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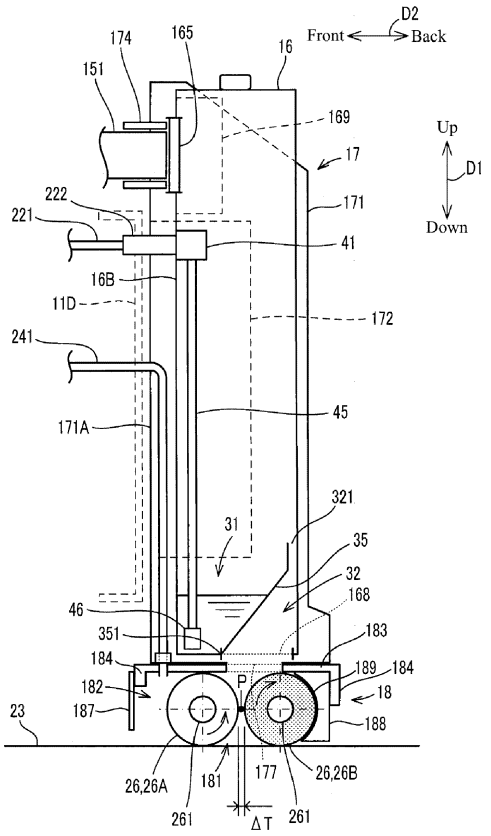
(54) FLOOR SURFACE CLEANING APPARATUS

(57) Provided is a floor surface cleaning apparatus with which a reduction in the size of the apparatus can be realized, the driving efficiency can be increased, and wastewater on a floor surface can be reliably retrieved regardless of the state of the floor surface. A floor surface cleaning apparatus (10) includes a water collecting nozzle (18), rotating brushes (26, 26A, 26B) that can retain water, and a water collecting box (16) that has a pooling portion (31) in which wastewater can be pooled. When the rotating brushes (26) are rotationally driven, wastewater on the floor surface (23) is absorbed and retained by the rotating brushes (26), and the wastewater retained in the rotating brushes (26) can be made into a mist and flung upwards by a centrifugal force generated by rotation of the rotating brushes (26) and passed through an opening (177) and a suction port (168) and pooled in the pooling portion (31) in the water collecting box (16).

FIG. 8



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Description

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application claims priority to Japanese Patent Application No. 2020-017978 filed February 5, 2020, the entire contents of which are incorporated herein by reference.

FIELD

[0002] The present invention relates to a floor surface cleaning apparatus that uses a cleaning liquid to clean a floor surface while moving over the floor surface.

BACKGROUND

[0003] Conventionally, a floor surface cleaning apparatus that cleans a floor surface using a rotating brush and a cleaning liquid is known. As an example of this type of floor surface cleaning apparatus, a floor surface cleaning device is known that, while using a curved water collecting nozzle to collect wastewater generated by cleaning a floor surface with a rotating brush, sucks up the collected wastewater using a vacuum pump or the like and transfers the wastewater to a wastewater tank (see JP 2018-304A). The floor surface cleaning device is provided with the water collecting nozzle so that the water suction port of the water collecting nozzle comes into contact with a floor surface.

[0004] JP 2018-304A is an example of related art.

SUMMARY

[0005] However, in the above-described conventional floor surface cleaning device, the water collecting nozzle has a structure where air is sucked in along with wastewater from the water suction port thereof, and thus a large capacity vacuum pump with a large output needs to be employed, which means that not only is the apparatus large, but also that the driving efficiency of the vacuum pump is poor. Also, wastewater cannot be sucked up without the water collecting nozzle being brought into close contact with a floor surface. Thus, if a floor surface is uneven, a gap occurs between the water collecting nozzle and the uneven portions of the floor surface, which leads to the problem of not being able to suck up wastewater and the possibility of wastewater being left on the floor surface. Also, if the floor surface cleaning device moves while the water collecting nozzle is in contact with a floor surface, waste such as rubbish and dust clogs up the contact portion and thus the waste then has to be removed.

[0006] The present invention aims to provide a floor surface cleaning apparatus in which a reduction in the size of the apparatus can be realized, the driving efficiency can be increased, and wastewater on a floor surface can be reliably retrieved regardless of the state of the floor surface.

(1) A floor surface cleaning apparatus according to an aspect of the present invention configured to clean a floor surface using a cleaning liquid while moving over the floor surface. The floor surface cleaning apparatus including a nozzle portion, rotating brushes, and a wastewater collecting box. The nozzle portion is elongated in a width direction intersecting a movement direction of the floor surface cleaning apparatus, and is configured to collect wastewater including the cleaning liquid as the floor surface cleaning apparatus. The rotating brushes are rotatably supported by the nozzle portion in a state of contact with the floor surface, and are configured to be able to retain water and fling the wastewater upward using a centrifugal force generated during rotation. The wastewater collecting box is provided above the nozzle portion and includes a suction port that is in communication with the inner portion of the nozzle portion and a pooling portion configured to pool the wastewater that has entered therein from the suction port.

According to such a configuration, when the rotating brushes are rotationally driven, wastewater on the floor surface can be absorbed by and retained in the rotating brushes. Also, wastewater droplets of wastewater retained in the rotating brushes can be flung upwards by the centrifugal force generated by rotation of the rotating brushes and moved to the pooling portion inside the wastewater collecting box via the suction port. Accordingly, even if the floor surface is uneven, wastewater on the floor surface can be reliably retrieved into the pooling portion regardless of the state of the floor surface.

(2) The floor surface cleaning apparatus according to the present invention further including a ventilator and a wastewater guiding path. The ventilator is configured to suck air from an internal space of the wastewater collecting box and generate an air current that moves wastewater droplets dispersed by rotation of the rotating brushes upward from the suction port. The wastewater guiding path is provided in the wastewater collecting box and is formed in a tapered shape extending upward from the suction port, and is configured to guide the wastewater droplets to the internal space of the wastewater collecting box.

According to this configuration, wastewater droplets that have been flung toward the suction port can easily enter the wastewater collecting box by riding an air current generated by air intake by the ventilator. Also, because the wastewater guiding path has an upwardly tapered shape, the updraft pressure in the vicinity of the exit of the wastewater guiding path can be increased even if the suction of the ventilator is small. Accordingly, even if the ventilator is a small capacity ventilator with a small output, wastewater

droplets that have advanced to the wastewater guiding path can be sucked up into the wastewater collecting box. In other words, a small capacity ventilator can be applied in the floor surface cleaning apparatus. As a result, the driving efficiency of the floor surface cleaning apparatus can be increased, and the floor surface cleaning apparatus can be made smaller due to the reduction in the size of the ventilator.

(3) The floor surface cleaning apparatus according to the present invention, wherein mthe wastewater guiding path is provided on one side of the movement direction in the internal space. A discharge port for air from the ventilator is provided on the other side of the movement direction in the wastewater collecting box.

According to this configuration, wastewater droplets that have passed the wastewater guiding path and moved upward ride the air current generated by air intake by the ventilator and move forward and fall into the pooling portion without reaching the discharge port, and are pooled in the pooling portion. Accordingly, wastewater droplets are prevented from flowing back down the wastewater guiding path.

(4) The floor surface cleaning apparatus according to the present invention, wherein the wastewater collecting box includes a pair of side walls separated in the movement direction and an inclined plate. The inclined plate is provided between the pair of side walls, with the pooling portion being formed between the inclined plate and one side wall and the wastewater guiding path being formed between the inclined plate and the other side wall.

According to this configuration, the pooling portion and the wastewater guiding path can be separated by the single inclined plate, and thus the internal configuration of the wastewater collecting box can be simplified.

(5) The floor surface cleaning apparatus according to the present invention further including a wastewater tank configured to contain the wastewater, and a first pump configured to suck the wastewater pooled in the pooling portion and transfer the wastewater to the wastewater tank.

According to this configuration, wastewater that cannot be pooled in the pooling portion can be retrieved to the wastewater tank. Accordingly, the floor surface cleaning apparatus can run for a long time before the wastewater tank is filled with wastewater.

(6) The floor surface cleaning apparatus according to the present invention, wherein the rotating brushes include at least one roller brush that is elongated in the width direction.

(7) The floor surface cleaning apparatus according to the present invention, wherein the rotating brushes include a first roller brush and a second roller brush that are parallel to each other and separated from each other in the movement direction. The first roller brush is a brush that is arranged on the movement direction side relative to the suction port, and is configured to be rotationally driven so as to slide rearwards opposite to the movement direction against the floor surface. The second roller brush is a brush that is arranged on the rear side opposite to the movement direction relative to the suction port, and is configured to be rotationally driven so as to slide in the same direction as the movement direction against the floor surface.

According to this configuration, the first roller brush can easily disperse wastewater retained therein toward the suction port, and the second roller brush can easily disperse wastewater retained therein toward the suction port. As a result, wastewater can be efficiently moved upward by the brushes, and the retrieval efficiency of wastewater is increased.

(8) The floor surface cleaning apparatus according to the present invention, wherein the water retaining capacity of the second roller brush is greater than the water retaining capacity of the first roller brush.

According to this configuration, wastewater that could not be absorbed by the first roller brush can be reliably absorbed and retrieved by the second roller brush while the floor surface cleaning apparatus is moving.

(9) The floor surface cleaning apparatus according to the present invention further including a guard member. The guard member is provided on a rear side opposite to the movement direction in the nozzle portion, and is configured to block the wastewater droplets dispersed rearward by the rotation of the rotating brushes.

According to this configuration, wastewater droplets dispersed rearward by the centrifugal force generated by rotation of the rotating brushes are prevented from being dispersed to the outer side of the nozzle portion.

(10) The floor surface cleaning apparatus according to the present invention, wherein the guard member includes a curved surface that comes in contact with or is provided in the vicinity of an outer circumferential surface of the rotating brush.

According to this configuration, wastewater droplets flung rearward from the rotating brushes are caught by the curved surface. Accordingly, wastewater caught by the curved surface can be reabsorbed by the rotating brushes.

(11) The floor surface cleaning apparatus according to the present invention, wherein the rotating brushes include a water absorbing material that has absorbability.

(12) The floor surface cleaning apparatus according to the present invention further including a cleaning liquid tank configured to contain the cleaning liquid; a linking tube configured to link the cleaning liquid tank and the nozzle portion; and a second pump configured to suck the cleaning liquid and transfer the

cleaning liquid into the nozzle portion via the linking tube.

[0007] According to this configuration, there is no need to spray the cleaning liquid onto the floor surface in advance. Also, because the cleaning liquid is supplied to the inside of the nozzle portion, wasteful consumption of the cleaning liquid can be suppressed compared to a case where the cleaning liquid is sprayed over a large area of the floor surface.

[0008] According to the present invention, a reduction in the size of the apparatus can be realized, the driving efficiency can be increased, and wastewater on a floor surface can be reliably retrieved regardless of the state of the floor surface.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

FIG. 1 is a perspective diagram showing an external view, from the front side, of a floor surface cleaning apparatus according to an embodiment of the present invention.

FIG. 2 is a schematic diagram showing a configuration of the inner portion of the floor surface cleaning apparatus.

