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(54) **Home appliance with a liquid guiding device**

(57) The invention relates to a home appliance, in particular laundry treatment apparatus, dish washer, dryer or washing machine. The home appliance comprises an articles treatment chamber, a process air channel (70) for guiding process air (A) to or from the articles treatment chamber for treating the articles using the process air, a liquid guiding device (41) having an inlet and an outlet. The liquid guiding device (41) is adapted to guide liquid from the inlet to the outlet, the outlet is adapted to direct the liquid to a component of the appliance and/or to a predefined location of the appliance, and the liquid guiding device (41) is formed by and is portion of the process air channel (70).

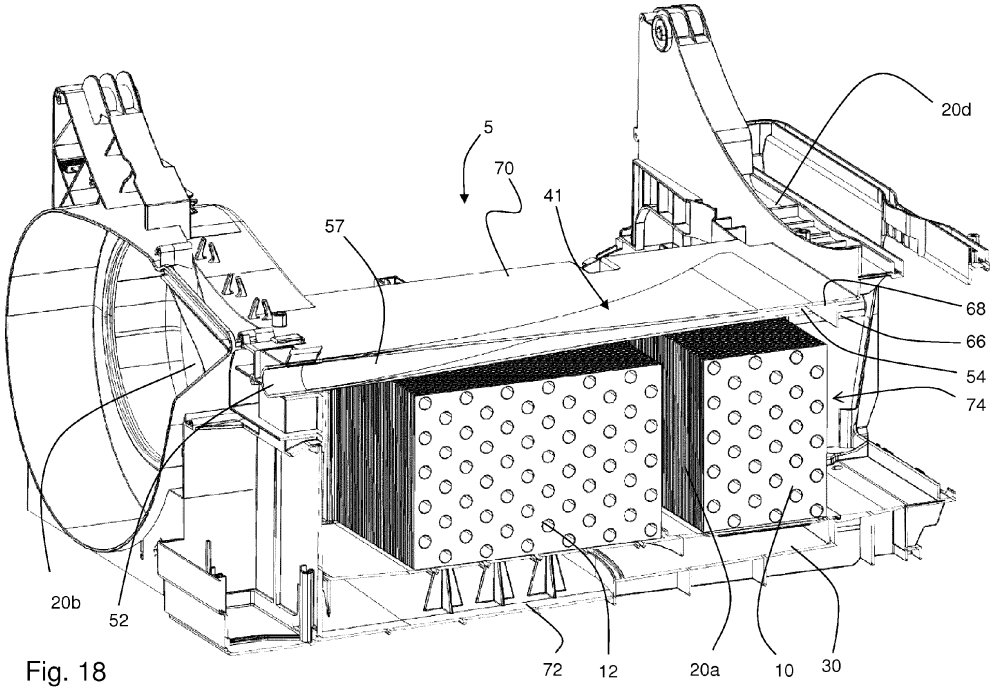

Fig. 18

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Description

[0001] The invention relates to a home appliance, in particular to a laundry treatment apparatus, a dish washer, a dryer or a washing machine, comprising a liquid guiding device.

[0002] WO 2009/077291 A1 discloses a laundry treatment apparatus comprising a cleaning device for cleaning a component (e.g. a heat exchanger) of the laundry treatment apparatus from fluff or lint. The cleaning unit has a rinsing unit by means of which rinsing fluid can be conducted to the component for removing fluff wherein the rinsing unit has a flow element which is disposed above the component and is configured for building up of dynamic pressure of the rinsing fluid in the flow element.

[0003] It is an object of the invention to provide a cost-efficient home appliance which keeps a component of the appliance and/or a predefined location of the appliance free from fluff or lint.

[0004] The invention is defined in claim 1. Particular embodiments are set out in the dependent claims.

[0005] According to claim 1 a home appliance, in particular a laundry treatment apparatus, a dish washer, a dryer or a washing machine, comprises an articles treatment chamber and a process air channel for guiding process air to and/or from the articles treatment chamber for treating the articles (e.g. laundry or dishes) using the process air. Furthermore, the home appliance comprises a liquid guiding device having an inlet and an outlet, wherein the liquid guiding device is adapted to guide liquid from the inlet to the outlet. The outlet is adapted to direct the liquid to a component and/or to a predefined location of the appliance.

[0006] The liquid guiding device is formed by and is portion of the process air channel. This geometric construction offers a space-saving reduced dimensional extension (e.g. height) of the liquid guiding device as it serves also as a common wall element of other portions within the home appliance. In other words, the liquid guiding device and the process air channel can be arranged in a space-saving manner within the home appliance cabinet. In particular, one side of the liquid guiding device is in contact with the liquid and the other side is at least partially in contact with the process air. The process air usually is circulated process air or process air sucked in as ambient or external air and exhausted from/to outside the home appliance or home appliance cabinet. Liquid guiding device's additional function as part of the process air channel or inversely regarded process air channel's additional function as part of the liquid guiding device supports a simple arrangement and mounting of these parts within the home appliance cabinet. It also may save material and/or assembling time.

[0007] Since the design of the liquid guiding device can be configured very simple there is no flow restriction for the liquid thus allowing a very fast speed of the liquid and a higher/greater liquid flow is possible and consequently an efficient cleaning of the predefined component surface or location.

[0008] Preferably the liquid guiding device comprises a shell-like construction. In this regard, at least one guiding shell is simultaneously part of the process air channel and the other shell(s) are separate parts or elements before assembling the home appliance. For example, said guiding shells can be manufactured or formed in separate molding tools and molding processes.

[0009] Preferably the liquid guiding device is formed or is essentially formed of two or more guiding shells. This construction enhances a simple production of the complete liquid guiding device. If the liquid guiding device comprises two or essentially two shells then the shells can constitute an upper part and a lower part or a left and a right part of the liquid guiding device.

[0010] Particularly, the laundry treatment apparatus is a heat pump tumble dryer or a washing machine with a drying function. Said tumble dryer or washing machine comprises a heat pump system, including at least one heat exchanger acting as evaporator for evaporating a refrigerant and/or cooling process air. The process air flow within the heat pump dryer is guided through a compartment of the dryer, i.e. through a compartment for receiving articles to be treated, e.g. a drum. The process air flow is usually driven by a process air blower. Preferably, a process air channel guides the process air flow outside the drum and includes different sections, including a section forming a battery channel in which the at least one heat exchanger is arranged. The air exiting the drum through the drum outlet (which is the loading opening of the drum) is filtered preferably by a fluff filter arranged close to the drum outlet in or at the process air channel.

[0011] Preferably the home appliance is a laundry treatment apparatus, particularly a dryer or a washing machine, wherein the articles treatment chamber is a laundry treatment chamber or a drum, and wherein the process air channel is formed as a process air circuit for circulating the process air through the laundry treatment chamber or drum or the process air channel is formed to guide the process air to and/or from the treatment chamber. Furthermore, this laundry treatment apparatus comprises a heat exchanger unit arranged within the process air channel. Particularly, said heat exchanger unit comprises a first heat exchanger adapted to cool the process air and a second heat exchanger adapted to heat the process air. The first heat exchanger or the second heat exchanger or both (the first and second) heat exchangers are arranged in a channel section or a battery channel of the process air channel. The liquid guiding device is partially formed in and by a section of the channel section or the battery channel thus supporting a compact construction of the laundry treatment apparatus. Alternatively instead of a home appliance having two heat exchangers (e.g. of a heat pump system thereof) the home appliance may have a cooling air / process air heat exchanger (e.g. condensate

dryer without heat pump) where cooling air is for example ambient air. In case of the process air circuit the process air channel is provided such as to circulate the process air to and from the treatment chamber. In case of a vented dryer (e.g. without heat pump system) the process air channel is used which does not provide a closed circuit and the process air channel guides the process air to and/or from the treatment chamber with an outlet or inlet of the treatment apparatus cabinet.

[0012] In preferred embodiments the component to be cleaned is a heat exchanger or a fluff filter and the outlet of the liquid guiding device is designed to clean at least a portion of the heat exchanger or at least a portion of the fluff filter by directing the liquid or liquid spray thereto during its cleaning operation. Particularly, the liquid or liquid spray is directed to the front side or process air entrance face of the heat exchanger or of a fluff filter to ensure an efficient cleaning of the component desired to be cleaned.

[0013] Preferably the liquid guiding device comprises at least one guiding shell formed in a process air channel section, wherein said process air channel section comprises at least one of the following features thus reducing the number of assembling parts and/or the assembling efforts:

[0014] The process air channel section is a portion of the home appliance basement shell, particularly of an upper/cover shell of the home appliance basement; the process air channel section is housing at least one heat exchanger at least partially; the process air channel section is part of a heat pump battery channel; the process air channel section is part of a home appliance bottom shell; the process air channel section is part of a stationary articles treatment chamber. For example, a stationary chamber is provided when the articles treatment chamber is a container of a dishwasher.

[0015] Supporting the desired space-saving construction, one guiding shell formed at the process air channel may be placed at the inside or the outside of the process air channel such as to provide the liquid guiding device at the interior or the exterior of the process air channel, respectively. Additionally or alternatively the process air channel preferably comprises a wall opening and the liquid guiding device is forming a closing or wall element such that when the liquid guiding device is inserted in the wall opening the process air channel is closed, sealed or covered at the wall opening. This construction supports an automatic sealing of the process air channel in the region of the liquid guiding device by simply mounting the liquid guiding device itself. Mounting of the liquid guiding device at the wall opening can be configured removable or non-removable.

[0016] There are several technical possibilities for forming the liquid guiding device at the process air channel:

- In a preferred embodiment a guiding shell of the liquid guiding device is fixed from outside to the process air channel such that the flow guiding volume of the liquid guiding device is at the outside of the process air channel interior.
- In a further preferred embodiment the mounting or fixing of a guiding shell occurs from inside to the process air channel such that the flow guiding volume of the liquid guiding device is at the inside of the process air channel interior. Thus, simplified mounting elements can be provided. Considering a complex and costly liquid-tightness of such mounting elements is not necessary since potential liquid leaking into the process air channel is not critical because liquid (namely condensate water) is collected anyway.

In a further preferred embodiment the liquid guiding device is a self-closed component (e.g. a blow-mold tube) or comprising two or more shells that are connected to each other in a liquid-sealing manner). This self-closed component interacts with an opening of the process air channel. The liquid guiding device is fixed at said opening in a sealing manner such that the opening of the process air channel is sealed against potential process air escape.

[0017] For implementing an alignment of several guiding shells, particularly first and second guiding shells there is preferably foreseen one or more alignment elements which is or are arranged at the first guiding shell or at the second guiding shell or at both guiding shells. The alignment elements may be of an inter-alignment type and/or an external-alignment type. The external-alignment type provides an alignment of the liquid guiding device (before or after assembling the liquid guiding device) the alignment with respect to a component of the home appliance where the liquid guiding device is to be mounted to. This alignment offers a mounting guidance for a simple mounting of the liquid guiding device. Said alignment element(s) ensure(s) a precise alignment of the liquid guiding device towards a defined position within the home appliance, e.g. in relationship to a battery channel or to a component to realize precise alignment of exhausted liquid towards said component to be cleaned. The inter-alignment type of alignment elements is used to adjust the two or more shells relative to each other during the assembling step for assembling the liquid guiding device.

[0018] In preferred embodiments an alignment element can be configured as a slot, rim, latch, snap-fit and/or bracket or as a similar element for designing a removable or non-removable connection between the guiding shells.

[0019] In a preferred embodiment a portion or the substantial portion of the flow direction extension of the liquid guiding device is extending parallel to the process air channel of the home appliance or parallel to the process air channel portion or parallel to the flow direction within the process air channel. Thus, space-saving arrangement of the liquid guiding device is enhanced additionally. The flow direction extension of the liquid guiding device is consistent with a longitudinal extension according to the mean or main (center) liquid flow direction. Preferably, at least X% of the longitudinal extension of the liquid guiding device is parallel to the process air channel, whereby X is one of the values 50, 60, 70, 80 or 90.

[0020] In general, the liquid guiding device has an inlet and an outlet. The liquid guiding device is adapted to guide liquid from the inlet to the outlet wherein the outlet is adapted to direct the liquid to a component (e.g. a heat exchanger) of the appliance and/or to a predefined location of the appliance. The liquid guiding device defines a cross section area constituting a liquid passage area for guiding the liquid.

[0021] Preferably this cross section area has an increasing first cross section dimension and a decreasing second cross section dimension along the flow direction from the inlet to the outlet in a way such that the cross section area is not decreasing from the inlet to the outlet, i.e. along the flow path of the liquid. Avoiding a decreasing cross section area means that the cross section area can be configured constant or increasing or slightly increasing along the flow direction.

[0022] In contrast to WO 2009/077291 A1, the aforementioned geometry of the cross section area along the flow direction is configured to avoid a build-up of dynamic pressure of the liquid within the liquid guiding device. Bottlenecks are also avoided between the inlet and outlet. Thus, manufacturing of a cost-saving simple geometric construction of the liquid guiding device is supported. Furthermore, such a geometry of the cross section area allows a reduced flow resistance of the liquid thus a lower pumping power is required. Since there is a reduced or no flow restriction, a higher/greater liquid flow rate is possible. The change of the cross section area between the inlet and outlet is designed such that the liquid dynamic pressure and/or the liquid velocity does not change or at least does not increase along the flow path from the inlet to the outlet. Since the dynamic pressure and the liquid velocity are in a physical relationship, also the liquid velocity is controlled advantageously.

[0023] The aforementioned first and second cross section dimensions are mathematical perpendicular to the main or mean or main liquid flow, i.e. the first and second cross section dimensions are mathematical perpendicular to each other and to a mathematical main axis of the liquid flow path.

[0024] Preferably, the cross section areas of the liquid channel can be defined as planes perpendicular to the main or mean liquid flow direction at each point along the course or line of the mean flow direction. These planes each is spanned by a first cross section dimension which is arranged orthogonal to the liquid flow direction and by a second cross section dimension which is arranged orthogonal to the liquid flow direction and simultaneously orthogonal to the first cross section dimension. Along the liquid flow direction the cross section area is particularly increasing in the first cross section dimension and is decreasing in the second cross section dimension. This increasing and decreasing occurs in a manner such that the value of the cross section area or liquid passage area is not decreasing from the inlet to the outlet. In other words, along the liquid flow direction there exist mathematical cross section areas and the value of these mathematical areas does not decrease from the inlet to the outlet. Particularly, said value increases or is constant along the liquid flow direction.

[0025] The aforementioned dimensions are lying on a plane that is perpendicular to the main or mean or central liquid flow, and their variation is measured in the sense of the main or mean or central liquid flow. If one dimension decreases, this variation has to be compensated by the increasing of a second dimension, in such a way that the area of the cross section of the channel stream inside the channel will surely not decrease.

[0026] In a preferred embodiment the cross section area of the liquid guiding device is constant or essentially constant along the flow direction from the inlet to the outlet. For example, a first dimension of the cross section area is defined as a height and a second dimension of the cross section area is defined as a width. Then the product of said height and width is constant or essentially constant.

[0027] Preferably the liquid guiding device has an outlet forming a nozzle or at least comprising a nozzle. A nozzle-like outlet region supports an even distribution of the liquid spray. The nozzle can be provided as a separate part connectable to the rest of the liquid guiding device. Alternatively, the nozzle is a monolithic or unitary part of the liquid guiding device at its outlet region.

