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(54) **Laundry drying domestic appliance having a steam nozzle unit**

(57) The invention relates to a laundry dryer which comprises: a laundry storing compartment (17) for receiving laundry to be treated, a front wall with a front loading opening, a rear frame (72) including a compartment back wall (74), a rear wall (94) forming at least a portion of a back cover (95) of the dryer, a rear channel (20b, 20c) for guiding process air at the backside of the laundry storing compartment (17) to the laundry storing compartment (17), a steam generation unit for generating steam for laundry steam treatment, and a nozzle unit (88) having one or a plurality of nozzle outlets (92) for injecting steam generated in the steam generation unit into the laundry storing compartment (17). The compartment back wall (74) and said rear wall (94) define said rear channel (20b, 20c). The compartment back wall (74) comprises a plurality of back wall openings (84) designed for passing process air from the rear channel (20b, 20c) into the laundry storing compartment (17). The nozzle outlet (92) of the nozzle unit (88) is arranged between said compartment back wall (74) and said rear wall (94) inside said rear channel (20b, 20c) so that steam ejected from the nozzle outlet (92) passes through at least one back wall opening (84) of the compartment back wall (74) before entering the laundry storing compartment (17).

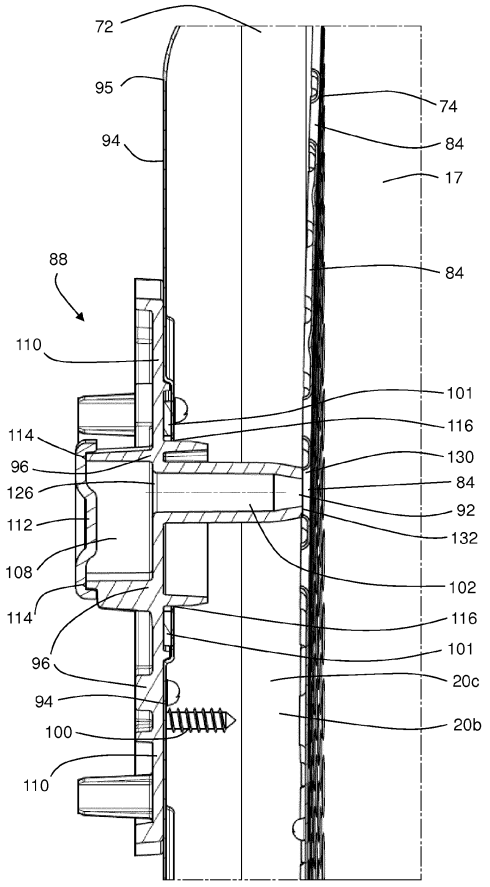

Fig. 7

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Description

[0001] The invention relates to a laundry dryer having a steam generation unit and a nozzle unit for supplying steam into a laundry treatment compartment for steam treatment.

[0002] EP 1 887 127 A1 discloses laundry treating machines having means for applying a steam treatment to laundry. The steam is directed inside a rotatable drum containing the laundry to be treated. Such steam treatment is used for removing odours from laundry or for relaxing and removing wrinkles from clothes.

[0003] WO 2004/059070 A1 teaches a laundry dryer with a laundry storing compartment defined by a cylindrical rotatable drum, a loading opening at the front end of the drum and a drum back wall at the rear end. This laundry dryer contains a processing unit having an evaporator for generating steam in order to remove odours from the laundry disposed in the drum. The steam is injected into the laundry storing compartment by an outlet of the process air channel fluidly connected to the laundry storing compartment at its rear end. The processing unit and its evaporator are arranged outside the laundry storing compartment adjacent to the mentioned outlet of the process air channel.

[0004] It is an object of the invention, to provide a laundry dryer in which the steam treatment of laundry is further improved.

[0005] The invention is defined in claim 1. Particular embodiments of the invention are set out in the dependent claims.

[0006] According to claim 1 a laundry dryer comprises a laundry storing compartment for receiving the laundry to be treated. The laundry storing compartment includes a circumferential wall defined by a rotatable drum and a compartment back wall. The dryer also comprises a front wall with a front loading opening for loading laundry into the laundry storing compartment. In this regard, the compartment back wall is arranged opposite to the loading opening. Furthermore, the dryer comprises a rear frame which includes the compartment back wall and it comprises a rear wall forming at least a portion of a back cover of the dryer. A rear channel is arranged for guiding process air at the backside of the laundry storing compartment into this compartment. The rear channel is defined by the compartment back wall and the rear wall and is able to pass process air through the compartment back wall into the laundry storing compartment. For this purpose, the compartment back wall is perforated by a plurality of back wall openings designed for passing said process air. The dryer comprises a steam generation unit (in short 'steamer') for generating steam for laundry steam treatment and a nozzle unit having one or a plurality of nozzle outlets for injecting steam generated in the steam generation unit into the laundry storing compartment.

[0007] In the invention, the nozzle outlet of the nozzle unit is arranged between the compartment back wall and the rear wall inside the rear channel such that steam ejected from the nozzle outlet is passing firstly or substantially through at least one back wall opening of the compartment back wall before entering the laundry storing compartment. Such arrangement of the nozzle outlet(s) permits a nozzle unit design without any functional portion extending into the laundry storing compartment. This design avoids any potential direct contact between the laundry in the laundry storing compartment and parts of the nozzle unit. Particularly, any direct contact between the laundry in the laundry storing compartment and the nozzle outlet(s) of the nozzle unit is avoided and consequently any potential drawbacks of the nozzle unit's performance are avoided (e.g. by laundry fluff at the nozzle outlets).

[0008] The nozzle unit (or at least portions thereof) is arranged at the backside of the compartment back wall. Preferably, the complete construction of the nozzle unit is arranged at the backside of the compartment back wall thus allowing a simple nozzle unit design to achieve the desired arrangement of the nozzle outlet(s) inside the rear channel.

[0009] Preferably, the nozzle unit has only a single nozzle outlet thus supporting a simple and space-saving construction of the nozzle unit and its steam guiding portion.

[0010] The nozzle unit is at least partially arranged preferably at the external side of the dryer cabinet. This arrangement of the nozzle unit supports a space-saving design of the cabinet. Particularly, a nozzle base portion mountable at the rear wall and a nozzle connection portion arranged at the base portion and adapted to connect a steam conduit between the steam generation unit and the nozzle unit are arranged at the external side of the dryer cabinet.

[0011] With regard to the feature "rear" it is noted that the rear side is the side opposite to the front of the dryer when the dryer is in operation orientation or position. In this regard, the front side is the side seen when standing in front of the dryer and looking towards the back side.

[0012] As already mentioned, the rear wall is forming a back cover of the dryer cabinet. The dryer cabinet is formed by sidewalls (left and right), a front wall, a rear wall and a top cover of the dryer.

[0013] The steam generating unit may be any steam generating unit, like a boiler-type steam generator or preferably a flow-through steam generator that transforms the supplied liquid into steam with a rate corresponding to the liquid supply rate. The steam generator is preferably arranged in the cabinet of the dryer, more preferably is arranged at a lower region of the dryer, e.g. below the laundry storing compartment and/or at a basement cover shell - for example of a heat pump system dryer.

[0014] The dryer may be any type of dryer, like an exhaust type dryer that exhausts the drying air to the outside of the dryer body after the process air has passed the laundry storing compartment. Preferably the dryer is a condenser type in which the processing air is (substantially or the most time) circulated in a closed loop and the

humidity from the laundry is condensed at a process air heat exchanger or condenser and collected in at least one condensate collection tank. The condenser type dryer may use ambient or outside air for heat exchanging or may use a heat pump system.

[0015] In an embodiment, the compartment back wall is stationary and the rotatable drum of the laundry storing compartment is rotatably coupled to the stationary compartment back wall.

[0016] Preferably, the rear wall forming the back cover of the dryer comprises a nozzle port into which a portion of the nozzle unit is inserted. Preferably the substantial portion of the nozzle unit is arranged outside the dryer cabinet and from there one or more steam guiding portions are passed through the nozzle port. In this regard, the nozzle unit comprises a connection portion and/or a base portion which is/are protruding from the rear wall or is/are extending at the backside of the rear wall. Particularly, the base portion and/or connection portion (connecting a steam conduit running from the steam generation unit to the nozzle unit) is/are arranged at or mounted on the rear side of the rear wall. This arrangement or mounting is preferably outside the cabinet of the dryer, whereat the back cover is considered the rear part of the cabinet.

[0017] Regarding the mounting of the nozzle unit the nozzle outlet(s) and other nozzle parts, e.g. steam guiding portion(s), are preferably mounted exclusively by mounting the nozzle base portion thus reducing mounting efforts and mounting time.

[0018] In another embodiment, a steam conduit is provided to fluidly connect the nozzle unit to the steam generation unit, wherein the steam conduit from the steam generation unit is passing through a conduit port formed in the rear wall which forms at least portion of the back cover of the dryer. This passing occurs such that a portion of the steam conduit extends from the conduit port to the connection portion of the nozzle unit. This specific course and guiding of the steam conduit allows arranging and guiding a steam conduit portion external to the dryer cabinet, i.e. outside the cabinet of the dryer or at the backside of the rear wall. Such an arrangement of the steam conduit portion facilitates additionally the mounting efforts and servicing regarding the fluid gateway between the connection portion of the nozzle unit and the steam conduit portion.

[0019] Preferably, the provided single nozzle outlet or the plurality of nozzle outlets each is associated to a predefined one of the plurality of back wall openings perforating the compartment back wall. In this regard, the single nozzle outlet or each one of the nozzle outlets is designed to direct a steam flow exiting this nozzle outlet directly to its associated back wall opening or through its associated back wall opening. Preferably, at least one, some or all of the back wall openings associated or assigned to a single nozzle outlet respectively, are already provided at the compartment back wall and thereby designed as air openings for passing air from the rear channel into the laundry storing compartment. Thus, a standard dryer design can be used for a machine model containing steam supply without any modification in the design of the compartment back wall. If the nozzle unit or the respective nozzle outlet is not provided, process air passes through the back wall opening during drying operation. The predefined association of nozzle outlets to air openings in the compartment back wall respectively makes a clear allocation (or also 'association'): at least one air opening is allocated to steam injection into the laundry storing compartment and the other air openings are allocated to the process air passing into the laundry storing compartment. This allocation supports an efficient performance of the dryer when the process air flow and the steam injection are operating at the same time.

[0020] Preferably, the aforementioned allocation is improved by abutting the at least one nozzle outlet against a rear side region at the associated back wall opening or against the rim of the respective associated wall opening.

[0021] Particularly, said abutting occurs such that a sealing is formed between the nozzle outlet(s) and the compartment back wall. Alternatively or additionally, a front surface portion of the nozzle outlet or the nozzle outlets is formed such that it is mating (e.g. like a negative relief) to a rear surface portion or rim surface portion of the respective associated back wall opening of the compartment back wall. Thus, steam cannot escape from the nozzle outlet into the rear channel and/or process air guided in the rear channel does not pass between the nozzle outlet and the associated back wall opening into the laundry storing compartment.

[0022] In an embodiment, a chamber outlet of the or a base portion of the nozzle unit, each of the chamber outlets or at least a portion of the chamber outlets has an associated steam guiding portion for guiding the steam from the nozzle unit base portion to the nozzle outlet. In this regard, the steam guiding portion or at least a portion of the steam guiding portion is formed such that it is extending or passing from the back region of the rear channel or from the rear side of the rear wall through the rear channel to the nozzle outlet. In case of a plurality or multiple nozzle outlets the nozzle unit base portion may include a separation chamber or at least a manifold. Thus, a defined distribution of the steam is possible.

[0023] In a preferred embodiment, the steam generation unit is arranged in a bottom section or a base section of the dryer. These sections having already existing hollow spaces can receive the steam generation unit without any additional space request. In particular, the steam generation unit is arranged below the laundry storing compartment and/or on an upper shell of the base section.

[0024] Preferably, the steam conduit is the only conduit connected to the nozzle unit at the backside of the rear wall. This keeps conduit guidance between the nozzle unit and the steam generation unit very simple and supports an easy servicing of these parts. Alternatively or additionally, the steam conduit is designed to supply

steam from the steam generation unit to the nozzle unit and simultaneously to drain condensed liquid from the nozzle unit to the steam generation unit. This means that two separate conduits (one conduit for steam and another conduit for condensed liquid) are avoided. Rather, the steam conduit has a double function (supplying steam and draining condensed liquid).

[0025] In another preferred embodiment, the nozzle unit comprises a separation chamber designed for separating steam and water (condensed steam). This chamber has a steam inlet in fluid connection with the steam generation unit and one or more chamber outlets in fluid connection with the one or more nozzle outlets. Preferably, the separation chamber is integrated space-saving within the base portion of the nozzle unit. Particularly, the at least one chamber outlet (also denotable as steam outlet) providing the steam to the respective nozzle outlet (s) is arranged at an upper or top section of the separation chamber. Thus, the natural rising of the steam can be used for a simple steam guiding within the nozzle unit.

[0026] Preferably, a flow axis direction of the steam inlet and a flow axis direction of a steam guiding portion providing the steam from the separation chamber to the nozzle outlet are inclined to each other or are perpendicular to each other. Such inclined or perpendicular arrangement may alternatively occur between the flow axis directions of the steam inlet and several steam guiding portions providing the steam from the separation chamber to the respective nozzle outlets. Said inclined or perpendicular arrangement of flow axis allows an efficient assistance in separating steam and water.

[0027] Preferably, the steam inlet is arranged at a lower or bottom section of the separation chamber and the conduit fluidly connecting the steam generation unit and the separation chamber is designed or formed as a draining conduit for draining water from the separation chamber towards the steam generation unit. For this purpose, the conduit is arranged at the dryer usually as a rising conduit with respect to the steam flow, particularly as a monotonically or constant rising conduit. The rising of conduit's design provides simultaneously a descending conduit (down pipe) with respect to the draining water.

[0028] In an embodiment, the nozzle unit comprises a or the connection portion or a conduit stub for facilitating mounting the steam conduit thereto. Preferably this connection portion or conduit stub has a fluid axis or flow axis oriented parallel or substantially parallel to the back side surface of the rear wall. Thus, the connected steam conduit is able to run parallel to the compartment back wall and/or the rear wall surface. This allows a space-saving arrangement of parts at the backside of the rear wall by using reduced depth dimension.

[0029] In another embodiment, the base portion of the nozzle unit comprises a mounting socket for mounting the nozzle unit on or at the backside of the rear wall. This mounting socket is preferably provided by a flange of the nozzle unit's base portion.

[0030] Preferably, a sealing element is arranged between the backside of the rear wall and the base portion and/or the mounting socket of the nozzle unit. This arrangement of a sealing element offers an efficient sealing against potential escape of process air out of the rear channel.

[0031] In an embodiment, a chamber or the separation chamber of the nozzle unit is formed of two or more chamber forming parts, wherein these parts are integrally fixed or connected, joined or bonded to each other. Preferably these parts are welded (e.g. ultrasonic-welding) together. For example, a cover portion is welded to the base portion or the separation chamber in order to close this base portion or separation chamber. A non-removable connection of these parts to each other may be such that these parts can be separated only by destruction. The chamber forming parts can be made of any plastic material.

[0032] Preferably, the/a separation chamber or the/a connection portion of the nozzle unit is mounted at the backside of the rear wall and the nozzle unit comprises at least one steam guiding portion each having an extension which passes through a or the nozzle port formed in the rear wall.

[0033] In a preferred embodiment, the at least one steam guiding portion has a span extending or substantially extending along the depth of the rear channel between the rear wall and the backside of the compartment back wall. This assists in avoiding any direct contact between the laundry in the laundry storing compartment and parts of the nozzle unit. Furthermore, steam guiding portion's extension along the complete depth of the rear channel allows a direct fluid connection between a nozzle outlet or several nozzle outlets and the compartment back wall. This design avoids potential loss of the steam performance by a steam portion flowing potentially into the rear channel (where it may condense) instead of guiding the steam straight into the laundry storing compartment.

