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(54) **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, comprising a liquid guiding device (41) having an inlet (52) and an outlet (54) and defining a liquid passage area (C, C1, C2, C3, C4, C5) for passing the liquid. The liquid guiding device (41) is adapted to guide liquid from the inlet (52) to the outlet (54). The outlet (54) is adapted to direct the liquid to a

component of the appliance and/or to a predefined location of the appliance. The liquid passage 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).

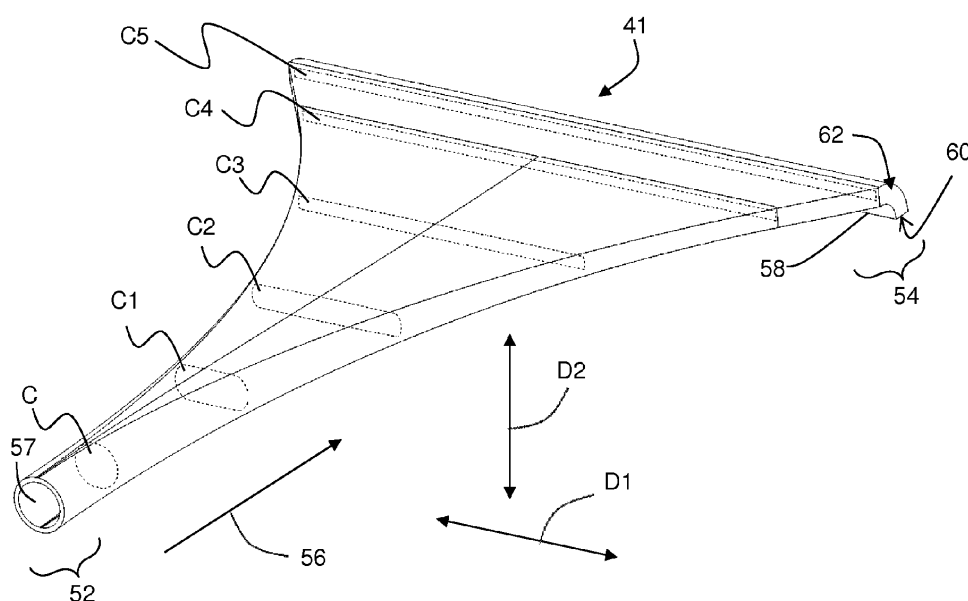


Fig. 3

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 a liquid guiding device having 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. 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. Due to enlarging of the first cross section dimension and narrowing of the second cross section dimension it is possible to adapt the geometry of the outlet of the liquid guiding device to the geometry of the component or the predefined or dedicated location to be cleaned. Thus, the exiting liquid spray is distributable such that the component or the predefined location can be evenly cleaned. Furthermore, the enlarging and narrowing cross section dimensions support a simple and space-saving integration or arrangement of the liquid guiding device within the home appliance, particularly in or at a basement of the home appliance.

[0006] The inventors have found that the specific shape of the conduit allows to minimize the liquid pressure drop thereby enhancing the liquid flow rate and the evenly distribution of the cleaning liquid at the outlet.

[0007] In contrast to WO 2009/077291 A1, the 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.

[0008] The aforementioned first and second cross section dimensions are mathematical perpendicular to the main or mean or center liquid flow, i.e. the first and second cross section dimensions are mathematical perpendicular to each other and perpendicular to a mathematical main axis of the liquid flow path.

[0009] 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.

[0010] 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.

[0011] The inlet of the liquid guiding device is connected to a liquid supply line. Preferably the liquid guiding device is a separate element, separate to the liquid supply line. Thus, different designs of a liquid guiding device according to the specific purpose can be connected to a standard liquid supply line. Additionally, the home appliance can be serviced in a cost-saving manner if a liquid guiding device or liquid supply line has to be substituted. Preferably, the liquid guiding

device comprises a dedicated inlet which is connectable with the liquid supply line. In an embodiment, the liquid supply line is a flexible line or hose.

[0012] In a preferred embodiment the liquid guiding device is manufactured of a material different from the material of the liquid supply line thus being a separate element from the liquid supply line. For example, the liquid guiding device is manufactured by separate molding.

[0013] Preferably, the liquid guiding device or at least a portion or a shell-like part thereof is formed as a rigid or semi-rigid part (e.g. from hard plastic).

[0014] Preferably, the component where the liquid is directed to is a heat exchanger. Cleaning the heat exchanger from fluff maintains the heat exchange performance over lifetime of the appliance. For example the heat exchanger is a heat exchanger of a heat pump system (then preferably the heat exchanger is the refrigerant evaporator or refrigerant heater). Or the heat exchanger is a cooling air/process air heat exchanger, which may be formed as crossflow or opposite flow type heat exchanger and/or which is used for example in a condensation dryer.

[0015] 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. In case of using a process air circuit the process air channel is provided for circulating the process air to and from the treatment chamber in a closed loop. 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. 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.

[0016] 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.

[0017] Preferably the liquid guiding device has an outlet region 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. In this regard, the sections of the liquid guiding device outside the nozzle can be provided as a single part or as several parts (e.g. shell-like parts).

[0018] According to a preferred embodiment the outlet of the liquid guiding device comprises a slit-like shape which facilitates a good areal adaption 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 discontinuous 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 or funnel shaped branch of the liquid guiding device is provided which opens towards the partial area.

[0019] Preferably the liquid guiding device is bent in the region of its outlet such that the liquid flow direction is changed in the region of its outlet. Thus, directing the liquid or liquid spray to the component surface or location to be cleaned is realized by a simple construction.

[0020] In a preferred embodiment an outer end section of the outlet 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.

[0021] Alternatively, the liquid guiding device is formed as or at least comprises an expanding element for enabling a liquid flow spatial distribution at the outlet. Preferably the aforementioned deflecting element and expanding element are foreseen simultaneously at the outlet.

[0022] 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.

[0023] 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.

[0024] 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 a cost-saving manufacturing of the liquid guiding device and its space-saving arrangement within the home appliance.

[0025] Preferably the liquid guiding device is formed or is essentially formed of preferably two or of at least two guiding shells. This construction enhances a simple production of the complete liquid guiding device.

[0026] For realizing 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.

[0027] 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.

[0028] Preferably the liquid guiding device is formed or is essentially formed of at least two guiding shells and one of the guiding shells is formed in and is a portion of the home appliance cabinet or a portion of a component housing or a portion of a home appliance basement shell. This geometric construction offers a space-saving reduced height of the liquid guiding device as it serves also as a common wall element of other portions within the home appliance. Moreover the number of components or the amount of material required is reduced due to double-usage of one of the shells.

[0029] In a preferred embodiment the home appliance comprises an articles treatment chamber and a process air channel for guiding the process air to or from the articles treatment chamber for treating the articles (e.g. laundry or dishes) using the process air. In case of said process air channel the liquid guiding device preferably forms a portion of said process air channel. In other words, an external surface of the liquid guiding device forms a portion of said process air channel enabling a space-saving assembling of the home appliance despite integration of a liquid guiding device. With regard to said process air channel the process air is particularly circulated process air or process air sucked in as ambient air and exhausted from or to outside the home appliance or home appliance cabinet.

[0030] Preferably one guiding shell forms a portion of a process air channel section wherein said process air channel section is housing at least one heat exchanger and/or is part of a heat pump battery channel and/or is part of a home appliance bottom shell and/or is part of a stationary articles treatment chamber.

[0031] Supporting the desired space-saving construction, said one guiding shell formed at a process air channel section 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.

[0032] In a preferred embodiment a portion or the substantial portion of the flow direction extension of the liquid guiding device is extending parallel to a process air channel of the home appliance or parallel to the flow direction within a 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 (center) main 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.

[0033] Preferably the home appliance is configured as a laundry treatment apparatus, particularly a dryer or a washing machine, wherein said laundry treatment apparatus comprises a laundry treatment chamber for treating laundry using process air, a process air channel (which may form a process air circuit for circulating the process air in a closed loop or the process air channel may guide the process air to and/or from the treatment chamber in a vented dryer), and a heat exchanger unit arranged within the process air channel.

[0034] 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 allowing a compact construction of the laundry treatment apparatus.

[0035] In a preferred embodiment the said channel section is arranged at an upper shell of a basement of the laundry treatment device or the said channel section is formed in said upper shell thus facilitating mounting the parts of the

laundry treatment apparatus.

[0036] 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 in its cleaning operation. Particularly, the liquid or liquid spray is directed to the front side or process air entrance face of a heat exchanger or of a fluff filter to ensure an efficient cleaning of the component desired to be cleaned.

[0037] 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.

[0038] 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.

[0039] 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.

[0040] 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.

[0041] 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,
- 5 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,
- 10 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,
- 15 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,
- 20 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,
- 25 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,
- 30 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.

35 **[0042]** 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.

40 **[0043]** 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.

50 **[0044]** 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.

55 **[0045]** 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.

[0046] 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. 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.

[0047] 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.

[0048] 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).

[0049] 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.

[0050] 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).

[0051] 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.

[0052] 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).

[0053] 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.

[0054] 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).

[0055] 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.

[0056] 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.

[0057] 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.

[0058] 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.

[0059] In comparison to Fig. 18 the embodiment according to Fig. 19 shows additionally a conduit corresponding to the feed pipe 48.

[0060] 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.

[0061] 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 18. Thus no liquid can come in contact with electrical parts or the interior of dryer 2 outside the process air channel 20.

[0062] 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.

[0063] 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.

[0064] 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.

[0065] 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.

[0066] 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

[0067]

	2	treatment apparatus
15	4	heat pump system
	5	base section
	6	refrigerant loop
	8	blower
	10	first heat exchanger
20	12	second heat exchanger
	14	compressor
	16	expansion device
	18	drum
	19	laundry
25	20	process air channel
	20a	battery channel
	20b	rear channel
	20c	rising channel
	20d	front channel
30	22	filter element
	24	condensed water filter
	30	condensate collector
	34	liquid conduit
	36	drain pump
35	38	valve
	40	condensate container
	41	liquid guiding device
	46	drain pipe
	48	feed pipe
40	50	drawer pipe
	52	inlet
	54	outlet
	56	(mean or main) liquid flow direction
	57	liquid channel
45	58	slit
	59	slit section
	60	nozzle outlet
	62	nozzle
	64	nozzle inlet
50	65	outlet rib
	66	deflecting element
	67	deflector wall
	68	outlet bar
	69	housing
55	70	upper shell
	72	lower shell
	74	front surface
	76	second guiding shell

	78	first guiding shell
	80	separate guiding shell
	82	wall opening
	84	control valve
5	A	process air flow
	B	refrigerant flow
	C, C1, C2, C3, C4, C5	cross section area
	D1	first cross section dimension
	D2	second cross section dimension
10	M	mounting direction

Claims

- 15 1. Appliance, in particular laundry treatment apparatus, dish washer, dryer (2) or washing machine, comprising a liquid guiding device (41) having an inlet (52) and an outlet (54) and defining a liquid passage area (C, C1, C2, C3, C4, C5) for passing the liquid, 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 passage 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).
- 25 2. Home appliance according to claim 1, 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).
- 30 3. Home appliance according to claim 1 or 2, wherein the first and second cross section dimensions (D1, D2) are mathematical perpendicular to each other and perpendicular to a mathematical main axis of the flow direction (56).
- 35 4. Home appliance according to claim 1, 2 or 3, wherein the liquid guiding device (41) is planar or essentially planar from the end region at the inlet to or close to the end region at the outlet in relation to one or two cross section planes along a main flow axis direction (56).
- 40 5. Home appliance according to any of the previous claims, wherein the outlet (54) is forming a nozzle (60).
6. Home appliance according to any of the previous claims, wherein the outlet (54) has a slit shape (58) or essentially has a slit shape (58).
- 45 7. Home appliance according to any of the previous claims, wherein the liquid guiding device (41) is bent in the region of the outlet (54) of the liquid guiding device (41) such that the liquid flow direction (56) is changed in the region of the outlet (54).
- 50 8. Home appliance according to any of the previous claims, wherein in an outer end section 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.
- 55 9. Home appliance according to any of the previous claims, wherein the liquid guiding device (41) comprises at least one deflector wall (67) inside its housing (69) for deflecting the liquid flowing towards the outlet (54), and/or whirl flow means (65) generating whirl flow within the liquid downstream the outlet (54).
10. 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).

