inlet 14 is preferably designed for generating an airflow 20 which covers the entire width of the treatment region 12.

An air-inlet path 48 extends from a front side 50 of the dishwasher 2, through the bottom door gap 52 to the air inlet 14. As an alternative, the air-inlet path 48 can extend from an opening in a housing part, or from an opening in the door 8, to the air inlet 14. The air-inlet path 48 is preferably labyrinthine (cf. Figures 1 and 3), in order to avoid the situation where wash liquid 38, during a spraying operation of the spray nozzles 28, passes out of the dishwasher 2 through the air-inlet path 48. A particle filter, for example a dust filter, may be arranged in the air-inlet path 48.

The deflector device 22, which is arranged in the air path 21 of the airflow 20, may be formed in one piece.

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As an alternative, the deflector device 22 may be formed in more than one piece, with at least two deflectors 23. The at least two deflectors 23 may be spaced apart from one another.

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In the case of those embodiments of the dishwasher 2 according to the invention which are illustrated in Figures 1 and 3, the deflector device 22 is spaced apart from the air inlet 14. In particular, the
10 deflector device 22 may be arranged on the treatment-chamber base 32. As an alternative, the deflector device 22, or at least one deflector 23 thereof, may be arranged on the tank screen 40. The deflector device 22 may alternatively be arranged
15 adjacent to the air inlet 14, for example on a treatment-chamber wall.

The air outlet 16 is arranged in a top rear region 56 of the treatment chamber 4. The air path 21, and thus
20 also the airflow 20, thus extends throughout the treatment region 12 of the treatment chamber 4, a good drying result thus being achieved. As an alternative, the air outlet 16 may be arranged at some other location above the wash-ware region 12.

25

Downstream of the air outlet 16, as seen in the flow direction, a drying channel 58 extends from the air outlet 16 to a machine outlet in the form of a blowing-out opening 60, which is preferably arranged on
30 the front side 50 of the machine, as is illustrated, for example, in Figures 1 to 4. The drying channel 58 preferably extends above the treatment chamber 4 and beneath a dishwasher top. An outlet covering 62, which is arranged in the region of the blowing-out opening
35 60, ensures the desired flow conditions at the blowing-out opening 60.

In its base 61, the drying channel 58 has a drainage means 63 running transversely to the channel base 61.

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The drainage means 63 has a drainage opening 64. The channel base 61 slopes up from the air outlet 16 in the direction of the drainage means 63. The drainage opening 64 of the drainage means 63 is protected on its underside against splash water from the treatment chamber 4 by a splash screen. In the embodiments described, the splash screen comprises a tubular drainage channel 65 having (cf., in this respect, also Figure 4 in particular) a downwardly directed drainage portion 65-1 adjacent to the drainage opening 64, having an intermediate portion 65-2 which adjoins the drainage portion 65-1 and runs transversely thereto, i.e. runs approximately horizontally, and having an end portion 65-3 which adjoins the intermediate portion 65-2, is, in turn, directed downwards and has an approximately downwardly directed opening. The splash screen or the drainage channel 65 may be oriented (cf. Figure 1) in the direction of the front side of the dishwasher 2 or else of the rear side thereof (cf. Figure 3). A lateral orientation is also conceivable.

The drainage means 63 is arranged closer to the blowing-out opening 60 than to the air outlet 16. In the case of the preferred embodiments described, the drainage means 63 is arranged in that half of the drying channel 58 which is directed towards the blowing-out opening 60, preferably in the region of approximately 60% to 95% of the drying-channel length, further preferably in the region of 75% to 85% of the length thereof.

In the bottom region of the blowing-out opening 60 (cf. Figure 4), an outflow barrier 66 is formed by a protrusion which extends upwards from the channel base 61 of the blowing-out opening 60. This barrier prevents wash liquid or condensation which reaches the outflow barrier 66 from passing out onto a floor or onto the door 8. Upstream of the outflow barrier 66, in the region of the same or in front of the same, a second

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drainage opening 67 is formed in the base of the drying channel 58. Liquid which is prevented from passing out of the dishwasher 2 by the outflow barrier 66 can run out through the second drainage opening 67. The second

5 drainage opening 67 opens out into a removal channel 68. The removal channel 68 terminates behind the top end of the door 8 of the dishwasher 2, above a door seal 68-2 serving as a sealing element between the door 8 and the housing of the dishwasher 2.