FIG. 3 is a schematic diagram showing a cross-section taken along a cutting line III-III in FIG. 2, and shows a configuration of a supporting holder supporting a water collecting box.

FIG. 4 is a rear-side perspective view showing a configuration of the supporting holder.

FIG. 5 is a side view of a rear portion of the floor surface cleaning apparatus, and shows a state where the water collecting box is mounted to the floor surface cleaning apparatus.

FIG. 6 is a side view of a rear portion of the floor surface cleaning apparatus, and shows a state where the water collecting box has been removed from the floor surface cleaning apparatus.

FIG. 7 is a perspective view showing a configuration of the water collecting box included in the floor surface cleaning apparatus.

FIG. 8 is an enlarged view showing a configuration of the inner portion of the water collecting box.

FIG. 9 is a schematic diagram showing the flow of cleaning liquid, wastewater, and air in the water collecting box.

DETAILED DESCRIPTION

[0010] Hereinafter, an embodiment according to one aspect of the present invention will be described with reference to the appended drawings. The embodiment of the present invention is an example embodiment of the present invention, and is not to be interpreted as limiting the present invention. To facilitate understanding of the present invention, internal configurations may be illustrated with solid lines in the drawings. Also, a vertical direction D1, a front-rear direction D2, and a left-right or width direction D3 shown in the drawings will be used in the description below.

Floor Surface Cleaning Apparatus 10

[0011] FIG. 1 is a perspective diagram showing an external view, from the front side, of a floor surface cleaning apparatus 10 (an example of a floor surface cleaning apparatus according to the present invention) according to an embodiment of the present invention. The floor surface cleaning apparatus 10 is an autonomous travel-type cleaning apparatus. As the floor surface cleaning apparatus 10 autonomously travels forward (in an advancing direction) over a floor surface 23 (see FIG. 2) of a concourse of an airport, a station, a shopping mall or the like, the floor surface cleaning apparatus 10 cleans the floor surface 23 by brushing the floor surface 23 (cleaned surface) while using a cleaning liquid. The floor surface cleaning apparatus 10 automatically performs cleaning while autonomously travelling over the floor surface 23 based on various kinds of cleaning information input in advance, such as a travelling route, a cleaning area, a cleaning time period, and a return position to which the floor surface cleaning apparatus returns to recharge.

[0012] It should be noted that the floor surface cleaning apparatus 10 is just one example of the floor surface cleaning apparatus according to the present invention, and the present invention is not limited to a floor surface cleaning apparatus that travels autonomously. For example, the present invention can also be applied to a cleaning apparatus that cleans the floor surface 23 using a cleaning liquid while being manually pushed by an operator to move over the floor surface 23. Alternatively, the present invention can also be applied to a cleaning apparatus that cleans a path surface of an outdoor footpath, a road, etc. while travelling autonomously or being manually moved over the path surface.

[0013] FIG. 2 is a schematic diagram showing a configuration of the floor surface cleaning apparatus 10. As shown in FIG. 2, the floor surface cleaning apparatus 10 is constituted by an apparatus body 11 and various functional units that the apparatus body 11 is provided with. Specifically, the apparatus body 11 is provided with a travelling unit 12, a motor 13, a battery 14, an air intake fan 15 (an example of a ventilator according to the present invention), a water collecting box 16 (an example of a wastewater collecting box according to the present invention), a supporting holder 17, a water collecting nozzle 18 (an example of a nozzle portion according to the present invention), an operation unit 20, a display panel 21, a cleaning liquid tank 24 (an example of a cleaning liquid tank according to the present invention), a supply pump 25 (an example of a second pump according to the present invention), a wastewater tank 22 (an example of a wastewater tank according to the present invention),

a retrieval pump 27 (an example of a first pump according to the present invention), a control unit 40, and the like.

[0014] The apparatus body 11 is the housing of the floor surface cleaning apparatus 10, and, as shown in FIG. 1, the floor surface cleaning apparatus 10 has an exterior cover 11A that forms the exterior thereof. Also, as shown in FIG. 2, the apparatus body 11 is provided with a chassis 11B on the lower portion thereof. The chassis 11B is provided approximately parallel to the floor surface 23. Also, the inner portion of the apparatus body 11 is appropriately provided with a frame for supporting the various functional units described above.

[0015] As shown in FIG. 2, a travelling portion 12 is provided on the lower portion of the apparatus body 11. The travelling portion 12 is a portion for transferring a conveyance force acting in an advancing direction to the floor surface 23 while maintaining the travelling orientation of the apparatus body 11, and is attached to the chassis 11B. The travelling portion 12 includes a pair of travelling wheels 121 that are rotationally driven by the motor 13 and four orientation maintaining casters 122. When the rotating speed of the wheels 121 is controlled to be the same speed, the floor surface cleaning apparatus 10 advances forward in a straight line, and when the rotating speeds of the wheels 121 are controlled to different speeds, the floor surface cleaning apparatus 10 turns to the side of the wheel 121 with the lower rotating speed.

[0016] The wheels 121 are located at the center, in a front-rear direction D2, of the chassis 11B, and are rotatably supported at two end portions thereof in a width direction D3. The four casters 122 are rotatably supported at two end portions of the front end of the chassis 11B and two end portions of the rear end of the chassis 11B. In a state where the floor surface cleaning apparatus 10 is placed on the floor surface 23, the outer circumferential surfaces of the wheels 121 and the casters 122 are supported by the floor surface 23. Accordingly, the apparatus body 11 is kept in the travelling orientation shown in FIGS. 1 and 2.

[0017] The air intake fan 15 is provided on the rear side of the inner portion of the apparatus body 11. The air intake fan 15 generates suction for sucking up wastewater mist (wastewater droplets) along with air from a later-described suction port 168 provided in the water collecting box 16 into the water collecting box 16. The air intake fan 15 makes the pressure in the water collecting box 16 negative by sucking out air in the water collecting box 16 from a discharge port 165 (an example of a discharge port according to the present invention) of the water collecting box 16, and thus creates an air current that moves air and wastewater mist from the suction port 168 upward. The air intake port of the air intake fan 15 is connected to a later-described air intake port 174 by a flexible tube 151 for air intake. Also, the air outlet of the air intake fan 15 is connected by an exhaust pipe (not shown) to a discharge port (not shown) provided in the chassis 11B. Thus, when the air intake fan 15 is driven, air is sucked in from the air intake port at the leading end of the flexible tube 151, and the air passes from the discharge port 165 through the flexible tube 151, the air intake fan 15, and the exhaust pipe to be discharged to the outside.

[0018] In a state where the water collecting box 16 is mounted to the supporting holder 17, the air intake port 174 is connected to the discharge port 165 provided in the upper portion of the water collecting box 16. In this way, due to a suitable interval being provided in a vertical direction D1 between the suction port 168 and the discharge port 165, wastewater mist sucked up from the suction port 168 by the air intake fan 15 falls into and is pooled in a later-described pooling portion 31, without reaching the discharge port 165. Meanwhile, only air sucked up from the suction port 168 rises with the upward air current generated by the air intake fan 15, and is discharged to the outside from the discharge port 165 (see the dotted arrows in FIG. 9).

[0019] The battery 14 is provided at the center of the apparatus body 11. The battery 14 supplies driving power to the motor 13 and the air intake fan 15. Also, the battery 14 supplies driving power to a later-described motor 62 (see FIG. 3) for rotationally driving rotating brushes 26.

[0020] As shown in FIG. 2, the water collecting box 16 is provided on the rear side of the apparatus body 11. The water collecting box 16 is covered by a cover 162 when mounted to the apparatus body 11. The water collecting box 16 is detachably mounted to the later-described supporting holder 17. Note that the cover 162 is attached to the supporting holder 17.

[0021] The supporting holder 17 is provided on the rear side of the apparatus body 11. The supporting holder 17 is configured to detachably support the water collecting box 16. The supporting holder 17 is provided with the air intake port 174. The air intake port 174 extends through the front face of the supporting holder 17 to the discharge port 165 of the water collecting box 16. The air intake port 174 is connected to an end portion of the flexible tube 151.

[0022] The water collecting nozzle 18 is provided in the lower portion of the supporting holder 17. The water collecting nozzle 18 is in communication with the water collecting box 16. Accordingly, when the air intake fan 15 is driven, air and wastewater mist sucked in from the water collecting nozzle 18 passes through an opening 177 and the suction port 168, and into the water collecting box 16. Note that the water collecting box 16, the supporting holder 17, and the water collecting nozzle 18 will be described later in detail.

[0023] The operation unit 20 is provided in the upper portion of the rear face of the apparatus body 11. The operation unit 20 is attached to the external cover 11A. The operation unit 20 is an apparatus that is operated by an operator, and is, for example, a terminal apparatus that includes a touch panel that enables touch operations. Various kinds of cleaning information (travelling route, cleaning area, cleaning time frame, return position, and other information) can be input to the floor surface

cleaning apparatus 10 from the operation unit 20. Input cleaning information is transferred to the control unit 40 and used in travelling control performed by the control unit 40.

[0024] The display panel 21 is provided on the front face of the apparatus body 11. The display panel 21 is a liquid crystal panel, for example. Various kinds of announcement information are displayed on the display panel 21 by the control unit 40 during cleaning. The announcement information is information including, for example, information indicating that cleaning is underway and guide information regarding a floor being cleaned.

[0025] The control unit 40 is provided in the upper portion of the apparatus body 11. The control unit 40 controls travelling of the floor surface cleaning apparatus 10, driving of the air intake fan 15, driving of the rotating brushes 26, screen display of the display panel 21, and the like. The control unit 40 includes, for example, controlling devices such as a CPU, a ROM, and a RAM, storage mediums or storage apparatuses such as an HDD or flash memory, and the like. The CPU is a processor for executing various types of arithmetic processing. The ROM is a non-volatile memory in which a control program such as BIOS or OS for executing various types of processing on the CPU is stored in advance. The RAM is a volatile or non-volatile memory that stores various kinds of information, and is used as a temporary storage memory (work area) for various types of processing executed by the CPU. The control unit 40 uses the CPU to execute various types of control programs stored in advance in the ROM or a storage apparatus to control travelling of the floor surface cleaning apparatus 10, driving of the air intake fan 15, driving of the rotating brushes 26, and the like.

[0026] The cleaning liquid tank 24 and the wastewater tank 22 are provided on a supporting frame 11C above the battery 14. The cleaning liquid tank 24 contains cleaning liquid used to clean the floor surface 23. The cleaning liquid is, for example, a liquid in which a detergent is dissolved in a solvent such as water, or alternatively, is just water. The wastewater tank 22 contains wastewater transferred by the later-described retrieval pump 27.