[0034] In order to achieve a stable nozzle unit construction, at least two (e.g. two or three or more) elements or parts of the nozzle unit are formed preferably as a single-piece or monolithic piece or single-molded part. In particular, said at least two elements are selected from the following listing of elements:

- a separation chamber or a portion of this separation chamber for separating the supplied steam and water,
- the one or more nozzle outlets,
- one or more steam guiding portions fluidly connecting a base portion or separation chamber of the nozzle unit to a respective one of the one or more nozzle outlets,
- a connection portion for fluidly connecting a steam conduit to the nozzle unit, and
- a mounting socket of the nozzle unit for mounting the nozzle unit.

[0035] The aforementioned single-piece or monolithic piece or single-molded design of at least two parts of the nozzle unit allows a simple mounting of the whole nozzle unit. Particularly, the whole nozzle unit is provided as a single-piece at the backside of the dryer (e.g. at the rear wall or at the rear channel) thus permitting a simple mounting from the backside at the assembly line and easy servicing. The nozzle unit is provided preferably as an injection molded part. Alternatively, at least two of the listed elements can be provided each as injection molded parts which are joined or bonded together (e.g. by ultrasonic welding or by gluing) such that the joined or bonded parts are inseparable without destroying the provided single-piece. Or the initially two or more separate parts of the nozzle unit are connected together (e.g. by welding or gluing) such that thereafter these form together a single or monolithic piece. This offers a good protection against unaware damaging any parts of the nozzle unit.

[0036] Furthermore, independent from the specific method of joining or bonding some or all parts of the nozzle unit the joined or bonded parts support water and steam proof surfaces of the nozzle unit thus ensuring constant steam performance of the nozzle unit.

[0037] Preferably, the nozzle unit is mounted as a single-piece element at the backside of the dryer cabinet or at the backside of the rear wall and is extending from the backside through a or the nozzle port into the rear channel where the one or the plurality of nozzle outlets is arranged.

[0038] In an embodiment, a cross section area of the one or more nozzle outlets corresponds to the cross section area of the associated back wall opening. Preferably, the ratio of said area of the nozzle outlet and said area of the associated wall opening is one of the following ranges: 0.6 to 0.8, 0.7 to 0.9, 0.8 to 1, 0.9 to 1.1, 1 to 1.3 or 1.1 to 1.5. This allows an aligning or central aligning between the nozzle outlet's cross section area and the associated wall opening's cross section area and consequently supports a steam guiding directly into the laundry storing compartment.

[0039] Preferably the one or more nozzle outlets are assigned to respective back wall openings which are arranged according to at least one of the following positions: above a horizontal plane running through the center (axis) of the laundry storing compartment, below a horizontal plane running through the highest point of the laundry storing compartment, and in a range of the upper third, upper fourth or upper fifth between the horizontal planes running through the center and the highest point of the laundry storing compartment. This positioning of the back wall openings allows steam supply into the laundry storing compartment in a region where the laundry is passing or is passing close to during tumbling and being spaced of the top of the compartment. Consequently, this positioning offers an improved steam distribution in the laundry storing compartment and over different passing pieces of laundry.

[0040] In further embodiments the laundry dryer is a condensation type dryer or a heat pump type dryer. In this regard, the rear channel is a portion of the closed loop drying air circuit. Independent from the specific dryer type a detangling body may be provided which is designed to provide a detangling function or to reduce tangling of the laundry stored in the laundry storing compartment during rotation of the drum. This detangling body is projecting from the compartment back wall and extending into the laundry storing compartment. Preferably, it is cone-shaped extending with its tapered end into the laundry storing compartment.

[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 dryer,

Fig. 2 a perspective view of the condenser dryer of Fig. 1 - partially disassembled,

Fig. 3 the front view of the dryer of Fig. 2,

Fig. 4 another perspective view of the dryer of Fig. 1 - partially disassembled,

Fig. 5 a front view of the rear frame and parts of a base section of the dryer of Fig. 1,

Fig. 6 an enlarged view of the detail VI in Fig. 5,

Fig. 7 the sectional view of the compartment back wall, nozzle unit and rear wall along line VII-VII in Fig. 6,

Fig. 8 a perspective view of the nozzle unit,

Fig. 9 a rear view of the nozzle unit of Fig. 8,

Fig. 10 the sectional view of the nozzle unit along line X-X in Fig. 9,

Fig. 11 an enlarged view of the detail XI in Fig. 10,

Fig. 12 a rear view of the rear frame with mounted nozzle unit and steam conduit,

Fig. 13 the sectional view of the rear frame along line XIII-XIII in Fig. 12,

Fig. 14 an enlarged view of the detail XIV in Fig. 13,

Fig. 15 a perspective view of the backside of the rear frame with mounted nozzle unit and steam conduit connected to the nozzle unit and the steam generation unit,

Fig. 16 a perspective view of the front side of the rear frame according to Fig. 15,

Fig. 17 a front view of the rear frame of Fig. 12,

Fig. 18 a perspective view of a front frame, a rear frame and in between a piping with a branching element for branching up a pump unit conduit of a condensation-type laundry dryer,

Fig. 19 another perspective view of the dryer of Fig. 18,

Fig. 20 a perspective view of the course of the piping of Fig. 18 between a pump unit, a steamer tank and a drain tank,

Fig. 21 an enlarged view of the detail XXI in Fig. 18,

Fig. 22 a side view of the branching element shown in Fig. 21,

Fig. 23 a sectional side view of the branching element of Fig. 22,

Fig. 24 the branching element of Fig. 23 in a closed position,

Fig. 25 the branching element of Fig. 23 in an open position,

Fig. 26 a perspective view of another model of dryer - in the assembled state,

Fig. 27 the perspective view of the dryer of Fig. 26 - with disassembled left cover,

Fig. 28 a perspective view of a dryer's base section carrying a steam generation unit and showing the steamer tank, the drain tank and the piping,

Fig. 29 a front view to the left front of the dryer parts of Fig. 28,

Fig. 30 a perspective view according to Fig. 28, without the base section,

Fig. 31 a front view to the left front of the dryer parts of Fig. 30,

Fig. 32 a perspective view of the piping between the drain pump, the steamer tank and the drain tank,

Fig. 33 the piping according to Fig. 32 in a disassembled state,

Fig. 34 a front view of an enlarged detail of a piping part according to Fig. 33 comprising the branching element,

Fig. 35 the sectional view of the branching element along line XXXV-XXXV in Fig. 34,

Fig. 36 a side view of the piping part according to Fig. 33 comprising the branching element, and

Fig. 37 the sectional view of the branching element along line XXXVII-XXXVII in Fig. 36.

[0042] The following figures are not drawn to scale and are provided for illustrative purposes.

[0043] Fig. 1 shows a schematically depicted laundry dryer 2. The dryer 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 4 forms the refrigerant loop 6 through which the refrigerant is circulated by the compressor 14 as indicated by arrow B.

[0044] The process air flow A within the dryer 2 is guided through a laundry storing compartment 17 of the dryer 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 53 of the drum 18) 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 dryer 2. The condensate formed at the first heat exchanger 10 is collected and guided to the condensate collector 30.

[0045] The condensate collector 30 is connected via a drain conduit 46, a drain pump 36 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 which is arranged at an upper portion of the dryer 2 from where it can be comfortably withdrawn and emptied by a user.

[0046] The dryer 2 comprises a control unit 51 for controlling and monitoring the overall operation of the dryer 2. For example and as shown in Fig. 1, the control unit

51 receives a temperature signal from a temperature sensor 41 which is arranged at the outlet of the second heat exchanger 12 (condenser) and which is indicative of the refrigerant temperature at this position. According to Fig. 1, the control unit 51 also controls the drain pump 36. Additionally, the control unit 51 is able to control other parts of the dryer 2.

[0047] Fig. 2 shows a front perspective view of a partially disassembled condenser dryer that uses a heat pump system 4. In the shown state the loading door of the dryer 2, the right cover, the lower shell of a bottom unit and a bottom panel are removed. The outer appearance of the depicted dryer 2 is defined by a top cover 56, a left cover or wall 58, a front cover 60 having a loading opening 10 and a front top panel 62. The front top panel 62 frames a drawer cover 64 of the condensate drawer 40, wherein here the drawer 40 has a condensate container that is completely pushed in a drawer compartment located at the upper part of the dryer 2. The right portion of the front top panel 62 forms an input section 66 wherein here the details of the input section 66 are not shown (like indicators, a display, switches and so on).

[0048] The loading opening 54 is surrounded by a loading frame 68 which is formed in the front cover 60. In loading direction behind the bottom section of the loading frame 68 a filter compartment/process air channel 20 is arranged which is adapted to receive the fluff filter 22 and which is formed in a front frame 70. At the back side of the loading opening 54 in the front frame 70 the drum 18 is arranged. In the embodiment shown the drum 18 is a rotating drum cylinder that is extending between the back side of the front frame 70 and the front side of a rear frame 72 (Fig. 4, Fig. 5). The open rear end of cylindrical rotatable drum 18 is closed by a compartment back wall 74 (Fig. 3) which is mounted at the rear frame 72 (Fig. 5). Back wall 74 is preferably provided as a separate element to the rear frame 72, formed for example from a metal plate. The compartment back wall 74 is disposed stationary, whereas the rotatable drum 18 is rotatably coupled to the compartment back wall 74. In the shown embodiment the rotation axis of the drum 18 is horizontal, however, the rotation axis may be inclined with respect to the horizontal axis or may be even vertical with some modifications to the shown embodiment, however without the requirement to modify other groups of the dryer 2.

[0049] Below the condensate drawer 40 and adjacent to the left upper corner of the front cover 60 or left above middle of the loading opening 54, a window panel 76 is inserted into a front cover window opening 78 (Fig. 3, Fig. 4). The window opening 78 and the window panel 76 allow visual inspection into the inside of the dryer outer body to check the liquid level of a liquid reservoir, particularly a steamer (liquid storing) tank 140 (see more detail below).

[0050] As indicated in Fig. 3 showing the dryer of Fig. 2 in front view, the condensate drawer 40 has a draw handle 82 at the drawer cover 64 to be gripped by the user for pushing the condensate drawer 40 in or pulling it out of the condensate drawer compartment 37 that is extending into the interior of the dryer 2 (Fig. 18, Fig. 19). Fig. 3 gives a view onto the compartment back wall 74 which has a plurality of back wall openings 84 through which processing air A enters the laundry storing compartment 17 from the back side or rear side of the drum 18. In the center of the compartment back wall 74 and surrounded by the air back wall openings 84 a cone 86 is arranged which is extending into the laundry storing compartment 17 (preferably with a tapered end) and has in this embodiment laundry detangling function.

[0051] The dryer comprises the following parts described in more detail below: a nozzle unit 88 (Fig. 7 - Fig. 10) and a steam generation unit 90 (in short 'steamer'; see Figs. 15, 16). The nozzle unit 88 has a nozzle outlet 92 for injecting steam generated in the steam generation unit 90 into the laundry storing compartment 17. As can be seen from Fig. 7, the nozzle unit 88 is mounted at a rear wall 94 which is forming at least a portion of a back cover 95 of the dryer 2. The compartment back wall 74 and the rear wall 94 define portion of the rear channel 20b and the rising channel 20c. The compartment back wall 74 comprises a plurality of the back wall openings 84 designed for passing process air from the rear channel 20b, 20c into the laundry storing compartment 17.

[0052] The nozzle unit 88 comprises a base portion 96 mounted at the back side of the rear wall 94. For its mounting the base portion is perforated by mounting holes 96 interacting with mounting screws 98 or the like (Fig. 7, Fig. 8). According to Fig. 7, a steam guiding portion 102 is fluidly connecting the base portion 96 to the nozzle outlet 92. The steam guiding portion 102 is extending from the base portion 96 into the rear channel 20b, 20c such that it spans substantially just the distance between the rear wall 94 and the compartment back wall 74 (i.e. the depth of the rear channel 20b, 20c), whereas the nozzle outlet 92 is in contact with a respective back wall opening 84 at the back side of the compartment back wall 74. The nozzle unit 88 comprises a connection portion 104 which is adapted to connect a steam conduit 106 which fluidly connects the steam generation unit 90 to the nozzle unit 88 (Fig. 10, Fig. 13, Fig. 15).

[0053] The nozzle outlet 92 is arranged at the back side at the compartment back wall 74 in such a manner that steam ejected from the nozzle outlet 92 passes through a respective back wall opening 84 before entering the laundry storing compartment 17 (Fig. 7).

[0054] In the embodiments, several elements of the nozzle unit 88 are formed as a single-piece or monolithic piece or single-molded part. These elements are the base portion 96, a separation chamber 108 contained in the base portion 96 for separating the supplied steam and water, the nozzle outlet 92, the steam guiding portion 102, the connection portion 104 and a substantially plan mounting socket 110 for mounting the nozzle unit 88. The water that is separated in the separation chamber may be formed by condensing the supplied steam - for example in the starting phase of steam supply when the

steam conduit and nozzle unit are at low temperature as compared to the steam temperature. Thus, the whole nozzle unit 88 is mountable only by mounting the mounting socket 110 via the mounting holes 98 and some screws 100. The separation chamber 108 defined by the inner geometry of the base portion 96 is closed by a chamber cover 112. Both parts 96 and 112 are joined together by a welding joint 114 (e.g. ultrasonic welding) such that these parts are integrally fixed and connected to each other in an inseparable monolithic manner. Consequently, the separation chamber 108 is water and steam proof.

[0055] The mounting socket 110 is part of the base section and mounted at the back side of the rear wall 94. In this regard, the rear wall 94 is perforated by a nozzle port 116 thus allowing the steam guiding portion 102 to extend from the base portion 96 through this nozzle port 116 into the rear channel 20b, 20c. To avoid any escape of process air out of the rear channel 20b, 20c in the region of the nozzle port 116, there is provided a flat sealing element 101 clamped between the back side of the rear wall 94 and the mounting socket 110 (Fig. 7, Fig. 10).

[0056] As can be seen from Fig. 15 and Fig. 16, the steam generation unit 90 is arranged in a base section 118 of the dryer 2. The steam conduit 106 is passing through a conduit port 120 contained in a bottom section of the rear frame 72 which is forming a portion of the back cover of the dryer 2 in this embodiment. The extension of the steam conduit 106 is such that a portion 122 of the steam conduit 106 extends at the back side of the rear frame 72 and the rear wall 94 from the conduit port 120 to the connection section 104 of the nozzle unit 88 (Fig. 15). The nozzle unit 88 and the steam conduit 106 are designed such that steam is supplied from the steam generation unit 90 to the nozzle unit 88 and condensed liquid (water) is drained from the nozzle unit 88 to the steam generation unit 90. For this purpose, the separation chamber 108 has a steam inlet 124 in fluid connection towards the steam generation unit 90 and a chamber outlet 126 in fluid connection towards the nozzle outlet 92 (Fig. 10, Fig. 14). The chamber outlet 126 is in fluid communication with the steam guiding portion 102 for guiding the steam from the separation chamber 108 to the nozzle outlet 92. The connection portion 104 comprises a conduit stub 128 for mounting the steam conduit 106, particularly its steam conduit portion 122, thereto (Fig. 9).

[0057] The steam inlet 124 is arranged at a lower section of the separation chamber 108, whereas the chamber outlet 126 is arranged at an upper section of the separation chamber 108. Simultaneously, the steam conduit portion 122 is descending from the connection portion 104 and the steam inlet 124 towards the steam generation unit 90 thus forming a draining conduit for draining water from the separation chamber 108 towards the steam generation unit 90. Thus, separation of steam and condensed water is realized in a natural physical manner without any complex design. In this regard, the flow axis direction of the steam inlet 124 (or the allocated/associated connection portion 104) and the flow axis direction of the steam guiding portion 102 are perpendicular to each other. In other embodiments, these flow axes are inclined to each other in an angle different from 90°.

[0058] The nozzle unit 88 comprises a single nozzle outlet 92 which is associated to one predefined back wall opening 84 (Fig. 7, Fig. 14). In further embodiments, the nozzle unit 88 comprises a plurality of nozzle outlets 92 and each one of these nozzle outlets 92 is assigned to a predefined one of a plurality of back wall openings 84. The nozzle outlet 92 is designed to direct a steam flow exiting this nozzle outlet 92 directly through its associated back wall opening 84 into the laundry storing compartment 17. In this regard, the nozzle outlet 92 abuts with its front surface portion 132 against an opening rim 130 of the respective associated back wall opening 84 such as to form a sealing between the nozzle outlet 92 and the compartment back wall 74. The nozzle outlet 92 is arranged such that its inner cross section area is centrally aligned to the cross section area of the associated wall opening 84.