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Downstream of the drainage means 63, i.e. between the drainage means 63 and the blowing-out opening 60, the channel base 61 slopes down, at least in part, in the direction of the blowing-out opening 60. In the

15 embodiments according to Figures 1 and 3, a portion 61-2 of the channel base 61 slopes down directly downstream of the drainage means 63. A further downwardly sloping channel-base portion 61-3 is arranged upstream of the outflow barrier 66 and

20 terminates at the outflow barrier 66.

The drying channel 58 has a channel body 69. This forms a first drying-channel portion 70, which extends from the air outlet 16 into the vicinity of the front edge

25 of the dishwasher 2. The first drying-channel portion 70 is adjoined by a second drying-channel portion 71, which opens out into the blowing-out opening 60. The channel body 69 and the main blower 18 are fastened on the top 4-2 of the treatment chamber 4 by a fastening

30 element, e.g. in the form of a bayonet nut 72. A condensation outflow 73 from the drying channel 58 into the treatment chamber 4 is provided in the region of the rear end of the drying channel 58, i.e. on that side of the same which is directed towards the air

35 outlet 16 of the treatment chamber 4, and at the lowermost point of the drying channel 58. The condensation outflow 73 can open out into the air outlet 16 of the treatment chamber 4, or it opens out into the treatment chamber 4 through apertures 74 in

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the channel body 69 and corresponding apertures 75 in the fastening element, which, as already mentioned, in the preferred embodiment illustrated is the bayonet nut 72.

5

In the embodiments illustrated, the main blower 18 is arranged in a region between the air outlet 16 and blowing-out opening 60 for the purpose of sucking air out of the treatment chamber 4. The main blower 18 is preferably arranged at the air outlet 16. As an alternative to the embodiments illustrated, the main blower may be set up for blowing air into the treatment chamber 4.

15 In particular, provision may be made, as is illustrated in Figure 1, for a helical housing of the main blower 18 to be inclined in the direction of the condensation outflow 73, so that liquid in the main blower 18 runs out in the direction of the condensation outflow 73. As
20 an alternative, it is also possible for the helical housing of the main blower 18 to be arranged horizontally.

The drying channel 58 preferably contains a closure
25 element 76, as is illustrated in Figures 1 and 3, for the purpose of closing the drying channel 58 when the main blower 18 is switched off. The closure element 76, in particular, prevents a spray mist from moving out of the dishwasher 2, through the drying channel 58 and the
30 blowing-out opening 60, during operation of the spray nozzles 28. The closure element 76 may be a controllable closure element controlled by a control means (not illustrated). However, the closure element 76 is preferably formed, as illustrated, by a flap
35 which is automatically opened by the airflow 20 generated by the main blower 18 and is automatically closed when the main blower 18 is switched off. For this purpose, the flap is preferably mounted at its top end, so that, when the main blower 18 is switched off,

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the flap is automatically closed by gravitational force.

Alongside the main blower 18, an additional blower 77
5 (cf. Figure 6) is provided for the purpose of feeding ambient air 78 to the airflow 20, downstream of the main blower 18 and downstream of the air outlet 16, as seen in the flow direction of the airflow 20. The additional blower 77 is provided for feeding ambient
10 air through an ambient-air channel 80 into the drying channel 58. In the case of the embodiment illustrated, an inlet 79 of the additional blower 77 is arranged on the top side of the additional blower 77, although it may be located at any other desired location, in
15 accordance with the type of blower used. A mouth region 82, in which the ambient-air channel 80 opens out into the drying channel 58, acts as a mixing chamber for mixing the ambient air 78 fed through the ambient-air channel 80 and the airflow 20 from the treatment
20 chamber 4. The ambient air is atmospheric external air which is taken in in a region between a treatment-chamber top and the dishwasher top.