[0028] According to a preferred embodiment the outlet of the liquid guiding device comprises a slit-like shape which facilitates a good spatial or two-dimensional adaptation to the component surface or predefined location to be cleaned. Instead of a single two dimensionally contiguous outlet area, 'the' outlet may be formed of 2, 3, 4, 5 or more discontiguous separated areas - while at the same time the requirement of constant, slightly increasing or increasing cross-section area is maintained in flow direction (from inlet to outlet). For example upstream of each or of at least one or some of the separated outlet areas (partial area of the outlet) a hopper of funnel shaped branch of the liquid guiding device is provided which opens towards the partial area.

[0029] Preferably the outlet region of the liquid guiding device is forming a nozzle and/or is bent to deflect the liquid in the outlet region. When the liquid guiding device is composed by shells, this nozzle region and/or bent outlet region is particularly formed at a first side by a first one of the guiding shells being separate of the process air channel and at a second or opposing side by a second one of the guiding shells being formed by the process air channel. Thus, the desired nozzle region and/or bent region at the outlet region can be assembled simply block-like.

[0030] Preferably the outlet region of the liquid guiding device is bent in such a manner that the liquid flow is changed in the region of its outlet according to a predefined direction. Thus, directing the liquid or liquid spray to the component surface or location to be cleaned is realized by a simple construction.

[0031] In a preferred embodiment an outer end section of the outlet or outlet region of the liquid guiding device is

formed as or at least comprises a deflecting element which is adapted to deflect the liquid at the outlet. This deflecting element even enhances an efficient directing or alignment of the liquid to the component or location to be cleaned by the liquid.

[0032] Preferably the aforementioned deflecting element and expanding element are foreseen simultaneously at the outlet.

[0033] Preferably, the liquid guiding device comprises at least one deflector wall inside its housing extending towards the outlet region of the liquid guiding device. The at least one deflector wall supports an even flow of the liquid towards the outlet region of the liquid guiding device. Particularly, the at least one deflector wall is arranged perpendicular to a plane section of the liquid guiding device spanned by the liquid flow direction and the first cross section dimension. The at least one deflector wall is advantageously formed integrally, particularly monolithic, at one or more of the inner sides of the liquid guiding device's housing thus offering a stable arrangement of the deflector walls.

[0034] In a further embodiment, the liquid guiding device carries means for generating a whirl flow and turbulences within the liquid flowing towards the surface, component or location to be cleaned. These whirl flow means are arranged at the outlet region outside the outlet itself. Liquid flowing out of the outlet passes these whirl flow means thus causing turbulences and whirling within the liquid for an enhanced removing of fluff from the surface, component or location to be cleaned. Particularly, the whirl flow means comprise a row of outlet ribs extending essentially along the flow direction of the liquid after passing the outlet. Preferably, at least some of the outlet ribs are arranged equidistant to each other.

[0035] According to a preferred embodiment the liquid guiding device is planar or essentially planar from the end region at the inlet to or close to the end region at the outlet regarded in one or two cross-section planes along the main flow direction. In case of two cross-section planes these planes are regarded as perpendicular to each other. This planar or essentially planar geometry of the liquid guiding device facilitates its space-saving arrangement within the home appliance.

[0036] Preferably, the inlet and outlet of the liquid guiding device are arranged in alignment in such a manner that the design of the liquid guiding device is made symmetrically with regard to a symmetry axis lying in a cross section plane along the mean or main liquid flow direction.

[0037] Alternatively, the design of the liquid guiding device is configured asymmetrically with regard to said cross section plane along the mean or main liquid flow direction. In case of said asymmetric design the center of the inlet and outlet of the liquid guiding device are not in alignment along the mean or main liquid flow direction.

[0038] In further preferred embodiments, the home appliance comprises more than one liquid guiding device each having an inlet and outlet. Arranging at least two liquid guiding devices, it is possible to switch and partial split the liquid flow pressure and/or flow rate towards several partial surfaces of a whole or full surface to be cleaned thus increasing the liquid flow pressure and/or flow rate towards the partial surfaces as compared to a full surface cleaning. Thus, a smart usage of cleaning liquid can be provided by increasing the local cleaning efficiency. The arrangement of several liquid guiding devices can be supplemented by installing one or more control valves upstream the inlets of the liquid guiding devices. Controlling the at least one control valve allows a cleaning of a partial portion of a component or predefined location by only one liquid guiding device if desired or necessary.

[0039] In case at least two liquid guiding devices are used within the home appliance it is possible to use only a symmetric design or only an asymmetric design of liquid guiding devices. Preferably, the geometry of all used liquid guiding devices is identical. Using at least one asymmetric liquid guiding device supports a space-saving arrangement of the whole group of liquid guiding devices.

[0040] A space-saving arrangement of the liquid guiding device is even enhanced by its preferred extension across or essentially across one dimension of the process air channel section which is housing at least one heat exchanger (e.g. a sole heat exchanger of the home appliance or a first and second heat exchanger).

[0041] In another embodiment the liquid guiding device is designed such that its longitudinal extension is extending parallel or essentially parallel to a flow direction through at least one heat exchanger (e.g. a sole heat exchanger of the home appliance or a first and second heat exchanger).

[0042] In case of an external arrangement of the shell-like liquid guiding device at the outside of the process air channel the process air channel has preferably at least one opening at the outlet end of the guiding shell formed in the process air channel. This construction design ensures passing of flown liquid through the liquid guiding device to the interior of the process air channel, particularly to a heat exchanger or evaporator arranged inside of the process air channel.

[0043] In case of an internal arrangement of the liquid guiding device at the inner side of the process air channel the process air channel has preferably a supply opening or supply connector. This preferred design ensures a supply of liquid from the outside to the inside of the process air channel at the inlet region of the liquid guiding device.

[0044] Preferably the liquid guiding device and the process air channel are designed in such a manner that the main direction of the liquid flow in the liquid guiding device and the main flow direction of the process air in the process air channel are or are essentially parallel or anti-parallel to each other.

[0045] In a preferred embodiment the inlet of the liquid guiding device is located at or in the region of a condensate pump or a condensate container as a liquid supply for the inlet thus offering a liquid supply which is existing anyway in

a conventional home appliance.

[0046] In another embodiment the outlet of the liquid guiding device is located at or neighboring to a front side or process entrance side of a heat exchanger arranged in the process air channel. This arrangement of the outlet in relationship with said front side or process entrance side permits an efficient cleaning of said front side or process entrance side thus ensuring a high heat exchange performance.

[0047] In other preferred embodiments the inlet of the liquid guiding device is connectable or is connected to one or more of the following liquid supplies:

an intermediate liquid tank, a condensate collection reservoir arranged in the basement of the home appliance, a removable condensate collection tank. Usually, the removable condensate collection tank is arranged in an upper region of the home appliance. In case of using said condensate collection tank it is possible in certain application cases to avoid installing a separate pump for supplying the liquid to the inlet due to the gravitation force of supplied liquid.

[0048] In an alternative embodiment a pump for pumping the liquid to the liquid guiding device is arranged between said liquid supply (e.g. intermediate liquid tank and/or condensate collection reservoir and/or removable condensate collection tank) and the liquid guiding device.

[0049] Preferably the aforementioned liquid supplies already exist within the home appliance performing conventional tasks (e.g. condensate collecting and transporting). In contrast it is possible to provide a liquid supply exclusively storing liquid for cleaning or liquid to be supplied to the liquid guiding device (e.g. said intermediate liquid tank).

[0050] Preferably said pump or said removable condensate collection tank is arranged at an upper section of the home appliance and the liquid guiding device is arranged in a basement thereof. With regard of this arrangement a liquid conduit is preferably used to achieve a simple liquid connection between said pump or tank and the liquid guiding device.

[0051] Reference is made in detail to preferred embodiments of the invention, examples of which are illustrated in the accompanying figures, which show:

Fig. 1 a schematic view of a laundry treatment apparatus,

Fig. 2 a perspective view of a liquid guiding device according to a first embodiment,

Fig. 3 a perspective view of a liquid guiding device according to a second embodiment,

Fig. 4 a sectional side view of the liquid guiding device according to Fig. 2,

Fig. 5 a sectional side view of the liquid guiding device according to Fig. 3,

Fig. 6 a detail of Fig. 5, showing the outlet region,

Fig. 7 a sectional side view of the outlet region according to a further embodiment,

Fig. 8 a sectional side view of the outlet region according to a further embodiment,

Fig. 9 a sectional side view of the outlet region according to a further embodiment,

Fig. 10 a sectional side view of the outlet region according to a further embodiment,

Fig. 11 a sectional side view of the outlet region according to a further embodiment,

Fig. 12 a sectional side view of the outlet region comprising a deflecting element according to a first embodiment,

Fig. 13 a sectional side view of the outlet region comprising a deflecting element according to a second embodiment,

Fig. 14 a bottom view of the liquid guiding device according to a further embodiment,

Fig. 15 a sectional side view of the liquid guiding device according to the section line XV - XV in Fig. 14,

Fig. 16 a side view of the liquid guiding device according to a further embodiment,

Fig. 17 a rear view of the liquid guiding device according to the view XVII in Fig. 16,

Fig. 18 a sectional perspective view of a basement of the laundry treatment apparatus,

Fig. 19 a perspective view of a basement of the laundry treatment apparatus,

Fig. 20 a perspective view of an upper shell of the basement according to Fig. 19 with a liquid guiding device according to a first embodiment of assembling design,

Fig. 21 a sectional side view of the upper shell according to Fig. 20,

Fig. 22 the sectional side view according to Fig. 21 with the liquid guiding device in a post-assembling position,

Fig. 23 a perspective view of an upper shell of the basement according to Fig. 19 with a liquid guiding device according to a second embodiment of assembling design,

Fig. 24 a perspective view of an upper shell of the basement according to Fig. 19 with a liquid guiding device according to a third embodiment of assembling design,

Fig. 25 a perspective view of a basement with the upper shell according to Fig. 24,

Fig. 26 a sectional side view of a basement of the laundry treatment apparatus,

Fig. 27 a perspective view of the basement according to Fig. 19 but with a liquid supply for the liquid guiding device according to a further embodiment,

Fig. 28 a top view of the basement according to Fig. 27 with an upper shell according to a further embodiment,

Fig. 29 a top view of the basement according to Fig. 27 with an upper shell according to a further embodiment,

Fig. 30 a sectional top view of the basement according to Fig. 28 with an integrated valve element, and

Fig. 31 a sectional top view of the basement according to Fig. 29 with an integrated valve element.

[0052] Fig. 1 shows a schematically depicted laundry treatment apparatus 2 which in this embodiment is a heat pump tumble dryer. The tumble dryer or treatment apparatus 2 comprises a heat pump system 4, including a closed refrigerant loop 6 which comprises in the following order of refrigerant flow B: a first heat exchanger 10 acting as evaporator for evaporating the refrigerant and cooling process air, a compressor 14, a second heat exchanger 12 acting as condenser for cooling the refrigerant and heating the process air, and an expansion device 16 from where the refrigerant is returned to the first heat exchanger 10. Together with the refrigerant pipes connecting the components of the heat pump system 4 in series, the heat pump system forms the refrigerant loop 6 through which the refrigerant is circulated by the compressor 14 as indicated by arrow B.

[0053] The process air flow within the treatment apparatus 2 is guided through a compartment 18 of the home appliance 2, i.e. through a compartment for receiving articles to be treated, e.g. a drum 18. The articles to be treated are textiles, laundry 19, clothes, shoes or the like. The process air flow is indicated by arrows A in Fig. 1 and is driven by a process air blower 8. The process air channel 20 guides the process air flow A outside the drum 18 and includes different sections, including the section forming the battery channel 20a in which the first and second heat exchangers 10, 12 are arranged. The process air exiting the second heat exchanger 12 flows into a rear channel 20b in which the process air blower 8 is arranged. The air conveyed by blower 8 is guided upward in a rising channel 20c to the backside of the drum 18. The air exiting the drum 18 through the drum outlet (which is the loading opening of the drum) is filtered by a fluff filter 22 arranged close to the drum outlet in or at the channel 20. The optional fluff filter 22 is arranged in a front channel 20d forming another section of channel 20 which is arranged behind and adjacent the front cover of the treatment apparatus 2. The condensate formed at the first heat exchanger 10 is collected and guided to the condensate collector 30.

[0054] The condensate collector 30 is connected via a drain pipe 46, a filter element 24, a drain pump 36, a valve 38 and a drawer pipe 50 to an extractable condensate drawer 40. I.e. the collected condensate can be pumped from the collector 30 to the drawer 40 (serving as a removable tank) which is arranged at an upper portion of the treatment apparatus 2 from where it can be comfortably withdrawn and emptied by a user.

[0055] It is a problem in dryers 2 having heat exchangers 10, 12 that fluff or lint which is generated during a drying

process accumulates on the surface of the heat exchanger 10 which is passed by process air first. This may happen with or without optional fluff filter 22 being arranged between the drum and the first heat exchanger 10. Lint accumulated on the heat exchanger 10 reduces the thermal efficiency of the heat exchanger 10 and constricts the flow of process air A.

[0056] To remove or wash off accumulated fluff from the surface of the first heat exchanger 10 a liquid guiding device 41 is provided close to the heat exchanger 10. The condensate collector 30 is connected via the drain pipe 46, the drain pump 36, the valve 38 and a feed pipe 48 to the cleaning device 41, wherein the drain pump 36 and the valve 38 are controlled by a control unit of the apparatus 2. Alternatively a circulation pump (not explicitly shown in the figures) is provided to pump condensate from the collector 30 to the liquid guiding device 41 - i.e. the circulation pump is provided additionally to the drain pump 36.

[0057] Fig. 2 shows a perspective view of the liquid guiding device 41 according to a first embodiment. The liquid guiding device 41 comprises an inlet 52 (inlet region) and an outlet 54 (outlet region). The liquid guiding device 41 guides liquid through a liquid channel 57 from the inlet 52 to the outlet 54. In Fig. 3 and Fig. 4 by arrow 56 a mean or main flow of liquid along the device 41 is indicated. Generally the liquid guiding device 41 can be denoted or considered as liquid channel. The liquid guiding device has an inner hollow space which - in operation - is filled by the flowing liquid from the inlet 52 to the outlet 54. The inner space is restricted by the inner surfaces of the walls formed by the device 41.

[0058] As shown in Fig. 3 the cross section areas C (C1..5) - which constitute a liquid passage area respectively - of the liquid channel 57 can be defined as planes perpendicular to the main or mean liquid flow direction 56 at each point along the course or line of the mean flow direction. These planes each is spanned by a first cross section dimension D1 which is arranged orthogonal to the liquid flow direction 56 and by a second cross section dimension D2 which is arranged orthogonal to the liquid flow direction 56 and simultaneously orthogonal to the first cross section dimension D1. Along the liquid flow direction 56 the cross section area C is increasing in the first cross section dimension D1 and is decreasing in the second cross section dimension D2 (Fig. 4). This increasing and decreasing occurs in a manner such that the value of the cross section area is not decreasing from the inlet 52 to the outlet 54. In other words, along the liquid flow direction 56 there exist mathematical cross section areas C, C1, C2, C3, C4 and C5 (indicated by dashed lines in Fig. 3) and the value of these mathematical areas C, C1, C2, C3, C4 and C5 does not decrease from the inlet 52 to the outlet 54. Particularly, said value increases or is constant along the liquid flow direction 56.