[0059] According to Fig. 17, a first horizontal plane 134 running through the center of the laundry storing compartment 17 is defined and a second horizontal plane 136 running through the highest point of the laundry storing compartment 17 is defined. The distance between these two planes 134, 136 defines a vertical range 138. Along this range 138, the one nozzle outlet 92 or a plurality of nozzle outlets 92 is assigned to respective back wall openings 84. In other embodiments here not shown the assigned back wall opening(s) 84 is/are arranged in the upper third or in the upper fourth or in the upper fifth of the range 138.

[0060] The condensation-type laundry dryer 2 according to Fig. 18 comprises in principle the elements and parts shown in Fig. 1. In particular, a drain tank (i.e. condensate drawer 40), a steam generation unit 90, a steamer tank 140 for storing liquid to be supplied to the steam generation unit 90 for generating the steam, and a pump unit (i.e. drain pump 36) for pumping the liquid collected in the condensation collection unit (i.e. condensate collector 30) to the drain tank 40 and the steamer tank 140 are provided. Additionally, a branching element 142 is provided. This element 142 is made for branching a pump unit conduit 144 into a steamer tank unit 146 and into a drain tank unit 148 (Fig. 20). The pump unit conduit 144 is connecting the branching element 142 to the pump unit 36. The steamer tank conduit 146 is connecting the branching element 142 to the steamer tank 140. The drain tank conduit is connecting the branching element 142 to the drain tank 40. The conduits 144, 146, 148 form a piping 150 for conveying the condensate to different destinations in the dryer.

[0061] The branching element 142 comprises a backflow-preventing member 152 preventing a backflow of liquid from the steamer tank 140 towards the pump unit

36. The backflow-preventing member 152 shown in Fig. 23 is a one-way valve arranged in the branching element 142. Furthermore, the backflow-preventing member 152 is arranged in the branch 154 of the branching element 142 where the liquid flows towards the steamer tank conduit 146. The member 152 comprises a valve seat 156 at a valve passage 158 and a valve member 160 which is adapted to cooperate with the valve seat 156. The movable valve member 160 is constituted by a ball or sphere and is urged against the valve seat 156 when the pump unit 36 is not activated and subsequently liquid tends to flow back from the line 146 towards the steamer tank 140 towards the branching element 142 and towards the pump unit 36. If this is the case, the valve member 160 and the valve seat 156 cooperate to close the valve passage 158, i.e. the valve member 160 is in a close position (Fig. 24). Then the liquid in the branch between the backflow- preventing member 152 and the upper hydraulic point of the steamer tank conduit 146.

[0062] If the valve member 160 is actuated by liquid pressure exerted by liquid pressurized by the pump unit 36 the valve passage 158 will be opened, i.e. the valve member 160 is in an open position (Fig. 23, Fig. 25). Within the valve passage 158 and opposite to the valve seat 156 there is arranged a stopping element 162 for restricting the opening path of the valve member 160 when the liquid is flowing into the forward direction 164 of the one-way backflow-preventing member 152. In other words, the stopping element 162 is designed to provide a clearance passage 166 for the liquid flow which bypasses the valve member 160 in its open position (Fig. 25). Thus, the backflow-preventing member 152 provides additionally a liquid flow restriction.

[0063] The liquid flow restriction function of the branching element 142 is adapted to reduce the liquid flow into the steamer tank conduit 146 in comparison to the liquid flow into the drain tank conduit 148. Due to the valve member 160 in its open position according to Fig. 25 the flow resistance between the branching element 142 and the steamer tank 140 is higher than the flow resistance of the drain tank conduit 148 between the branching element 142 and the drain tank 40. The valve member 160 and the stopping element 162 a liquid flow restricting element of the branching element 142 by providing a reduced liquid flow cross section towards the steamer tank conduit 146 in comparison to the liquid flow cross section towards the drain tank conduit 148. The liquid flow cross section towards the steamer tank conduit 146 is defined particularly by the clearance passage 166 and an orifice 168 arranged in the axial end region of the branch 154 and having a diameter or cross section area that is less than the inner diameter 170 or cross section area of the branch 154 providing the fluid connection to the drain tank conduit 148.

[0064] In Fig. 20, the branching element 142 is arranged in a region of the base section 118 of the dryer 2 (see also Fig. 18). In further embodiments the branching element 142 is arranged at an upper region 172 of the cabinet of the dryer 2 (Fig. 28 - Fig. 31). In this regard, the branching element 142 is preferably arranged in a height level within the dryer which is at least 3/4 or 4/5 or 5/6 of the total height of the dryer 2. As seen from Fig. 22 - Fig. 25, the branching element 142 is made as a T-junction.

[0065] According to Fig. 20 or Fig. 28, the highest point 174 of the steamer tank conduit 146 has a height level which is lower than the highest point 176 of the drain tank conduit 148. In particular, the height level of the steamer tank conduit 146 is at least 3/4 or 4/5 or 5/6 of the height level of the drain tank conduit 148. In other embodiments, the highest point 174 of the steamer tank conduit 146 has the same height or is even higher than the highest point 176 of the drain tank unit 148.

[0066] Regarding Fig. 28 - Fig. 31, it can be seen that the conduit 146 arranged between the branching element 142 and the steamer tank 140 is designed such that its connection length between the branching element 142 and the steamer tank 140 is minimized with respect to the connection line provided by the conduit 144, 148 between the pump unit 36 and the drain tank 40. Hereby a second piping 184 for supplying the condensate to the steamer tank 140 and removable tank 40 is provided.

[0067] In Fig. 28 and Fig. 29 it can be seen that the steam generation unit 88 is arranged in the region of the base section 118 of the dryer 2. The steam generation unit 88 is supplied with liquid to generate steam in order to convey this steam to the nozzle unit 90, as described above. The liquid is supplied to the steam generation unit from the steamer tank 140 via a connection conduit 178 (Fig. 28 - Fig. 31).

[0068] Fig. 34 - Fig. 37 show a branching element 142 in a second piping 184 having a design different to the design of the piping 150 according to Fig. 20 - Fig. 25. The branching element 142 according to Fig. 34 - Fig. 37 does not have a backflow-preventing function but only a liquid flow reducing function such that a flow resistance between the branching element 142 and the steamer tank 140 is higher than a flow resistance of the drain tank conduit 148 between the branching element 142 and the drain tank 40. This liquid flow reduction towards the steamer tank 140 occurs by a conduit passage 180 in the branch 154 having locally a smaller diameter 182 than the inner diameter 170 in the branching element 142 towards the drain tank conduit 148 and towards the drain pump 36.

[0069] In the above the reason for reducing the flow rate of condensate pumped by the pump unit 36 toward the steamer tank 140 as compared to the higher flow rate pumped towards the condensate drawer 40 (drain tank) is the expectation that only a lower portion of the condensate is needed for steam treatment of the laundry. Thus most part of the condensate formed in a laundry drying cycle will normally not be required for steam treatment. The steamer tank 140 is provided with an overflow conduit 190 shown in Fig. 30 by which excess water that can not be stored by the steamer tank 140 is flowing back

to the condensate collector 30. From there it is pumped upward to tanks 40 and 140 again. By reducing the ratio of the flow rate to steamer tank 140 an excessive activation of the pump 36 can be avoided.

[0070] In both embodiments of above piping 150 or 184, a backflow prevention member (compare 152) and/or a flow restriction element (compare 166 or 170) can be provided at the branching element 142. Alternatively the backflow prevention member can be provided at any position between the branching element and the inlet to the steamer tank 140 of the steamer tank conduit 146.

Reference Numeral List:

[0071]

2	laundry dryer
4	heat pump system
6	refrigerant loop
8	blower
10	first heat exchanger
12	second heat exchanger
14	compressor
16	expansion device
17	laundry storing compartment
18	drum
19	laundry
20	process air channel
20a	battery channel
20b	rear channel
20c	rising channel
20d	front channel
22	fluff element
30	condensate collector
36	drain pump
37	condensate drawer compartment
40	condensate drawer
41	temperature sensor
46	drain conduit
50	drawer pipe
51	control unit
54	loading opening
56	top cover
58	left cover
60	front cover
62	front top panel
64	drawer cover
66	input section
68	loading frame
70	front frame
72	rear frame
74	compartment back wall
76	window panel
78	front cover window opening
82	drawer handle
84	back wall opening
86	detangling cone
88	nozzle unit
90	steam generation unit
92	nozzle outlet
94	rear wall95 back cover
96	base portion
98	mounting hole
100	mounting screw
101	sealing element
102	steam guiding portion
104	connection portion
106	steam conduit
108	separation chamber
110	mounting socket
112	chamber cover
114	welding joint
116	nozzle port
118	base section
120	conduit port
122	steam conduit portion
124	steam inlet
126	chamber outlet
128	conduit stub
130	opening rim
132	front surface portion
134	first horizontal plane
136	second horizontal plane
138	range
140	steamer tank
142	branching element
144	pump unit conduit
146	steamer tank conduit
148	drain tank conduit
150	piping
152	backflow-preventing member
154	branch
156	valve seat
158	valve passage
160	valve member
162	stopping element
164	forward direction
166	clearance passage
168	orifice
170	inner diameter
172	upper region
174	highest point
176	highest point
178	connection conduit
180	conduit passage
182	smaller diameter184 piping
190	overflow conduit
A	process air flow
B	refrigerant flow

Claims

1. Laundry dryer (2) comprising:

   a laundry storing compartment (17) for receiving laundry (19) to be treated and including a circumferential wall defined by a rotatable drum (18) and a compartment back wall (74),
   a front wall (60) with a front loading opening (54) for loading laundry (19) into the laundry storing compartment (17), wherein the compartment back wall (74) is opposite to the loading opening (54),
   a rear frame (72) including said compartment back wall (74),
   a rear wall (94) forming at least a portion of a back cover (95) of the dryer (2),
   a rear channel (20b, 20c) for guiding process air (A) at the backside of the laundry storing compartment (17) to the laundry storing compartment (17),
   a steam generation unit (90) for generating steam for laundry steam treatment, and
   a nozzle unit (88) having one or a plurality of nozzle outlets (92) for injecting steam generated in the steam generation unit (90) into the laundry storing compartment (17),
   wherein said compartment back wall (74) and said rear wall (94) define said rear channel (20b, 20c),
   wherein the compartment back wall (74) comprises a plurality of back wall openings (84) designed for passing process air (A) from the rear channel (20b, 20c) into the laundry storing compartment (17), and
   wherein the nozzle outlet (92) of the nozzle unit (88) is arranged between said compartment back wall (74) and said rear wall (94) inside said rear channel (20b, 20c) so that steam ejected from the nozzle outlet (92) passes through at least one back wall opening (84) of the compartment back wall (74) before entering the laundry storing compartment (17).

2. Laundry dryer according to claim 1, wherein the compartment back wall (74) is stationary and the rotatable drum (18) of the laundry storing compartment (17) is rotatably coupled to the stationary compartment back wall (74).

3. Laundry dryer according to claim 1 or 2, wherein the rear wall (94) forming at least a portion of the back cover (95) of the laundry dryer (2) comprises a nozzle port (116) through which the nozzle unit (88) is arranged and the nozzle unit (88) comprises a connection portion (104) or a base portion (96), wherein the connection portion (104) or the base portion (96) is protruding from the rear wall (94) or is extending at the back side of the rear wall (94).

4. Laundry dryer according to any of the preceding claims, wherein a steam conduit (106) is fluidly connecting the nozzle unit (88) to the steam generation unit (90), wherein the steam conduit (106) from the steam generation unit (90) is passing through a conduit port (120) formed in the rear wall (94) forming at least a portion of the back cover (95) of the laundry dryer (2) so that a portion (122) of the steam conduit (106) extends from the conduit port (120) to the connection portion (104) of the nozzle unit (88).

5. Laundry dryer according to any of the preceding claims, wherein in case of a single nozzle outlet (92) the one nozzle outlet (92) is associated to a predefined one of the back wall openings (84) or wherein in case of a plurality of nozzle outlets (92) each one of the nozzle outlet (92) is assigned to a predefined one of the plurality of back wall openings (84), and wherein the one or each one of the nozzle outlets (92) is designed to direct a steam flow exiting this nozzle outlet (92) directly to its associated back wall opening (84) or through its associated back wall opening (84).

6. Laundry dryer according to any of the preceding claims, wherein the nozzle outlet (92) abuts or the nozzle outlets (92) abut against a rear side region at the associated back wall opening (84) or abuts against the rim (130) of the respective associated back wall opening (84).

7. Laundry dryer according to claim 6,
   wherein the nozzle outlet (92) or the nozzle outlets (92) abut against the respective back wall opening (84) such as to form a sealing between the nozzle outlet (92) and the compartment back wall (74), or
   wherein a front surface portion (132) of the nozzle outlet (92) or the nozzle outlets (92) is formed mating to a rear surface or rim surface portion (130) of the respective associated back wall opening (84).

8. Laundry dryer according to any of the preceding claims, wherein a chamber outlet (126) of the or a base portion (96) of the nozzle unit (88), each of the chamber outlets (126) or at least a portion of the chamber outlets (126) has an associated steam guiding portion (102) for guiding the steam from the or a base portion (96) to the nozzle outlet (92), wherein the steam guiding portion (102) or at least a portion of the steam guiding portion (102) are formed passing from the back region of the rear channel (20b, 20c) or from the rear side of the rear wall (94) through the rear channel (20b, 20c) to the nozzle outlet (92).

9. Laundry dryer according to any of the preceding claims,

wherein the steam generation unit (90) is arranged in a bottom section or a base section (118) of the dryer (2); or
wherein the steam conduit (106) is the only conduit connected to the nozzle unit (88) at the backside of the rear wall (94) or the steam conduit (106) is designed to supply steam from the steam generation unit (90) to the nozzle unit (88) and to drain condensed liquid from the nozzle unit (88) to the steam generation unit (90).

10. Laundry dryer according to any of the preceding claims, wherein the nozzle unit (88) comprises a separation chamber (108) having a steam inlet (124) in fluid connection with the steam generation unit (90) and one or more chamber outlets (126) in fluid connection with the one or more nozzle outlets (92), the separation chamber (108) being designed for separating steam and water.

11. Laundry dryer according to claim 10, wherein the steam inlet (124) is arranged at a lower or bottom section of the separation chamber (108) and a conduit (106, 122) fluidly connecting the steam generation unit (90) and the separation chamber (108) is formed as a draining conduit for draining water from the separation chamber (108) towards the steam generation unit (90).

12. Laundry dryer according to any of the preceding claims, wherein the nozzle unit (88) comprises a or the connection portion (104) or a conduit stub (128) for mounting a or the steam conduit (106) thereto.

13. Laundry dryer according to any of the preceding claims, wherein the base portion (96) of the nozzle unit (88) comprises a mounting socket (110) for mounting the nozzle unit (88) on or at the backside of the rear wall (94).

14. Laundry dryer according to any of the preceding claims, wherein a sealing element (101) is arranged between the backside of the rear wall (94) and the base portion (96) or the mounting socket (101) of the nozzle unit (88).

15. Laundry dryer according to any of the preceding claims, wherein a chamber (108) or the separation chamber (108) of the nozzle unit (88) is formed of two or more chamber forming parts (96, 112) and wherein the two or more chamber forming parts (96, 112) are integrally fixed or connected to each other.

16. Laundry dryer according to any of the preceding claims, wherein the or a separation chamber (108) or a or the connection portion (104) of the nozzle unit (88) is mounted at the backside of the rear wall (94) and the nozzle unit (88) comprises one or more steam guiding portions (102) each having an extension which passes through a or the nozzle port (116) formed in the rear wall (94).