[0027] The supply pump 25 is a pump that sucks the cleaning liquid from the cleaning liquid tank 24, and transfers the cleaning liquid to the water collecting nozzle 18. A plate-shaped vertical frame 11D is provided extending upward from the rear end portion of the chassis 11B, inside the apparatus body 11. The supply pump 25 is attached to the front face of the vertical frame 11D. The cleaning liquid tank 24 and the water collecting nozzle 18 are linked by a supply tube 241 (an example of a linking tube according to the present invention) via the supply pump 25. The supply tube 241 is a flexible tube that has flexibility, for example. For this reason, when the supply pump 25 is driven, cleaning liquid is sucked from the cleaning liquid tank 24, and the cleaning liquid is supplied to the inside of the water collecting nozzle 18 via the supply tube 241. In the present embodiment, when the floor surface cleaning apparatus 10 is performing a cleaning operation, the cleaning liquid is supplied to a gap 182 (see FIG. 8) provided at the front of the inner portion of the water collecting nozzle 18 (see dotted arrow in FIG. 9).

[0028] The retrieval pump 27 is attached to the wastewater tank 22. The retrieval pump 27 is a pump that sucks wastewater pooled in the later-described pooling portion 31 provided in the water collecting box 16, and transfers the wastewater to the wastewater tank 22. The retrieval pump 27 and the water collecting box 16 are linked via a retrieval tube 221, which is a flexible tube or the like. Specifically, the end portion of the retrieval tube 221 on the water collecting box 16 side is connected to a tube joint 41 provided in the water collecting box 16.

Supporting Holder 17

[0029] As shown in FIG. 2, the supporting holder 17 is provided on the rear side of the floor surface cleaning apparatus 10. The supporting holder 17 is attached to the vertical frame 11D inside the apparatus body 11.

[0030] FIG. 3 is a diagram showing the configuration of the supporting holder 17 that supports the water collecting box 16, and is a cross-sectional view taken along cutting line III-III shown in FIG. 2 as seen from the rear side looking forward. FIG. 4 is a rear-side perspective view showing the configuration of the supporting holder 17. Note that FIG. 4 shows a state where the water collecting box 16 has been removed. Also, in FIG. 4, all structures other than the supporting holder 17 and the water collecting nozzle 18 are omitted from the diagram.

[0031] As shown in FIGS. 3 and 4, the supporting holder 17 includes a base portion 171 extending in the vertical direction D1 and a box accommodating portion 172 fixed to the base portion 171.

[0032] The base portion 171 is formed by bending sheet metal, and configured by a base plate 171A attached to the vertical frame 11D and side plates 171B and 171C that respectively protrude rearward from two ends in the width direction D3 of the base plate 171A. The cylindrical air intake port 174 (see FIG. 4) for connecting an end portion of the flexible tube 151 is attached to the upper end of the base plate 171A. The air intake port 174 protrudes forward from the base plate 171A. Also, the air intake port 174 passes through the base plate 171A, and an end portion thereof is visible in an upper end portion on the rear face of the base plate 171A (see FIG. 4).

[0033] In a state where the water collecting box 16 is mounted to the box accommodating portion 172, the discharge port 165 provided in a front wall 16B of the water collecting box 16 is connected to the end portion of the air intake port 174. Accordingly, the flexible tube 151 and the water collecting box 16 are connected so that air can be sucked from the water collecting box 16.

[0034] Note that an air filter 169 that catches and removes waste such as rubbish and dust from the air dis-

charged from the discharge port 165 and cleans the air is provided in the water collecting box 16. A chemical filter, an HEPA filter, an ULPA filter, or the like can be used as the air filter 169, for example.

[0035] The box accommodating portion 172 detachably supports the water collecting box 16. The box accommodating portion 172 is fixed to the rear face of the base portion 171, and is disposed in the center, with respect to the width direction D3, of the base portion 171. The box accommodating portion 172 is formed by bending sheet metal, and is configured by an attachment plate 172A fixed to the base portion 171 and side plates 172B and 172C that respectively protrude rearward from two ends in the width direction D3 of the attachment plate 172A. The box accommodating portion 172 is shorter in the width direction D3 than the base portion 171, and thus the box accommodating portion 172 is accommodated in a space surrounded by the side plate 171B and the side plate 171C of the base portion 171.

[0036] The box accommodating portion 172 is open on the rear side thereof and is also open upward. Accordingly, as shown in FIGS. 5 and 6, in a state where an unshown door of the cover 162 is open, the water collecting box 16 can be lifted obliquely upward and rearward relative to the box accommodating portion 172, and the water collecting box 16 can be easily removed from the box accommodating portion 172. Here, FIGS. 5 and 6 are side views of the rear portion of the floor surface cleaning apparatus 10, where FIG. 5 shows a state where the water collecting box 16 is mounted to the box accommodating portion 172, and FIG. 6 shows a state where the water collecting box 16 has been removed from the box accommodating portion 172.

[0037] A bottom face 172D of the box accommodating portion 172 is provided with a rectangular opening 177 (see FIG. 4) that is elongated in the width direction D3. The opening 177 is in communication with the later-described water collecting nozzle 18. In the state where the water collecting box 16 is mounted to the box accommodating portion 172, the suction port 168 (see FIG. 6) provided in a bottom face 16A of the water collecting box 16 is aligned with the opening 177. Accordingly, the water collecting nozzle 18 and the water collecting box 16 are in communication with each other, and wastewater mist sucked up with air from the water collecting nozzle 18 can flow through the suction port 168 and into the water collecting box 16.

[0038] As shown in FIG. 3, the supporting holder 17 is provided with a motor 62 that supplies a driving force to the later-described rotating brushes 26, and a transfer mechanism 64 constituted by a plurality of gears. The motor 62 is provided in an accommodating portion 179 provided between the side plate 172C and the side plate 171C. The rotational driving force of the motor 62 is transferred to rotation shafts 261 of the rotation brushes 26 via the transfer mechanism 64. When the motor 62 is driven by the control unit 40 while the floor surface cleaning apparatus 10 is travelling, the rotation brushes 26 rotate in predetermined directions.

Water Collecting Box 16

[0039] FIG. 7 is a perspective view showing the configuration of the water collecting box 16. FIG. 8 is an enlarged view showing the configuration inside the water collecting box 16. The water collecting box 16 is for temporarily pooling wastewater sucked from a later-described suction port 181 of the water collecting nozzle 18. As shown in FIG. 7, the water collecting box 16 is formed in a hollow box shape, and formed in a parallelepiped shape that is long in the vertical direction D1 and the width direction D3 and is thin in the front-rear direction D2.

[0040] The suction port 168, which is long in the width direction D3, is formed in the bottom face 16A of the water collecting box 16. The suction port 168 is formed on the rear side of the bottom face 16A. In a state where the water collecting box 16 is mounted to the supporting holder 17, the suction port 168 is aligned with the opening 177 formed in the bottom face 172D of the box accommodating portion 172 (see FIGS. 4 and 8).

[0041] Also, the discharge port 165, which is in communication with the inside of the water collecting box 16, is formed in the upper portion of the front wall 16B on the front side of the water collecting box 16. In other words, the discharge port 165 is provided in the water collecting box 16 on the forward side, which coincides with the advancing direction (forward-movement direction) of the floor surface cleaning apparatus 10. The discharge port 165 is a through hole for discharging air in the water collecting box 16 to the outside due to air being sucked in by the air intake fan 15. In a state where the water collecting box 16 is mounted to the box accommodating portion 172, the discharge port 165 is connected to the air intake port 174.

[0042] In the present embodiment, while the suction port 168 is provided on the rear side of the bottom face 16A, the discharge port 165 is provided in the front wall 16B of the water collecting box 16 and at a position separated upward from the bottom face 16A. Accordingly, wastewater mist that has been flung towards the suction port 168 from the water collecting nozzle 18 is more likely to ride the air current generated by air intake by the air intake fan 15 and flow into the water collecting box 16. Also, the wastewater that has flowed into the water collecting box 16 moves forward on the air current generated by air intake by the air intake fan 15, falls into the later-described pooling portion 31 without reaching the discharge port 165, and is pooled in the pooling portion 31 (see the solid arrows in FIG. 9).

[0043] As shown in FIG. 8, the pooling portion 31 for temporarily pooling wastewater is provided in the water collecting box 16. Wastewater that has flowed from the water collecting nozzle 18 and through the opening 177 and the suction port 168 into the water collecting box 16 is pooled in the pooling portion 31.

[0044] A wastewater guiding path 32 is formed in the water collecting box 16. The wastewater guiding path 32 extends upward from the suction port 168 and is formed in an upwardly tapered shape. The wastewater mist that has advanced upward from the suction port 168 travels along the wastewater guiding path 32, and is guided into the space in the water collecting box 16 from an exit 321 at the upper end portion of the wastewater guiding path 32. In this way, because the wastewater guiding path 32 is formed in an upwardly tapered shape, the suction force of the air intake fan 15 can increase the updraft pressure in the vicinity of the exit 321 of the wastewater guiding path 32, even if the suction force is not of a magnitude with which the wastewater mist can reach the discharge port 165. Thus, even if a small capacity air intake fan 15 with a small output is employed, wastewater mist that has advanced to the wastewater guiding path 32 can be sucked up into the water collecting box 16.

[0045] Specifically, an inclined plate 35 is provided between the front wall 16B of the water collecting box 16 and a rear wall 16C facing the front wall 16B from the rear side, and the wastewater guiding path 32 is formed by this inclined plate 35 and the rear wall 16C. The inclined plate 35 is a plate-shaped member elongated in the width direction D3, and both end portions thereof in the width direction D3 are joined to two side walls 16D (see FIG. 7) of the water collecting box 16. Also, the inclined plate 35 extends rearward and obliquely upward from the bottom face 16A of the water collecting box 16, and as a result of being bent upward from the extension end thereof, the upwardly tapered wastewater guiding path 32 is formed between the inclined plate 35 and the rear wall 16C. Note that the front wall 16B and the rear wall 16C are an example of a pair of side walls according to the present invention.

[0046] Also, a base end portion 351 of the inclined plate 35 is joined to the front end of the suction port 168 of the bottom plate 16A. As described above, both ends in the width direction D3 of the inclined plate 35 are respectively joined to the side walls 16D of the water collecting box 16, and thus the pooling portion 31 is formed by the bottom face 16A, the front wall 16B, the inclined plate 35, and the rear wall 16C. In other words, the pooling portion 31 is formed between the inclined plate 35 and the front wall 16B.

[0047] The tube joint 41 is provided in the water collecting box 16.

The tube joint 41 is fixed to the inner surface of the front wall 16B of the water collecting box 16. The tube joint 41 is provided above the pooling portion 31. The tube joint 41 is connected to the retrieval tube 221 via the through hole formed in the front wall 16B.

[0048] The tube joint 41 is, for example, a so-called one-touch female joint, and is linked to the end portion of the retrieval tube 221 according to an attachment/detachment operation to attach/detach the water collecting box 16 to/from the supporting holder 17. By pulling the water collecting box 16 rearward and obliquely upward when removing the water collecting box 16, the tube joint 41 is removed from a male-type tube joint 222 provided at an end portion of the retrieval tube 221 due to a tensile force acting rearwards. Also, when the water collecting box 16 is mounted to the supporting holder 17, the tube joint 41 is inserted into the tube joint 222 of the retrieval tube 221 by a pressing force acting forward generated at the time of mounting, and the tube joint 222 and the tube joint 41 are thus linked. Note that the tube joint 222 is fixed to the vertical frame 11D.