[0059] A longitudinal section plane can be represented by the main liquid flow direction 56 and the first cross section dimension D1. Another longitudinal section plane can be represented by the main liquid flow direction 56 and the second cross section dimension D2. At least in partial sections along the liquid path between the inlet 52 and the outlet 54 of the liquid channel 57 the inner wall surface and preferably also the outer wall surface of the liquid guiding device 41 is substantially planar with regard to the said one or two longitudinal cross section plane(s).

[0060] The outlet region 54 comprises a slit 58 with preferably or substantially rectangular cross section (Fig. 2, Fig. 5). In the embodiment according to Fig. 5 the slit 58 conforms to a nozzle outlet 60 of a nozzle 62. At the opposite side of the nozzle outlet 60 the nozzle 62 comprises a nozzle inlet 64. The nozzle 62 is part of the whole liquid guiding device 41. It can be constituted monolithic or unitary with the liquid guiding device 41. Alternatively, nozzle 62 is connectable as an originally separate part to the rest of the liquid guiding device 41 during the assembly of the apparatus 2.

[0061] Regarding the nozzle 62, its nozzle outlet 60 defines a nozzle cross section which - according to the described principle - is not smaller than a cross section area of the liquid guiding device 41 positioned upstream to said nozzle cross section with respect to the liquid flow direction 56. Rather, the nozzle cross section has a value equal with the cross section area C5 or larger than this cross section area C5 (Fig. 3).

[0062] Preferably the liquid guiding device 41 is bent in its outlet region 54 by the specific geometric design of the nozzle 62 (Fig. 5). By means of its bent design the nozzle 62 allows a change of the liquid flow direction 56 in the outlet region 54.

[0063] Fig. 6 shows the nozzle 62 according to Fig. 5. The bent design corresponds to a circular angle of 90°. Accordingly, the liquid flow direction 56 changes approximately 90° at the nozzle outlet 60. By means of a different nozzle designs the liquid flow direction 56 changes less than 90° (Fig. 7) or more than 90° (Fig. 8).

[0064] Fig. 9 shows an embodiment of a nozzle 62 comprising a nozzle outlet 60 which is trumpet-like expanded as compared to the nozzle inlet 64. In Fig. 10 the nozzle outlet 60 has a bent course in direction to the original liquid flow direction 56. According to Fig. 11 the liquid flow direction 56 has changed at the nozzle outlet 60 about 90° whereby the bent course of the nozzle 62 between its nozzle inlet 64 and nozzle outlet 60 is configured meander-like.

[0065] Fig. 12 shows a liquid guiding device 41 comprising a wall-like deflecting element 66 which causes a deflection of the liquid at the outlet 54. The deflecting element 66 is directed in a plane approximately perpendicular to the origin liquid flow direction 56 and extends beyond the nozzle outlet 60. Thereby spraying the liquid towards the rear side (opposite to the forward flow of the liquid in most part of the device 41) is preferred and there is no loss of liquid away from the heat exchanger 10 front side (compare Fig. 26).

[0066] Fig. 13 shows a wall-like or roof-like deflecting element 66 according to a further embodiment. The deflecting element 66 is again directed in a plane approximately perpendicular to the origin liquid flow direction 56. It extends downwards beyond the outlet region 54 of the liquid guiding device 41 and is arranged at the end of an outlet bar 68

extending along the original liquid flow direction 56. Thus this nozzle 62 forms an outlet 54 with liquid flow expanding and deflecting function.

[0067] The embodiment of the liquid guiding device 41 according to Fig. 14 comprises several deflector walls 67. The deflector walls 67 are arranged inside the housing 69 of the liquid guiding device 41. Therefore, the all in all four deflector walls 67 are indicated by dashed lines as hidden parts. The deflector walls 67 extend along the mean or main liquid flow direction 56 towards the outlet region 54 of the liquid guiding device 41, thus dividing the slit 58 into five slit sections 59 having different extensions along the first cross section dimension D1. The deflector walls 67 are arranged perpendicular to a plane section of the liquid guiding device 41 spanned by the liquid flow direction 56 and the first cross section dimension D1 (Fig. 15). As can be seen in Fig. 15, the deflector walls 67 are integrally, particularly monolithic, formed at the inner sides of the housing 69 of the liquid guiding device 41. The deflector walls 67 support an even flow of the liquid towards the outlet region 54.

[0068] In a further embodiment, the liquid guiding device 41 carries means for generating a whirl flow and turbulences within the liquid flowing towards the surface or location to be cleaned. These means are arranged at the outlet region 54 outside the nozzle 62 and comprise a row of outlet ribs 65 (Fig. 16). The outlet ribs 65 extend essentially along the second cross section dimension D2 and are arranged equidistant to each other along the first cross section dimension D1 (Fig. 17). Liquid flowing out of the outlet 54 passes the outlet ribs 65 thus causing turbulences and whirling within the liquid for an enhanced removing of fluff from the surface or location to be cleaned.

[0069] Fig. 18 shows a sectional perspective view of a base section 5 or basement of the treatment apparatus comprising an upper shell 70 and a corresponding lower shell 72. In the basement 5 the lower shell 72 and the upper shell 70 at least partially form the process air channel 20. In particular shells 70, 72 together form the battery channel 20a indicated in Fig. 1, wherein the first and second heat exchangers 10, 12 are arranged within the battery channel 20a. The upper shell 70 and the liquid guiding device 41 at least partially serve as a cover or casing for the battery channel 20a and consequently for the process air channel 20. In other words, the liquid guiding device 41 is part or portion of the process air channel 20. Liquid is supplied to the inlet 52 of the liquid guiding device 41 and then to the outlet 54 via the liquid channel 57. At the outlet region 54 the liquid is directed to the wall-like deflecting element 66 and is deflected there towards the front surface 74 of the first heat exchanger 10. The liquid or liquid spray sweeps along the front surface 74 thus cleaning the heat exchanger 10 from fluff. In Fig. 18, the deflecting element 66 is part of the upper shell 70 of the base section 5 and not an integral portion of the conduit outlet 54 according to Fig. 12 and Fig. 13.

[0070] In comparison to Fig. 18the embodiment according to Fig. 19 shows additionally a conduit corresponding to the feed pipe 48.

[0071] Fig. 20 shows the upper shell 70 of the basement 5 with a liquid guiding device 41 according to a first embodiment of assembling the liquid guiding device 41. It is formed essentially of two guiding shells, a first guiding shell 78 and a second guiding shell 76. The second guiding shell 76 is formed integrally at the upper shell 70 and consequently in a section of the process air channel 20. The separate first guiding shell 78 is placed and mounted at the inside of the upper shell 70 and consequently at the inside of the process air channel 20 (specifically the battery channel 20a) in order to provide the completed liquid guiding device 41 at the interior of the process air channel 20.

[0072] Fig. 21 shows the aforementioned inside mounting of the lower and separate first guiding shell 78 by directing it along a mounting direction M to the upper second guiding shell 76 integrally arranged at the upper shell 70 in order to fix the shell 78 to the shell 76. After assembling both shells 76, 78 to each other the liquid guiding device 41 is in a post-assembling position or state (Fig. 22). This inside ceiling attachment has the advantage that in case of liquid leaks along the joining line between shells 76, 78 the leaking liquid is collected within the battery channel 20a which forms at its bottom part (bottom shell 72) the condensate collector 30 shown in Fig. 1 and Fig. 18. Thus no liquid can come in contact with electrical parts or the interior of dryer 2 outside the process air channel 20.

[0073] In Fig. 23 the upper shell 70 carries integrally the second guiding shell 76 which is configured to be covered by the first guiding shell 78 at the outer side or exterior of the battery channel 20a.

[0074] In the embodiment of Fig. 24 two separate guiding shells 80 are interacting with each other to build a liquid guiding device 41 as a separate element in a first assembling step. This liquid guiding device 41 forms a closing or wall element when inserting the assembled (complete) liquid guiding device 41 (Fig. 25) in a further assembling step in a wall opening 82 of the battery channel 20a. Thus, the process air channel 20 is automatically closed, covered and particularly sealed at the wall opening 82 during assembling the liquid guiding device 41. In the vertical front-rear cross section of the basement 5 shown in Fig. 26 it can be seen that the opening 82 is closed by the device 41. As indicated by arrows 56 and B the process air flow B through the battery channel 20a is parallel but opposite to the main flow 56 of the liquid through the extended or most part of the liquid guiding device 41.

[0075] The embodiment according to Fig. 27 shows a section of a liquid conduit 34 (as an alternative to the feed pipe 48) to supply the liquid guiding device 41 with liquid. Here and in contrast to the version shown in Fig. 26, the section of the liquid conduit 34 which is immediately upstream the inlet 52 is vertical and coming from above.

[0076] In Fig. 28 a symmetric arrangement of two liquid guiding devices 41 is foreseen at the upper shell 70 of the basement 5. Fig. 29 shows an asymmetric arrangement of two liquid guiding devices 41 which have a different design.

[0077] The aforementioned arrangements of two liquid guiding devices 41 can be supplemented by installing a control valve 84 between the devices 41 and the condensate container (Fig. 30, Fig. 31). Controlling the control valve 84 allows a cleaning of a partial portion of the heat exchanger 10 (or another desired component/location) by only one device 41 if desired or necessary. In this operation manner cleaning of a component requires at least two actions, namely to supply the liquid to the left/right front surface 74 of the heat exchanger 10. On the other hand, by this switching and partial splitting the liquid flow pressure and/or flow rate towards the partial surfaces is increased as compared to a full surface cleaning in the embodiments above. Thus, a smart usage of cleaning liquid can be provided by increasing the local cleaning efficiency.

Reference Numeral List

2	treatment apparatus	56	(mean or main) liquid flow direction
4	heat pump system	57	liquid channel
5	base section	58	slit
6	refrigerant loop	59	slit section
8	blower	60	nozzle outlet
10	first heat exchanger	62	nozzle
12	second heat exchanger	64	nozzle inlet
14	compressor	65	outlet rib
16	expansion device	66	deflecting element
18	drum	67	deflector wall
19	laundry	68	outlet bar
20	process air channel	69	housing
20a	battery channel	70	upper shell
20b	rear channel	72	lower shell
20c	rising channel	74	front surface
20d	front channel	76	second guiding shell
22	filter element	78	first guiding shell
24	condensed water filter	80	separate guiding shell
30	condensate collector	82	wall opening
34	liquid conduit	84	control valve
36	drain pump	A	process air flow
38	valve	B	refrigerant flow
40	condensate container	C, C1, C2, C3, C4, C5	cross section area
41	liquid guiding device	D1	first cross section dimension
46	drain pipe	D2	second cross section dimension
48	feed pipe	M	mounting direction
50	drawer pipe		
52	inlet		
54	outlet		

Claims

1. Home appliance, in particular laundry treatment apparatus, dish washer, dryer (2) or washing machine, the home appliance comprising:

   an articles treatment chamber (18),
   a process air channel (20) for guiding process air (A) to or from the articles treatment chamber (18) for treating the articles (19) using the process air (A),
   a liquid guiding device (41) having an inlet (52) and an outlet (54),
   wherein the liquid guiding device (41) is adapted to guide liquid from the inlet (52) to the outlet (54),
   wherein the outlet (54) is adapted to direct the liquid to a component (10) of the appliance (2) and/or to a predefined location of the appliance (2), and
   wherein the liquid guiding device (41) is formed by and is portion of the process air channel (20).

2. Home appliance according to claim 1, wherein the liquid guiding device (41) is formed or is essentially formed of two or more guiding shells (76, 78, 80).

3. Home appliance according to claim 1 or 2,
wherein the home appliance is a laundry treatment apparatus, in particular a dryer (2) or washing machine,
wherein the articles treatment chamber is a laundry treatment chamber or a drum (18),
wherein the process air channel (20) is formed as a process air circuit for circulating the process air (A) through the laundry treatment chamber or drum (18) or is formed for guiding the process air to or from the laundry treatment chamber,
wherein a heat exchanger unit is arranged in the process air channel comprising a first heat exchanger (10) adapted to cool the process air (A) and a second heat exchanger (12) adapted to heat the process air (A), and
wherein the first heat exchanger (10), the second heat exchanger (12) or the first and second heat exchangers (10, 12) are arranged in a channel section (20) or battery channel (20a) of the process air channel and the liquid guiding device (41) is partially formed in and by a section of the channel section (20) or battery channel (20a).

4. Home appliance according to any of the previous claims,
wherein the component is a heat exchanger (10) and the outlet (54) of the flow guiding device (41) is designed to clean at least a portion (74) of the heat exchanger (10) by directing the liquid thereto in operation, or
wherein the component is a fluff filter and the outlet of the flow guiding device (41) is designed to clean at least a portion of the fluff filter by directing the liquid thereto in operation.

5. Home appliance according to any of the previous claims, wherein the liquid guiding device (41) comprises at least one guiding shell (76) formed in a process air channel section (20a) and the process air channel section (20a) is one or more of the following:

a portion of the home appliance basement shell (5, 70, 72),
the cover shell (70) of the home appliance basement (5)
is housing at least one heat exchanger (10, 12) at least partially,
part of a heat pump battery channel (20a),
part of a home appliance bottom shell (72), or
part of a stationary articles treatment chamber (18).

6. Home appliance according to any of the previous claims, wherein another one of the guiding shells (76, 78, 80) is placed at the inside or outside of the process air channel (20) such as to provide the liquid guiding device (41) at the interior or the exterior of the process air channel (20), or
wherein the process air channel (20) has a wall opening (82) and the liquid guiding device (41) is forming a closing or wall element such that when the liquid guiding device (41) is inserted in the wall opening (82) the process air channel (20) is closed, sealed or covered at the wall opening (82).

7. Home appliance according to any of the previous claims, wherein one or more alignment elements are provided at the first (76, 80), or at the second (78, 80), or at the first and second guiding shells (76, 78, 80), wherein the one or more alignment elements are designed to align the first and second guiding shell (76, 78, 80).

8. Home appliance according to any of the previous claims, wherein a portion or the substantial portion of the flow direction extension (56) of the liquid guiding device (41) is extending parallel to the process air channel (20) or to the process air channel portion or parallel to the flow direction within the process air channel (20).

9. Home appliance according to any of the previous claims, wherein the liquid passage n area (C, C1, C2, C3, C4, C5) of the liquid guiding device (41) is increasing in a first cross section dimension (D1) and is decreasing in a second cross section dimension (D2) along the flow direction (56) from the inlet (52) to the outlet (54) in a way such that the liquid passage area (C, C1, C2, C3, C4, C5) is not decreasing from the inlet (52) to the outlet (54).

10. Home appliance according to any of the previous claims, wherein the liquid passage area (C, C1, C2, C3, C4, C5) is constant or essentially constant along the flow direction (56) from the inlet (52) to the outlet (54).

11. Home appliance according to any of the previous claims, wherein the outlet (54) is forming a nozzle (62), or wherein the outlet (54) has a slit shape (58) or essentially has a slit shape (58).

12. Home appliance according to any of the previous claims, wherein the outlet region (54) of the liquid guiding device (41) is forming a nozzle (62) or is bent to deflect the liquid in the outlet region (54), wherein the nozzle (62) or bent end region is formed at a first side by a first one (78) of the guide shells being separate of the process air channel (20) and at a second or opposing side by a second one (76) of the guide shells which is formed by the process air channel (20).

13. Home appliance according to any of the previous claims, wherein the liquid guiding device (41) is bent in the end region (54) of the liquid guiding device (41) at the side of the outlet (54) such that the liquid flow direction (56) is changed at the end region (54).