17. Laundry dryer according to any of the preceding claims, wherein two or three or more of the following elements which are part of the nozzle unit (88) are formed as a single-piece or monolithic piece or single-molded part:

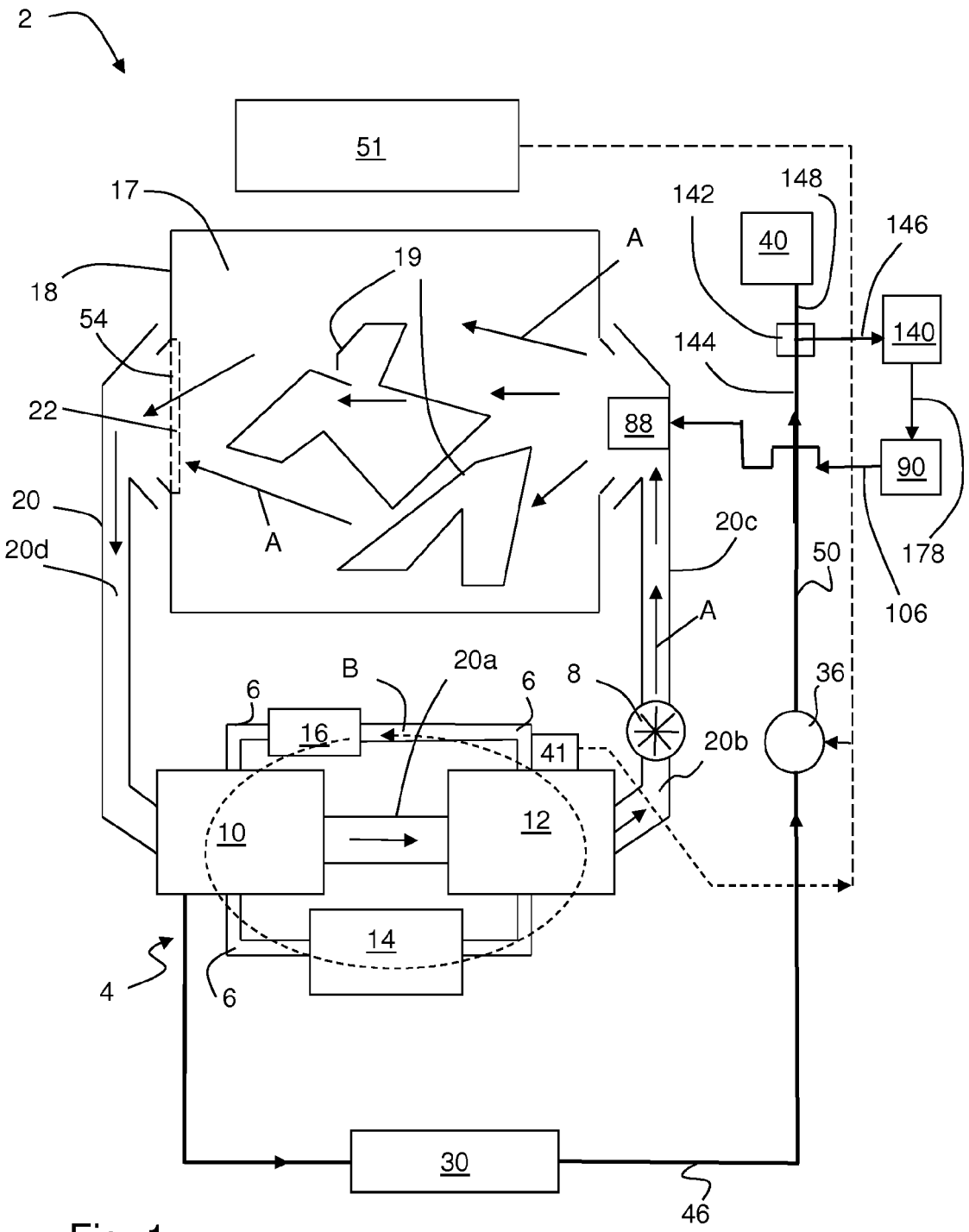
a separation chamber (108) or a portion of the separation chamber (108) for separating the supplied steam and water,
the one or more nozzle outlets (92),
one or more steam guiding portions (102) fluidly connecting a base portion (96) or separation chamber (108) of the nozzle unit (88) to a respective one of the one or more nozzle outlets (92),
a connection portion (104) for fluidly connecting a steam conduit (106) to the nozzle unit (88),
a mounting socket (110) of the nozzle unit (88) for mounting the nozzle unit (88).

18. Laundry dryer according to any of the preceding claims, wherein an area of the one or more nozzle outlets (92) corresponds to the area of the associated back wall opening (84) or wherein the ratio of the area of the nozzle outlet (92) and the area of the associated back wall opening (84) is in one of the following ranges: 0.6 to 0.8, 0.7 to 0.9, 0.8 to 1, 0.9 to 1.1, 1 to 1.3 or 1.1 to 1.5.

19. Laundry dryer according to any of the preceding claims, wherein the one or the more nozzle outlets (92) are assigned to respective back wall openings (84), wherein the assigned back wall opening (84) or assigned back wall openings (84) are arranged according to one or more of the following positions:

above a horizontal plane (134) running through the center of the laundry storing compartment (17),
below a horizontal plane (136) running through the highest point of the laundry storing compartment (17),
in a range (138) of the upper third, upper fourth or upper fifth between the horizontal planes (134, 136) running through the center and the highest point of the laundry storing compartment (17).

20. Laundry dryer according to any of the preceding claims, wherein the laundry dryer is a condensation type dryer or a heat pump type dryer (2) and the rear channel (20b, 20c) is a portion of the closed loop drying air circuit (20).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A
A
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148
40
146
140
144
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90
178
106
50
20c
A
B
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8
36
16
41
20b
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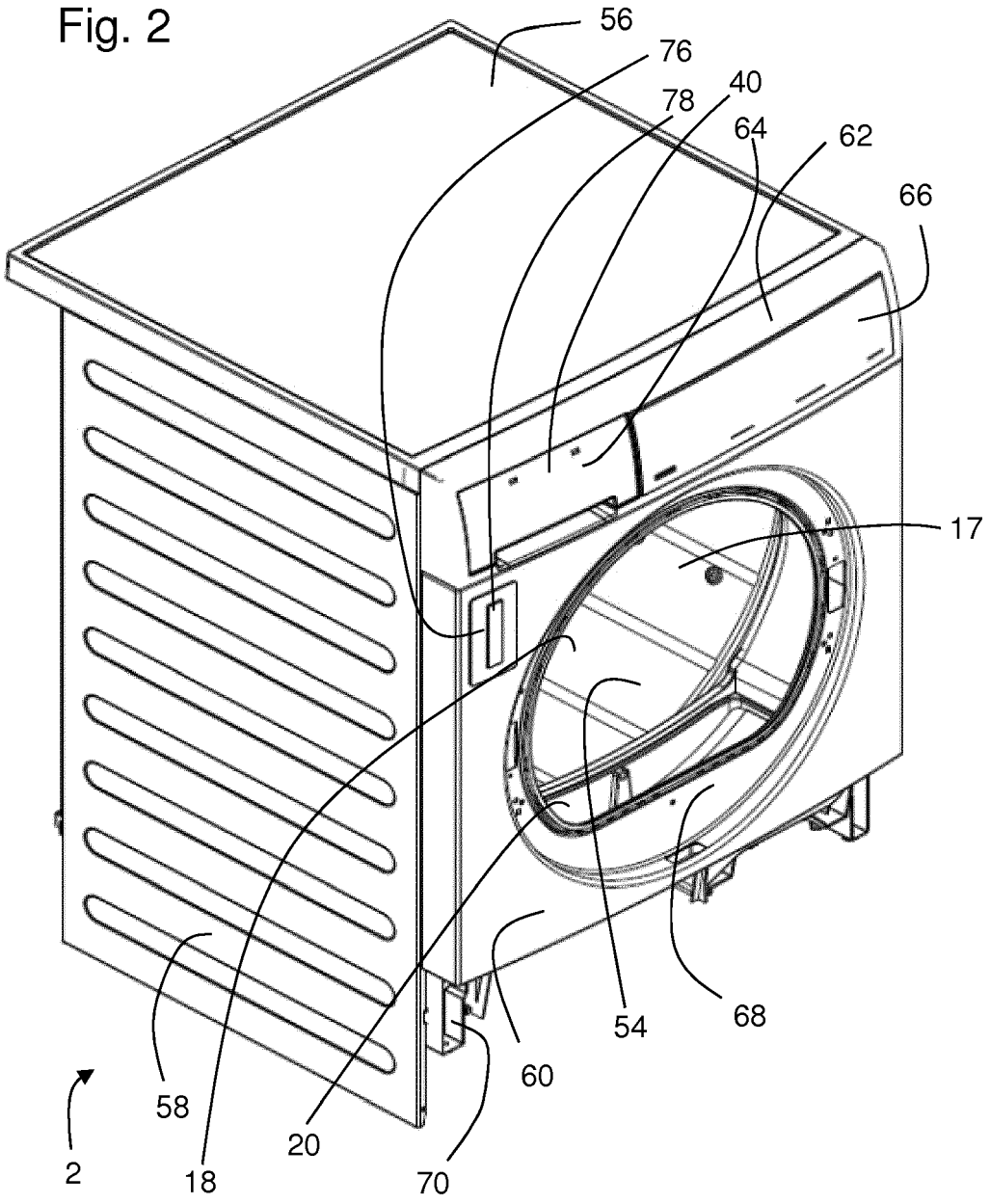
46