[0049] Straight piping 45 is provided in the water collecting box 16, extending from the tube joint 41 to the bottom face of the pooling portion 31. The lower end portion of the piping 45 is provided with a filter 46 made of a sponge material, unwoven cloth, or the like. Thus, when the retrieval pump 27 is driven, wastewater is sucked into the piping 45 from the pooling portion 31 via the filter 46, and wastewater then passes through the piping 45, the tube joint 41, and the retrieval tube 221 to be transferred to the wastewater tank 22 (see the dotted arrows in FIG. 9).

Water Collecting Nozzle 18

[0050] As shown in FIG. 8, the water collecting nozzle 18 is provided on the lower side of the supporting holder 17. When the floor surface cleaning apparatus 10 moves while performing a cleaning operation, as the floor surface cleaning apparatus 10 moves, the water collecting nozzle 18 collects wastewater including cleaning liquid sprayed onto the floor surface 23. Also, the water collecting nozzle 18 is a portion for moving the collected waste water and air to the water collecting box 16 in response to the air intake fan 15 and the motor 62 running during a cleaning operation performed by the floor surface cleaning apparatus 10. The water collecting nozzle 18 has the suction port 181 that faces the floor surface 23.

[0051] The water collecting nozzle 18 has an elongated shape in the width direction D3, and is configured by a bottom plate 183 that forms the bottom plate 172D of the box accommodating portion 172, and a square-shaped tubular outer peripheral wall 184 that protrudes downward from the outer peripheral edge of the bottom plate 183. That is, the water collecting nozzle 18 and the box accommodating portion 172 share the bottom plate 183 and are separated from each other in the vertical direction by the bottom plate 183. In other words, the box accommodating portion 172 and the water collecting box 16 are provided above the water collecting nozzle 18. The outer peripheral wall 184 is open downward and forms the suction port 181 mentioned above.

[0052] A pair of rotating brushes 26 (26A and 26B) are rotatably provided in the water collecting nozzle 18. The pair of rotating brushes 26 are made of an absorbent material that has absorbency so that they can retain the cleaning liquid. In other words, the pair of rotating brushes 26 are formed so as to be able to retain water.

[0053] In the water collecting nozzle 18, the pair of ro-

tating brushes 26 are lined up in the front-rear direction D2, and are arranged so as to be parallel to each other. Also, the pair of rotating brushes 26 each have the same outer diameter and the same length in the width direction D3. The pair of rotating brushes 26 are rotatably supported by the water collecting nozzle 18 in a state where the outer circumferential surfaces of both brushes 26 are in contact with the floor surface 23. Each of the pair of rotating brushes 26 is a roller brush that is elongated in the width direction D3. The rotation shaft 261 of each rotating brush 26 is rotatably supported piercing two side plates 186 (see FIG. 3) in the width direction D3 of the outer peripheral wall 184 of the water collecting nozzle 18.

[0054] Of the two rotating brushes 26, the front brush 26A (an example of a first roller brush according to the present invention) arranged on the front side is provided forward of the suction port 168 and the opening 177. Also, the rear brush 26B (an example of a second roller brush according to the present invention) arranged on the rear side of the front brush 26A is provided rearward of the suction port 168 and the opening 177. More specifically, the rotating brushes 26 are arranged so that a center point P of the line segment joining the center of the front brush 26A and the rear brush 26B is located below the suction port 168 and the opening 177. In the present embodiment, as described later, the rear brush 26B has a higher water holding capacity, and thus the rotating brushes 26 are arranged so that the center point P is located on the forward side of the central line of the suction port 168 and the opening 177. Note that, as shown in FIG. 8, the front brush 26A and the rear brush 26B are arranged spaced apart from each other in the front-rear direction D2 by a predetermined interval ΔT. The predetermined interval ΔT is defined as being in the range of $0<\Delta T<=20mm$.

[0055] The rotational driving of the rotating brushes 26 is controlled by the control unit 40. In the present embodiment, the rotating speeds of the rotating brushes 26 are controlled to be the same. Meanwhile, the front brush 26A is rotationally driven such that the outer circumferential surface thereof slides rearward against the floor surface 23. Specifically, in FIG. 8, the front brush 26A is rotationally driven in a counter-clockwise rotation direction. Also, the rear brush 26B is rotationally driven such that the outer circumferential surface thereof slides forward against the floor surface 23. Specifically, in FIG. 8, the rear brush 26B is rotationally driven in a clockwise rotation direction.

[0056] As described above, the front brush 26A and the rear brush 26B are made of a material that has absorbency. In the present embodiment, the water retaining capacity of the front brush 26A differs from the water retaining capacity of the rear brush 26B, specifically, the water holding capacity of the rear brush 26B is greater than the water holding capacity of the front brush 26A. For example, the rear brush 26B is a brush flocked with innumerable soft linear fibers, and the front brush 26A is a brush flocked with innumerable hard linear fibers. Accordingly, the front brush 26A mainly has the role of cleaning away dirt on the floor surface 23 rather than absorbing wastewater on the floor surface 23. Also, the rear brush 26B mainly has the role of absorbing wastewater on the floor surface 23 rather than cleaning away dirt on the floor surface 23.

[0057] Because the rotating brushes 26 are configured this way, due to the rotating brushes 26 rotating, the floor surface 23 can be cleaned while wastewater on the floor surface 23 is absorbed by the rotating brushes 26. Also, using the centrifugal force generated during rotational driving, the retained wastewater can be made into a mist and flung from the opening 177 and the suction port 168 toward the wastewater guiding path 32 (see the solid arrows in FIG. 9).

[0058] The front end portion of the outer peripheral wall 184 of the water collecting nozzle 18 is provided with a sheet-shaped seal member 187 that has elasticity, extending toward the floor surface 23. The seal member 187 has a rectangular shape elongated in the width direction D3, and is joined to the front end portion of the outer peripheral wall 184 over the entire width direction D3 length thereof. A minute gap is provided between the lower end of the seal member 187 and the floor surface 23. Because the seal member 187 is provided in this manner, even if cleaning liquid is supplied to the gap 182 forward of the water collecting nozzle 18 during a cleaning operation performed by the floor surface cleaning apparatus 10, the seal member 187 can prevent the cleaning liquid from splashing forward and leaking to the outside. Also, even if cleaning liquid is dispersed forward by the rotation of the front brush 26A, the seal member 187 can prevent the cleaning liquid from being dispersed to the outside.

[0059] Also, the rear end portion of the outer peripheral wall 184 of the water collecting nozzle 18 is provided with a guard member 188 that extends toward the floor surface 23. The guard member 188 is a long member elongated in the width direction D3, and is joined to the rear end portion of the outer peripheral wall 184 over the entire width direction D3 length thereof. The lower end of the guard member 188 either comes in contact with the floor surface 23 or, alternatively, a minute gap is provided between the lower end and the floor surface 23. The guard member 188 is a member for preventing wastewater dispersed rearward by the centrifugal force generated by rotation of the rear brush 26B from being dispersed rearward and to the outside of the water collecting nozzle 18, and is formed as a resin member that has elasticity, for example.

[0060] A curved surface 189 that comes into contact with the outer circumferential surface of the rear brush 26B is provided on the front side of the guard member 188. In this way, by eliminating a gap between the outer circumferential surface of the rear brush 26B and the curved surface 189, even if retained wastewater is flung by the centrifugal force generated by rotation of the rear brush 26B, the flinging of the wastewater is impaired by

the curved surface 189 and is reabsorbed by the rear brush 26B. Note that the curved surface 189 does not need to come into contact with the outer circumferential surface of the rear brush 26B, and may be provided close to the outer circumferential surface with a minute gap therebetween.

[0061] As described above, in the floor surface cleaning apparatus 10 according to the present embodiment, because the water retaining rotating brushes 26 (26A and 26B) are provided in the water collecting nozzle 18 and the pooling portion 31 that can pool wastewater is provided in the water collection box 16, when the rotating brushes 26 are rotationally driven, the rotating brushes 26 can absorb and retain wastewater from the floor surface 23. Also, using the centrifugal force generated by the rotation of the rotating brushes 26, the wastewater retained in the rotating brushes 26 can be made into a mist and flung upward, and moved to the pooling portion 31 in the water collecting box 16 via the opening 177 and the suction port 168. Accordingly, even if the floor surface 23 is uneven, wastewater on the floor surface 23 can be reliably retrieved to the pooling portion 31.

[0062] Also, the air intake fan 15 is provided in the floor surface cleaning apparatus 10 and the wastewater guiding path 32 is provided in the water collecting box 16. Thus, wastewater mist flung toward the opening 177 and the suction port 168 can easily move into the water collecting box 16 by riding an air current generated by air intake by the air intake fan 15. Also, because the wastewater guiding path 32 is formed in an upwardly tapered shape, the updraft pressure in the vicinity of the exit 321 of the wastewater guiding path 32 can be increased, even if the suction power of the air intake fan 15 is low. Accordingly, even if a small capacity air intake fan 15 with a small output is employed, wastewater mist that has advanced to the wastewater guiding path 32 can be sucked up into the water collecting box 16. In other words, in the floor surface cleaning apparatus 10, a small capacity air intake fan 15 can be applied. As a result, depletion of the battery 14 can be suppressed, and the driving efficiency of the air intake fan 15 can be increased. Also, by making the air intake fan 15 smaller, the floor surface cleaning apparatus 10 can be made smaller.

[0063] Also, inside the water collecting box 16, the wastewater guiding path 32 is provided in the lower portion on the rear side of the water collecting box 16, and the discharge port 165 for air from the air intake fan 15 is provided in the upper portion of the front wall 16B of the water collecting box 16. Thus, wastewater mist that has moved along the wastewater guiding path 32 and passed the exit 321 upward rides the air current generated by air intake by the air intake fan 15 and moves forward, and falls into the pooling portion 31 without reaching the discharge port 165, and is pooled in the pooling portion 31 (see the solid arrows in FIG. 9). Accordingly, wastewater mist is prevented from moving back down the wastewater guiding path 32 from the exit 321.

[0064] Also, in the water collecting box 16, the pooling portion 31 and the wastewater guiding path 32 are separated in the front-rear direction D2 by the single inclined plate 35. Thus, the internal structure of the water collecting box 16 can be simplified.

[0065] Also, the floor surface cleaning apparatus 10 is provided with the wastewater tank 22 and the retrieval pump 27 that sucks up wastewater pooled in the pooling portion 31 and transfers the wastewater to the wastewater tank 22. Accordingly, wastewater that cannot be pooled in the pooling portion 31 can be retrieved to the wastewater tank 22. Accordingly, the floor surface cleaning apparatus 10 can be run for a long time before the wastewater tank 22 is filled with wastewater.

[0066] Also, the water collecting nozzle 18 is provided with two rotating brushes 26 (26A and 26B), and the front brush 26A and the rear brush 26B are rotationally driven in different rotation directions as described above while the floor surface cleaning apparatus 10 performs a cleaning operation. Accordingly, the wastewater retained in the front brush 26A is likely to be dispersed toward the opening 177, and the wastewater retained in the rear brush 26B is also likely to be dispersed toward the opening 177. As a result, wastewater can be efficiently moved upward by the rotating brushes 26.