14. Home appliance according to any of the previous claims, wherein in the outer end region of the outlet (54) of the liquid guiding device (41),
the liquid guiding device (41) is formed as or comprises a deflecting element (66) adapted to deflect the liquid at the outlet (54), or
the liquid guiding device (41) is formed as or comprises an expanding element for enabling a liquid flow spatial distribution at the outlet

15. Home appliance according to any of the previous claims, wherein in one or two cross-section planes along the main flow direction (56) the liquid guiding device (41) is planar or essentially planar from the end region at the inlet (52) to or close to the end region at the outlet (54).

16. Home appliance according to any of the previous claims, wherein the liquid guiding device (41) is extending across or essentially across one dimension of the process air channel section (20) which is housing the or a heat exchanger (10, 12) or is housing a first (10) and second (12) heat exchanger.

17. Home appliance according to any of the previous claims, wherein the longitudinal extension of the liquid guiding device (41) is extending parallel or essentially parallel to a flow direction through a or the heat exchanger (10, 12) or a or the first (10) and second (12) heat exchangers.

18. Home appliance according to any of the previous claims, wherein the process air channel (20) has at least one opening at the outlet end of the guiding shell (76) formed in the process air channel (20) for passing liquid flown through the liquid guiding device (41) to the interior of the process air channel (20).

19. Home appliance according to any of the previous claims, wherein the process air channel (20) has a supply opening or supply connector adapted to supply liquid from outside to the inside of the process air channel (20) at the inlet (52) of the liquid guiding device (41).

20. Home appliance according to any of the previous claims, wherein the main direction (56) of the liquid flow in the liquid guiding device (41) and the main flow direction of the process air (A) in the process air channel (20) are or are essentially parallel or anti-parallel to each other.

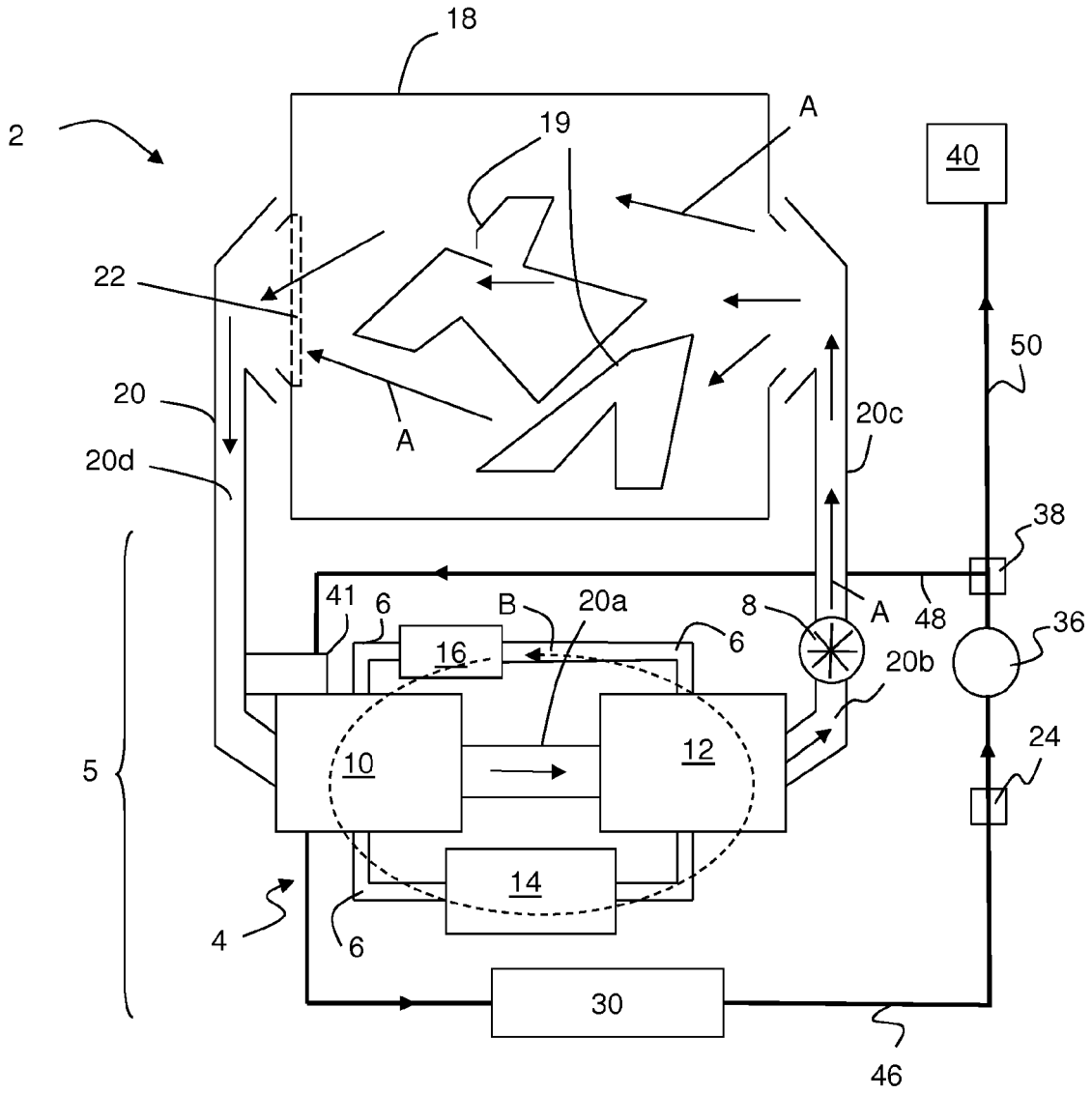
21. Home appliance according to any of the previous claims, wherein within the home appliance (2)
the inlet (52) of the liquid guiding device (41) is located at or in the region of a condensate pump or a condensate container (40), or
the outlet (54) of the liquid guiding device (41) is located at or neighboring to the front side (74) or process entrance side of a heat exchanger (10) arranged in the process air channel (20).

22. Home appliance according to any of the previous claims, wherein the inlet (52) of the liquid guiding device (41) is selectively connectable to one or more of or is connected to
an intermediate liquid tank,
a removable condensate collection tank (40), or
a condensate collection reservoir (30) which is arranged in the basement (5) of the home appliance (2).

23. Home appliance according to any of the previous claims, wherein a pump (36, 42) for pumping the liquid to the liquid guiding device (41) is arranged between the intermediate liquid tank, or a removable condensate collection tank (40), or a condensate collection reservoir (30) and the liquid guiding device (41).

24. Home appliance according to any of the previous claims, wherein the pump (42) or the removable condensate

collection tank (40) is arranged at an upper section of the home appliance (2) and a liquid conduit (34) is guided downward within the home appliance (2) body to the liquid guiding device (41) arranged in a basement (5) thereof.


18
2
19
A
40
22
50
20
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20c
20d
38
41
6
B
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48
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46