As is illustrated in Figure 6, flow-directing elements
25 84 may be provided in order to improve mixing of the two airflows. Flow-directing elements 86 may be provided downstream of the mouth region 82, as seen in the flow direction, in order to reduce vortexing in the resulting airflow 88. Feeding ambient air into the
30 airflow 20 flowing out of the treatment chamber 4 reduces a condensation effect outside the dishwasher 2 which is caused by the moisture-laden air flowing out of the spray chamber 4. The ambient-air channel 80 may contain a closure element 90 for the purpose of closing
35 the ambient-air channel 80 when the additional blower 77 is switched off. The closure element 90 of the ambient-air channel 80 may be formed, in particular, by a closure element as has been described above with reference to the drying channel 58. The course taken by

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the condensation outflow 73 can also be gathered clearly from Figure 6. This condensation outflow comprises a channel which extends (radially) in the direction of the main blower 18 and then opens out into
5 an aperture in the bayonet nut 72.

In the embodiment illustrated, the main blower 18 is designed for generating an airflow 20 at a rate corresponding to 6 times to 12 times the
10 treatment-chamber volume per minute. Whereas the air is taken in axially out of the treatment chamber, it is blown out in the radial direction.

In the case of the embodiment which is illustrated in
15 Figure 1, a splash guard 102 is arranged upstream of the air outlet 16 in order to avoid or reduce instances where liquid passes out of the treatment chamber 4 through the air outlet 16. The splash guard 102 may be provided with a grease filter. In the embodiment
20 illustrated, the splash guard 102 is arranged in relation to the condensation outflow 73 such that condensation running out through the condensation outflow 73 drips onto the splash guard 102 and is directed by the same to a peripheral region 104 of the
25 treatment chamber 4 and thus past the wash-ware region 12. The splash guard is optional and has not been illustrated in the embodiment according to Figure 3.

For the program control of the dishwasher 2 and its
30 parts, such as, in particular, the main blower 18 and the additional blower 77, a program controller 200, which is indicated schematically in Figure 2, is provided.

35 A person skilled in the art will realize that the features disclosed can be used not just in the combinations described, but also in other combinations and on their own.

WHAT IS CLAIMED IS:

1. An industrial dishwasher in the form of a batch dishwasher, containing a treatment chamber (4) for accommodating batches of wash ware (6) in a treatment region (12);

a door (8) for closing a loading and unloading opening (10) of the treatment chamber (4);

an air inlet (14) into the treatment chamber (4);

an air outlet (16) out of the treatment chamber (4);

a main blower (18) for generating an airflow (20) along an air path (21), which extends from the air inlet (14), through the treatment chamber (4), to the air outlet (16), the airflow (20) in the treatment chamber (4) being channelled through the treatment region (12) in order to dry the wash ware (6);

a drying channel (58) which extends from the air outlet (16) of the treatment chamber (4) to a blowing-out opening (62) of the dishwasher, for the purpose of removing the airflow from the air outlet (16) through a blowing-out opening (60), wherein the drying channel (58) has a drainage means (63) which runs transversely to a base (61) of the drying channel (58), the drainage means (63) having a drainage opening (64), the channel base (61) sloping up in the direction of the drainage means (63), and wherein, in the bottom region of the blowing out opening (60), an outflow barrier (66) is formed by a protrusion which extends upwards from the channel base (61) of the blowing-out opening (60).

2. The dishwasher according to Claim 1, wherein the drainage opening (64) of the drainage means (63) has, on its underside, a splash screen (65) for protecting it against splash water from the treatment chamber (4).

3. The dishwasher according to Claim 2, wherein the splash screen (65) is a tubular drainage channel which comprises a downwardly directed drainage portion (65-1) adjacent to the drainage opening (64) and also comprises an intermediate portion (65-2) which adjoins the drainage portion (65-1) and runs transversely thereto, and further comprises a downwardly directed end portion (65-3) which adjoins the intermediate portion (65-2) and has a downwardly directed opening.