[0067] Also, as described above, the water retaining capacity of the rear brush 26B is greater than the water retaining capacity of the front brush 26A. For this reason, while the floor surface cleaning apparatus 10 is moving forward, even if wastewater that could not be absorbed by the front brush 26A moves rearward, the wastewater can be reliably retrieved by the rear brush 26B.

[0068] Also, because the water collecting nozzle 18 is provided with the guard member 188, wastewater dispersed rearward by a centrifugal force generated by rotation of the rear brush 26B can be prevented from being dispersed to the outside from the rear side of the water collecting nozzle 18. The guard member 188 is provided with a curved surface 189. Thus, wastewater that has been flung rearward from the rear brush 26B is caught by the curved surface 189, and can be reabsorbed by the rear brush 26B.

[0069] Also, the floor surface cleaning apparatus 10 is provided with the cleaning liquid tank 24, the supply tube 241, and the supply pump 25, and thus there is no need to spray the cleaning liquid onto the floor surface 23 in advance. Also, cleaning liquid is supplied to the inside of the water collecting nozzle 18, and thus wasteful consumption of the cleaning liquid can be suppressed compared to a case where the cleaning liquid is sprayed over a large area of the floor surface 23.

[0070] It should be noted that, in the above-described embodiment, the front brush 26A and the rear brush 26B were exemplified as being constituted by linear fibers, but the present invention is not limited to this configuration. For example, the front brush 26A and the rear brush 26B may be made of sponge materials with different water retaining capacities, or other resin or fibrous materials.

[0071] Also, in the above-described embodiment, a configuration is exemplified where the pair of rotating brushes 26 are provided in the water collecting nozzle 18, but the number of rotating brushes 26 is not limited to two, and one or three or more may be employed.

[0072] Also, in the above-described embodiment, the floor surface cleaning apparatus 10 is exemplified as the configuration shown in FIG. 1 including the air intake fan 15, the cleaning liquid tank 24, the wastewater tank 22, and the like, but the present invention is not limited to the configuration shown in FIG. 1. The present invention may be realized as a floor surface cleaning apparatus including at least the water collecting nozzle 18, the rotating brushes 26, and the water collecting box 16.

LIST OF REFERENCE NUMERALS

[0073]

10	Floor surface cleaning apparatus
14	Battery
15	Air intake fan
16	Water collecting box
17	Supporting holder
18	Water collecting nozzle
22	Wastewater tank
23	Floor surface
24	Cleaning liquid tank
25	Supply pump
26	Rotating brush
26A	Front brush
26B	Rear brush
27	Retrieval pump
31	Pooling portion
32	Wastewater guiding path
35	Inclined plate
165	Discharge port
168	Suction port
169	Air filter
174	Air intake port
177	Opening
187	Seal member
188	Guard member
189	Curved surface
221	Retrieval tube
241	Supply tube
261	Rotation shaft
321	Exit

Claims

1. A floor surface cleaning apparatus for cleaning a floor surface (23) using a cleaning liquid while moving over the floor surface (23), the floor surface cleaning apparatus (10) comprising:

a nozzle portion (18) that is elongated in a width direction intersecting a movement direction of the floor surface cleaning apparatus (10), and configured to collect wastewater including the cleaning liquid as the floor surface cleaning apparatus (10) moves;

rotating brushes (26) that are rotatably supported by the nozzle portion (18) in a state of contact with the floor surface (23), and are configured to be able to retain water and fling the wastewater upward using a centrifugal force generated during rotation; and

a wastewater collecting box (16) that is provided above the nozzle portion (18) and includes a suction port (168) that is in communication with the inner portion of the nozzle portion (18) and a pooling portion (31) configured to pool the wastewater that has entered therein from the suction port (168).

2. The floor surface cleaning apparatus (10) in claim 1, further comprising:

a ventilator (15) configured to suck air from an internal space of the wastewater collecting box (16) and generate an air current that moves wastewater droplets dispersed by rotation of the rotating brushes (26) upward from the suction port (168); and

a wastewater guiding path (32) that is provided in the wastewater collecting box (16) and is formed in a tapered shape extending upward from the suction port (168), and is configured to guide the wastewater droplets to the internal space of the wastewater collecting box (16).

3. The floor surface cleaning apparatus (10) according to claim 2,

wherein the wastewater guiding path (32) is provided on one side of the movement direction in the internal space, and

a discharge port (165) for air from the ventilator (15) is provided on the other side of the movement direction in the wastewater collecting box (16).

4. The floor surface cleaning apparatus (10) according to claim 2 or 3, wherein the wastewater collecting box (16) includes:

a pair of side walls (16B, 16C) separated in the movement direction; and

an inclined plate (35) that is provided between the pair of side walls (16B, 16C), the pooling portion (31) being formed between the inclined plate (35) and one side wall (16B) and the wastewater guiding path (32) being formed between the inclined plate (35) and the other side wall (16C).

5. The floor surface cleaning apparatus (10) according to any one of claims 1 to 4, further comprising:

a wastewater tank (22) configured to contain the wastewater; and
a first pump (27) configured to suck the wastewater pooled in the pooling portion (31) and transfer the wastewater to the wastewater tank (22).

6. The floor surface cleaning apparatus (10) according to any one of claims 1 to 5, wherein the rotating brushes (26) include at least one roller brush that is elongated in the width direction.

7. The floor surface cleaning apparatus (10) according to claim 6,
wherein the rotating brushes (26) include a first roller brush (26A) and a second roller brush (26B) that are parallel to each other and separated from each other in the movement direction,
the first roller brush (26A) is a brush that is arranged on the movement direction side relative to the suction port (168), and is configured to be rotationally driven so as to slide rearwards opposite to the movement direction against the floor surface (23), and
the second roller brush (26B) is a brush that is arranged on the rear side opposite to the movement direction relative to the suction port (168), and is configured to be rotationally driven so as to slide in the same direction as the movement direction against the floor surface (23).

8. The floor surface cleaning apparatus (10) according to claim 7, wherein the water retaining capacity of the second roller brush (26B) is greater than the water retaining capacity of the first roller brush (26A).

9. The floor surface cleaning apparatus (10) according to any one of claims 1 to 8, further comprising:
a guard member (188) that is provided on a rear side opposite to the movement direction in the nozzle portion (18), and is configured to block the wastewater droplets dispersed rearward by the rotation of the rotating brushes (26).

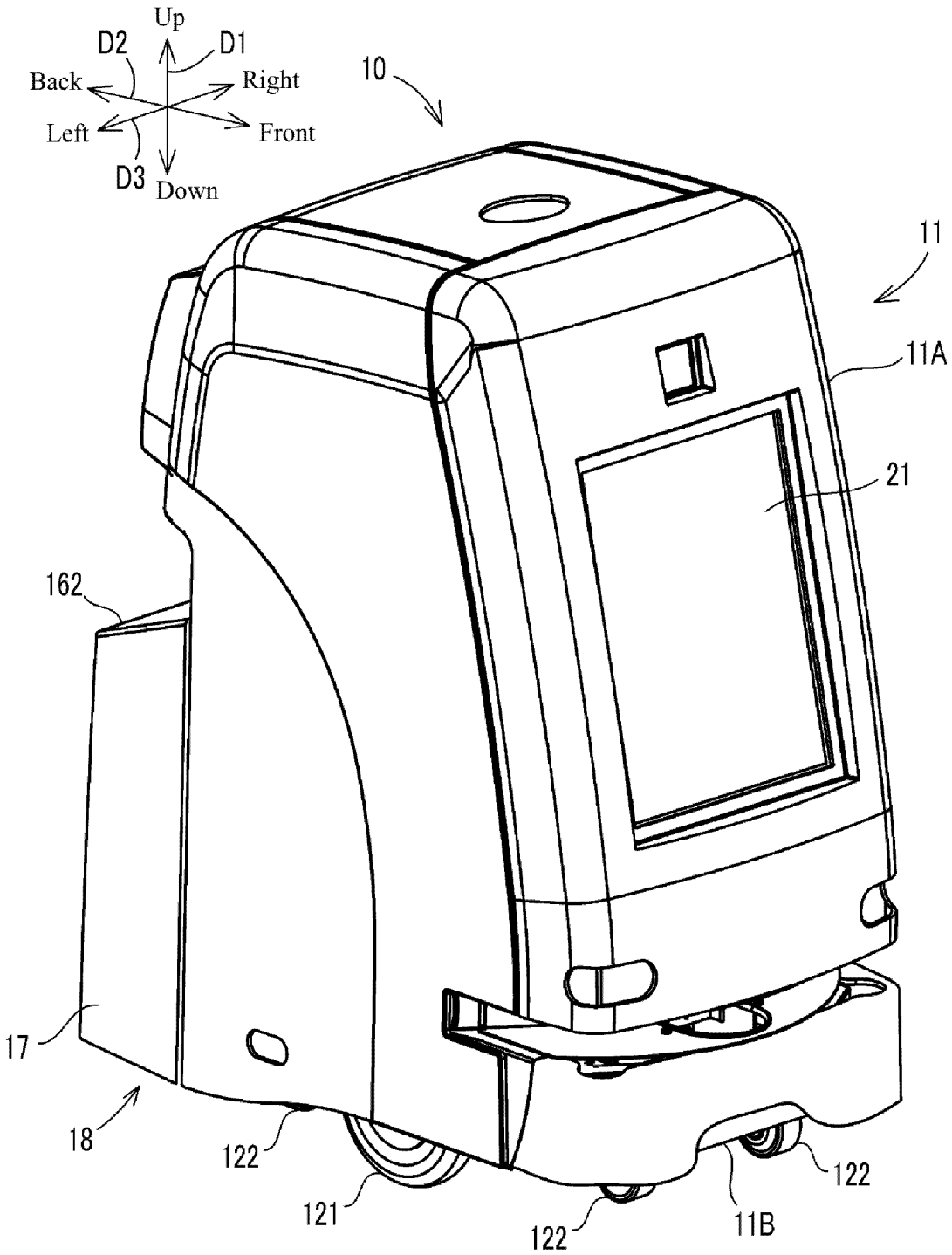
10. The floor surface cleaning apparatus (10) according to claim 9, wherein the guard member (188) includes a curved surface (189) that comes in contact with or is provided in the vicinity of an outer circumferential surface of the rotating brush (26).

11. The floor surface cleaning apparatus (10) according to any one of claims 1 to 10, wherein the rotating brushes (26) include a water absorbing material that has absorbability.

12. The floor surface cleaning apparatus (10) according to any one of claims 1 to 11, further comprising:

a cleaning liquid tank (24) configured to contain the cleaning liquid;
a linking tube (241) configured to link the cleaning liquid tank and the nozzle portion (18); and
a second pump (25) configured to suck the cleaning liquid and transfer the cleaning liquid into the nozzle portion (18) via the linking tube (241).