Fig. 1

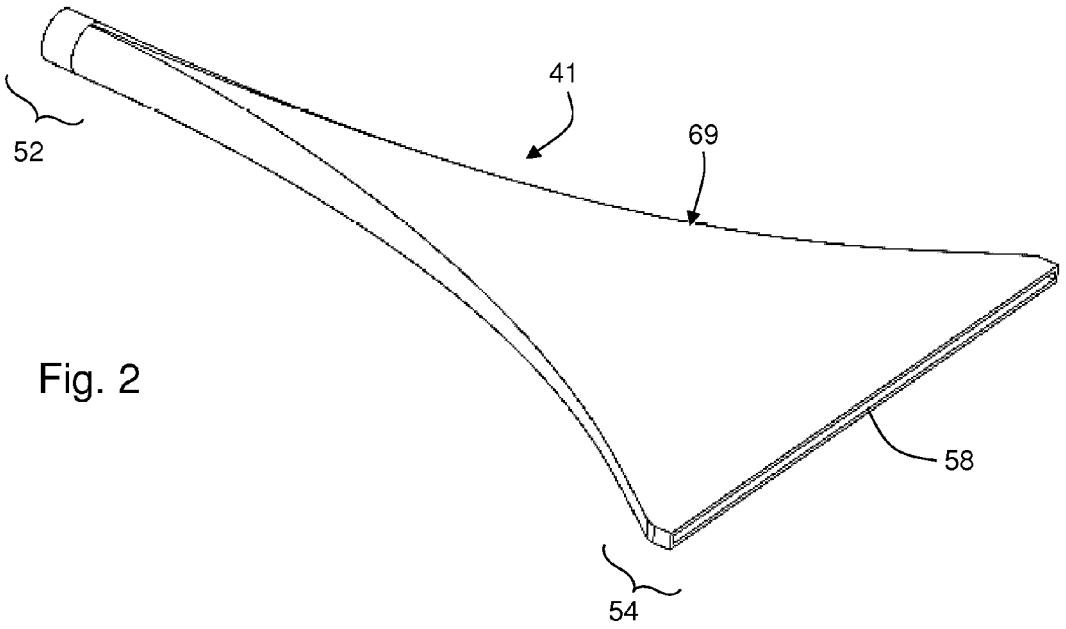

Fig. 2

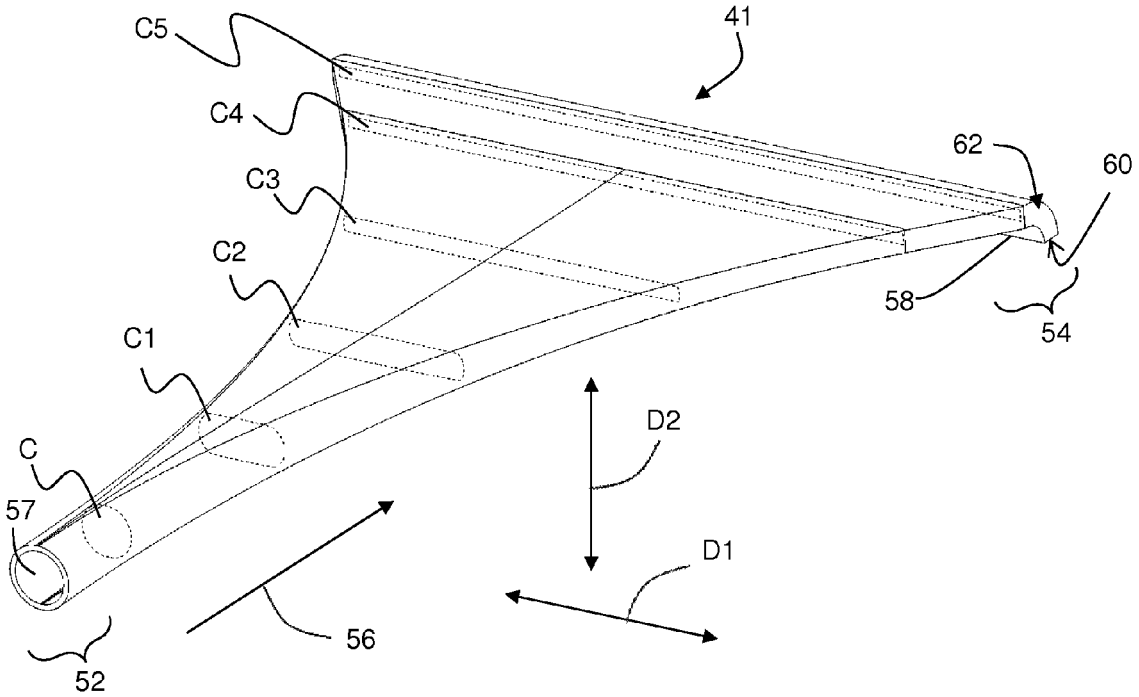

Fig. 3

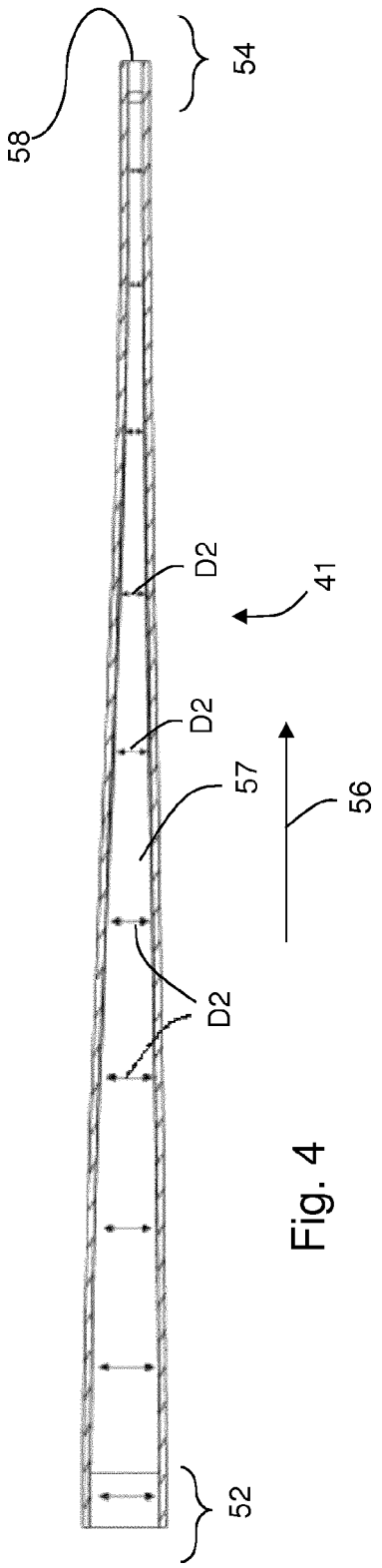

Fig. 4

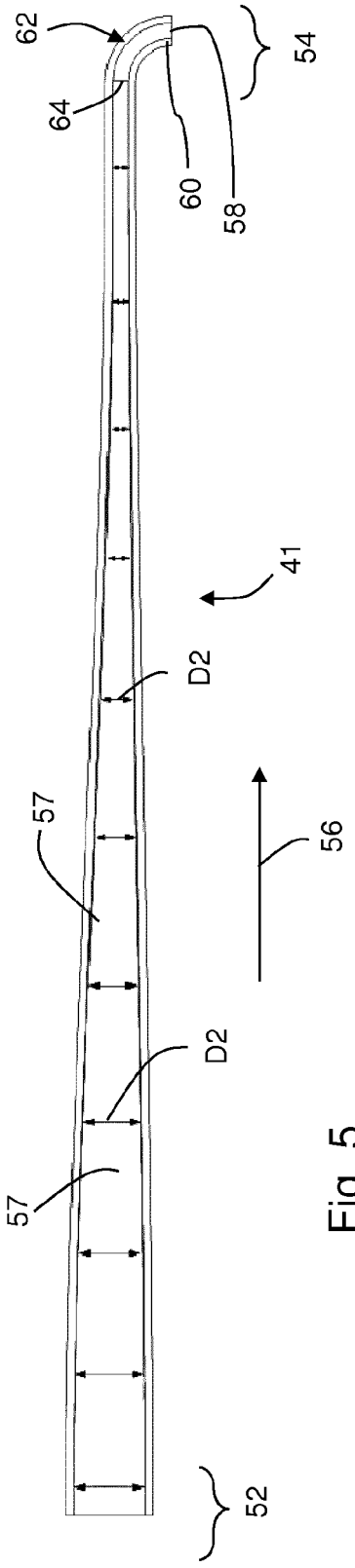

Fig. 5

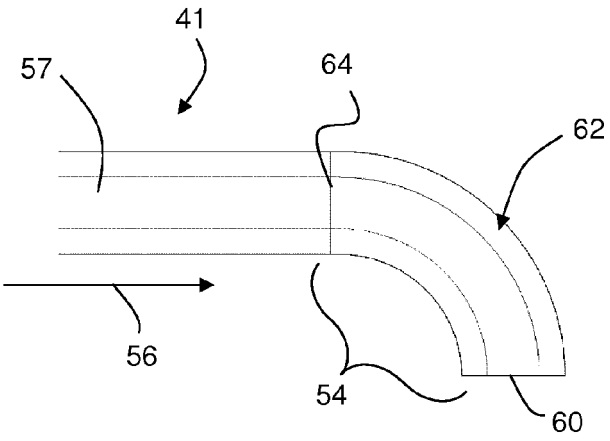

Fig. 6

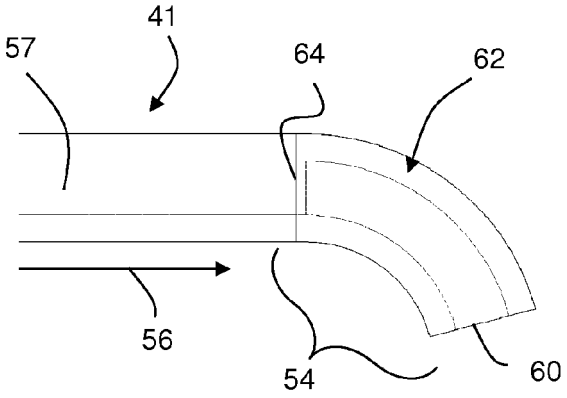

Fig. 7

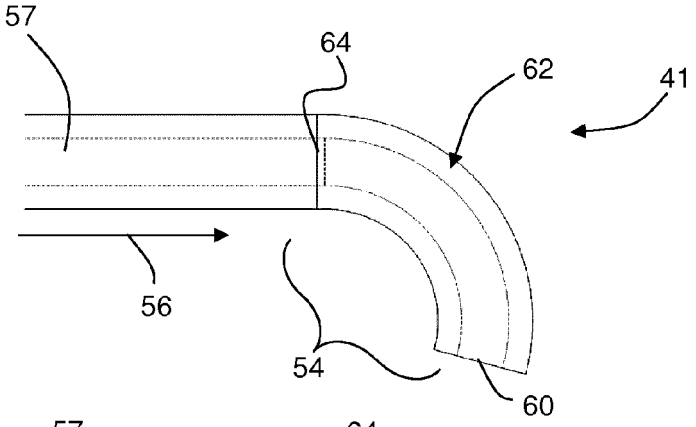

Fig. 8

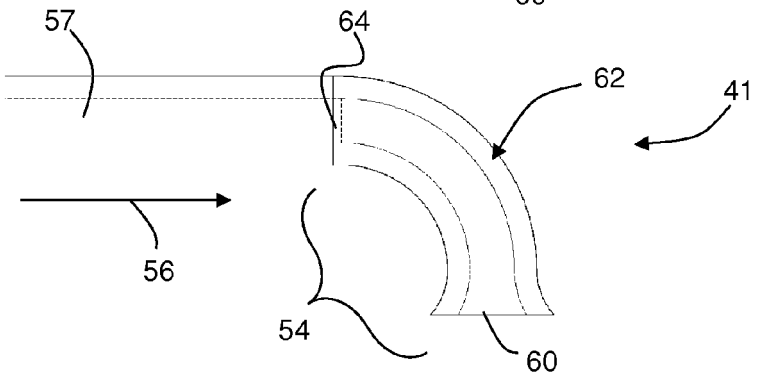

Fig. 9