11. Home appliance according to any of the previous claims, wherein the liquid guiding device (41) is formed or is essentially formed of two or at least two flow guiding shells.
12. Home appliance according to claim 11, wherein one or more alignment elements are provided at a first, or a second, or a first and second guiding shell designed to align the two or at least two guiding shells (76, 78, 80), or to align at least one guiding shell (76, 78) and a portion of a home appliance basement shell (5, 70).
13. Home appliance according to claim 11 or 12, wherein the liquid guiding device (41) is formed or is essentially formed of at least two guiding shells (76, 78) and one of the guiding shells (76) is formed in and is a portion of the home appliance cabinet or a portion of a component housing or a portion of a home appliance basement shell (5, 70).
14. Home appliance according to any of the previous claims, wherein the component is a heat exchanger (10, 12) 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 (54) 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.
15. Home appliance according to any of the previous claims, further comprising an articles treatment chamber (18) and a process air channel (20) for guiding the process air (A) to or from the articles treatment chamber (18) for treating the articles (19) using the process air (A), wherein the liquid guiding device (41) forms a portion of the process air channel (20).
16. Home appliance according to claim 14, wherein the process air channel section (20, 20d), in which the one guiding shell (76) is formed, is housing at least one heat exchanger (10, 12), or is part of a heat pump battery channel (20a), or is part of a home appliance bottom shell (70, 72), or is part of a stationary articles treatment chamber (18).
17. Home appliance according to claim 15 or 16, wherein the one guiding shell (76) 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), respectively.
18. 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 a process air channel (20) of the home appliance (2) or parallel to the flow direction within the process air channel (20), wherein the process air channel (20) is guiding the process air (A) to or from the articles treatment chamber (18) for treating the articles (19) using the process air (A).
19. Home appliance according to any of the previous claims, wherein the home appliance is a laundry treatment apparatus, in particular a dryer (2) or washing machine, the laundry treatment apparatus comprising:
 - a laundry treatment chamber (18) for treating laundry (19) using process air (A),
 - a process air channel for circulating the process air (A) in a process air circuit or for guiding the process air to or from the treatment chamber (18), and
 - a heat exchanger unit 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), wherein the first heat exchanger (10), or 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).
20. Home appliance according to claim 18, wherein the channel section (20) is or is formed in an upper shell (70) of a basement (5) of the laundry treatment apparatus (2).

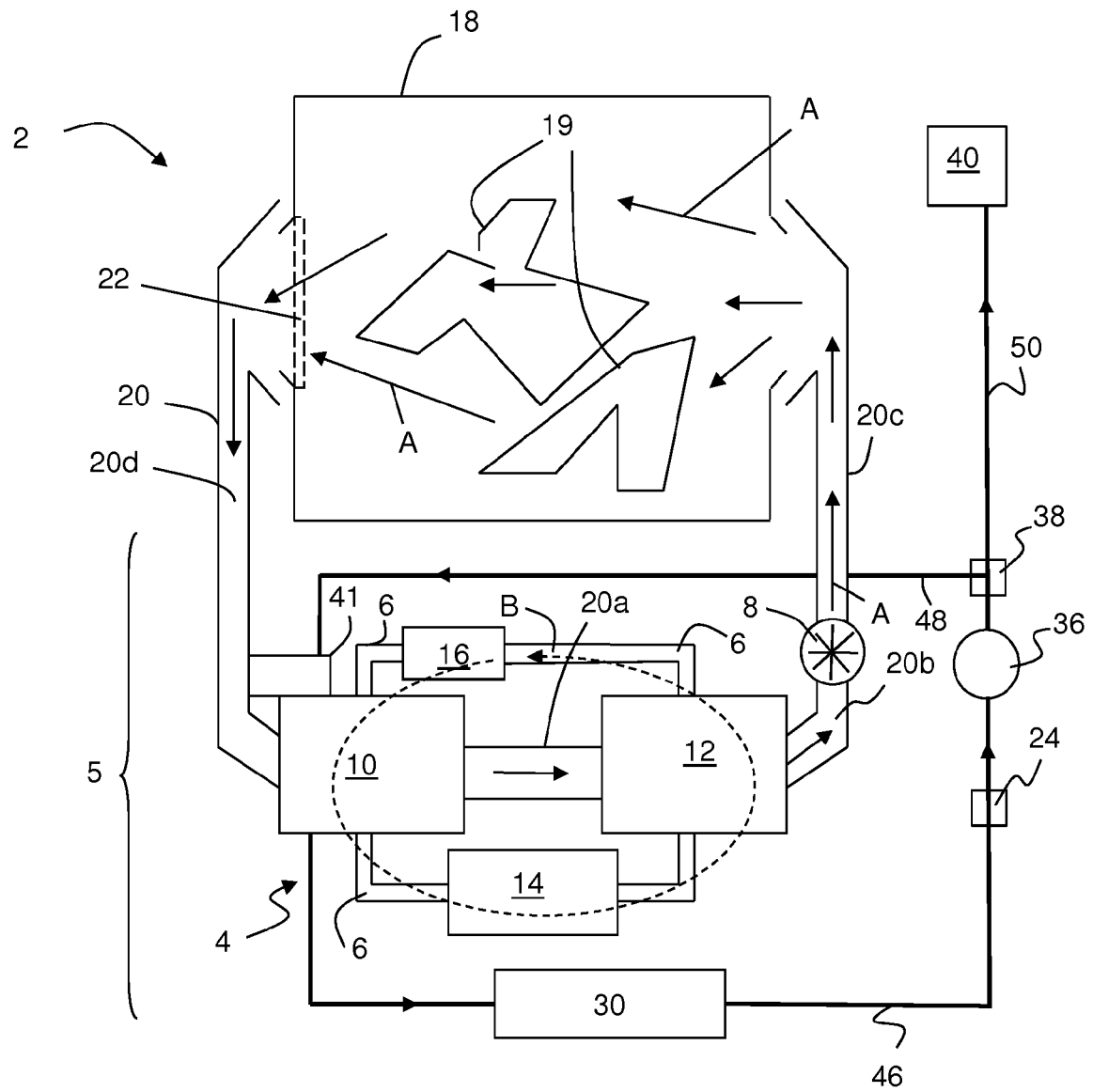
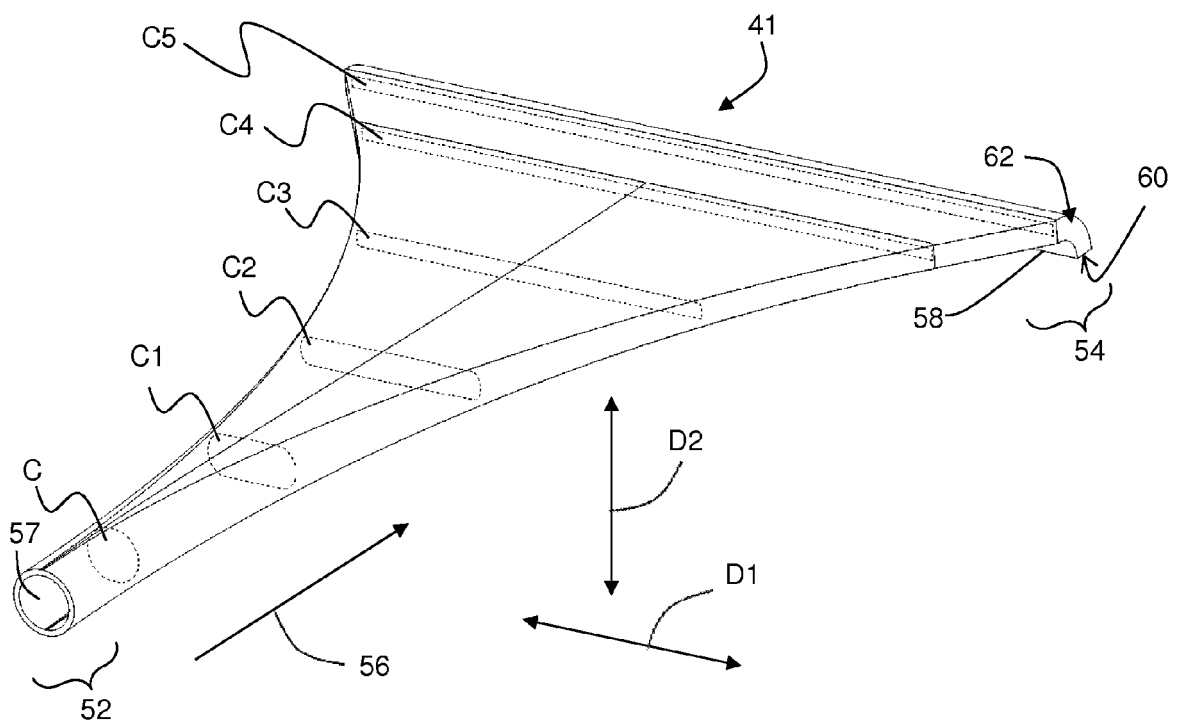
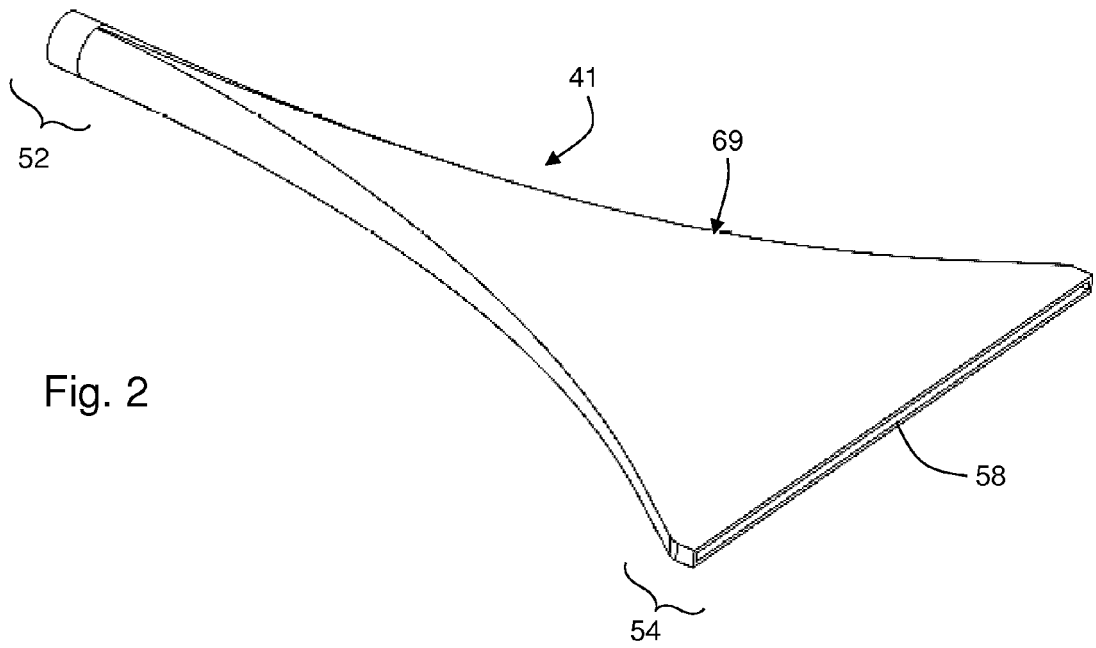