FIG. 1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11A
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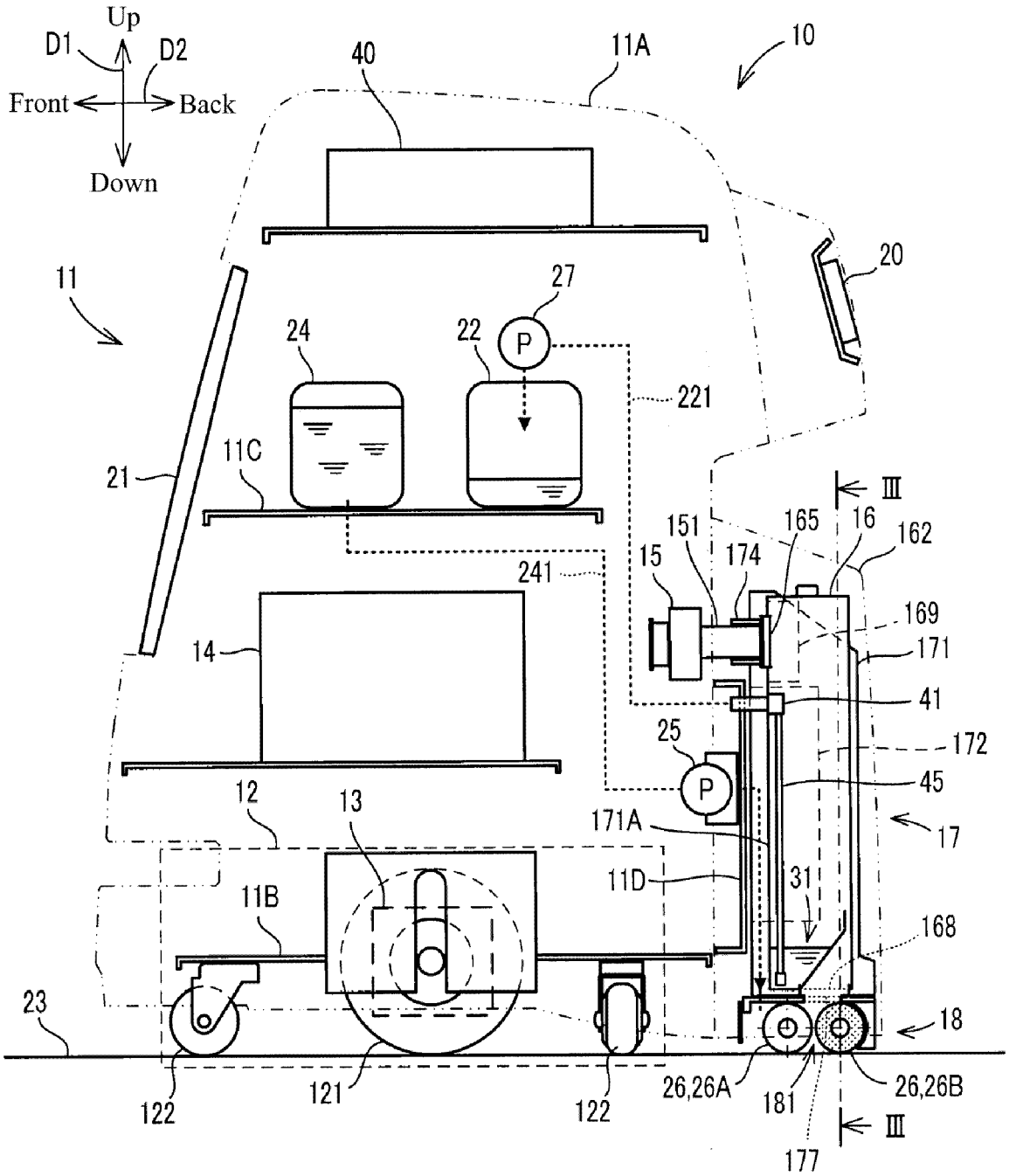
11B
122

FIG. 2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165
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162
15
174
241
169
171
14
41
25
172
P
45
12
13
171A
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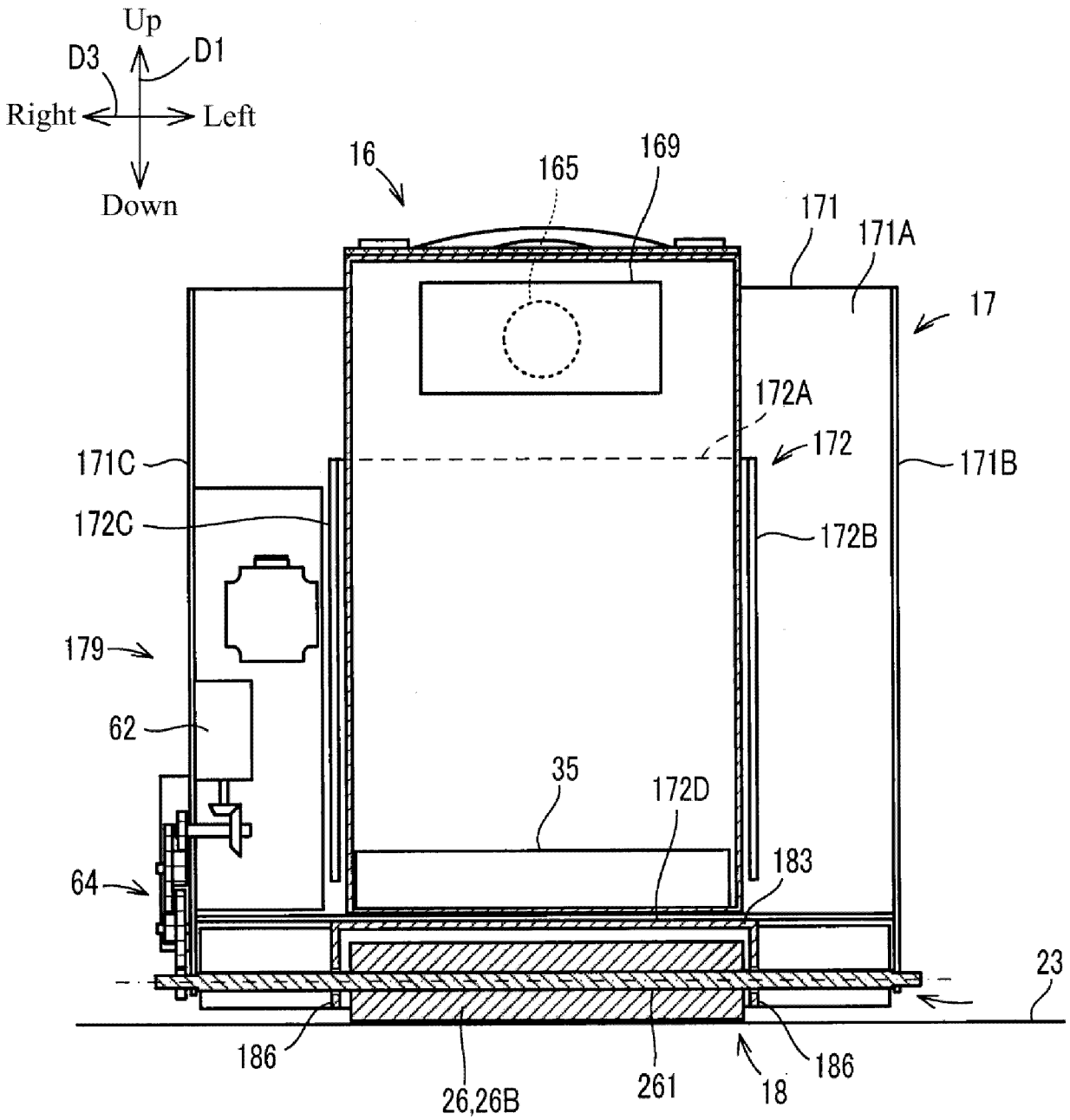
26,26A
181
26,26B
III
177

FIG. 3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35
172D
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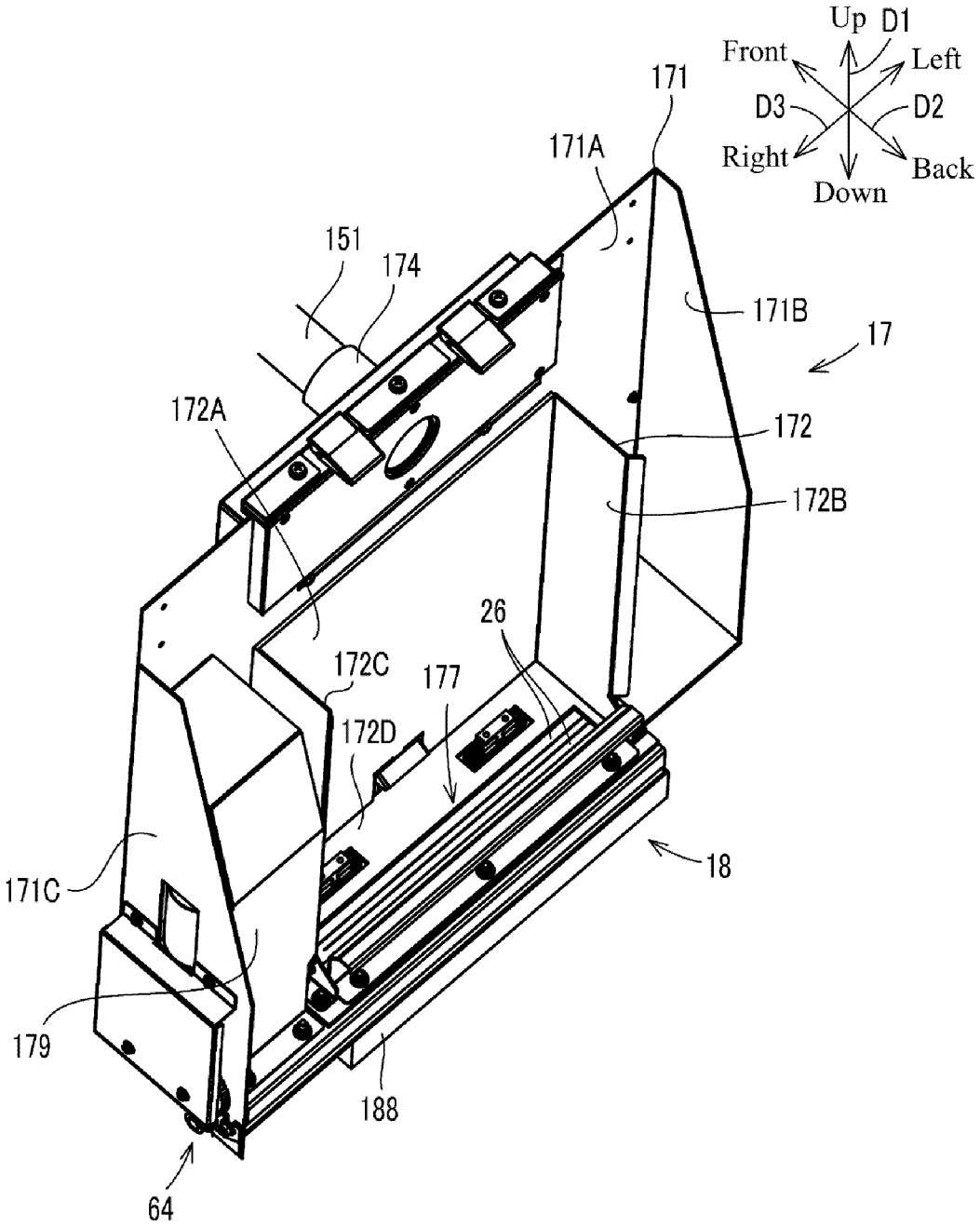
64
23
186
26,26B
261
18
186