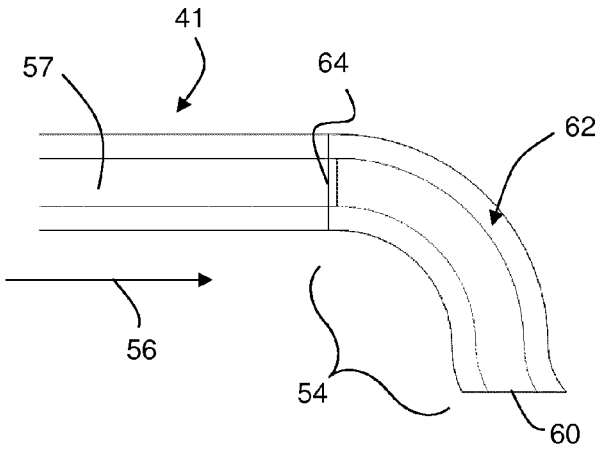

Fig. 10

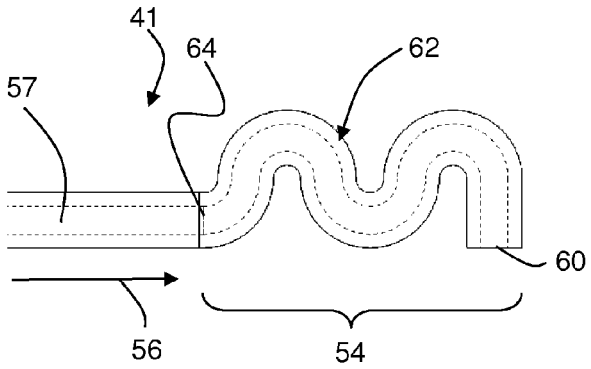

Fig. 11

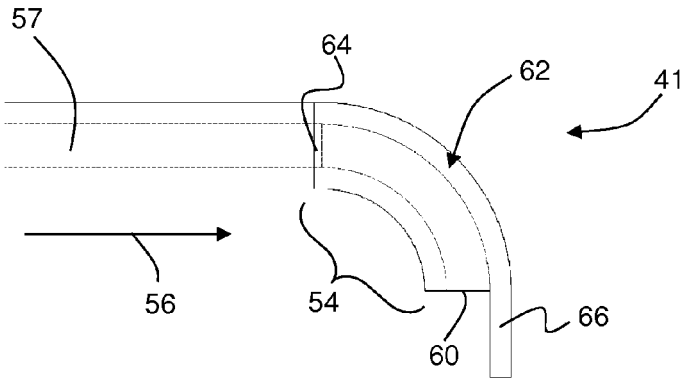

Fig. 12

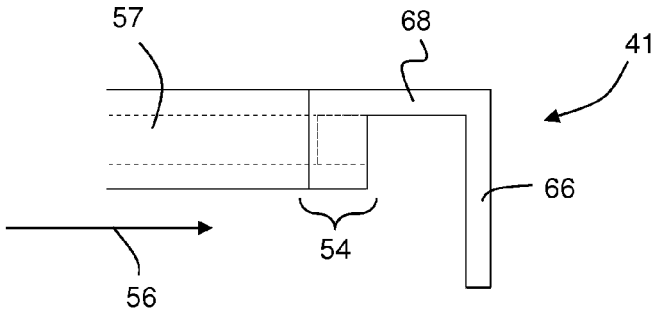

Fig. 13

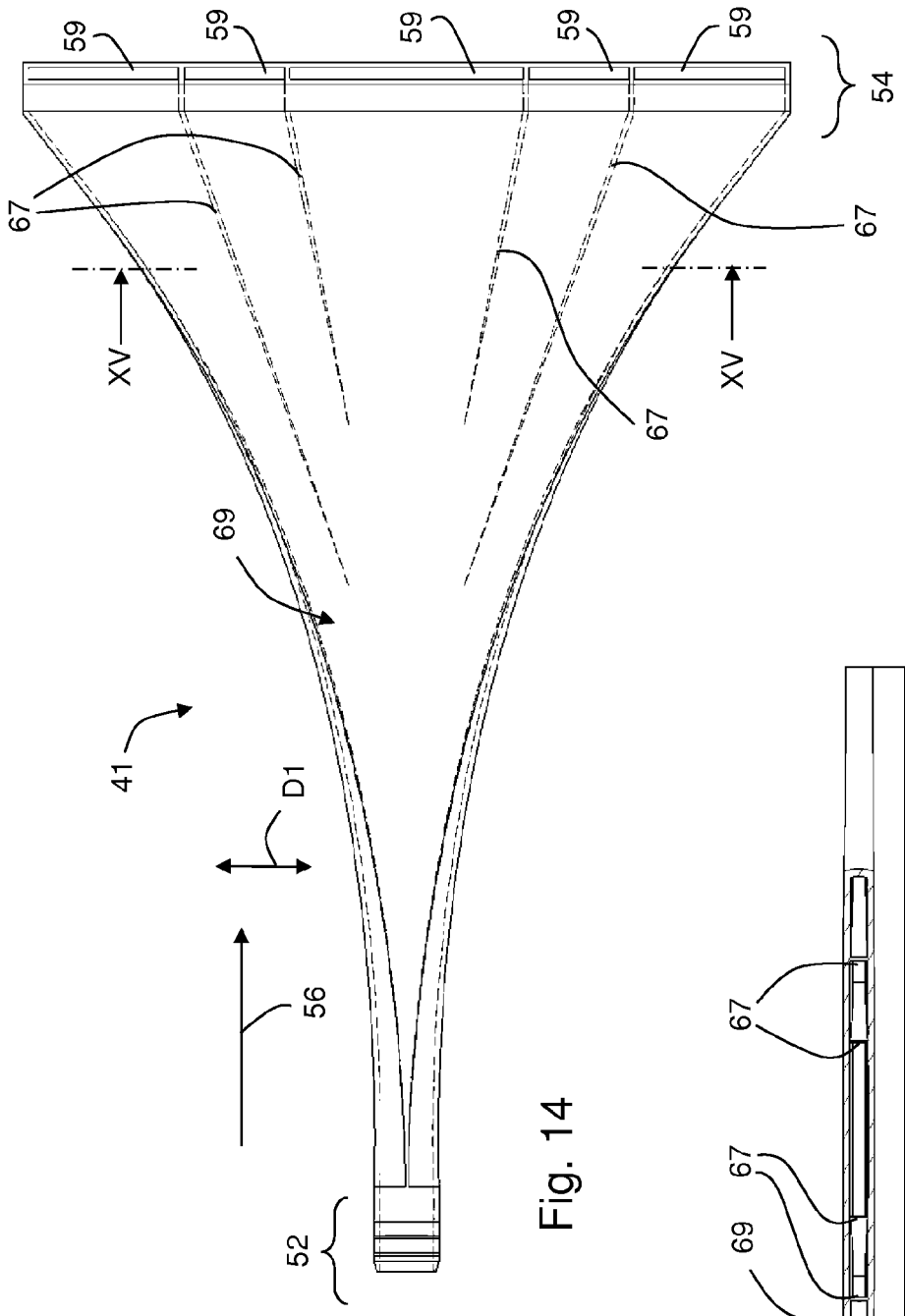

Fig. 14

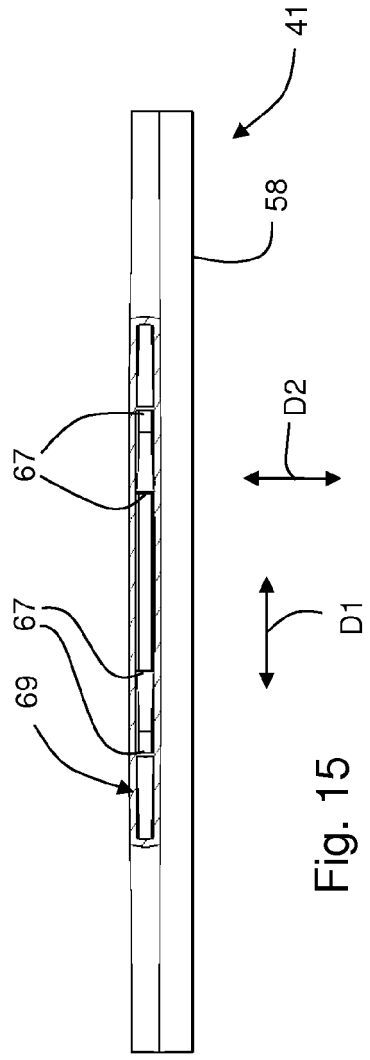

Fig. 15

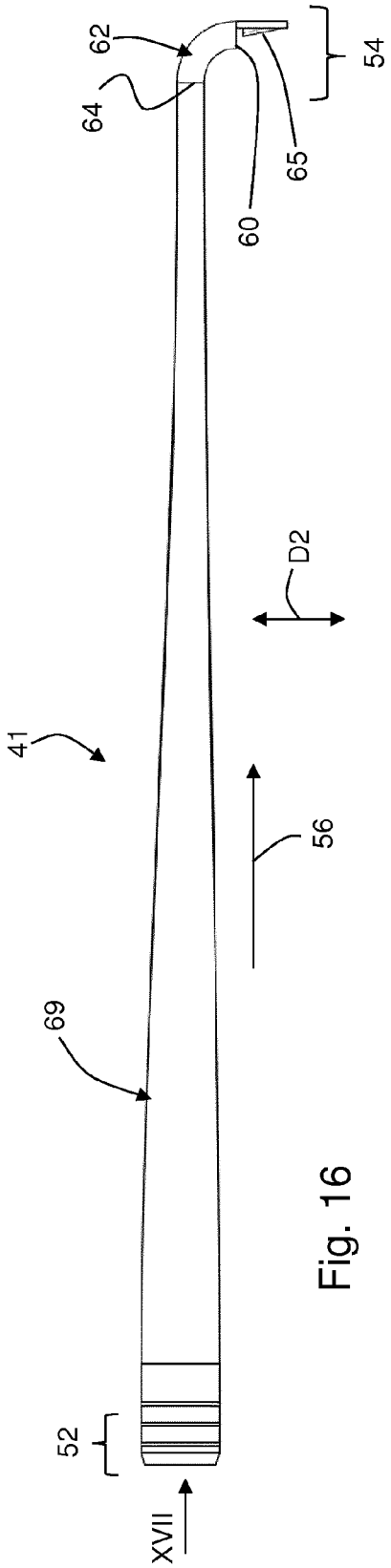

Fig. 16

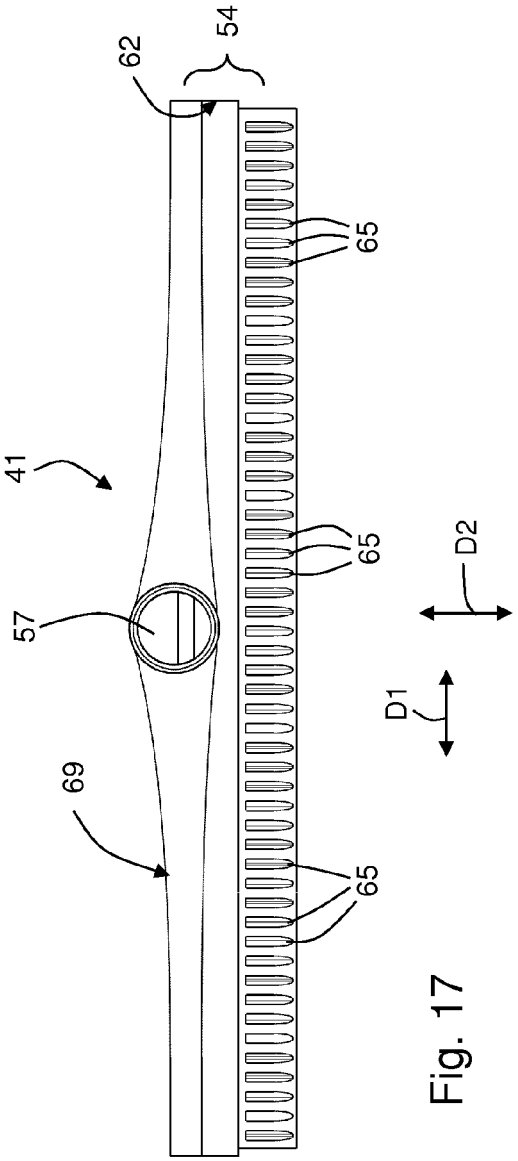

Fig. 17