4. The dishwasher according to Claim 1, wherein in the upstream of the outflow barrier (66), a second drainage opening (67) is formed in the channel base (61).

5. The dishwasher according to Claim 4, wherein the second drainage opening (67) opens out into a removal channel (68) which terminates behind a top end of the door (8).

6. The dishwasher according to any one of Claims 1 to 5, wherein between the drainage means (63) and the blowing-out opening (60), the channel base (61) slopes down, at least in part, in the direction of the blowing-out opening (60).

7. The dishwasher according to any one of Claims 1 to 6, wherein the drying channel (58) is arranged above the treatment chamber (4) and beneath a dishwasher top.

8. The dishwasher according to any one of Claims 1 to 7, wherein the drying channel (58) has a channel body (69) which forms a first drying-channel portion (70), which extends from the air outlet (16) up to a housing wall of the dishwasher (2) and is adjoined by a second drying-channel portion (71), which opens out into the blowing-out opening (60).

9. The dishwasher according to any one of Claims 1 to 8, wherein the drainage means (63) is arranged closer to the blowing-out opening (60) than to the air outlet (16) of the treatment chamber (4).

10. The dishwasher according to any one of Claims 1 to 9, wherein a condensation outflow (73) from the drying channel (58) into the treatment chamber (4) is provided in the rear end portion of the drying channel (58), the rear end of the drying channel (58) portion being directed towards the air outlet (16) of the treatment chamber (4), and at the lowermost point of the channel base (61).

11. The dishwasher according to any one of Claims 1 to 10, wherein the air inlet (14) of the treatment chamber (4) is arranged beneath the door (8), at a lower level than the treatment region (12).

12. The dishwasher according to any one of Claims 1 to 11, wherein the air outlet (16) out of the treatment chamber (4) is arranged on a rear side of the dishwasher (2), at a higher level than the treatment region (12).

13. The dishwasher according to any one of Claims 1 to 12, wherein an additional blower (77) is provided for the purpose of feeding ambient air into the drying channel (58) upstream of the drainage means, and immediately downstream of the main blower (18).