Fig. 1



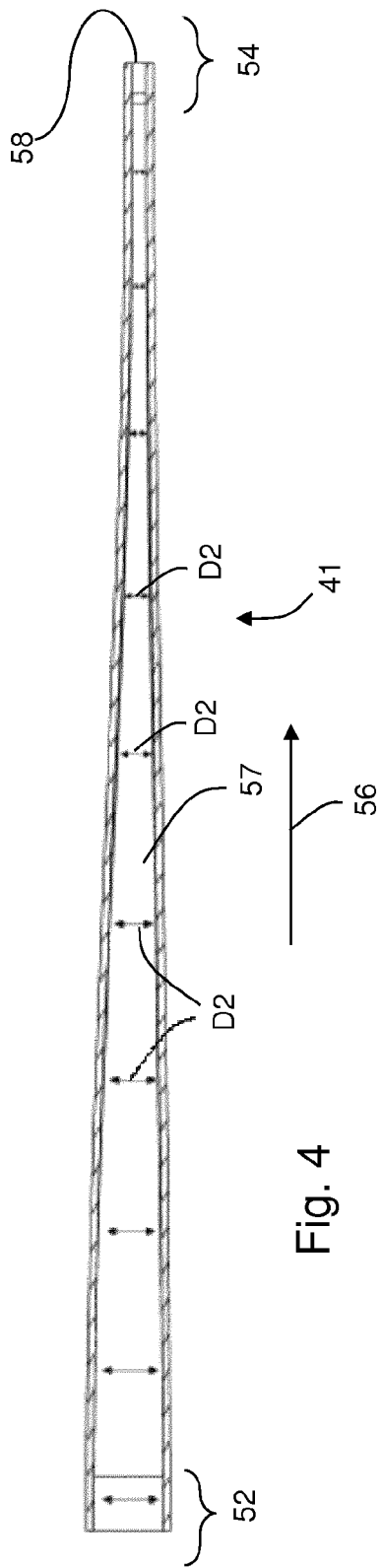


Fig. 4

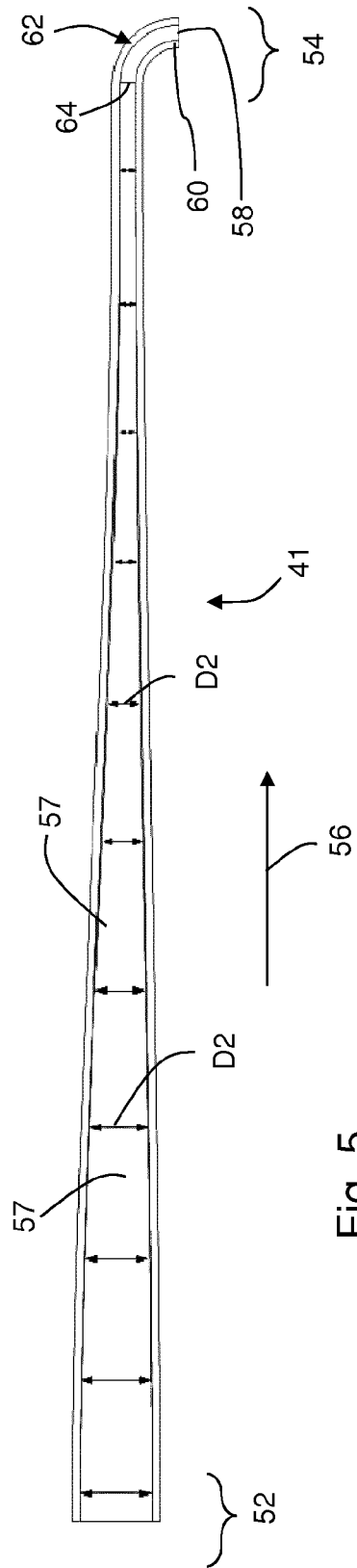


Fig. 5

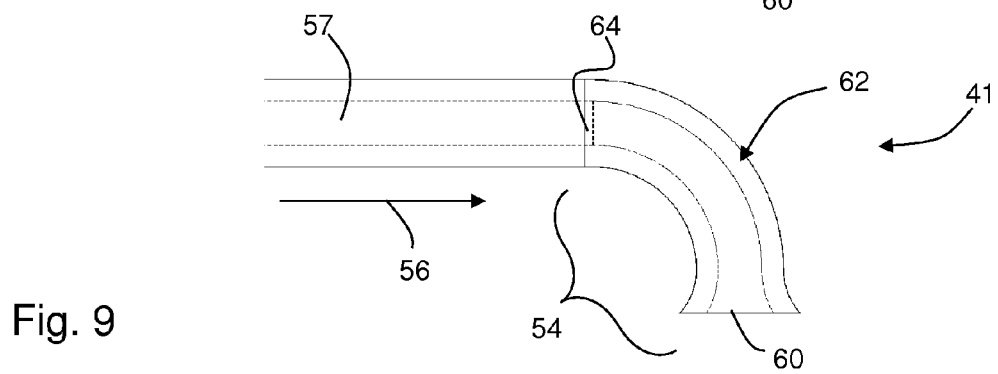
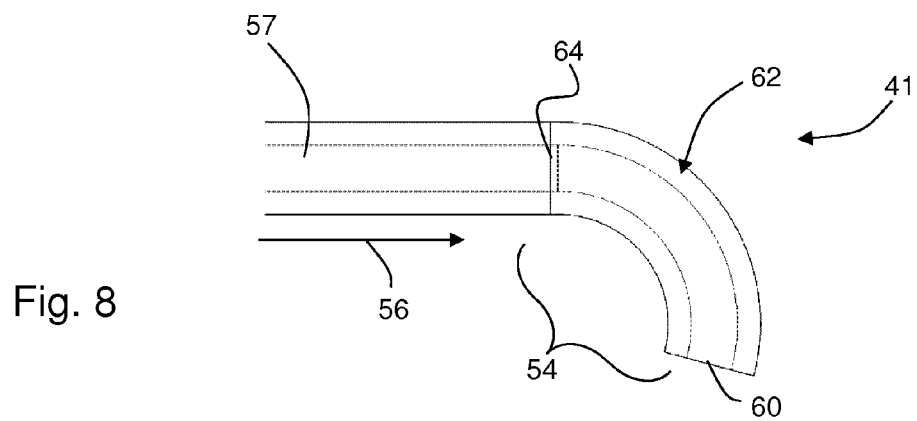
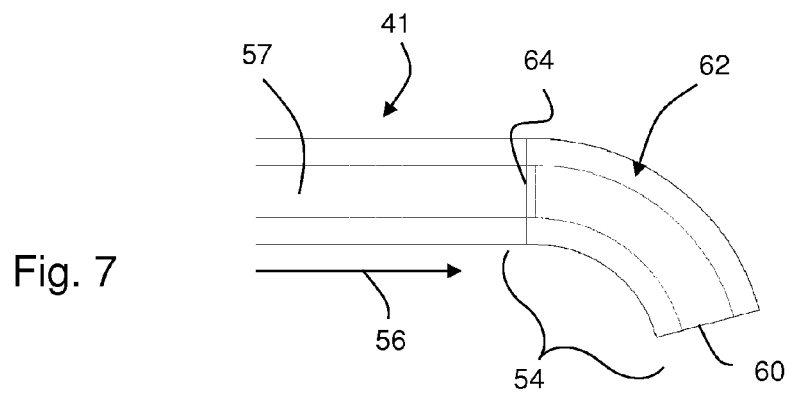
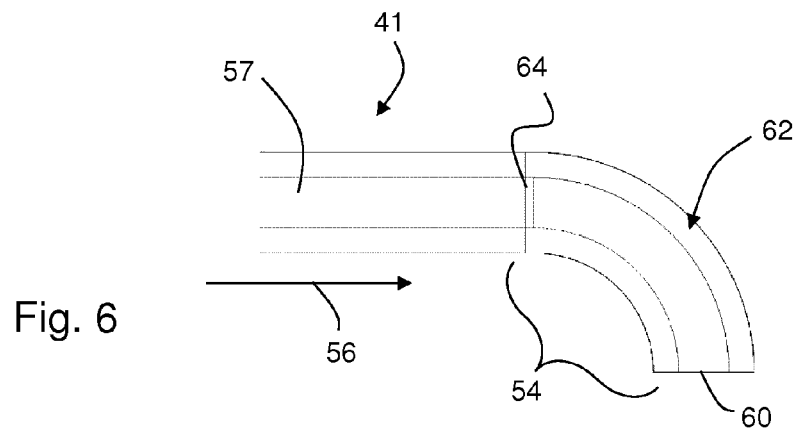


Fig. 10

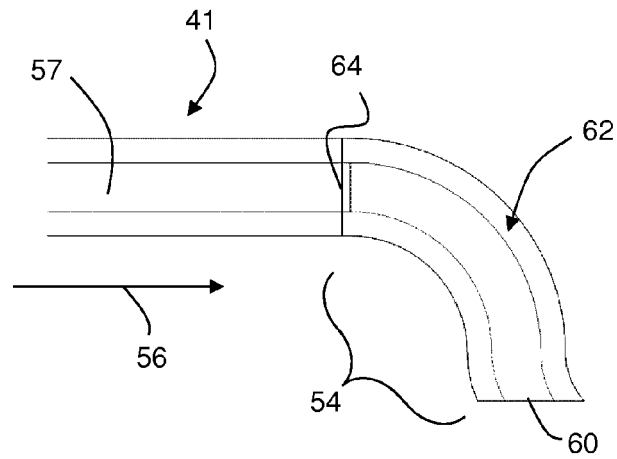


Fig. 11

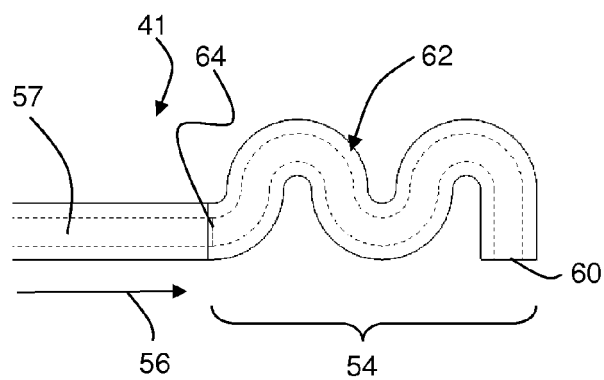


Fig. 12

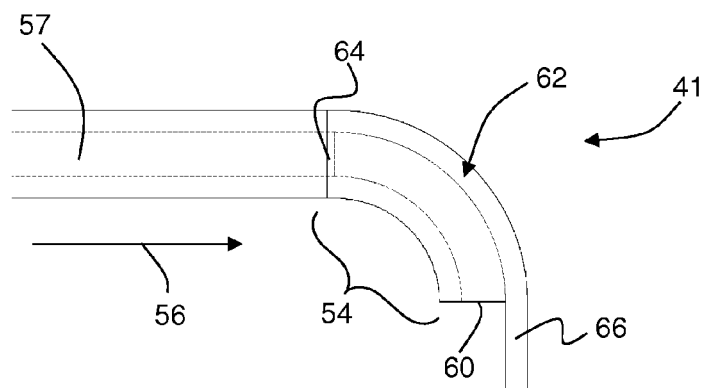
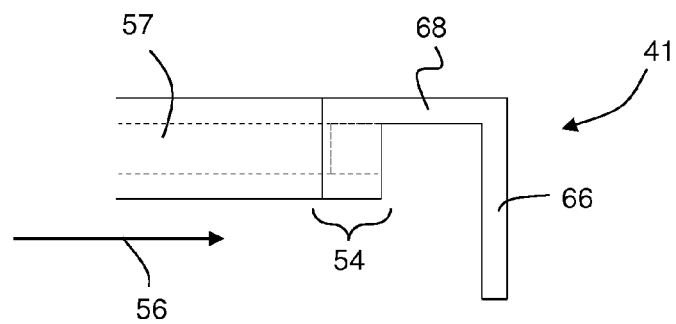