Fig. 1

Fig. 2



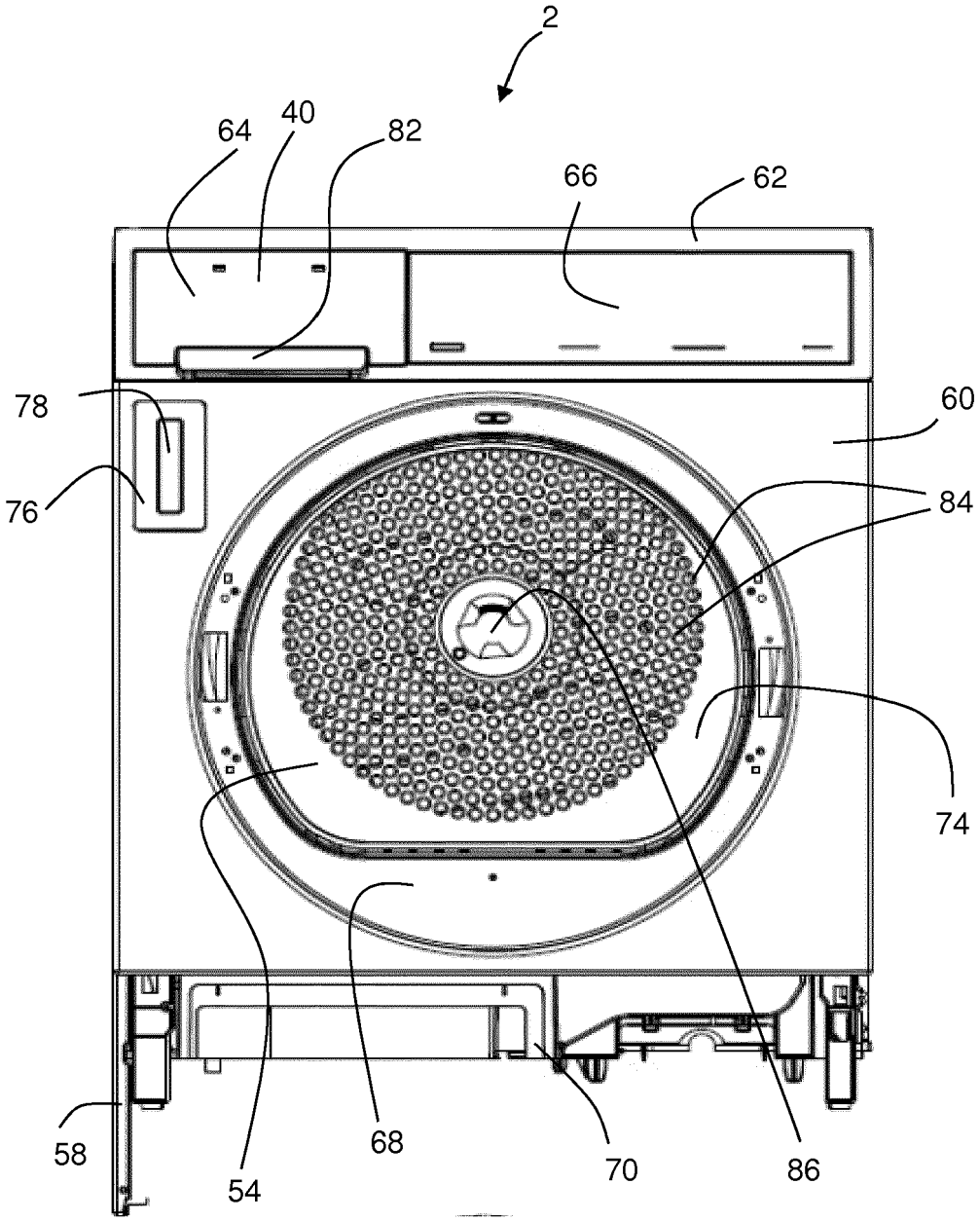


Fig. 3

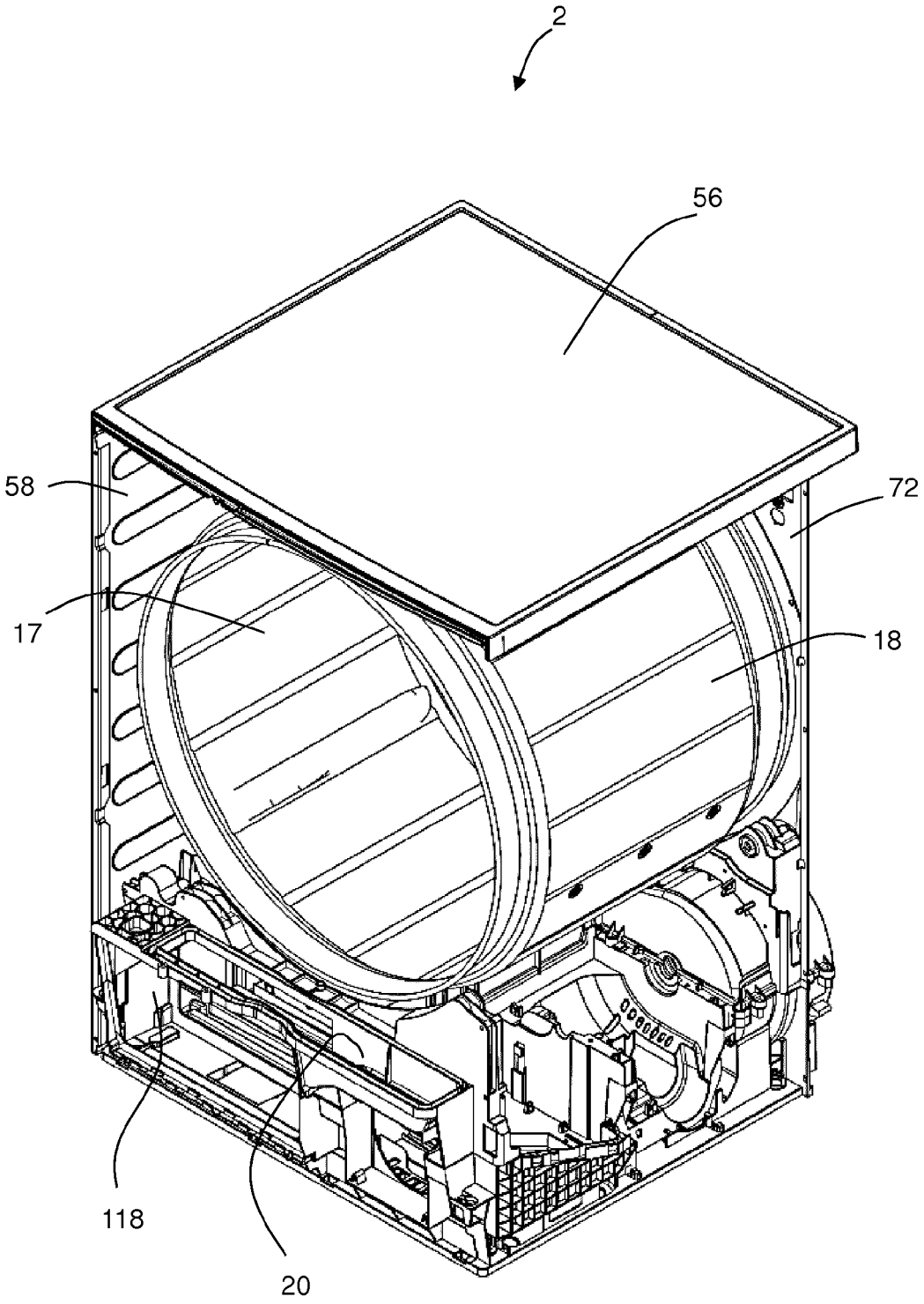


Fig. 4

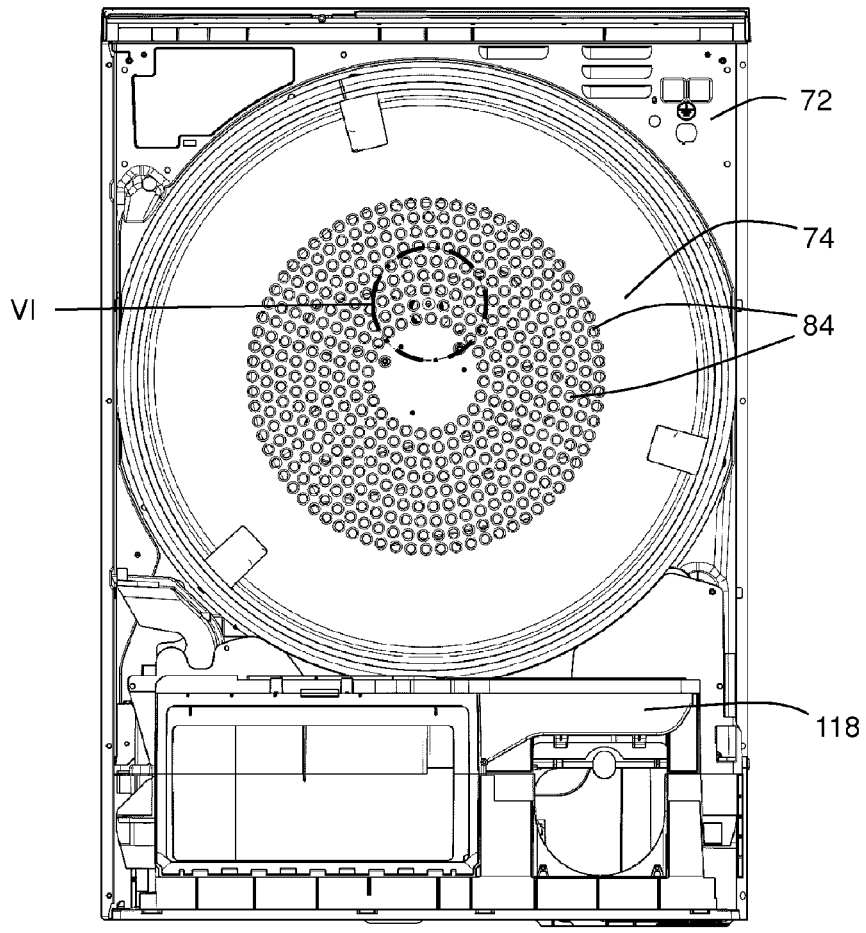


Fig. 5

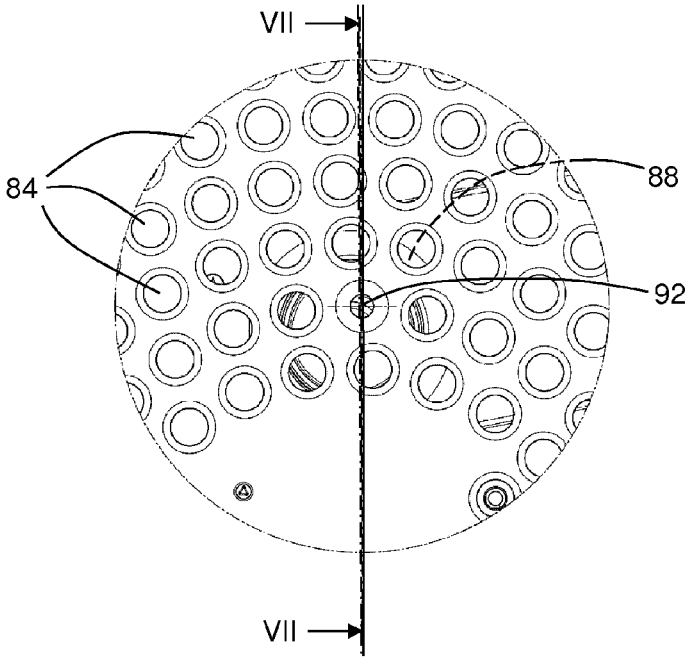
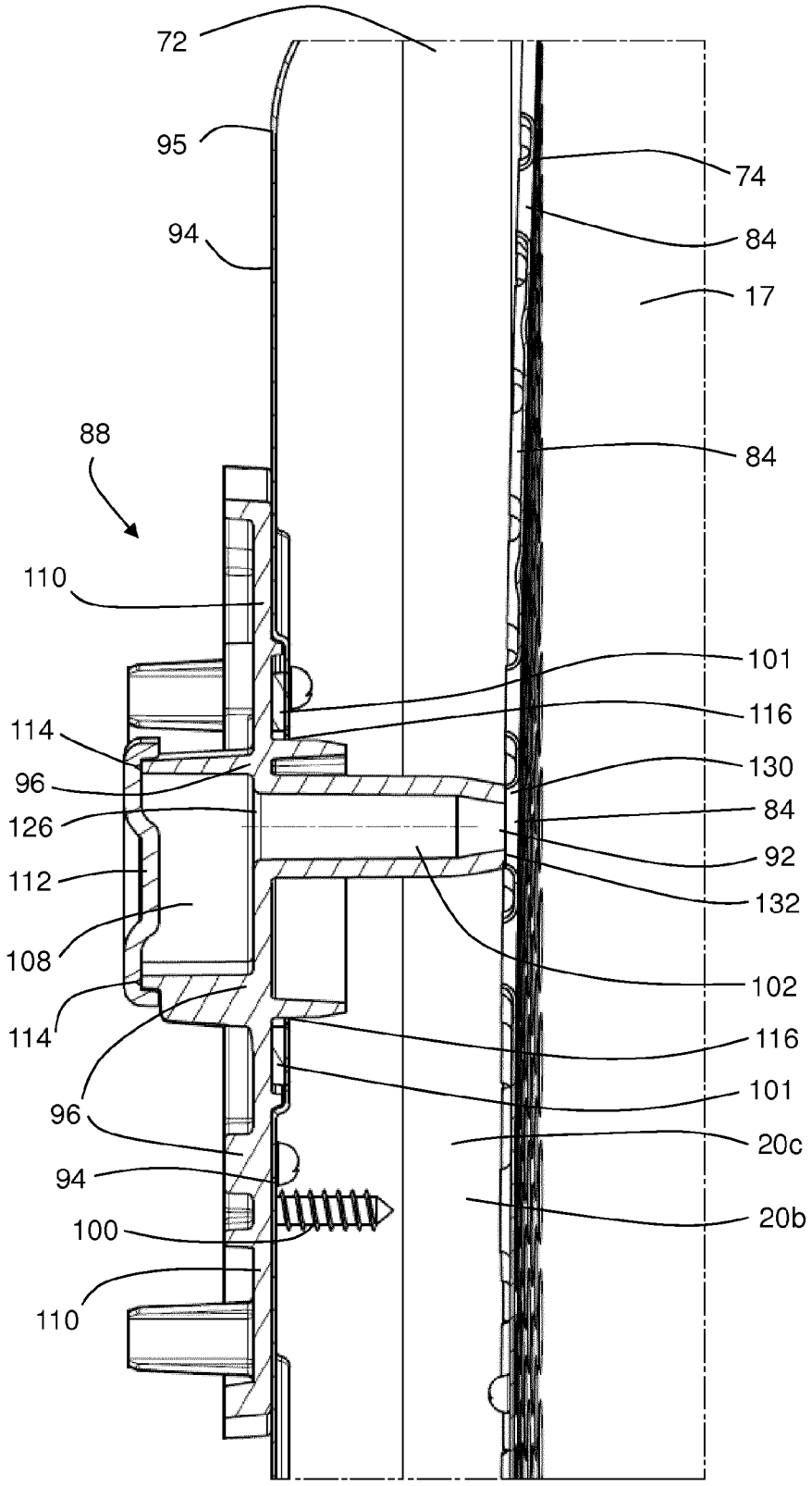


Fig. 6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101
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102
114
116
96
101
20c
94
20b
100
110

Fig. 7

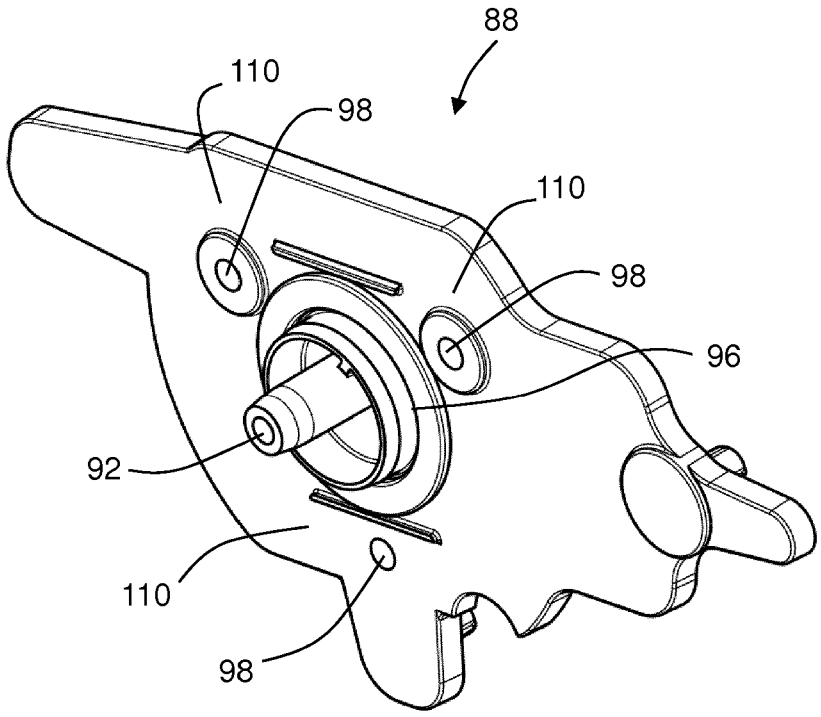


Fig. 8

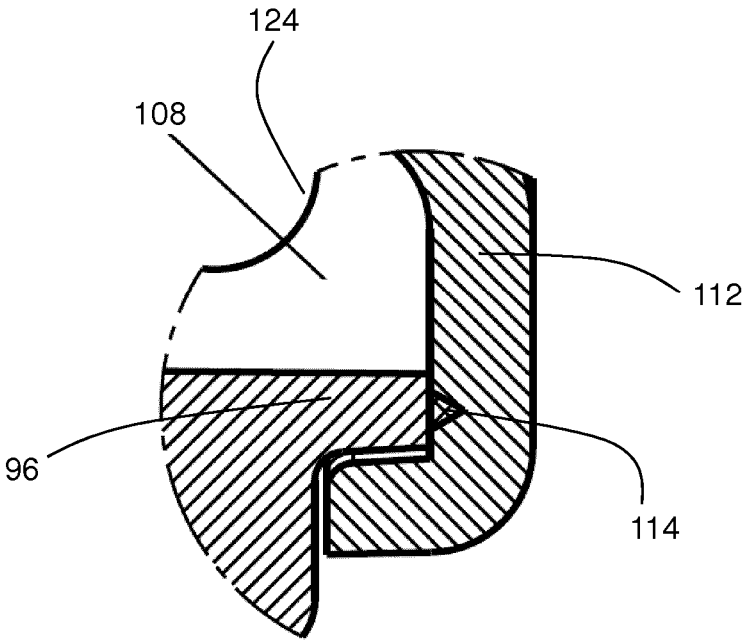


Fig. 11

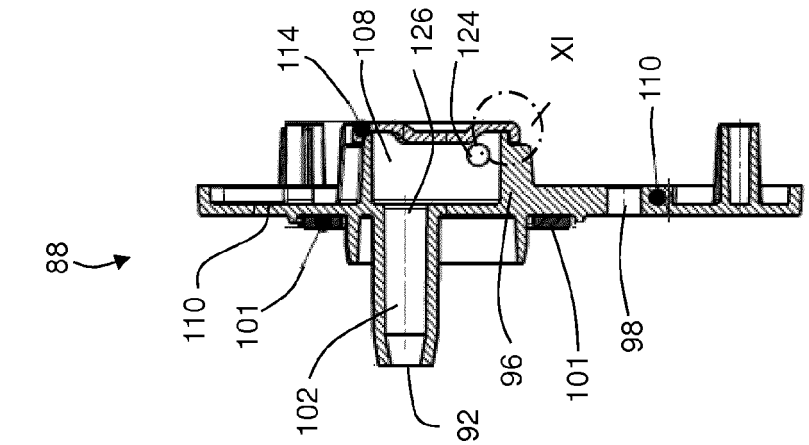
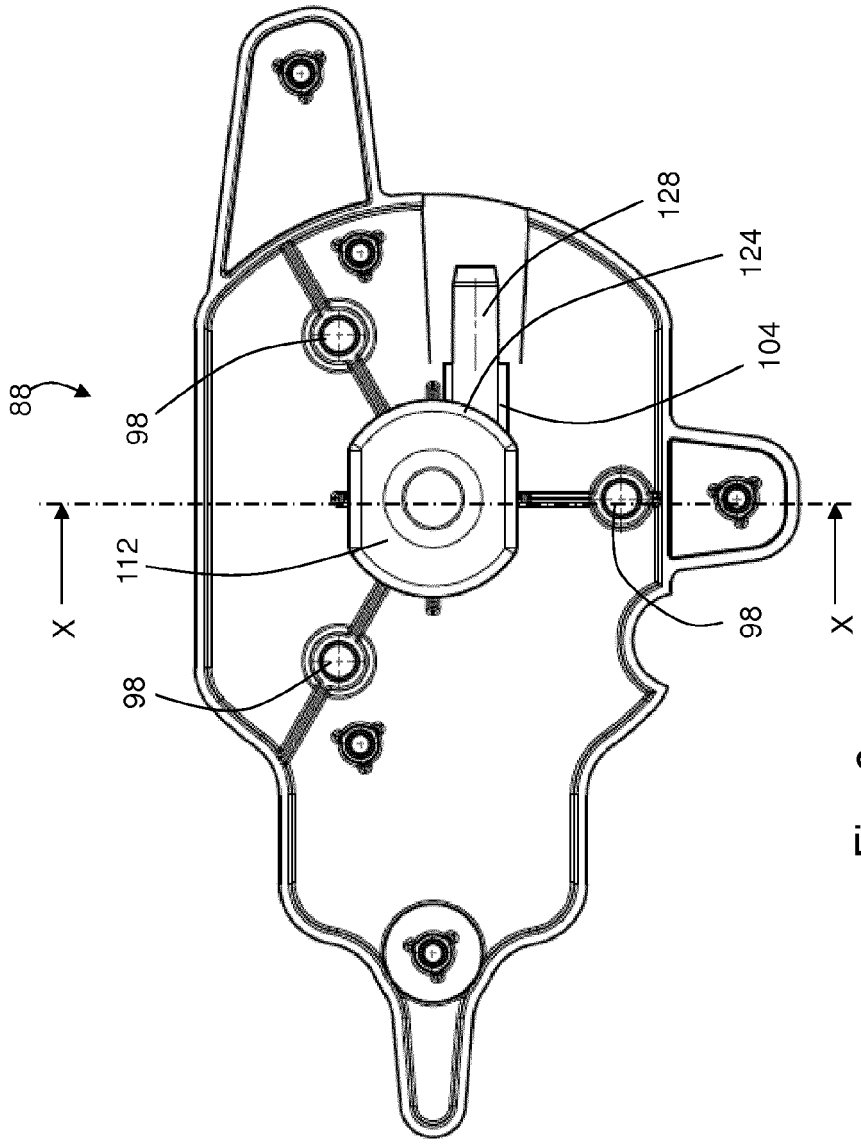