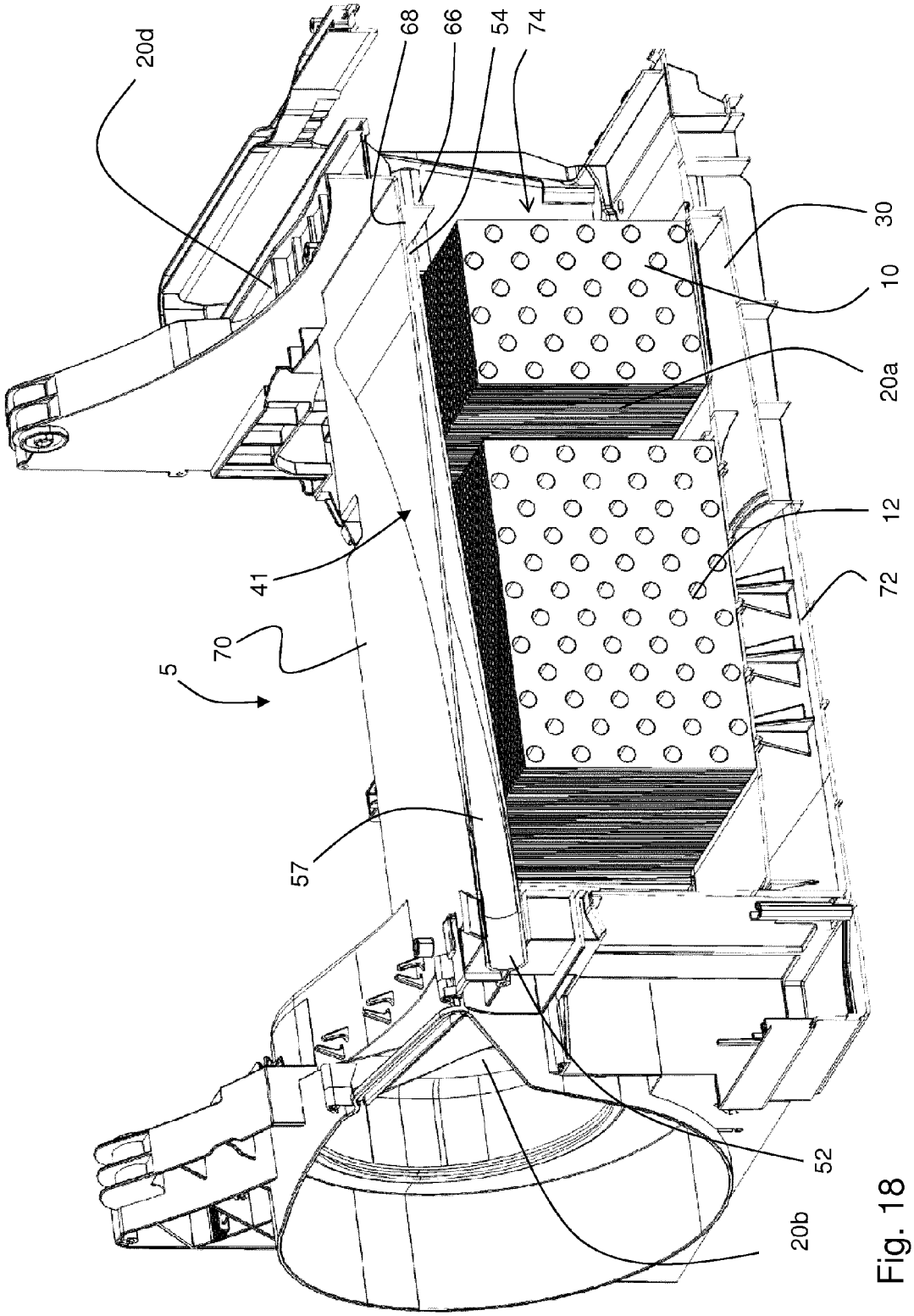

Fig. 18

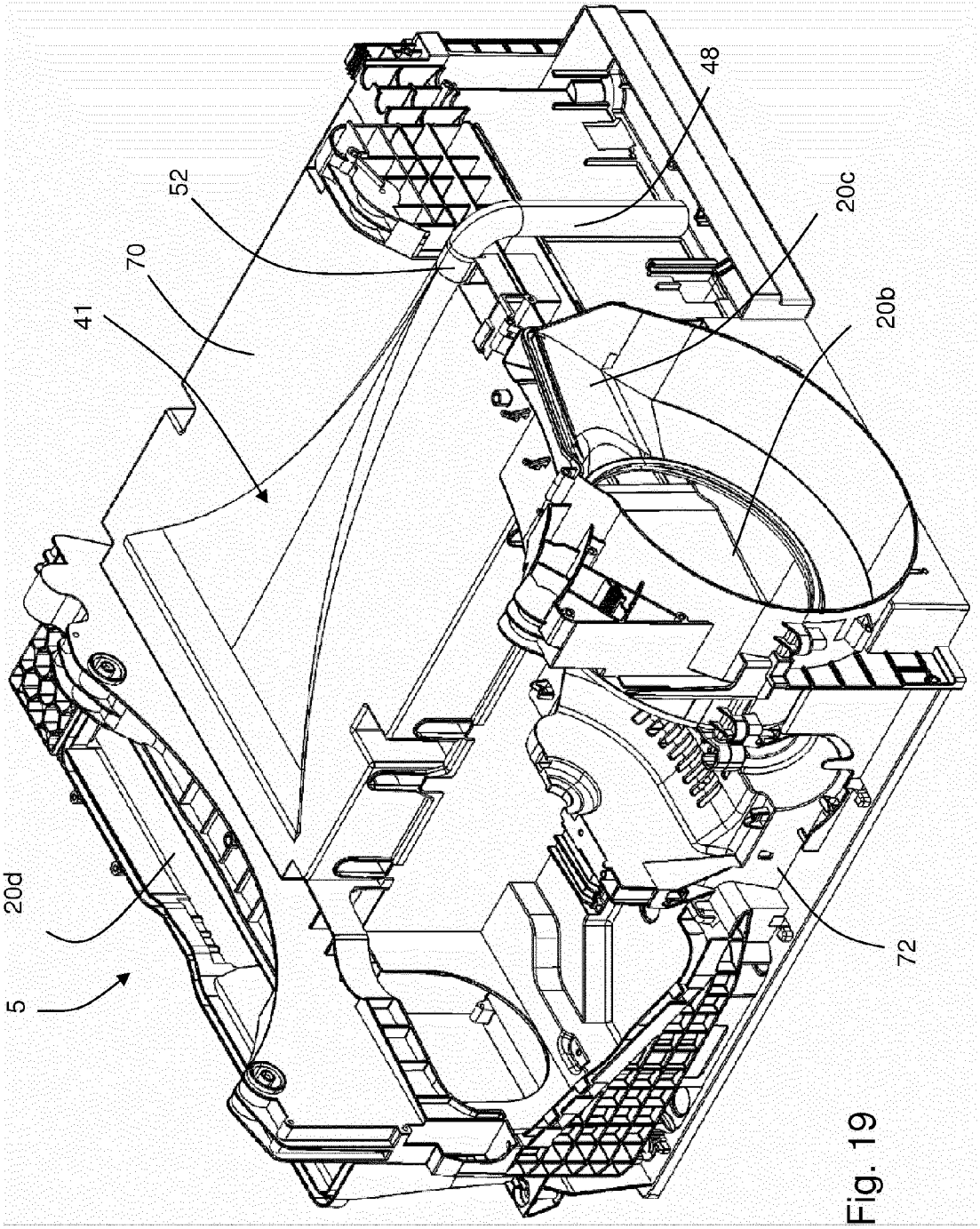

Fig. 19

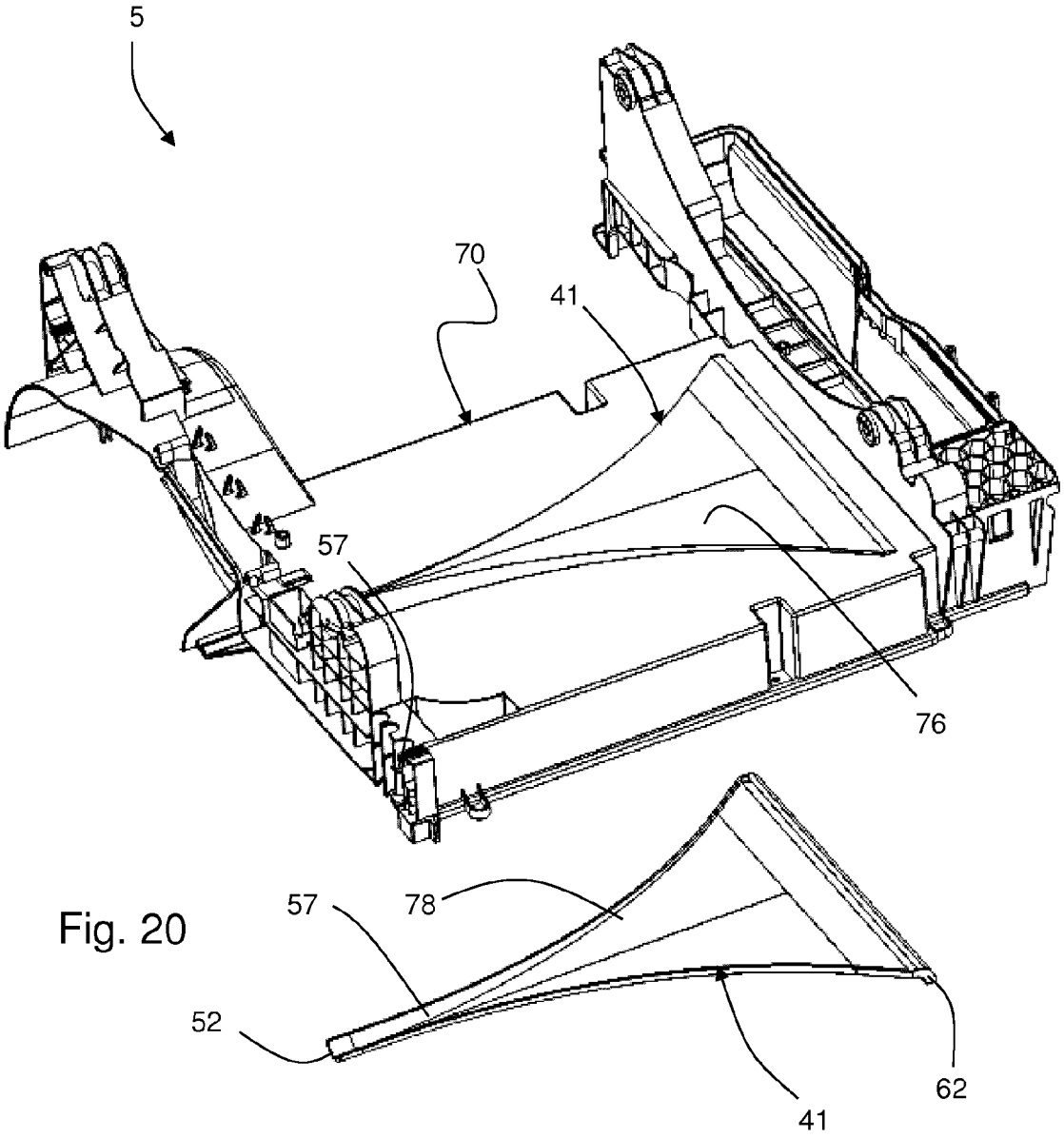

Fig. 20

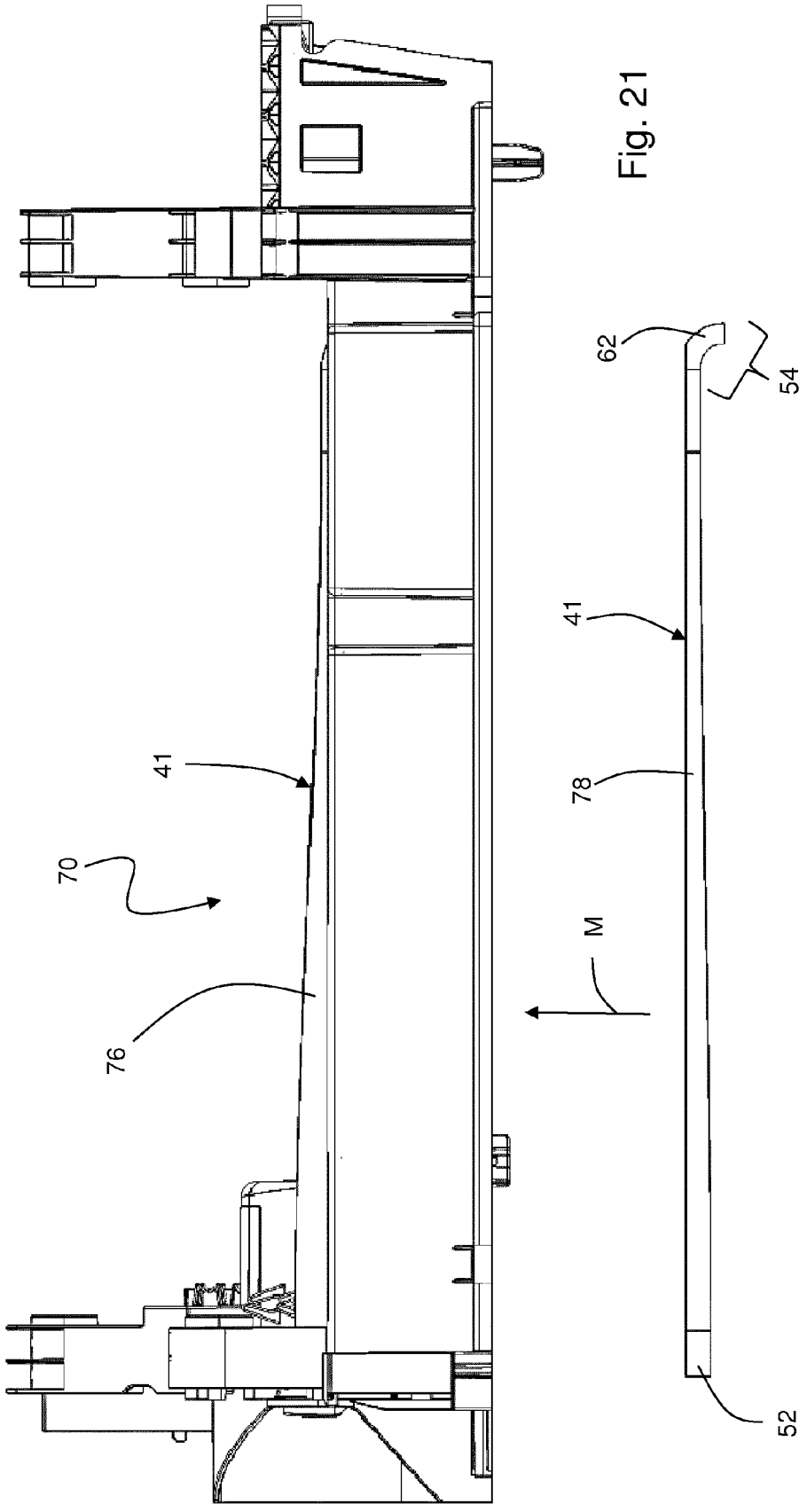

Fig. 21

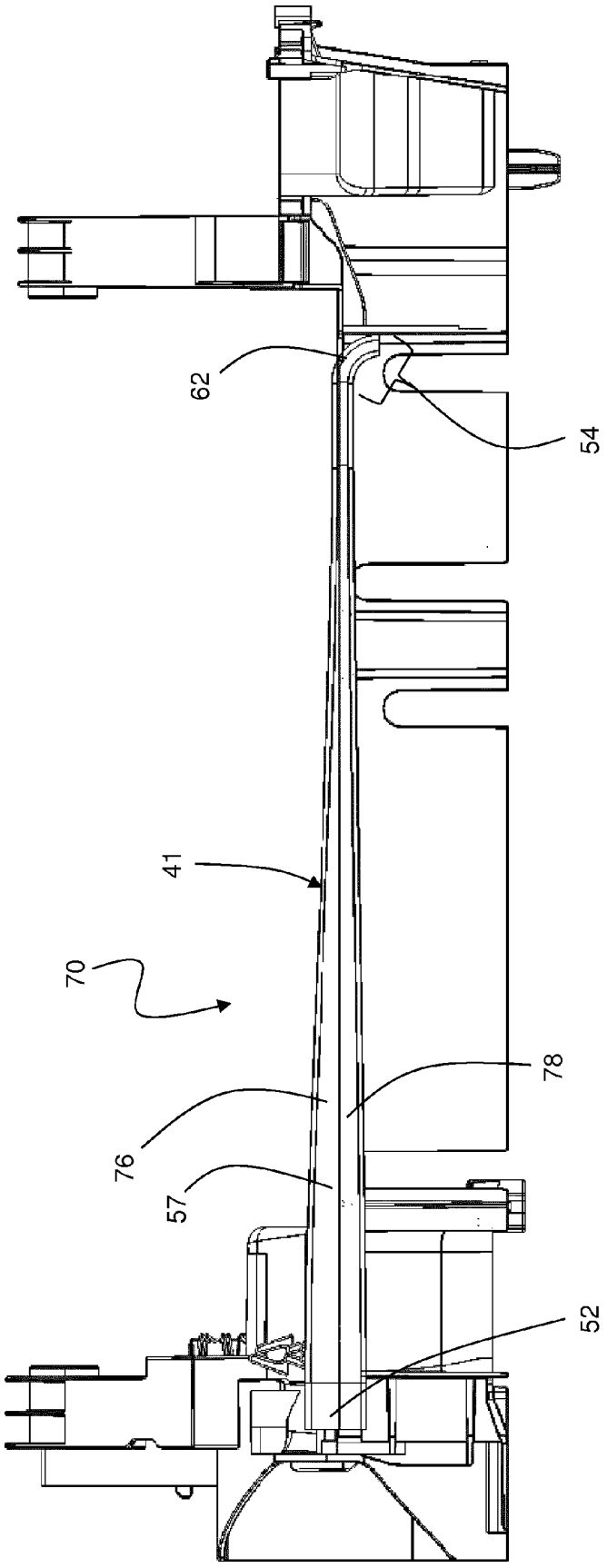

Fig. 22

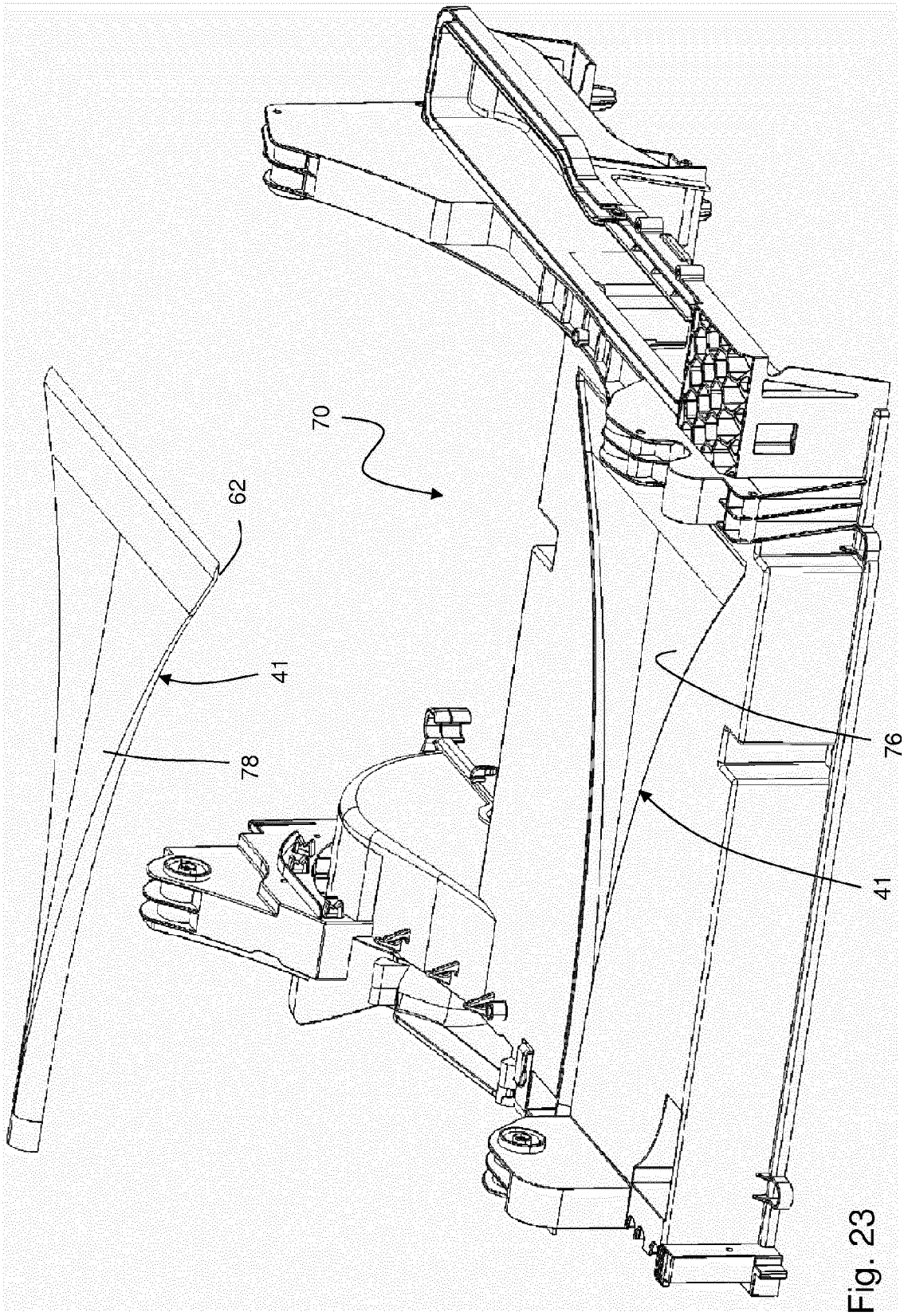

Fig. 23

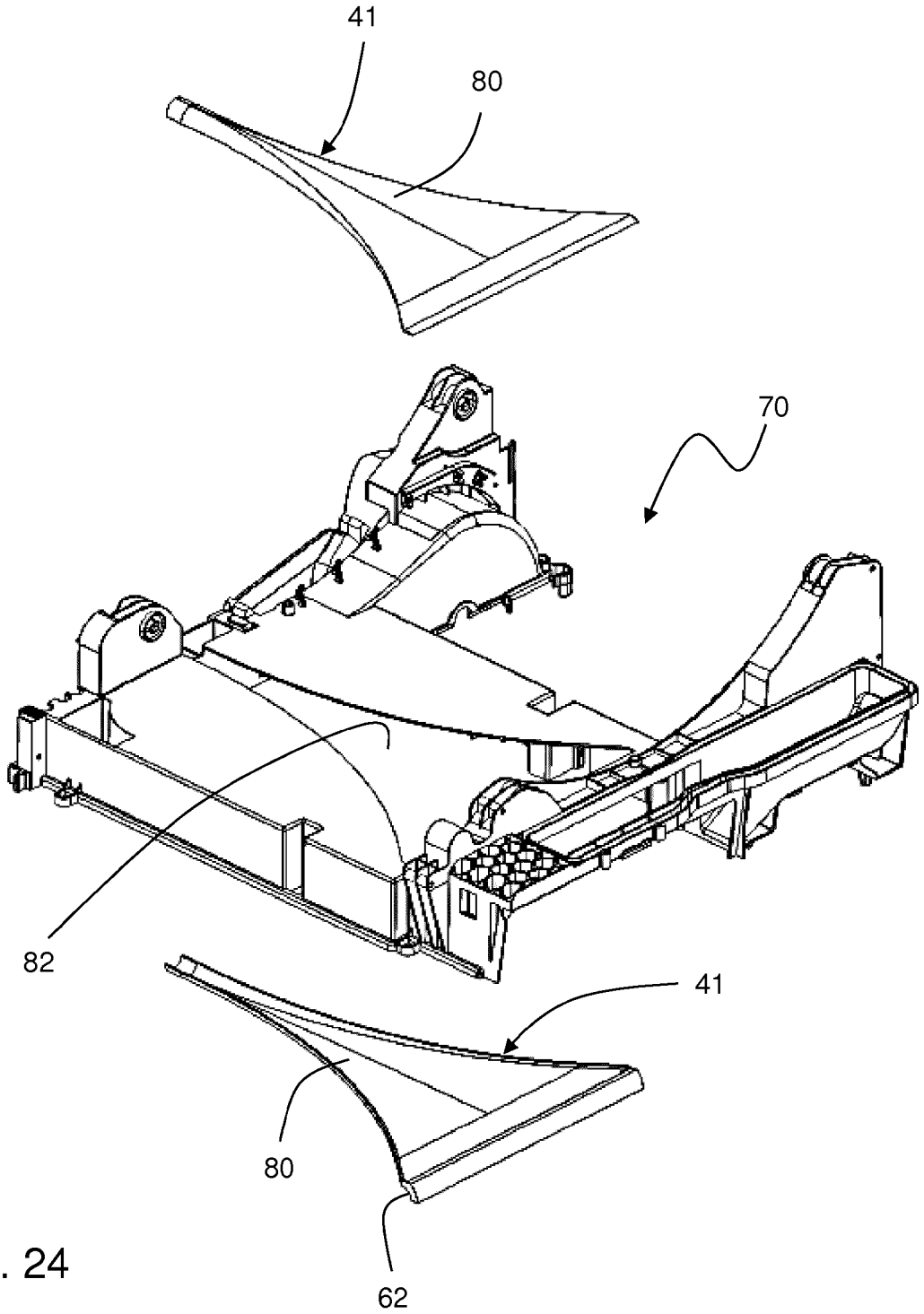

Fig. 24

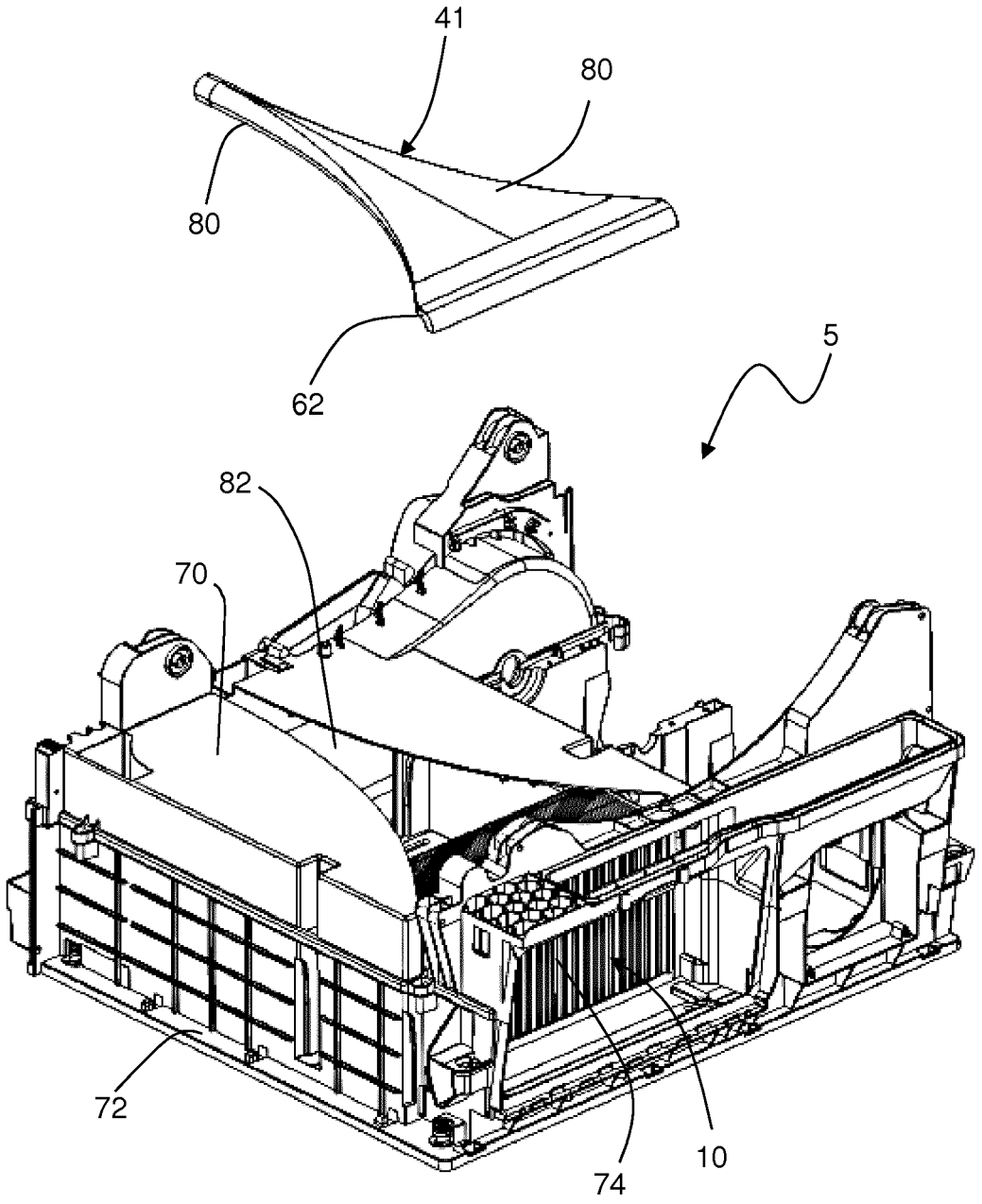

Fig. 25

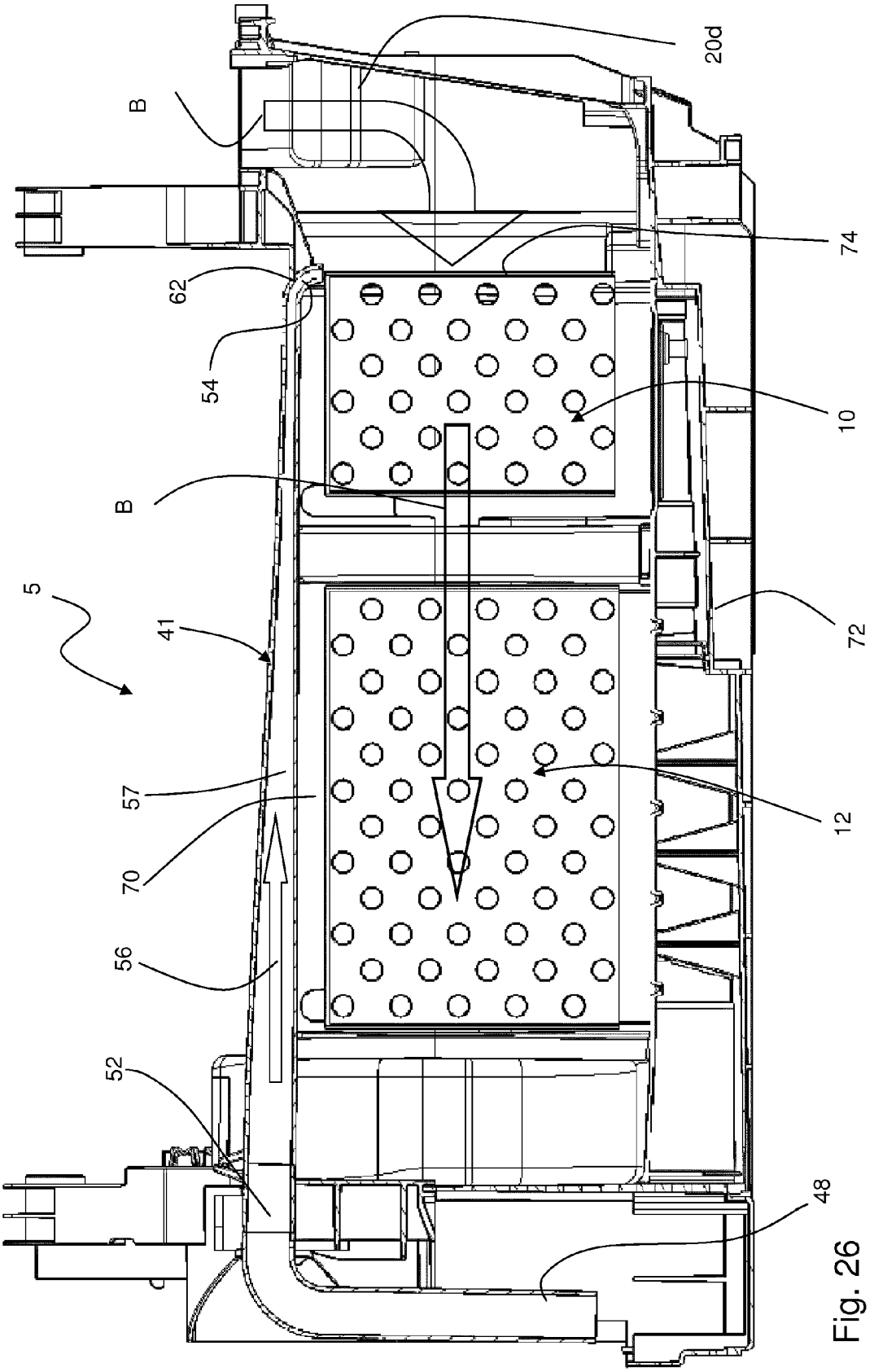