Fig. 13



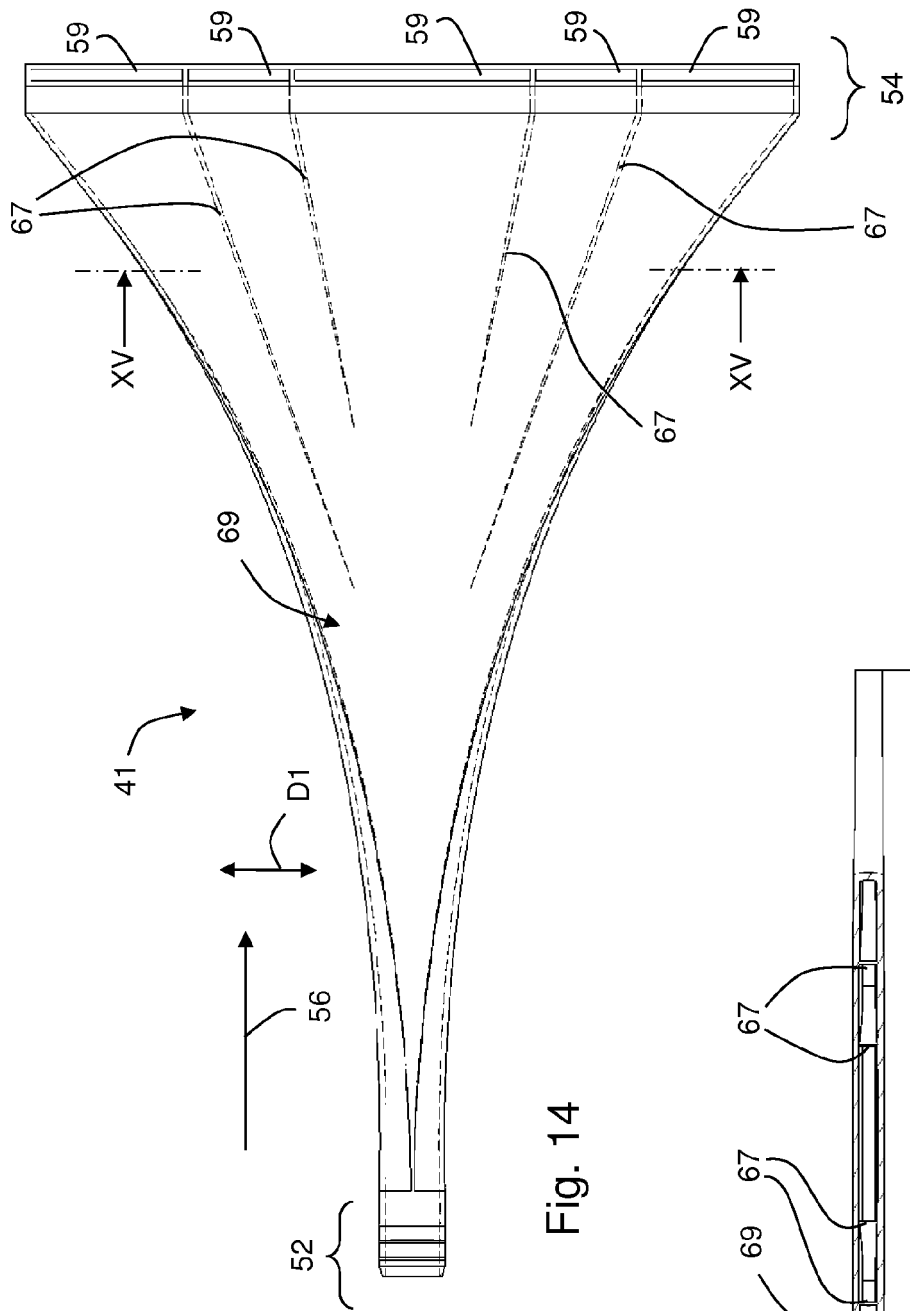


Fig. 14

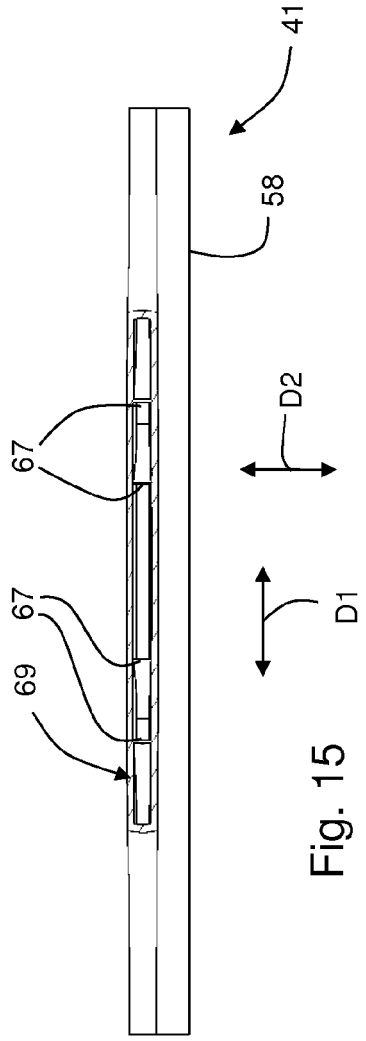
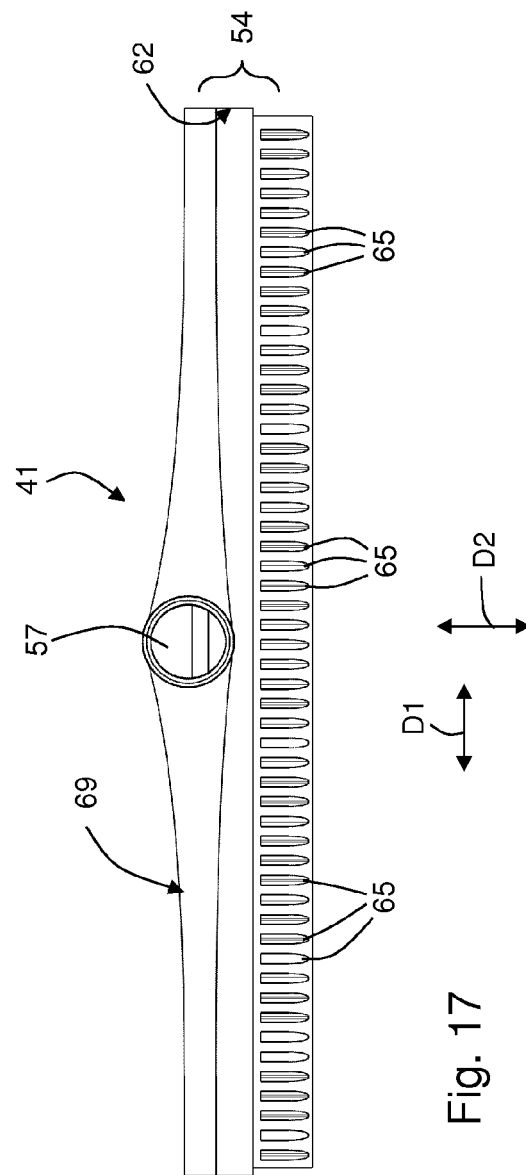
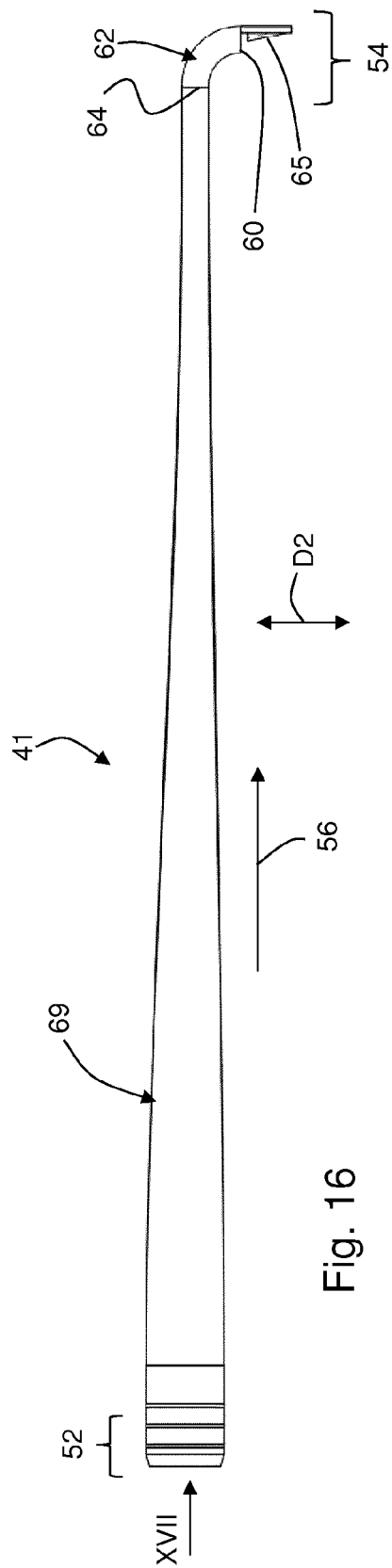