88
114
108
126
124
XI
110
110
101
102
92
96
101
98

Fig. 10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X
X
98
98
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104
98

Fig. 9

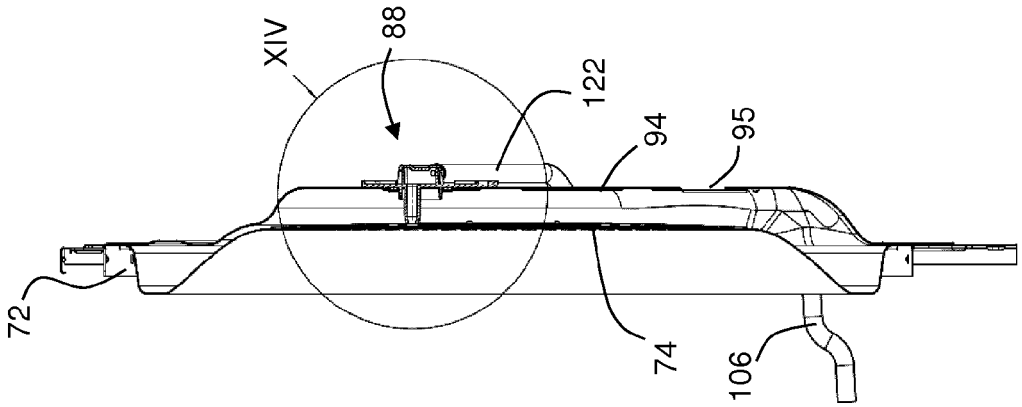


Fig. 13

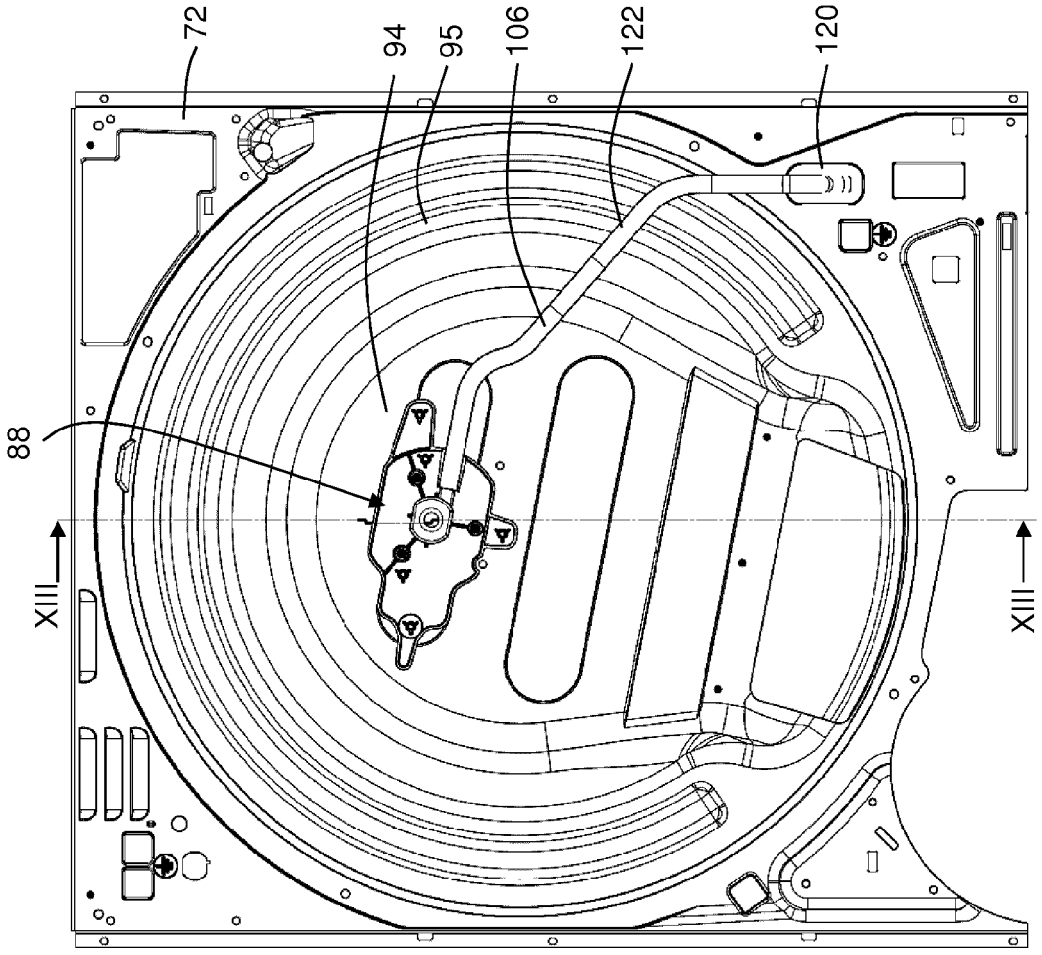


Fig. 12

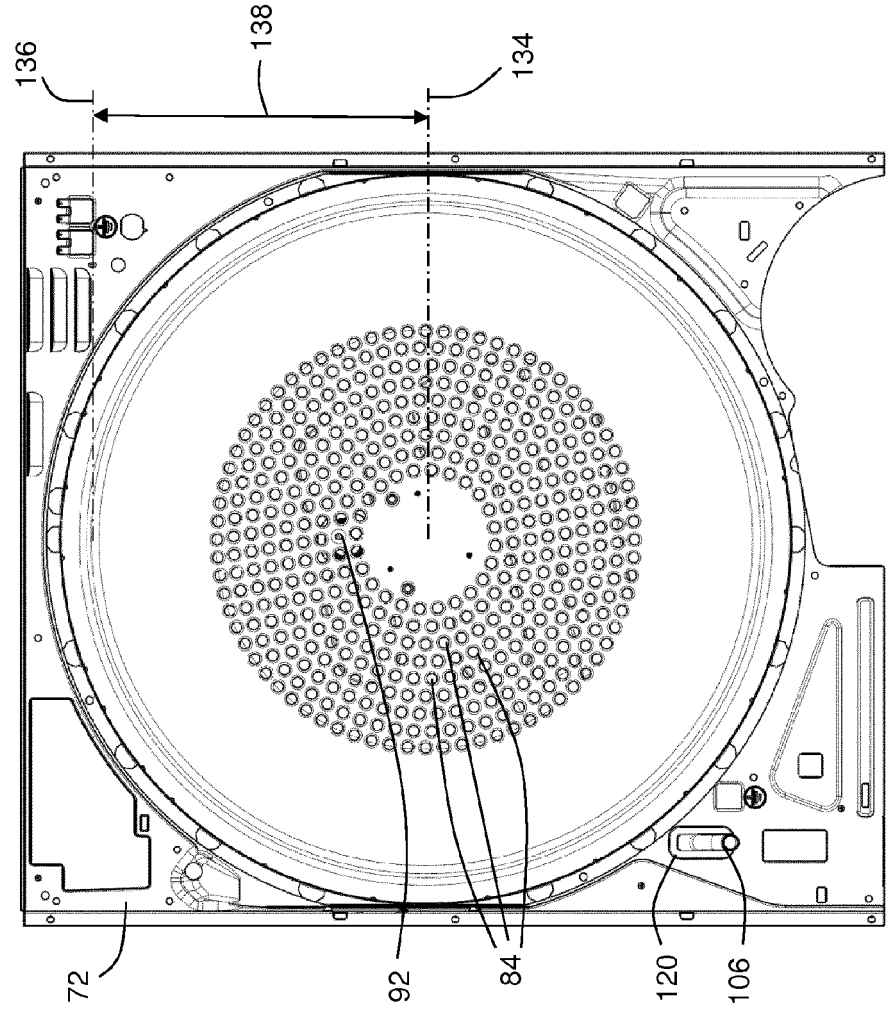


Fig. 17

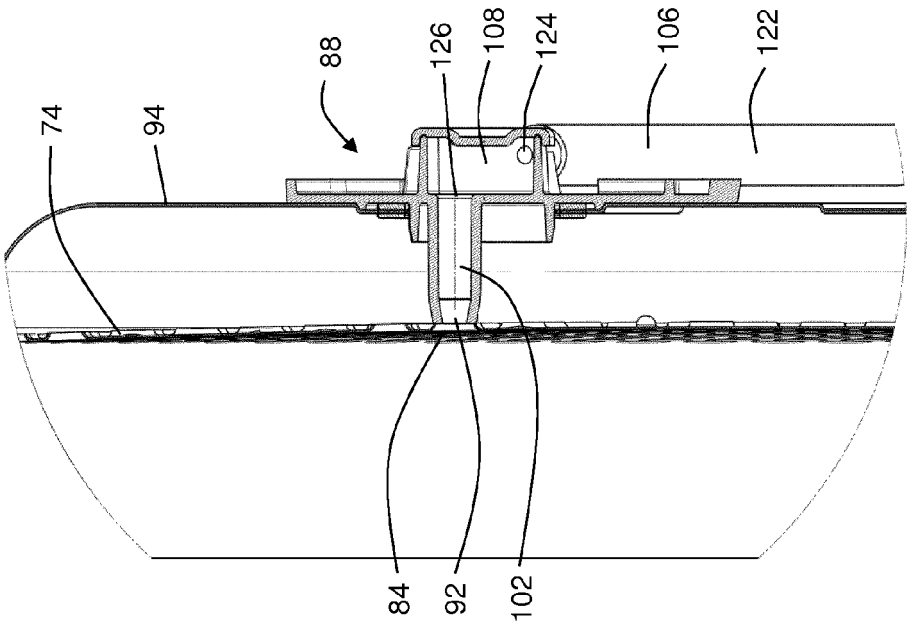


Fig. 14

Fig. 15

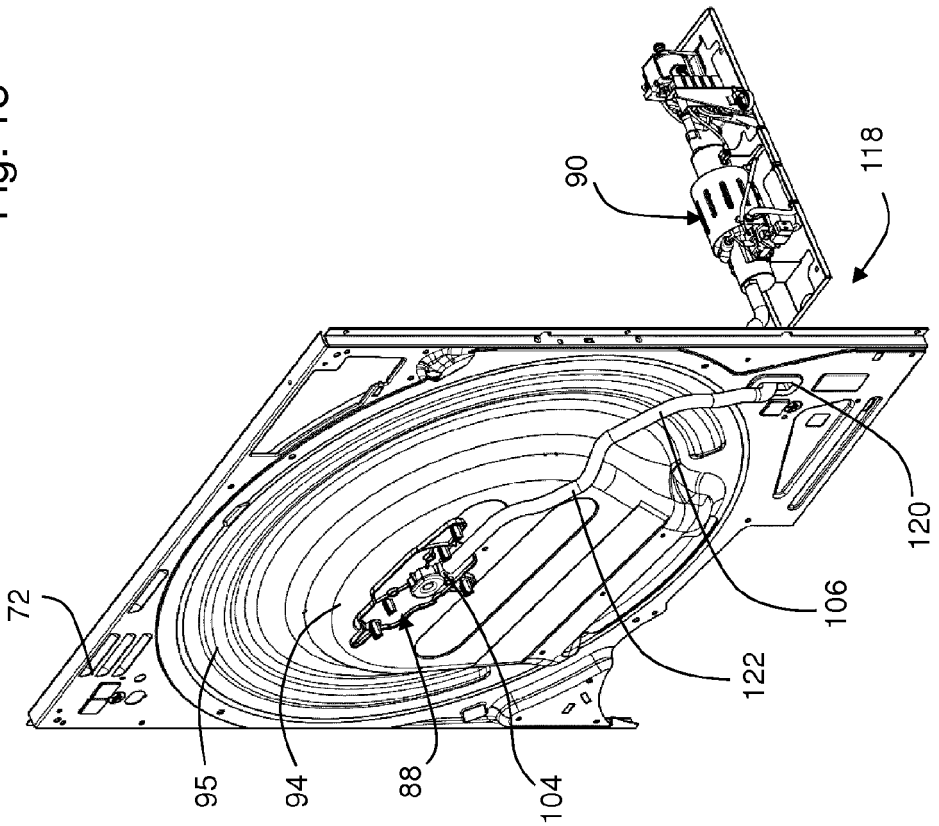
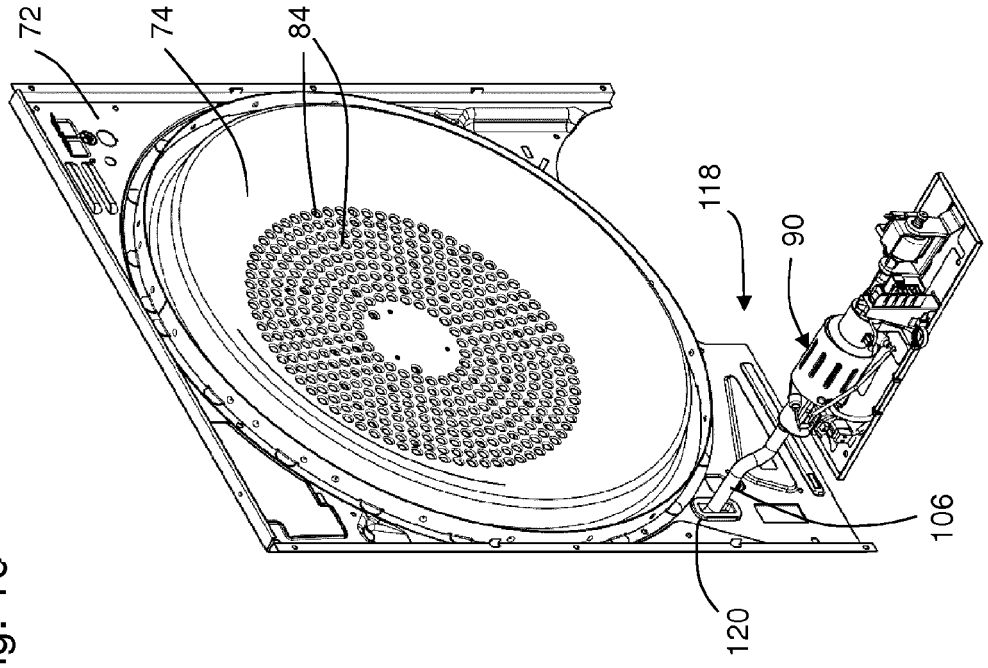
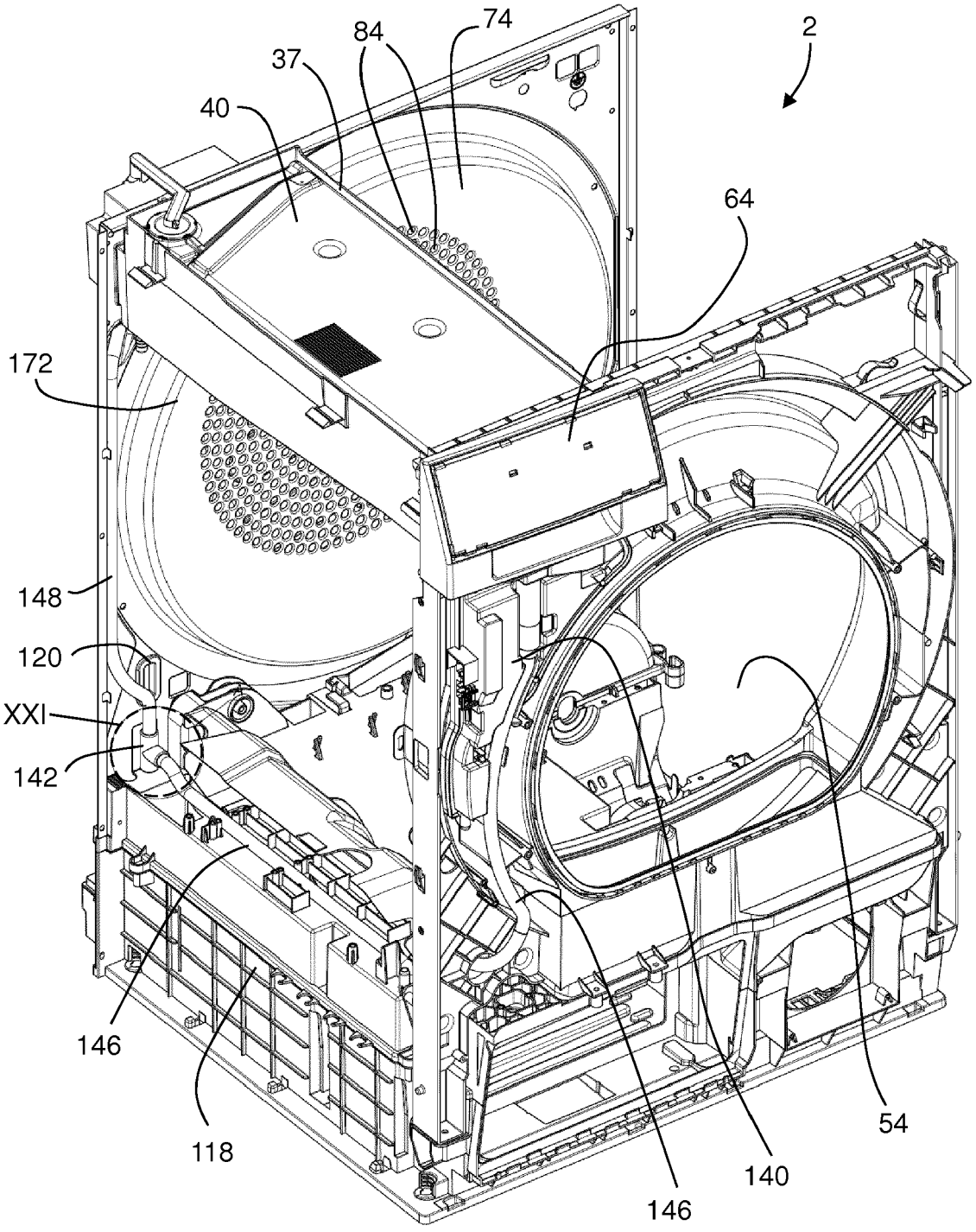