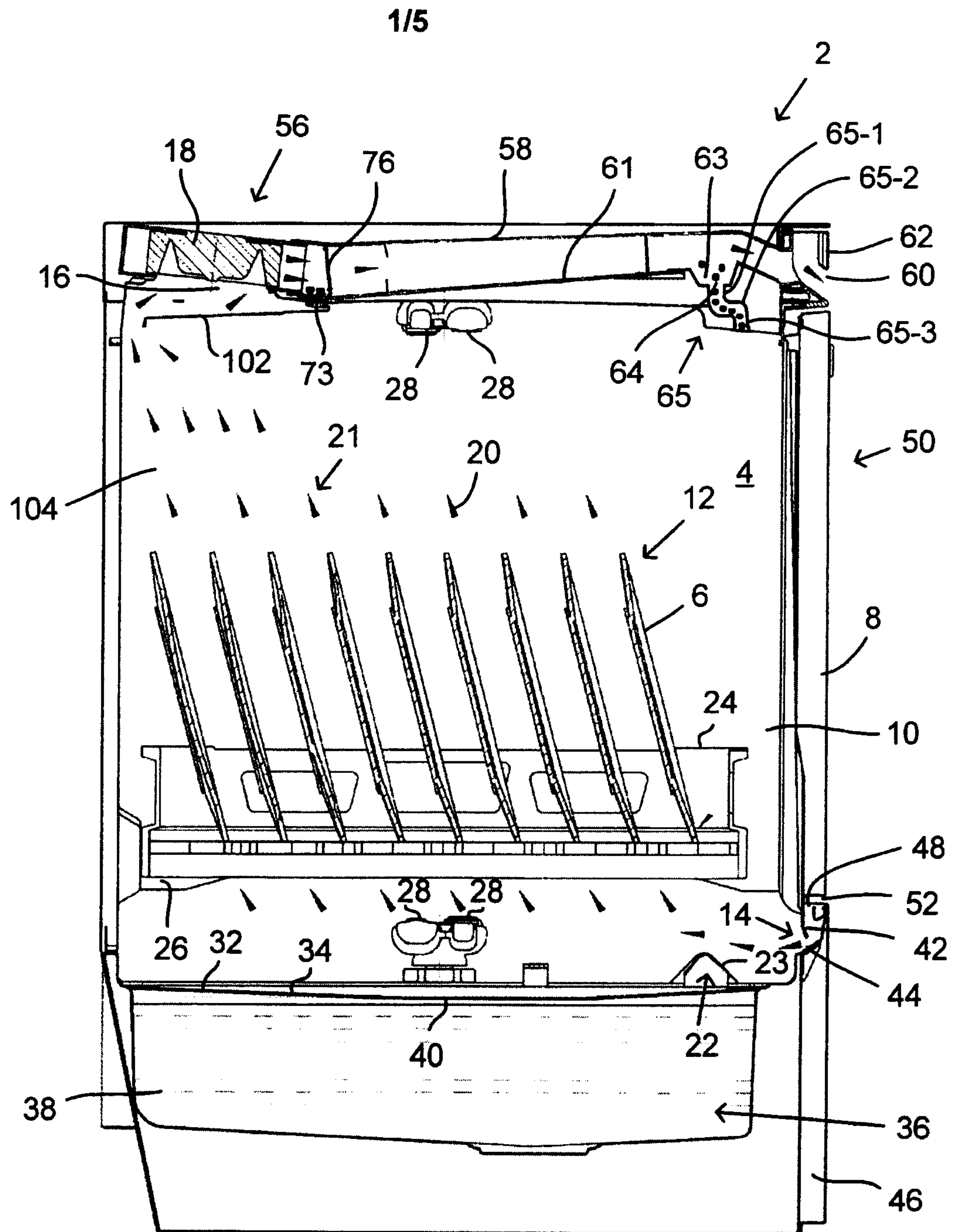


Fig. 1

Julay & Singlet
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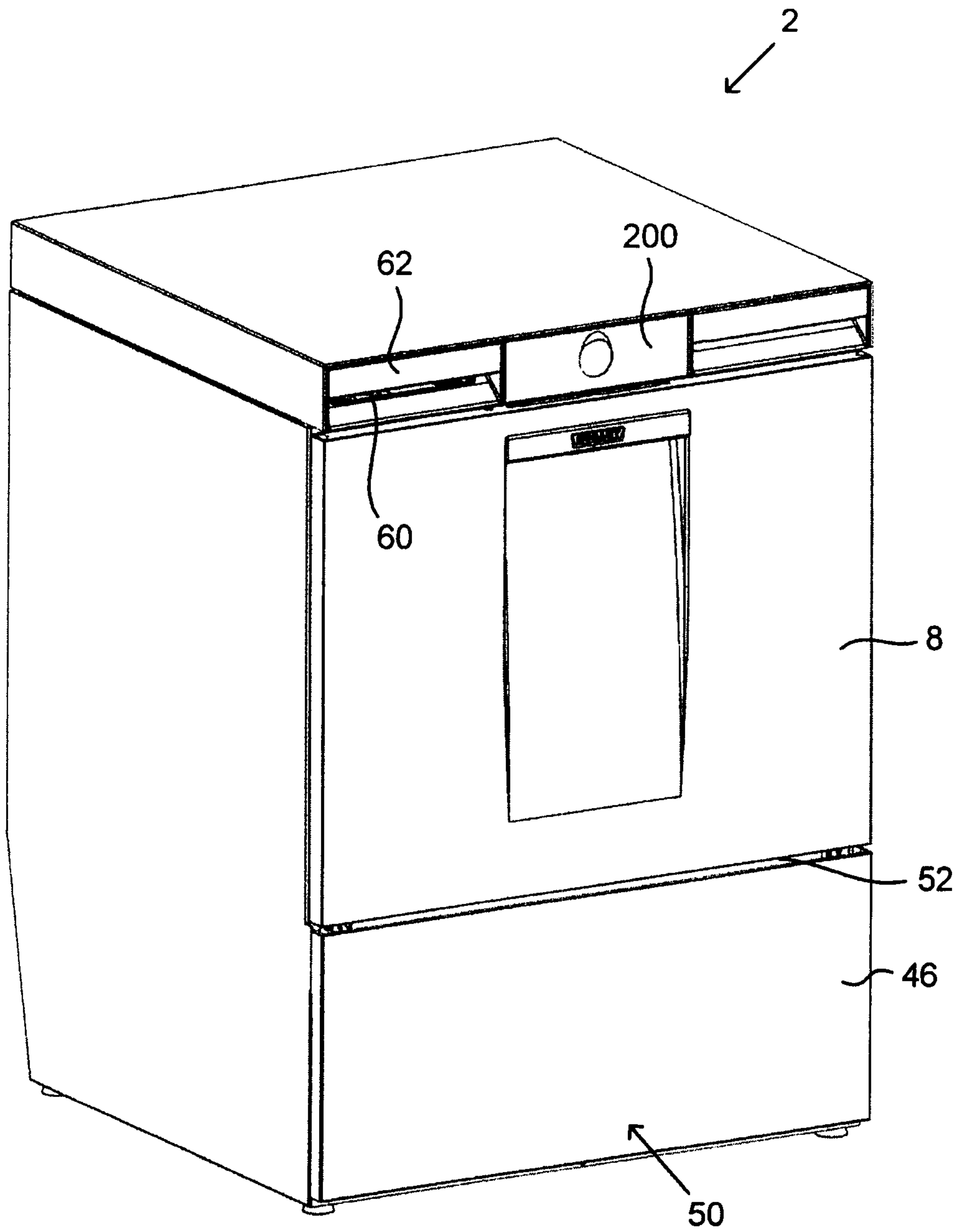