Fig. 15



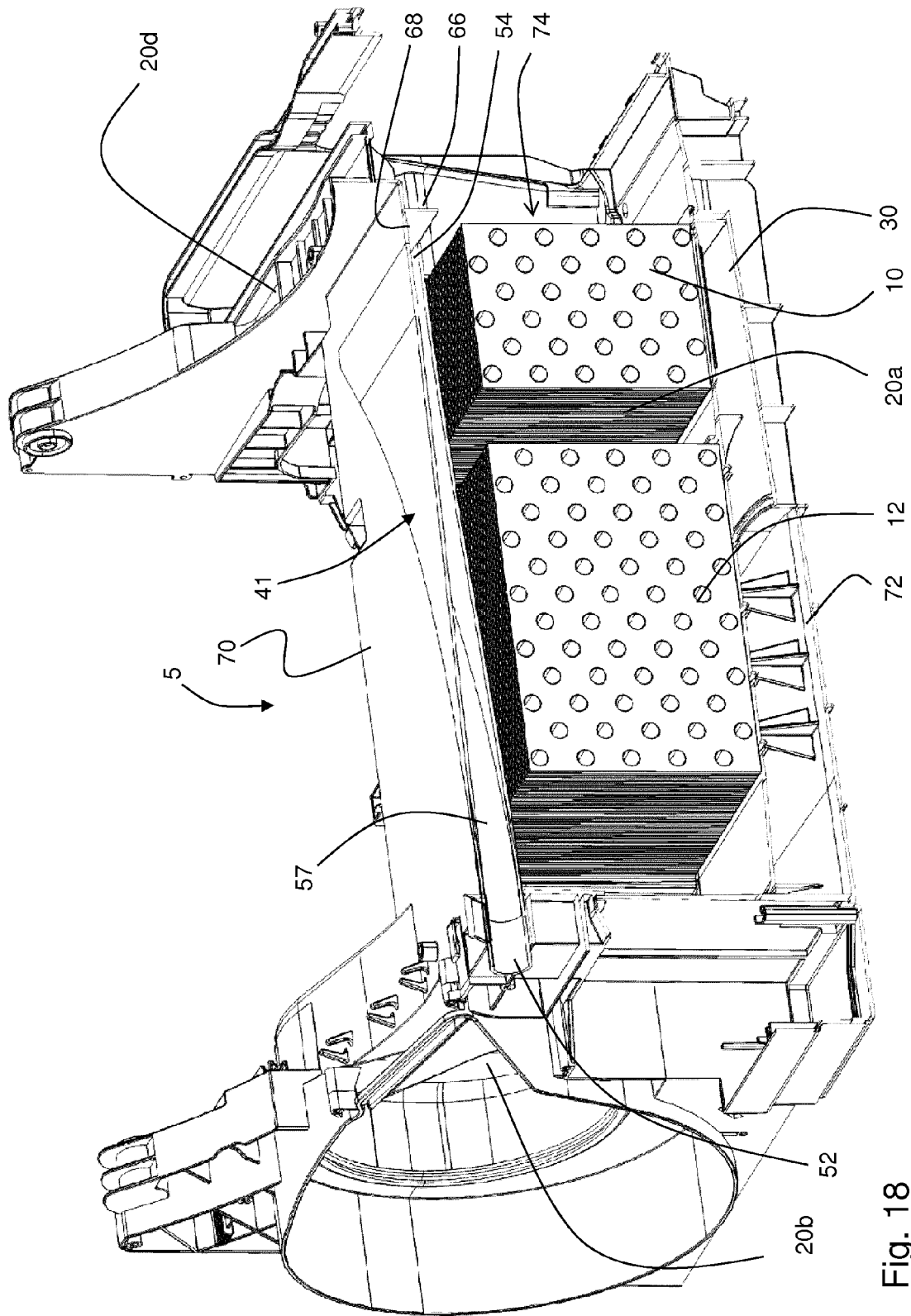
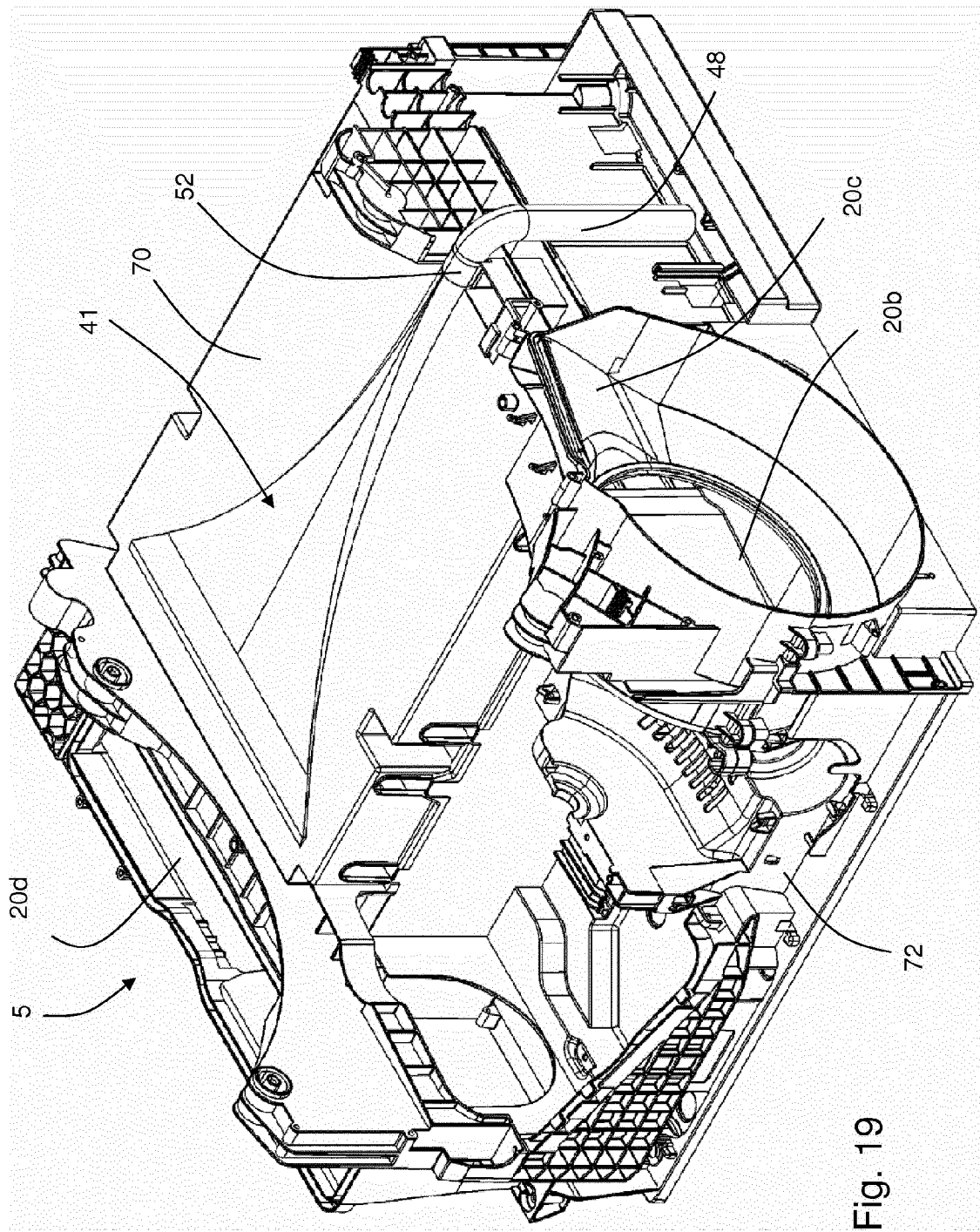