FIG. 4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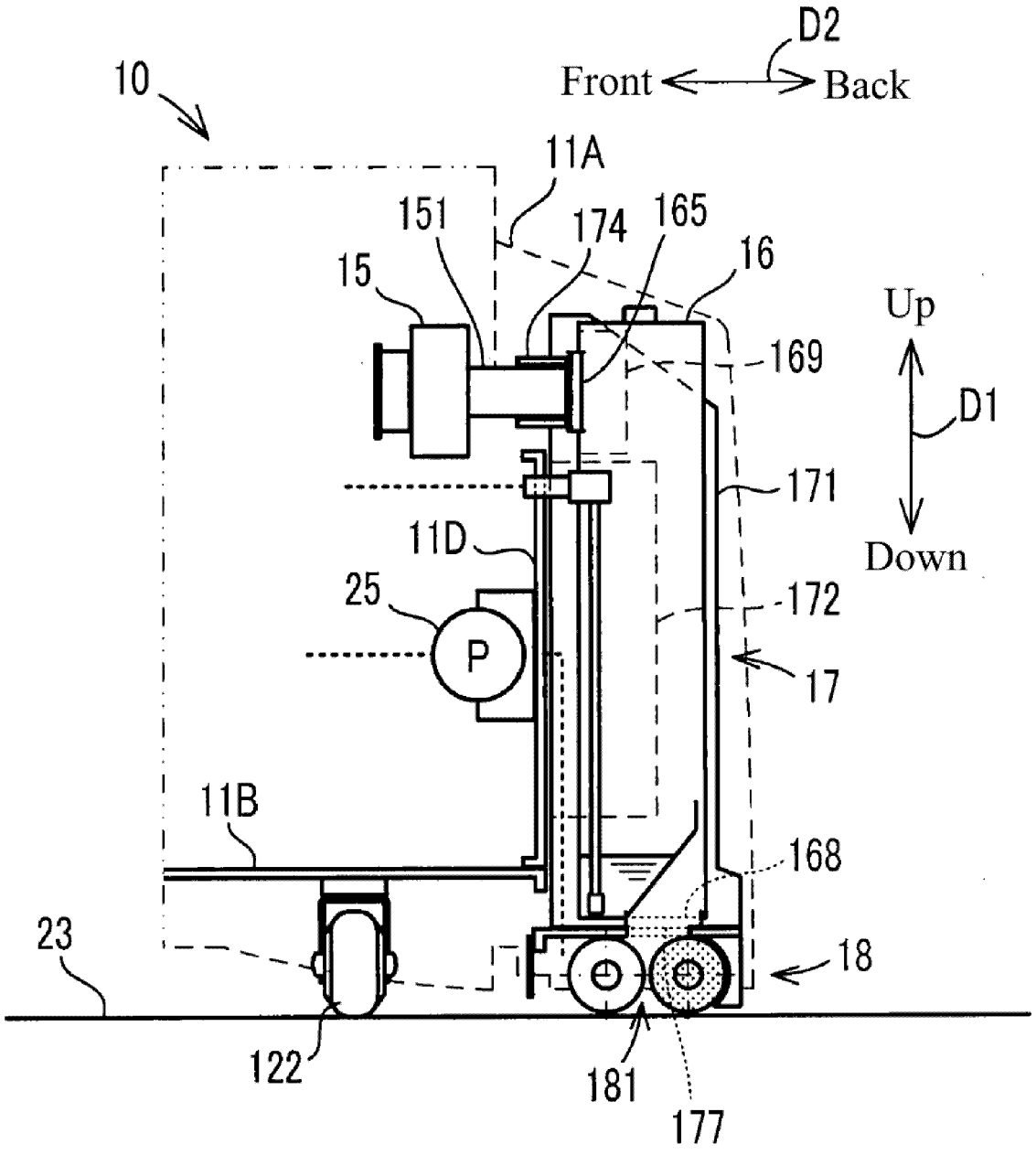
172D
171C
18
179
188
64

FIG. 5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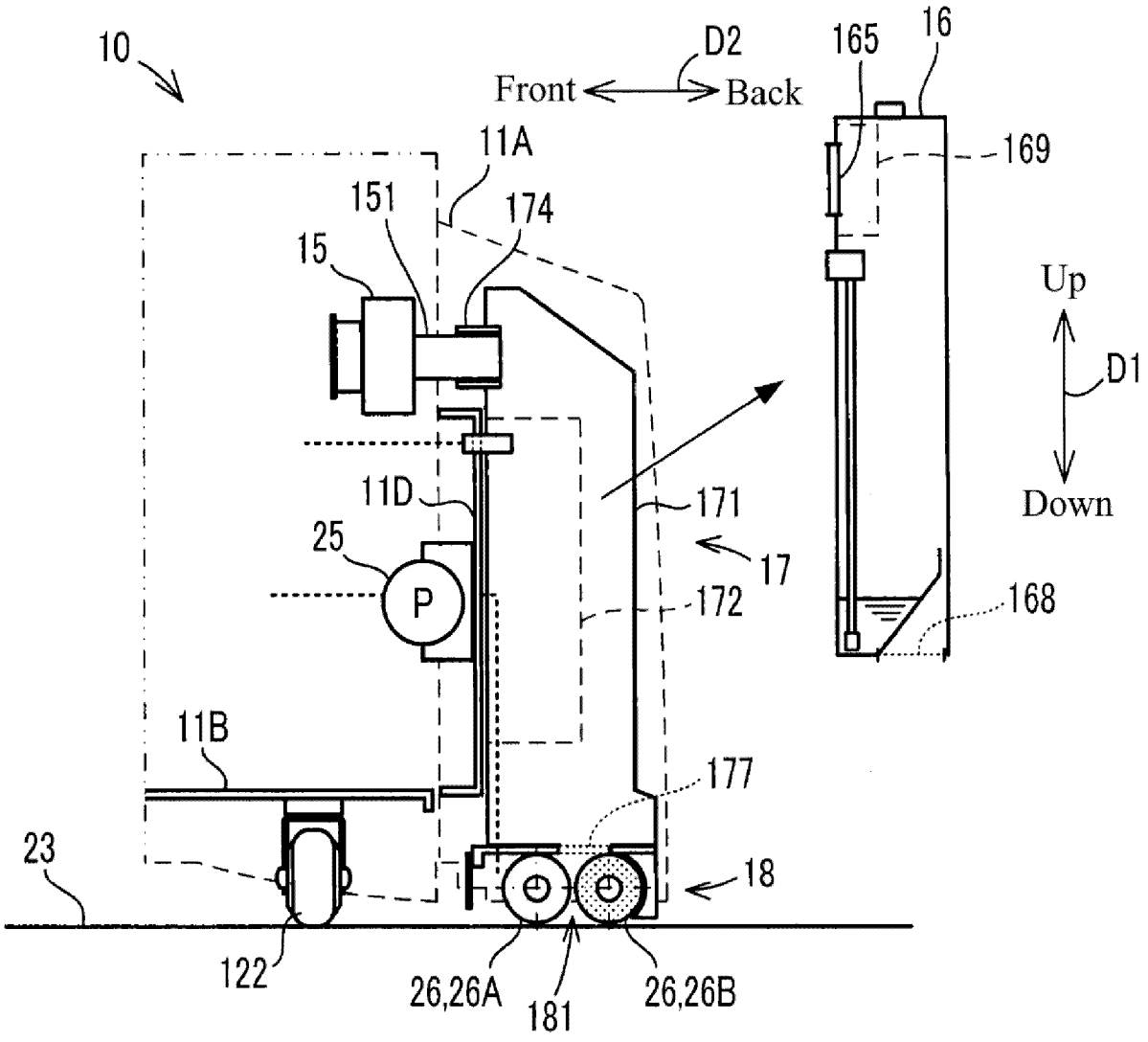
168
23
18
122
181
177

FIG. 6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11B
177
23
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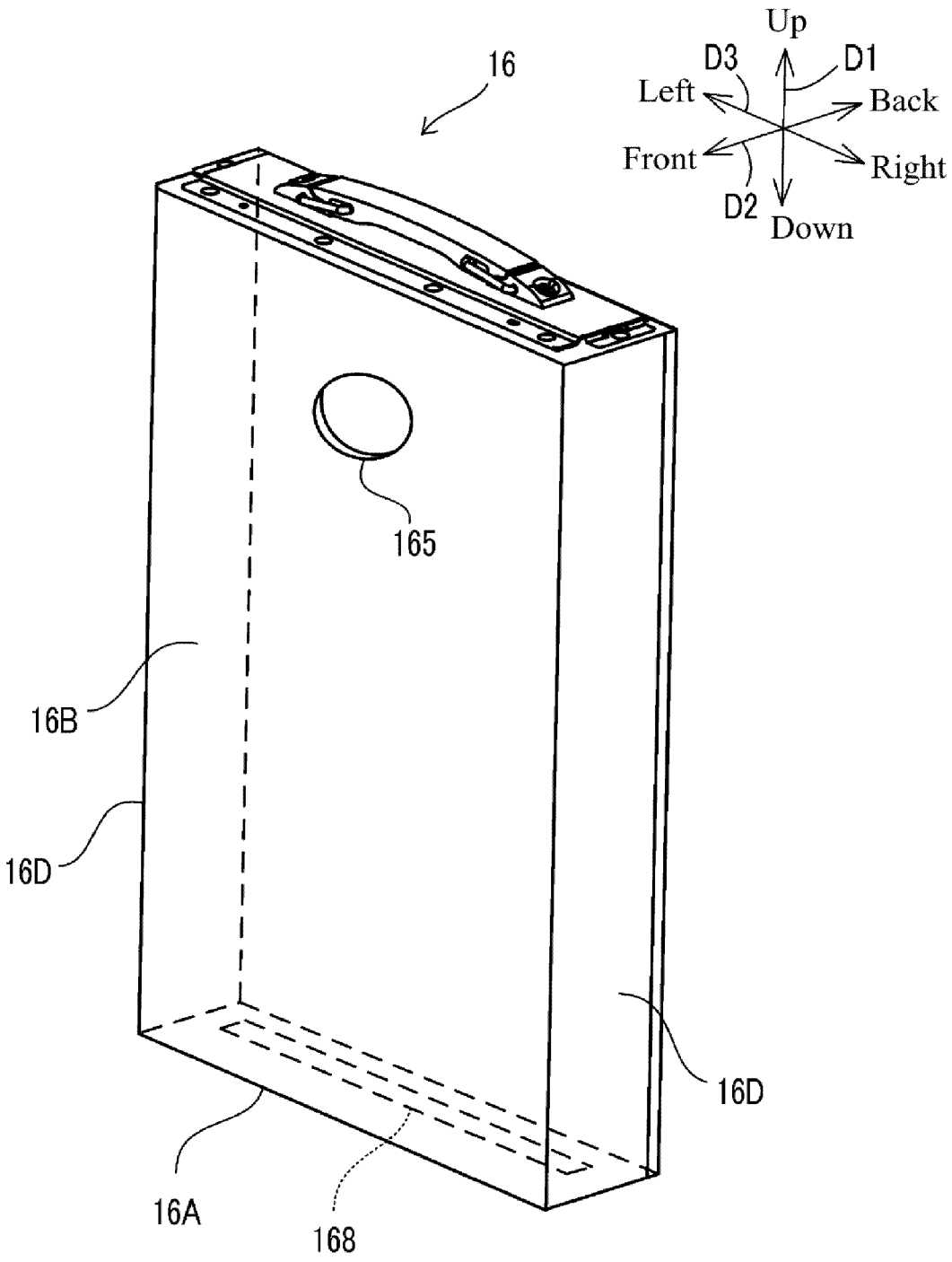
122
26,26A
181
26,26B