Fig. 16





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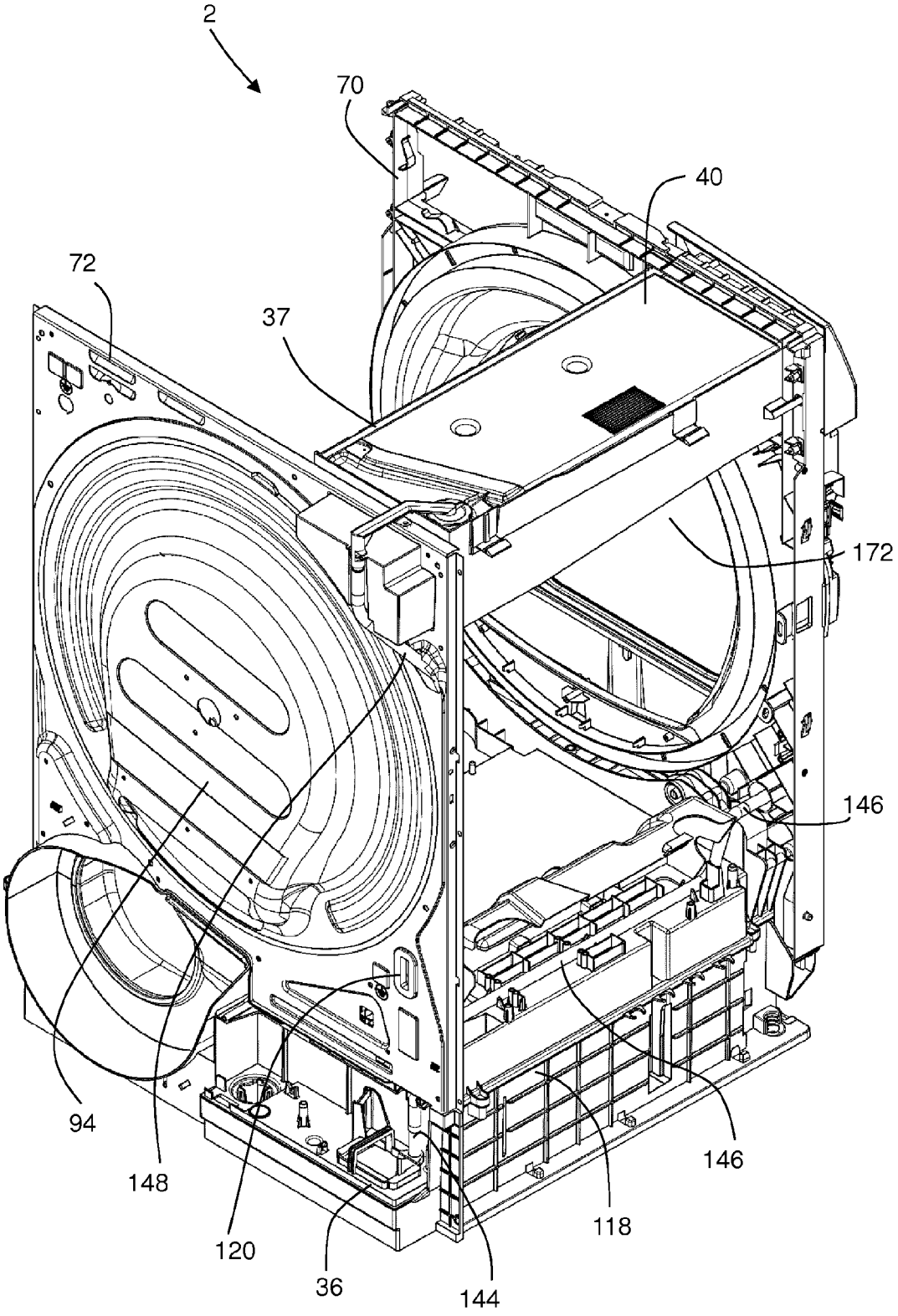

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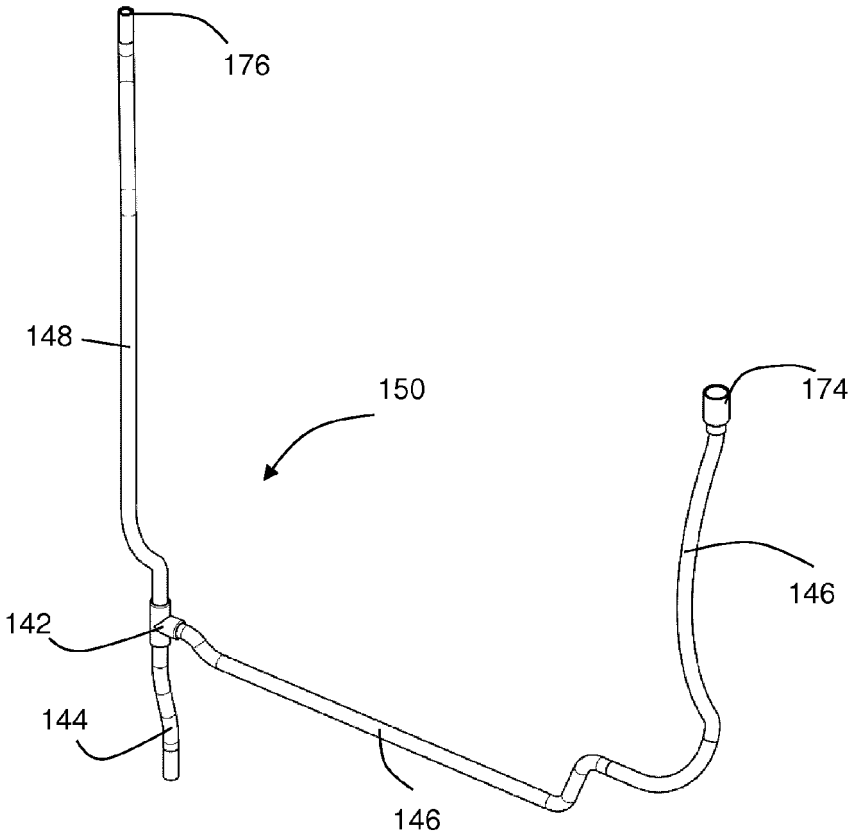

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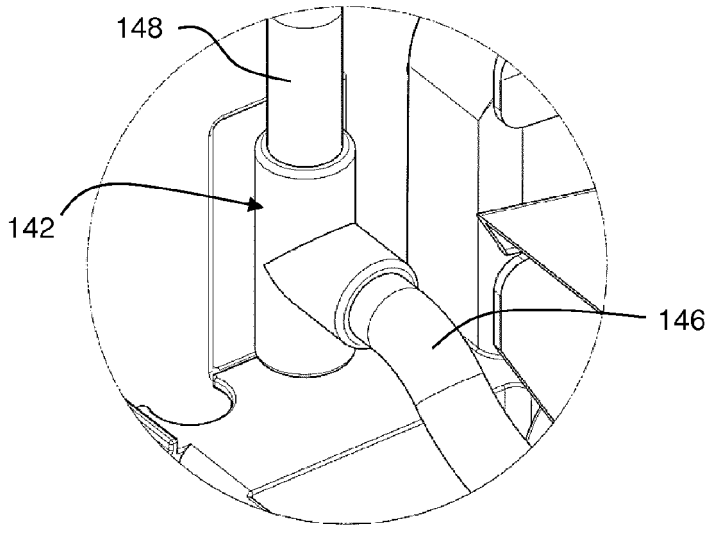

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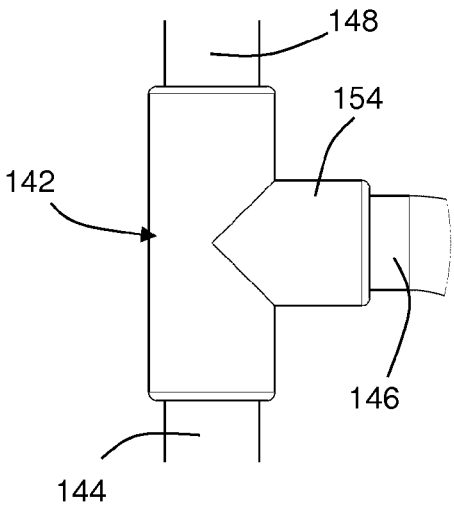

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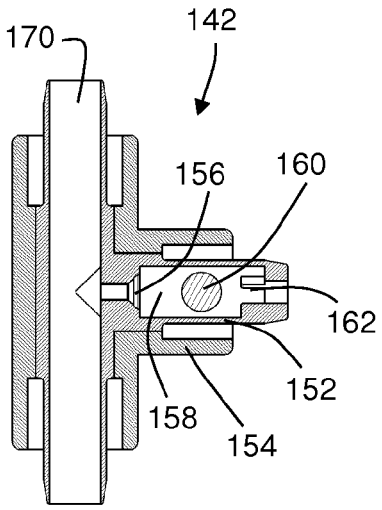
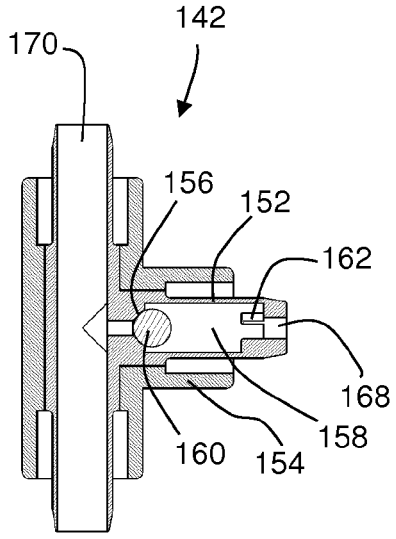


Fig. 23



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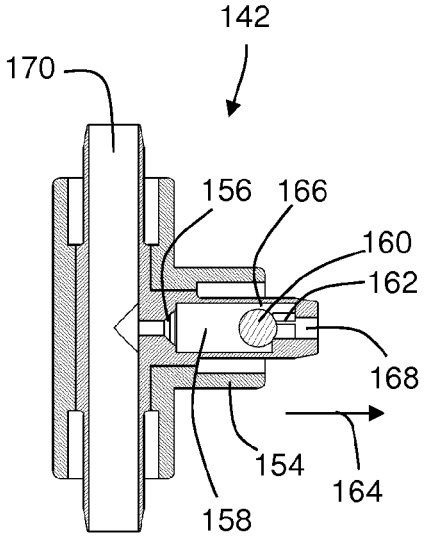

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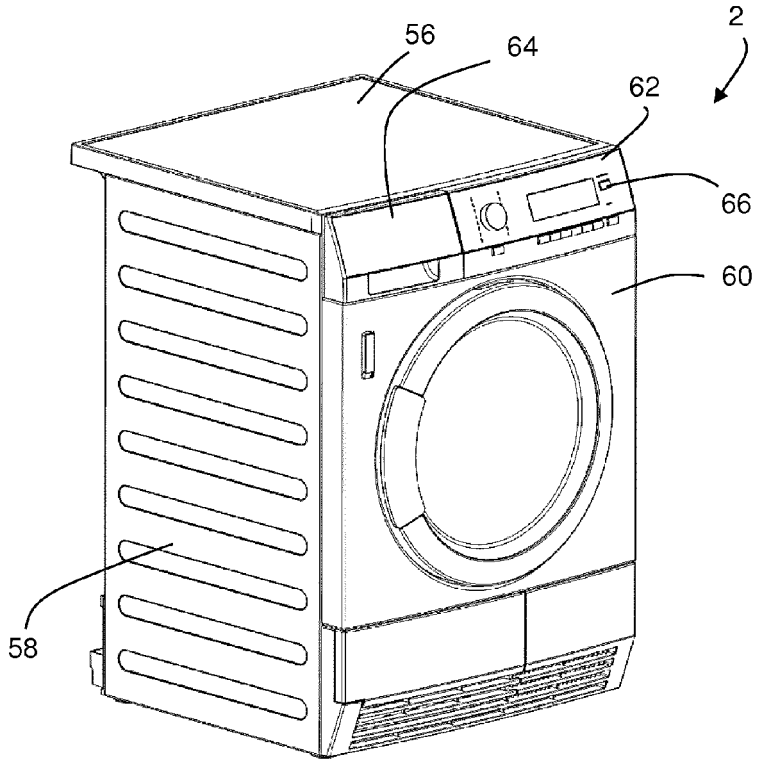

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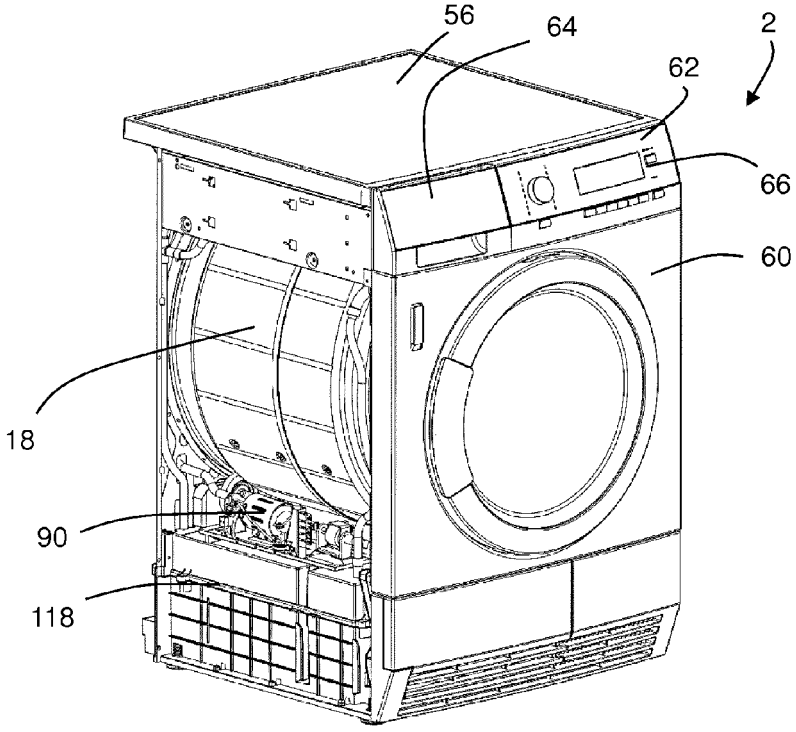