Fig. 18



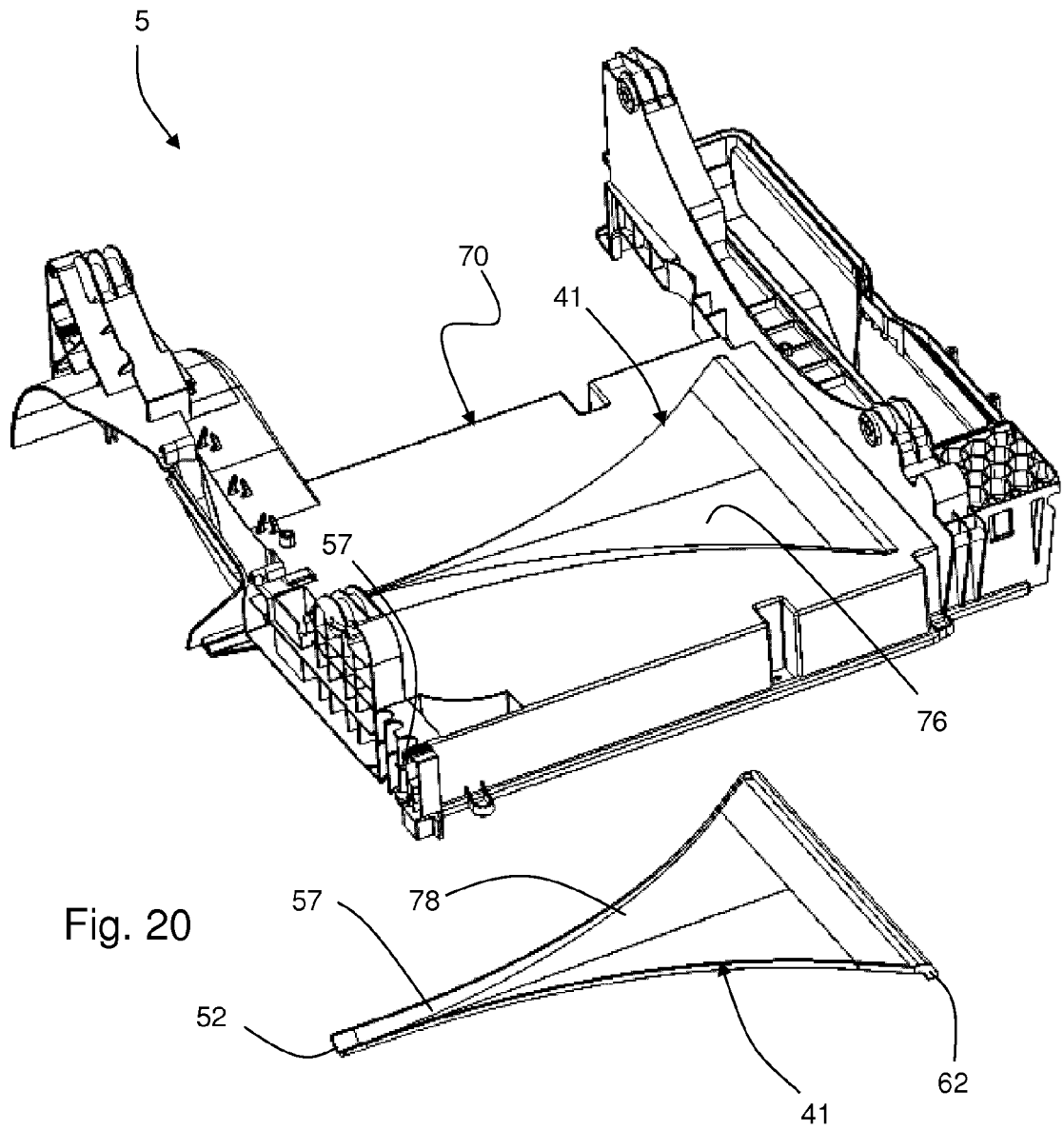
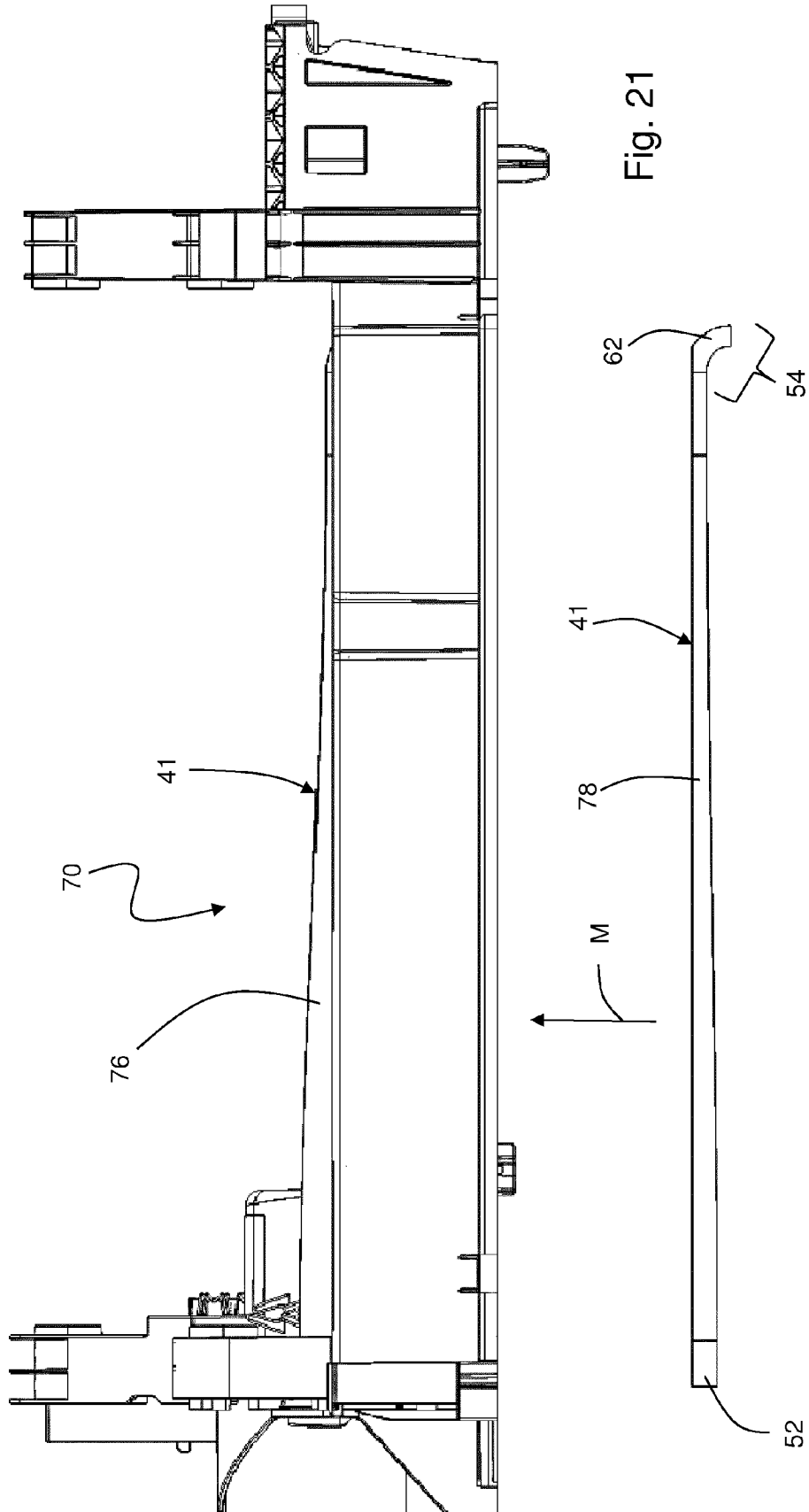
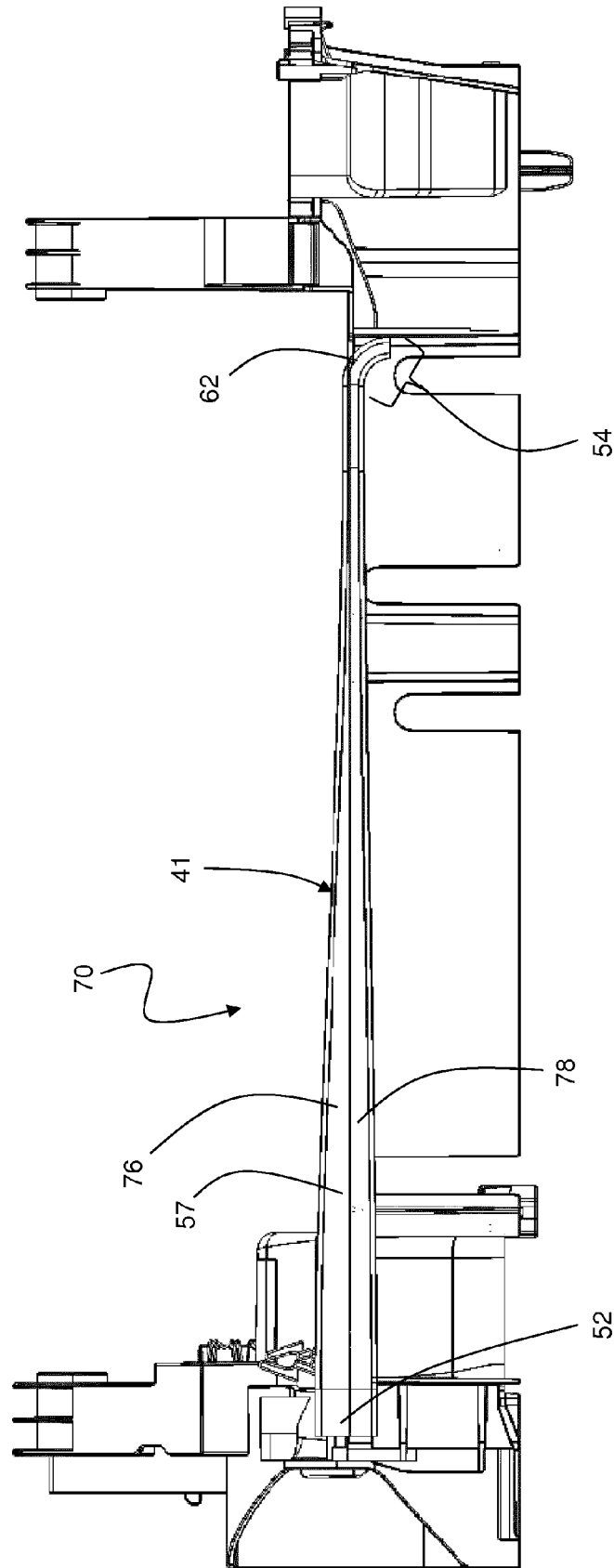
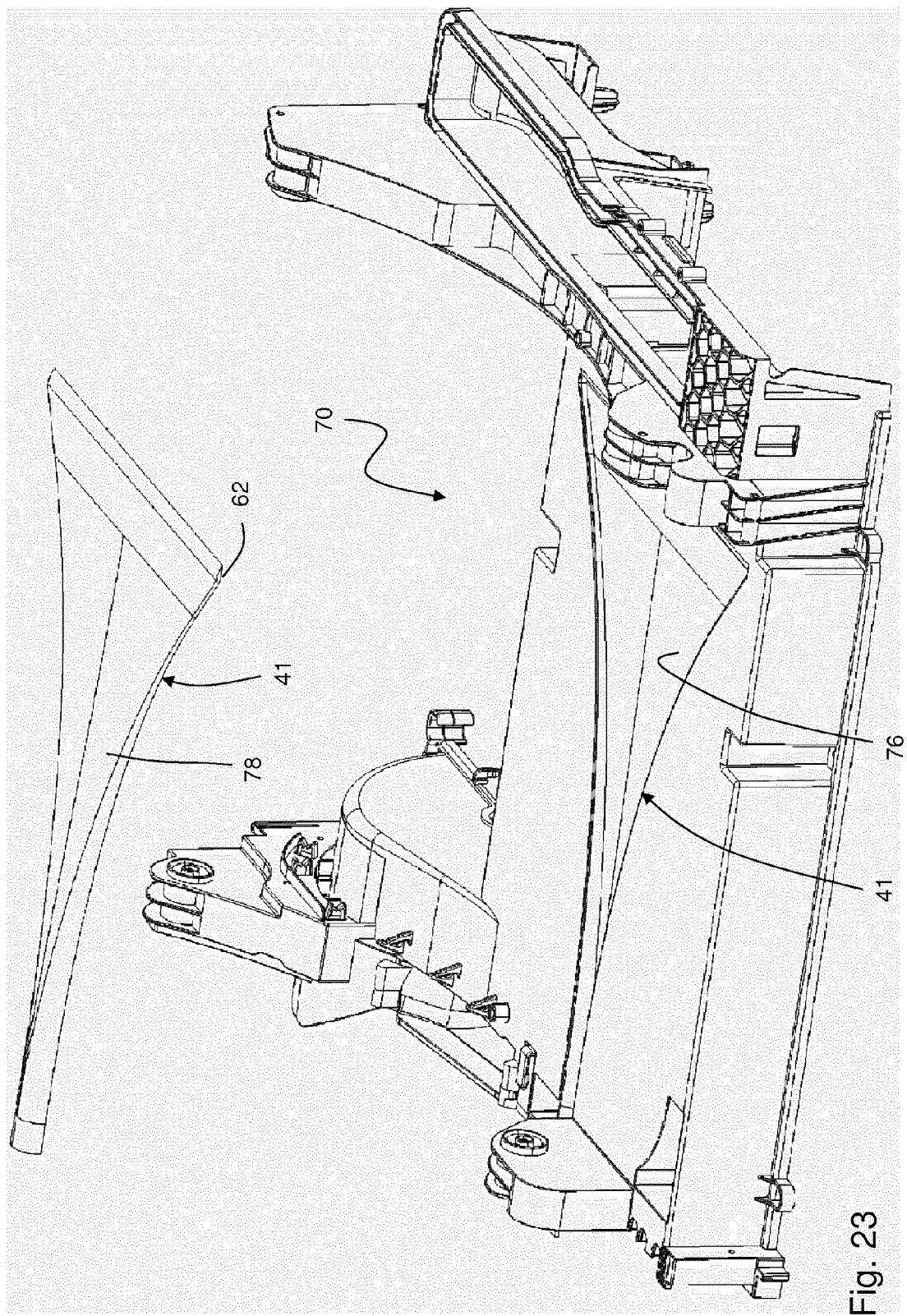