Fig. 26

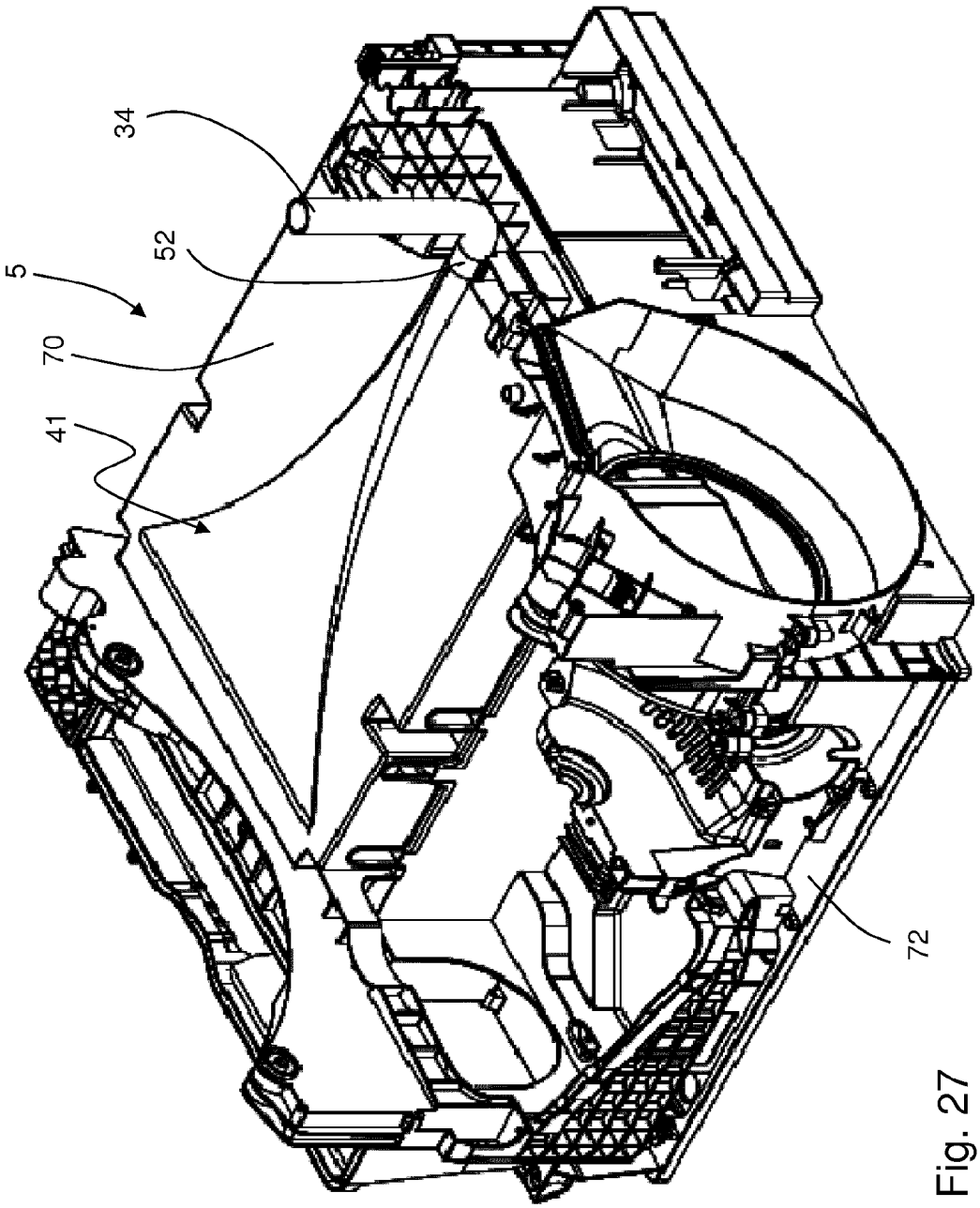

Fig. 27

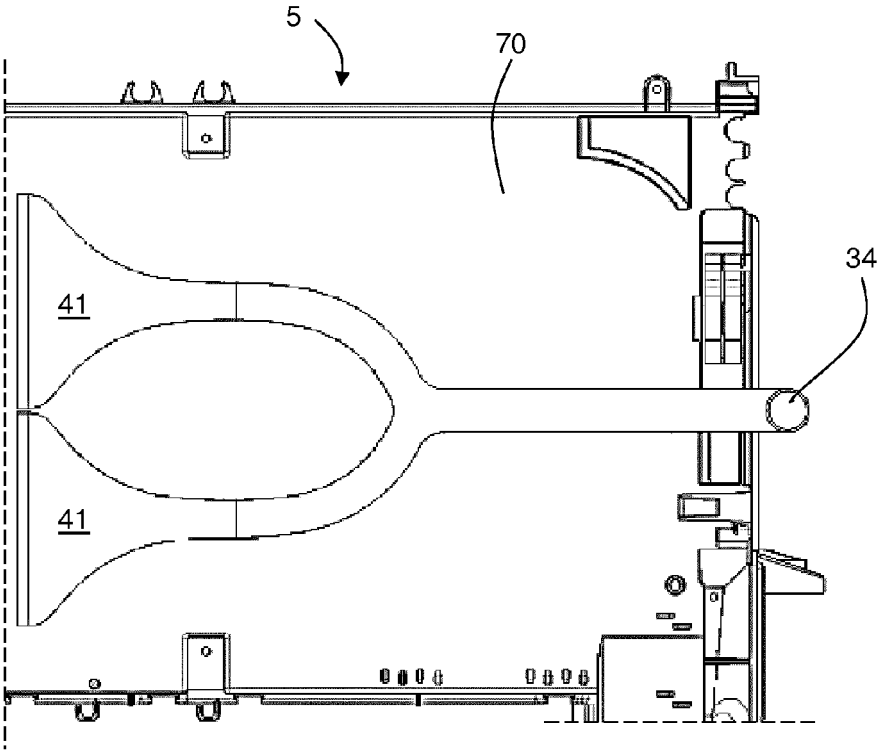

Fig. 28

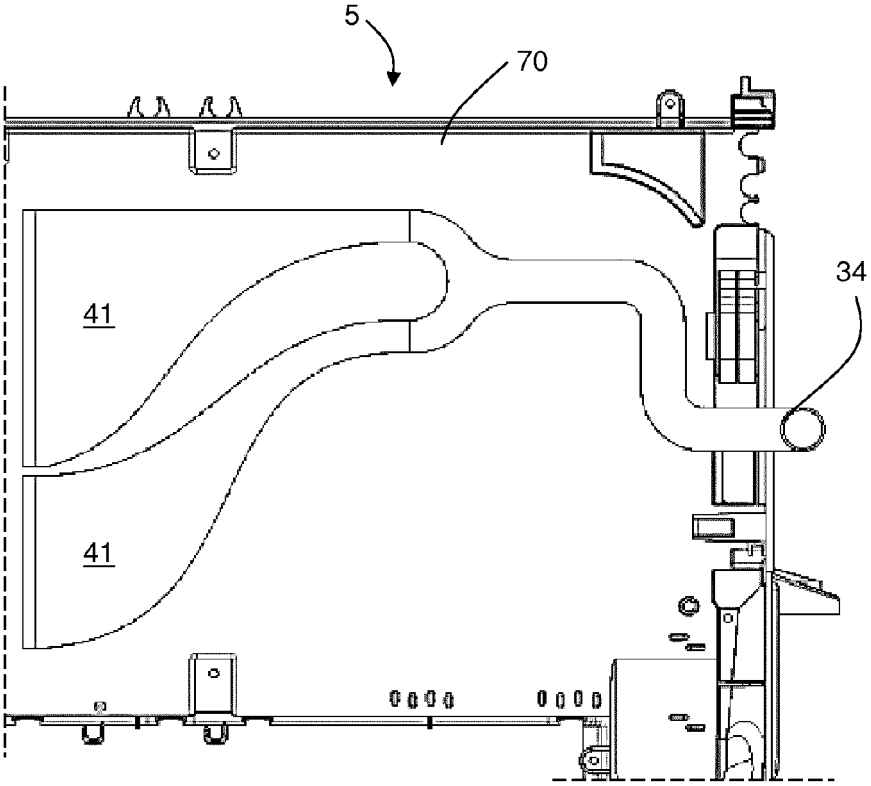

Fig. 29

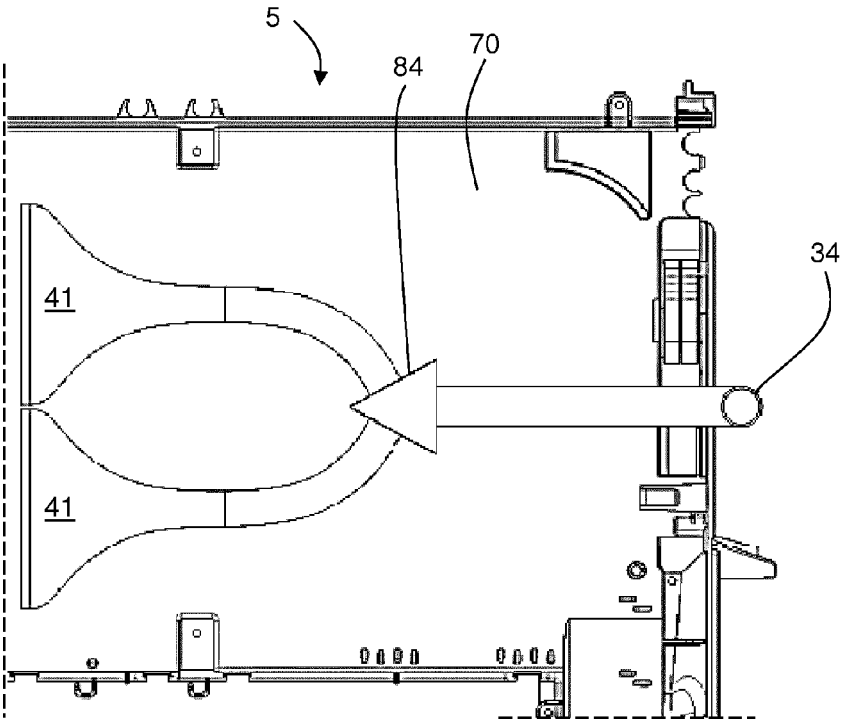

Fig. 30

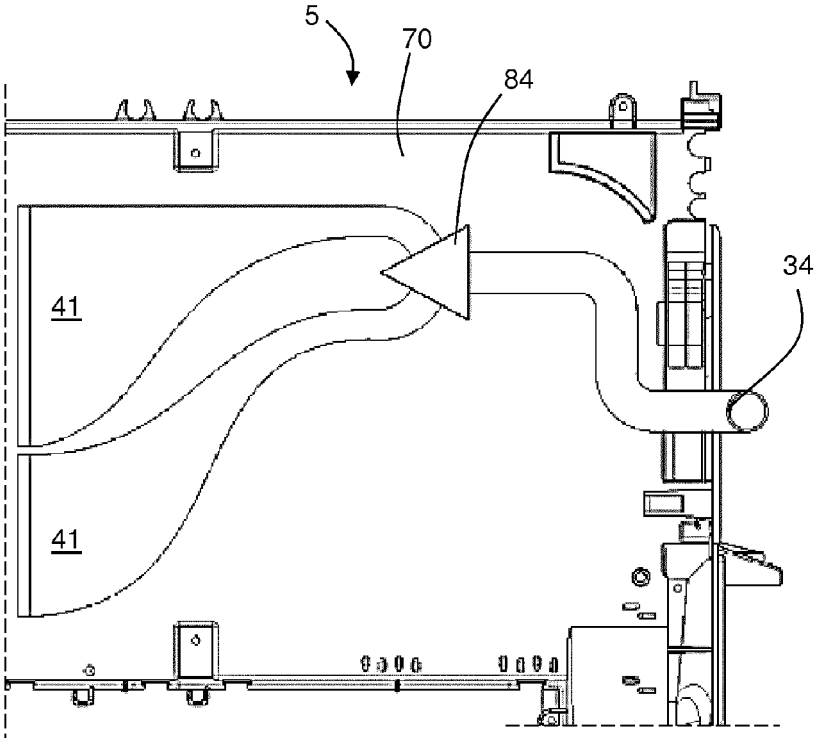

Fig. 31

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 March 2013	Weinberg, Ekkehard

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