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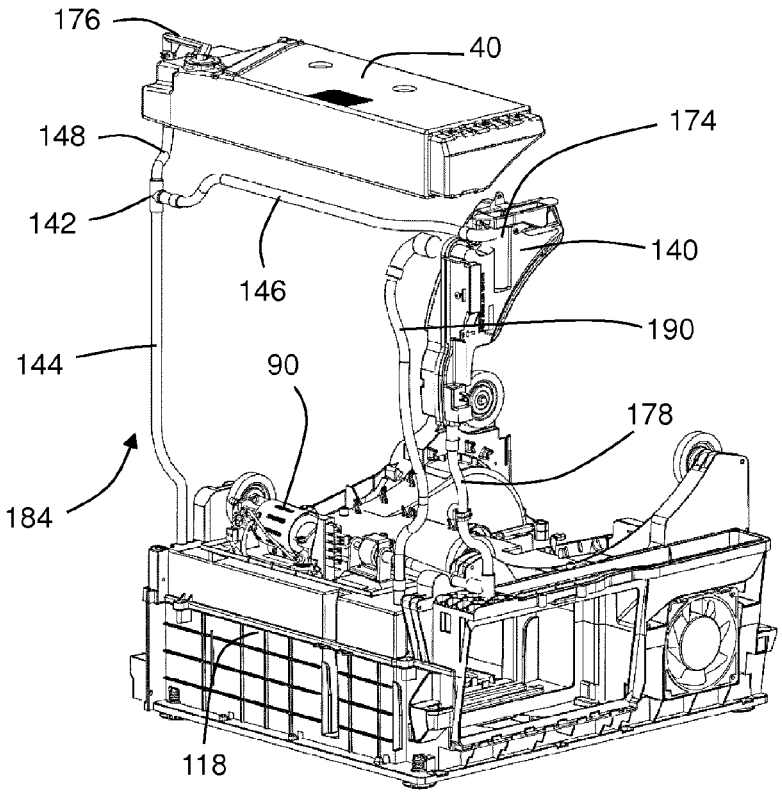
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Fig. 28

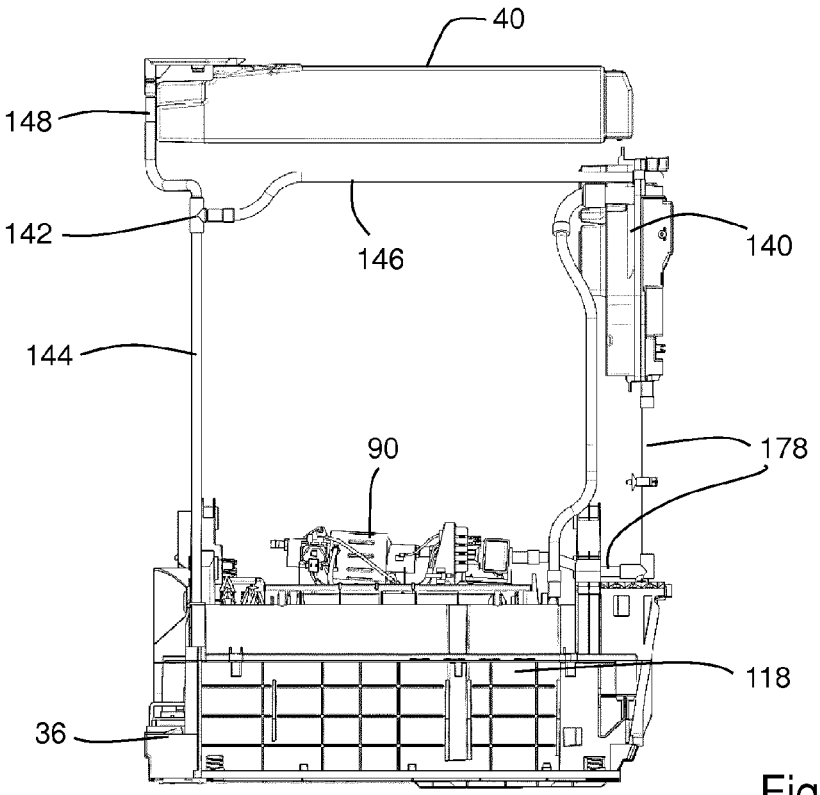
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Fig. 29

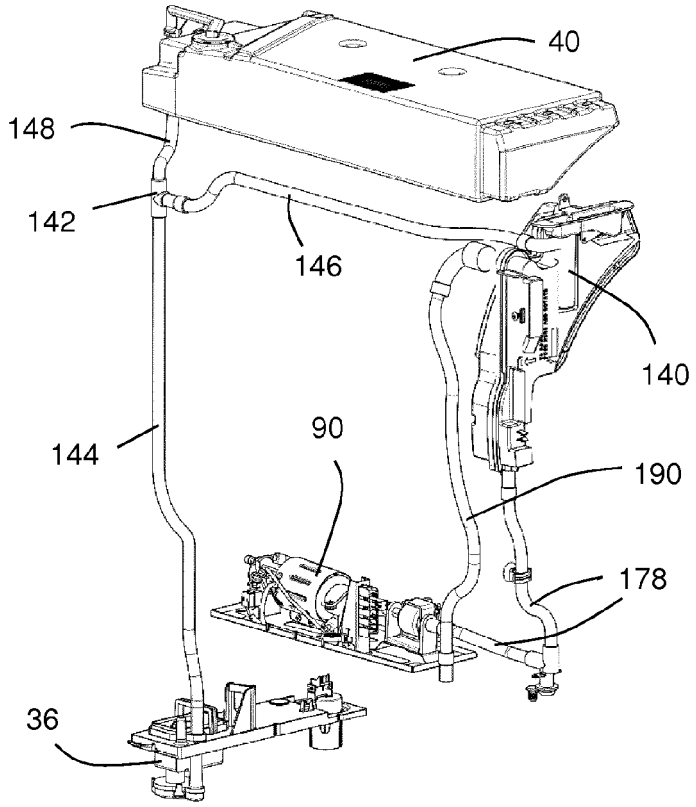
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Fig. 30

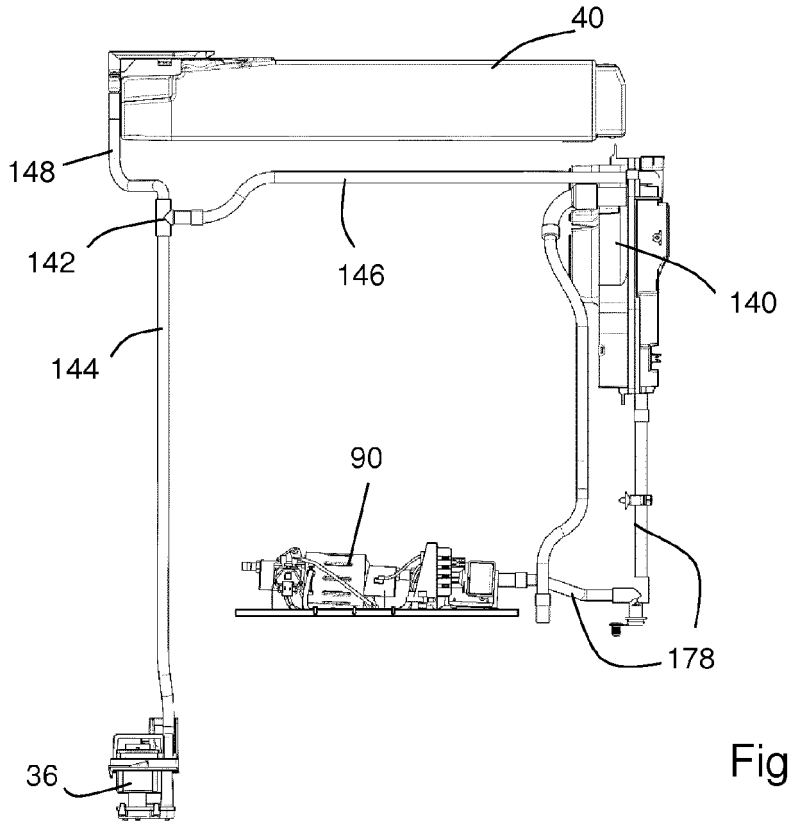
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Fig. 31

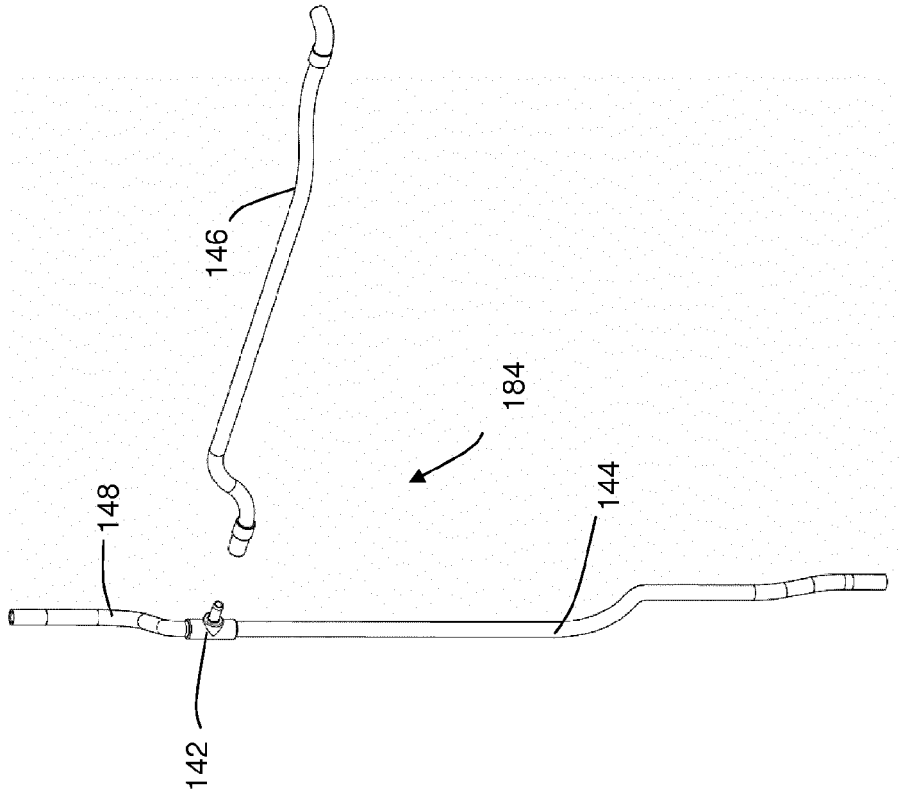


Fig. 33

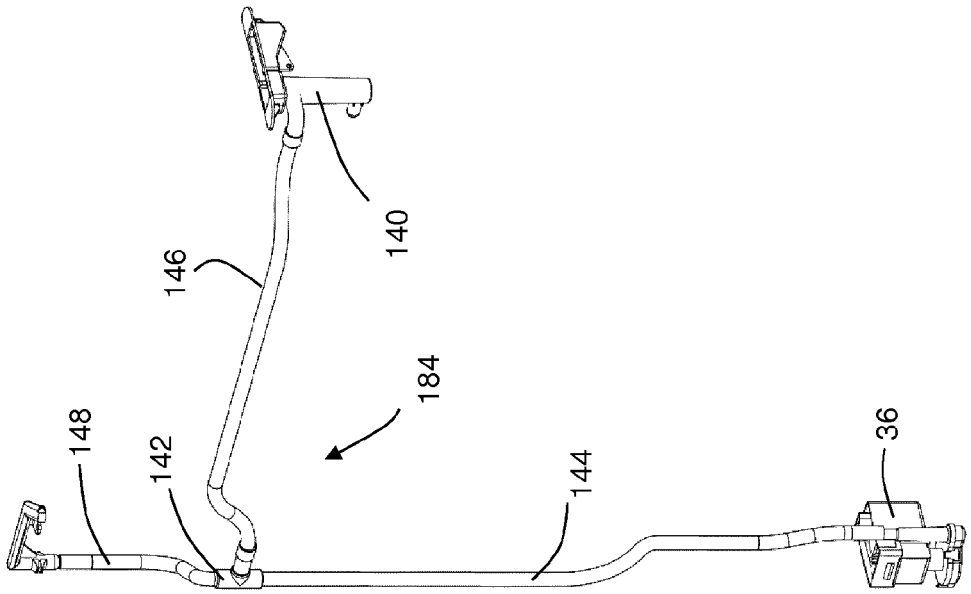


Fig. 32

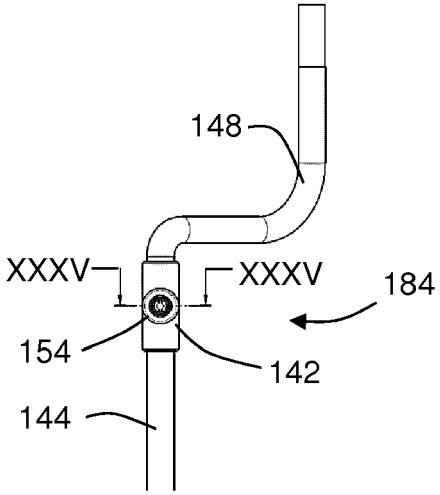
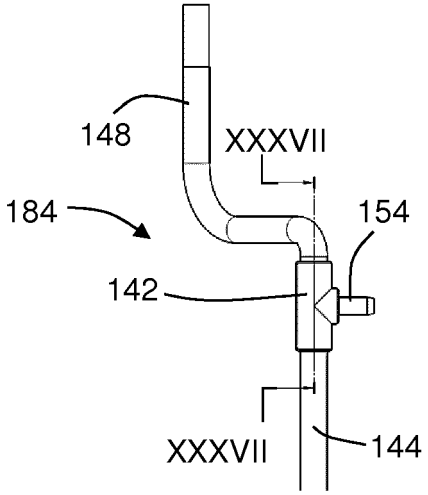


Fig. 34



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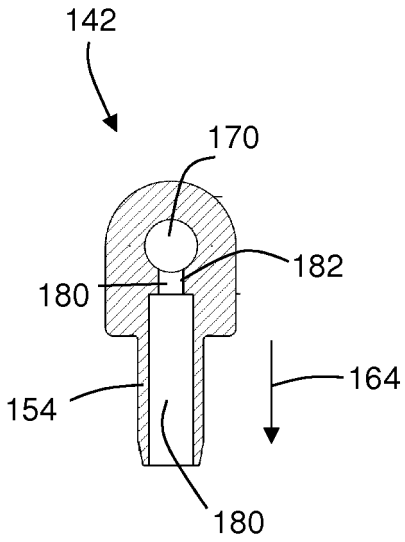

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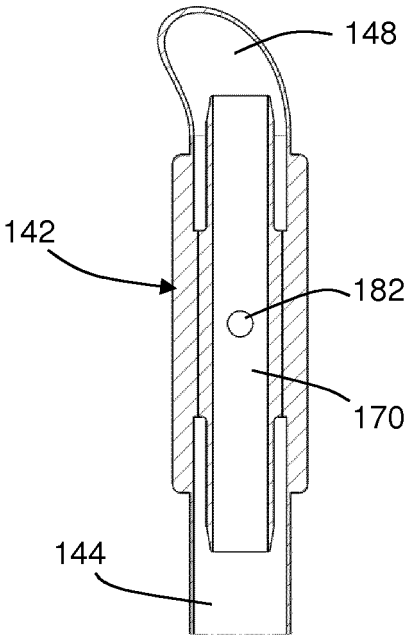

Fig. 37

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Application Number
EP 12 19 9323

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A	US 2010/115788 A1 (KIM YOUNG SOO [KR] ET AL) 13 May 2010 (2010-05-13) * the whole document *	1-20	
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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	17 May 2013	Prosig, Christina

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