Fig. 20







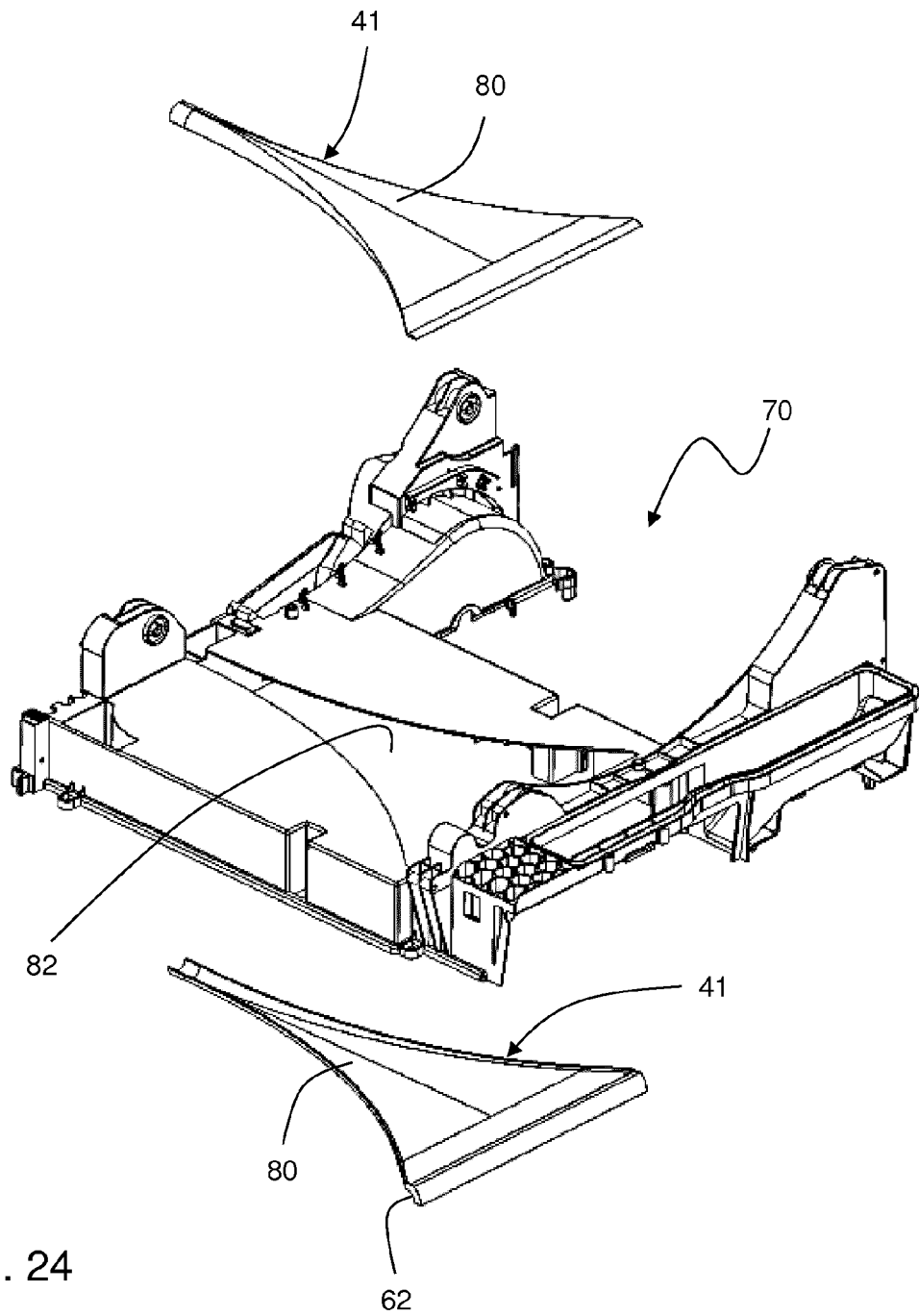


Fig. 24

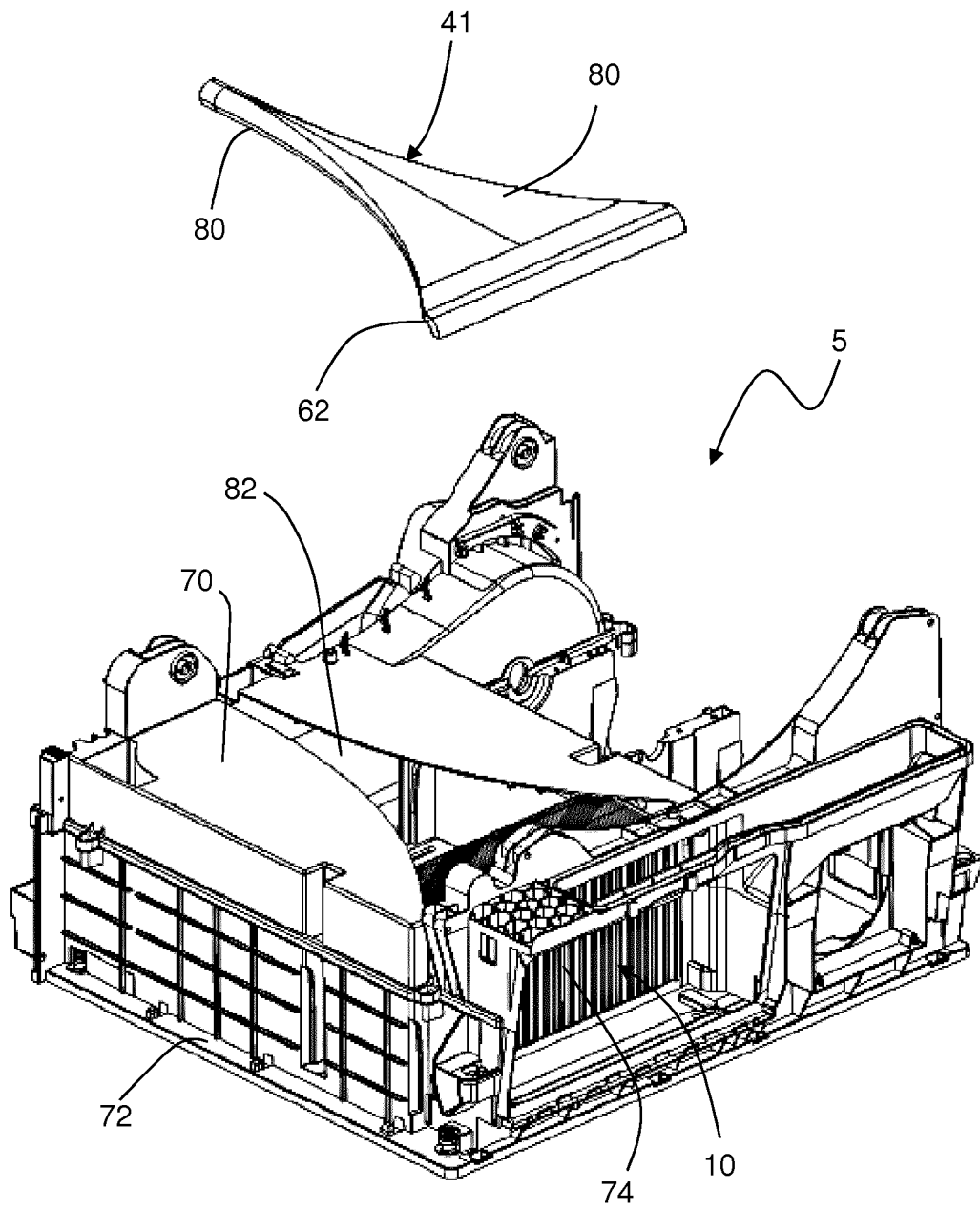


Fig. 25

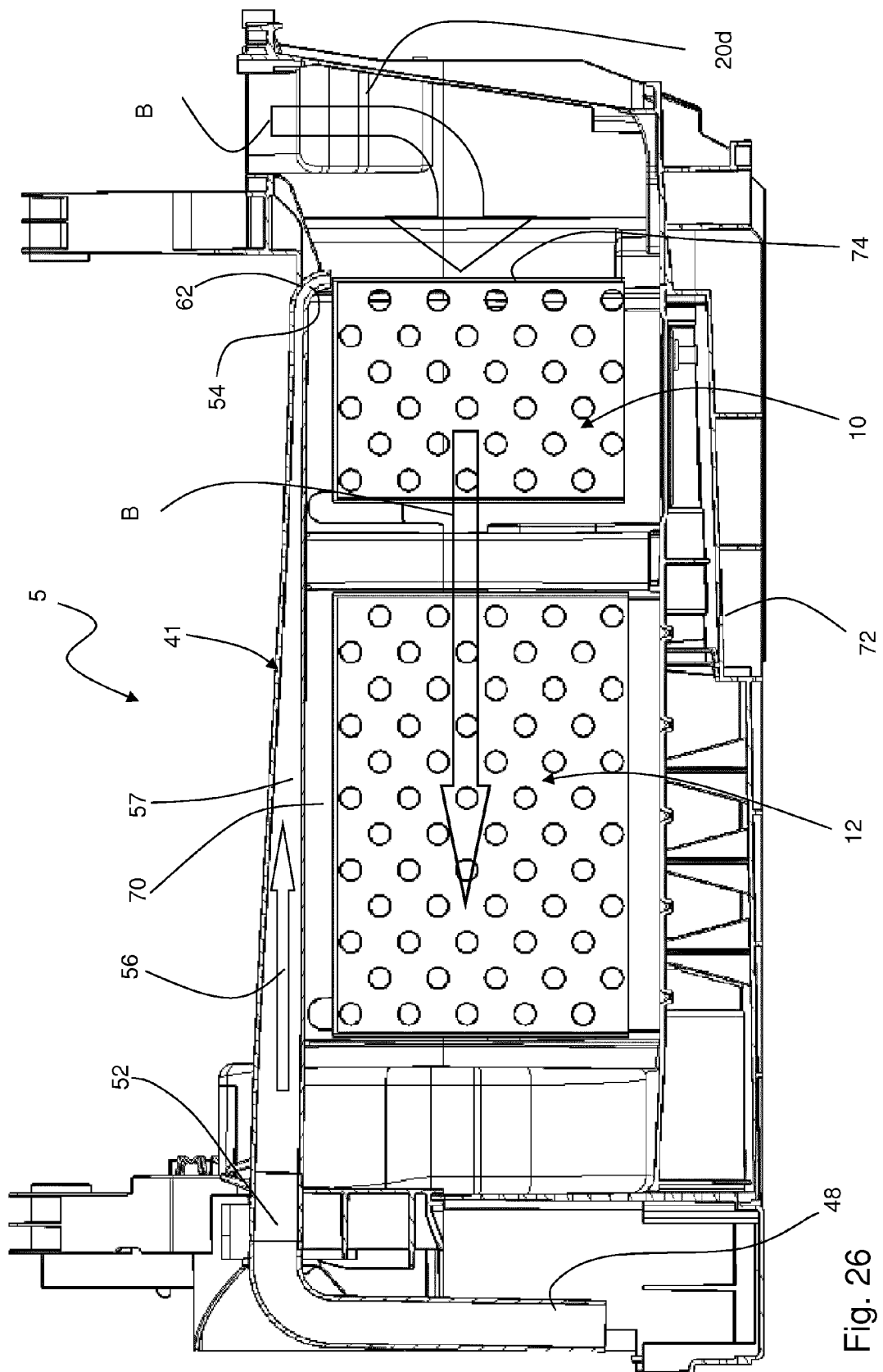


Fig. 26

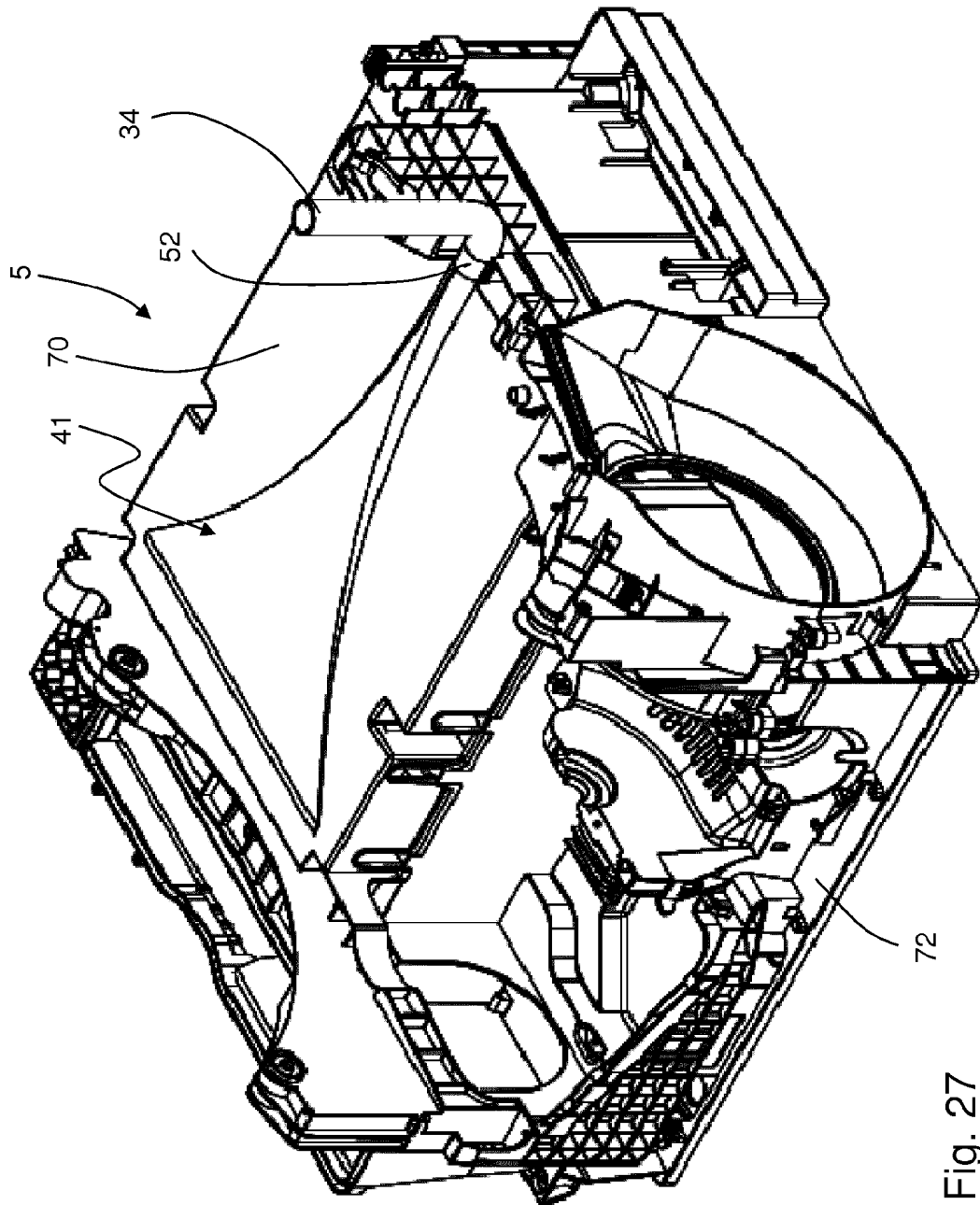


Fig. 27

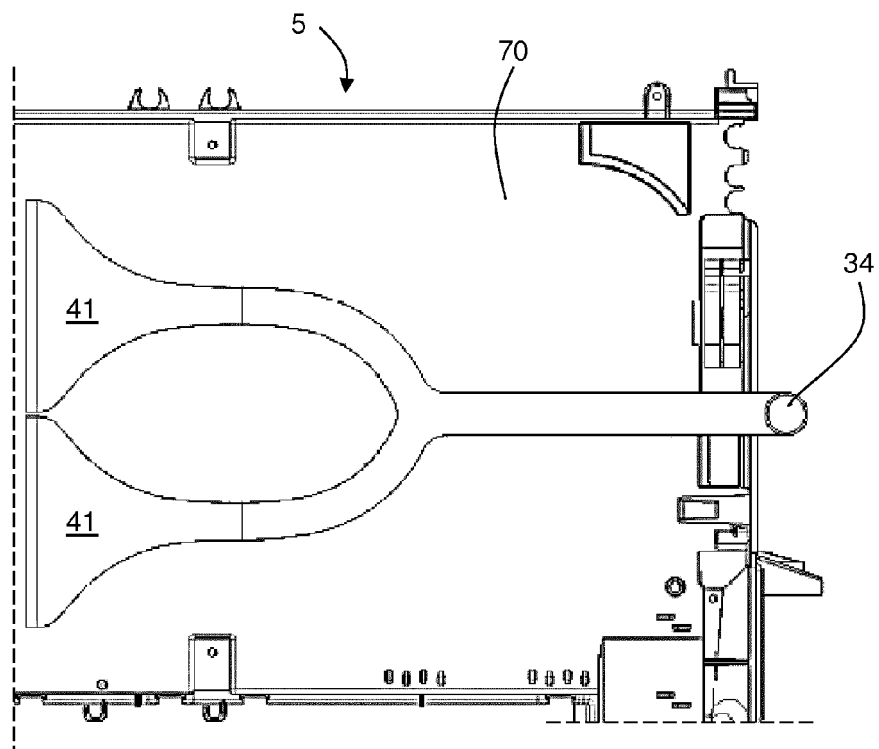


Fig. 28

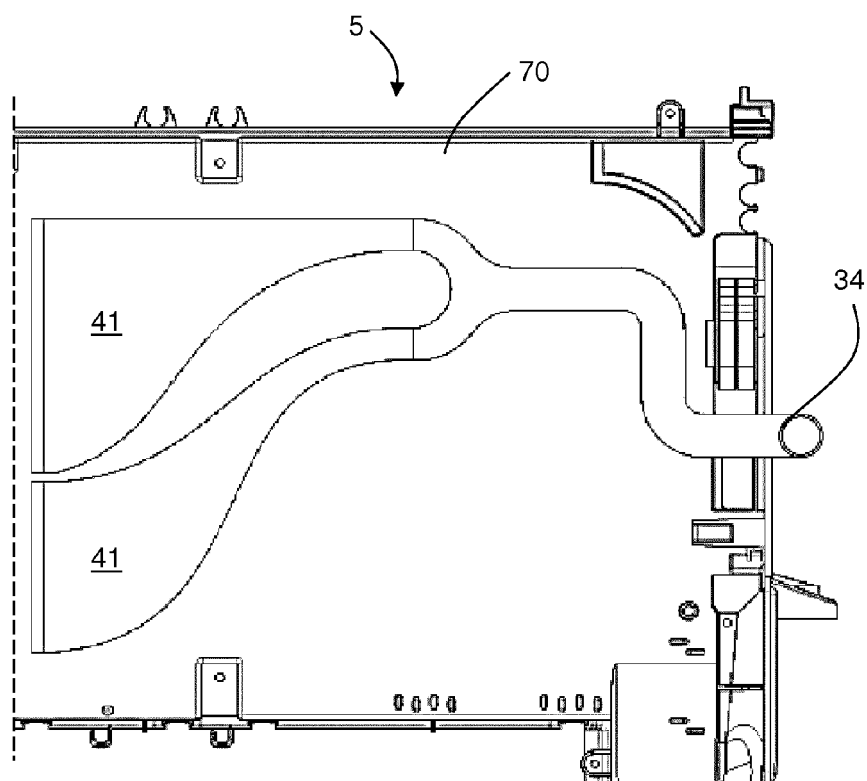


Fig. 29

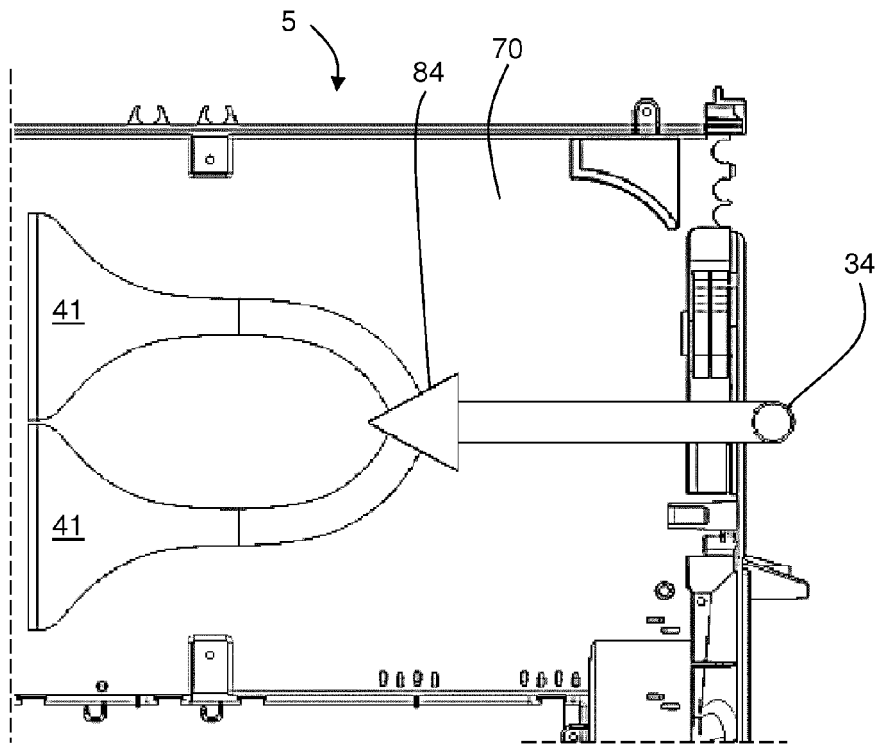


Fig. 30

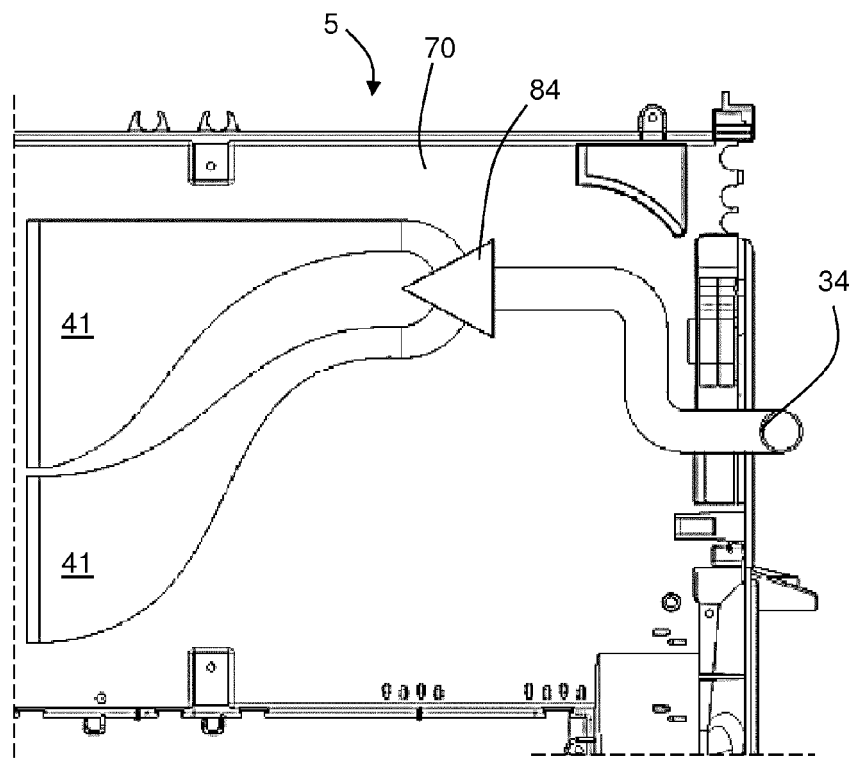


Fig. 31



EUROPEAN SEARCH REPORT

Application Number
EP 12 18 4363

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 10 2009 047155 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 1 June 2011 (2011-06-01)	1	INV. D06F39/08 D06F58/22 D06F58/24
A	* paragraph [0047]; figure 4 *	2-20	
A	DE 10 2009 046683 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 19 May 2011 (2011-05-19)	1-20	
	* paragraphs [0005], [0041]; figures 1-4 *		
A	DE 101 46 641 C1 (MIELE & CIE [DE]) 12 December 2002 (2002-12-12)	1-20	
	* paragraphs [0003] - [0005] *		
	* paragraphs [0011] - [0016] *		
A	EP 0 481 187 A1 (ZANKER GMBH [DE]) 22 April 1992 (1992-04-22)	1	
	* column 2, line 31 - column 3, line 32 *		
	* column 9, line 4 - column 9, line 32 *		
	* figure 2 *		
A	WO 2012/085839 A1 (INDESIT CO SPA [IT]; PAOLINI WILLIAM [IT]; CESARONI ANDREA [IT]; MARCH) 28 June 2012 (2012-06-28)	1	TECHNICAL FIELDS SEARCHED (IPC)
	* abstract; figures 1-12 *		D06F
A	US 2005/223583 A1 (LEE TAE H [KR] ET AL LEE TAE HEE [KR] ET AL) 13 October 2005 (2005-10-13)	1	