Fig. 2

Fuller & Associates
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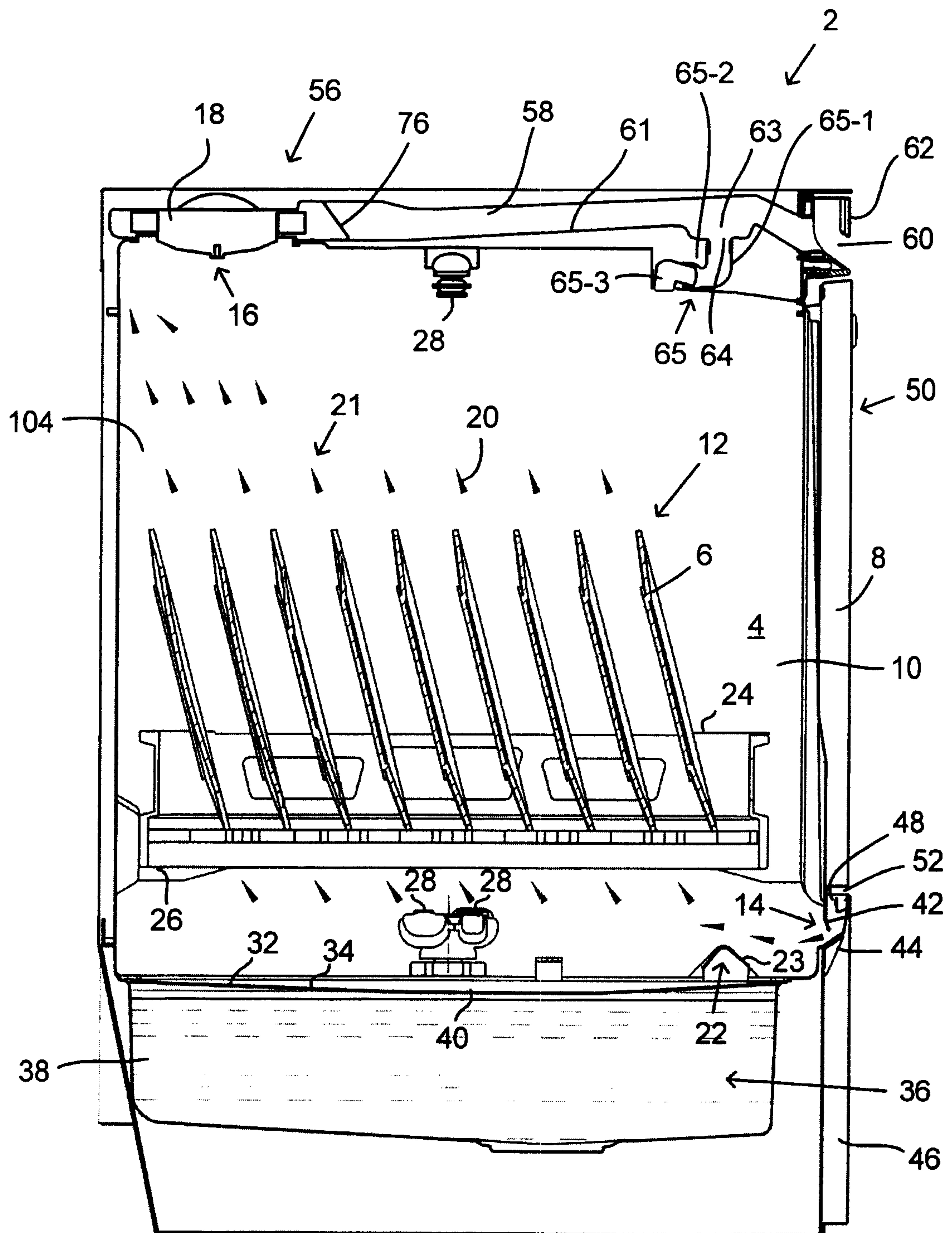