	* abstract; figures 1-4 *		
A	EP 1 055 767 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 29 November 2000 (2000-11-29)	1	
	* abstract; figures 1-3 *		
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 8 March 2013	Examiner Weinberg, Ekkehard
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
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 2
EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 12 18 4363

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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08-03-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102009047155 A1	01-06-2011	CN 102666966 A	12-09-2012
		DE 102009047155 A1	01-06-2011
		EP 2504483 A1	03-10-2012
		WO 2011064161 A1	03-06-2011
DE 102009046683 A1	19-05-2011	CN 102753749 A	24-10-2012
		DE 102009046683 A1	19-05-2011
		EP 2521813 A2	14-11-2012
		WO 2011057954 A2	19-05-2011
DE 10146641 C1	12-12-2002	AT 356350 T	15-03-2007
		DE 10146641 C1	12-12-2002
		EP 1297780 A2	02-04-2003
		ES 2280463 T3	16-09-2007
EP 0481187 A1	22-04-1992	DE 4032903 A1	23-04-1992
		EP 0481187 A1	22-04-1992
WO 2012085839 A1	28-06-2012	NONE	
US 2005223583 A1	13-10-2005	JP 2005296630 A	27-10-2005
		KR 20050099283 A	13-10-2005
		US 2005223583 A1	13-10-2005
EP 1055767 A1	29-11-2000	AT 247735 T	15-09-2003
		EP 1055767 A1	29-11-2000

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2009077291 A1 [0002] [0007]