Fig. 3

Delapour & Singmaster
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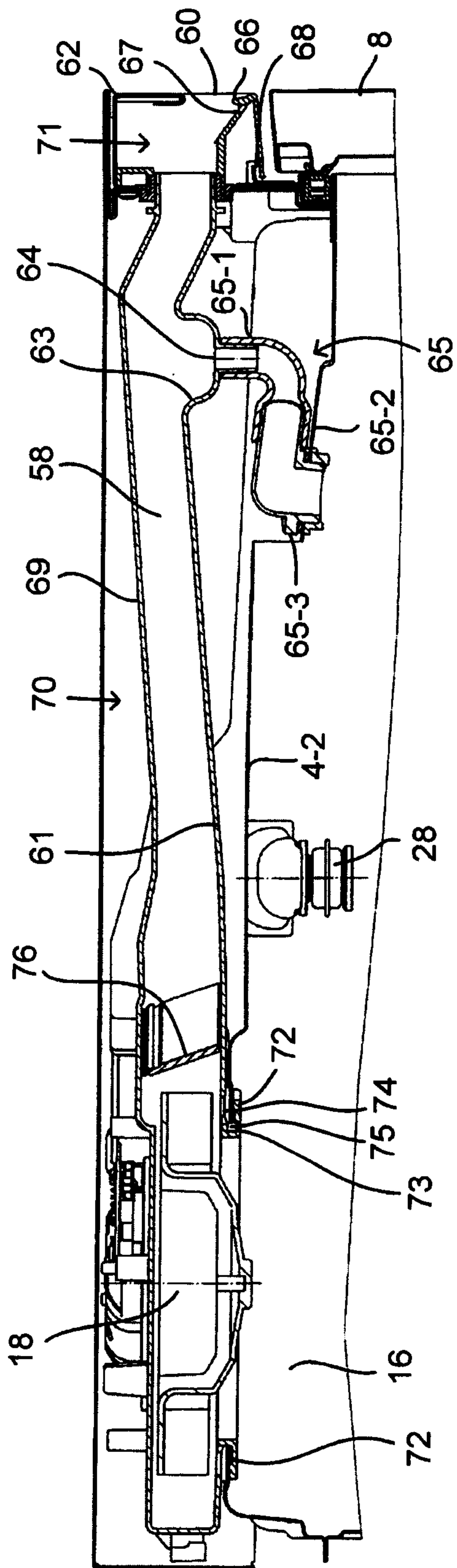


Fig. 4

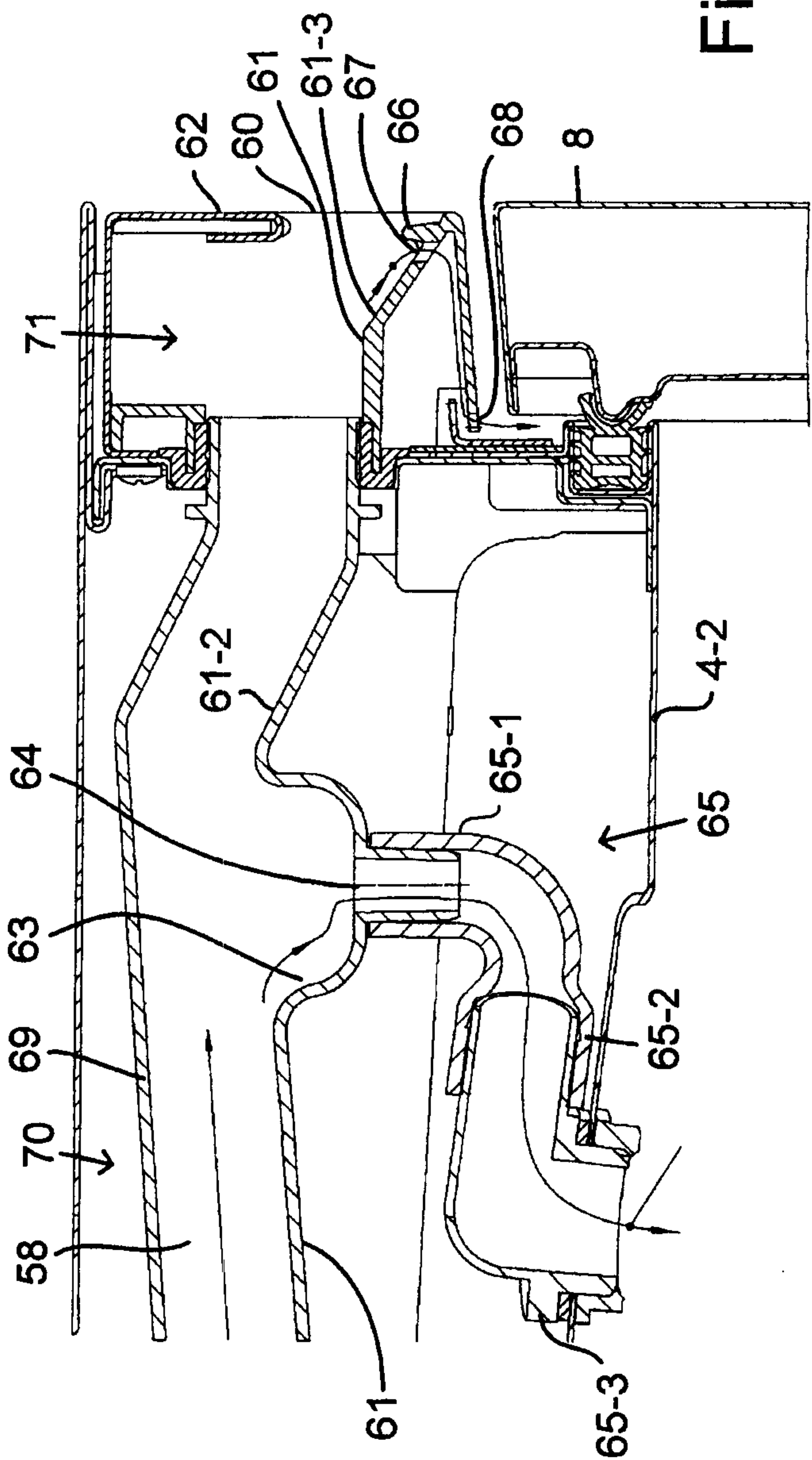


Fig. 5

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Fig. 6