FIG. 7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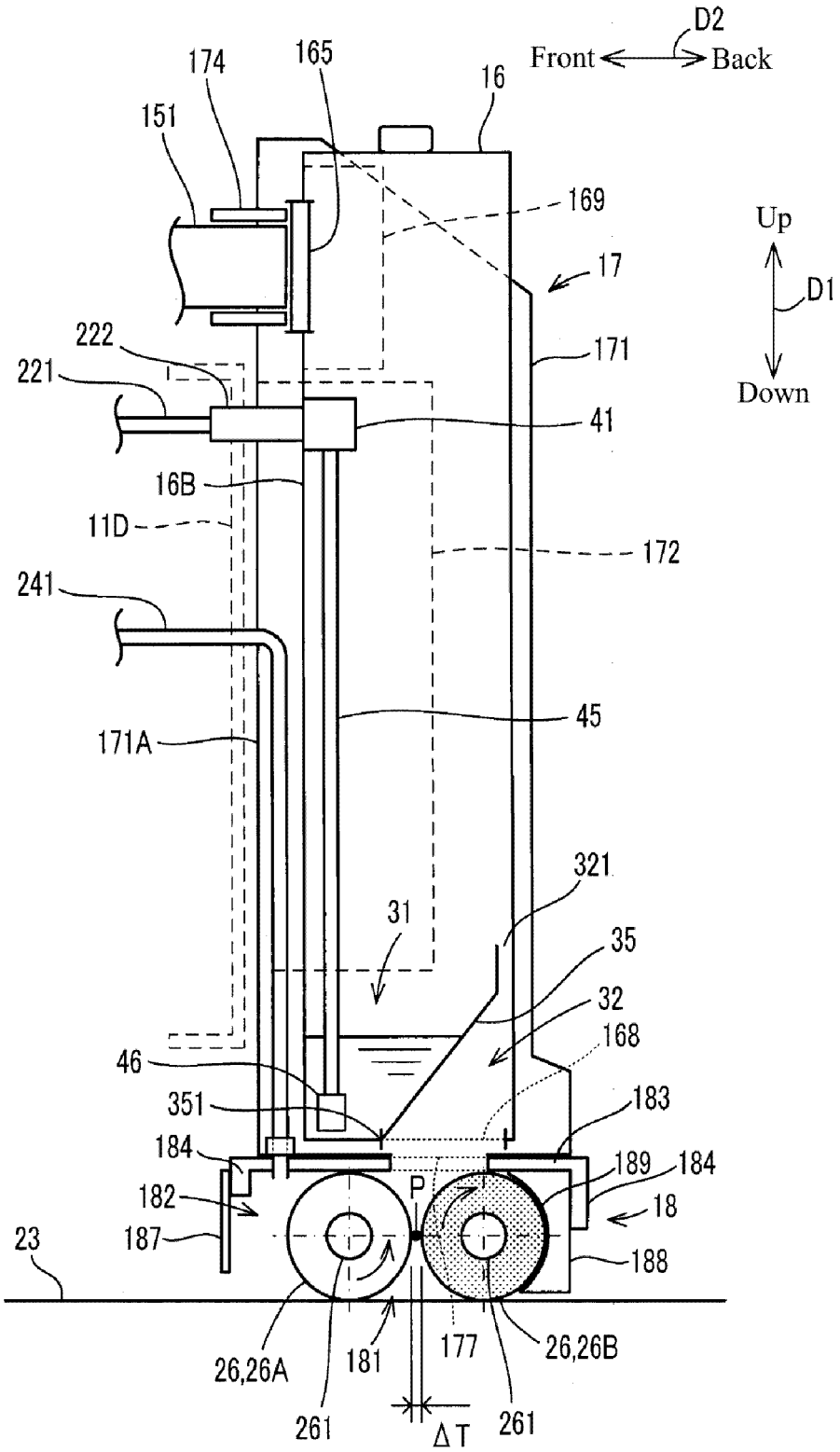
16B
16D
16D
16A
168

FIG. 8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171A
321
31
35
32
168
46
351
183
184
189
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P
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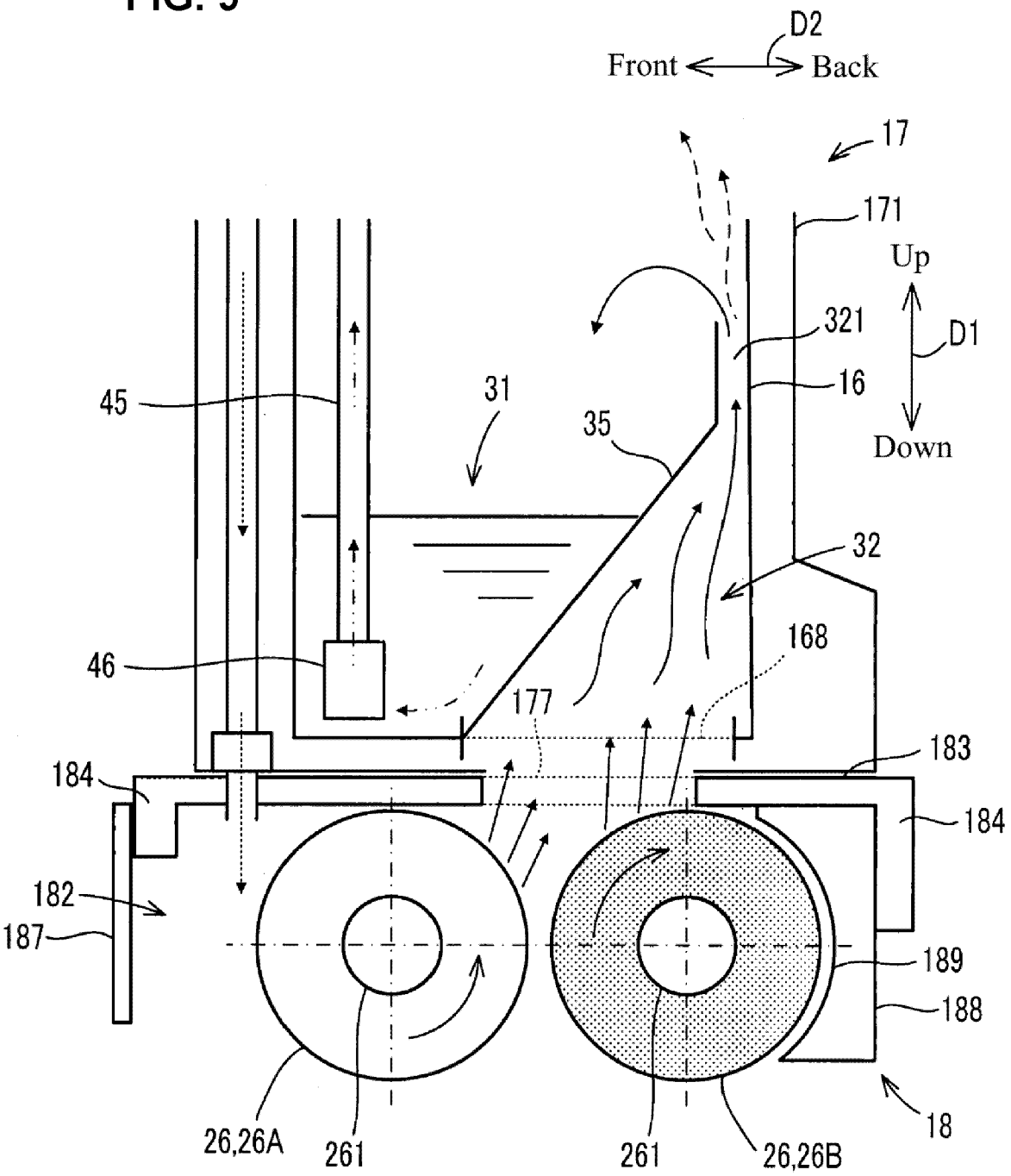
187
188
23
26,26A
181
177
26,26B
261
ΔT
261

FIG. 9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18
26,26A
261
261
26,26B

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EUROPEAN SEARCH REPORT

Application Number
EP 21 15 1513

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 Y A	EP 2 387 932 A1 (KONINKL PHILIPS ELECTRONICS NV [NL]) 23 November 2011 (2011-11-23) * paragraphs [0031] - [0033] *	1,2,5-7, 12 9-11 3,4,8	INV. A47L9/04 A47L11/18 A47L11/24 A47L11/40
Y	EP 2 395 895 A1 (KONINKL PHILIPS ELECTRONICS NV [NL]) 21 December 2011 (2011-12-21) * paragraphs [0033] - [0035]; figure 3 *	9-11	
A	DE 21 2015 000069 U1 (ALLCLEAN REINIGUNGS-UND UMWELT-TECHNIK GMBH [DE]) 29 September 2016 (2016-09-29) * paragraph [0082] *	1-12	

TECHNICAL FIELDS SEARCHED (IPC)
A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	7 June 2021	Eckenschwiller, A

CATEGORY OF CITED DOCUMENTS

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07-06-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2387932 A1	23-11-2011	CN 102247110 A	23-11-2011
		CN 102905600 A	30-01-2013
		CN 202198539 U	25-04-2012
		EP 2387932 A1	23-11-2011
		EP 2571415 A1	27-03-2013
		JP 5906236 B2	20-04-2016
		JP 2013526939 A	27-06-2013
		RU 2012155351 A	27-06-2014
		US 2013025077 A1	31-01-2013
		WO 2011145039 A1	24-11-2011
EP 2395895 A1	21-12-2011	CA 2753156 A1	15-04-2010
		CA 2753157 A1	15-04-2010
		EP 2191763 A1	02-06-2010
		EP 2395894 A1	21-12-2011
		EP 2395895 A1	21-12-2011
		WO 2010041184 A1	15-04-2010
		WO 2010041185 A1	15-04-2010
DE 212015000069 U1	29-09-2016	DE 212015000069 U1	29-09-2016
		WO 2015124311 A1	27-08-2015

EPO FORM P0459

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2020017978 A **[0001]**
- JP 2018000304 A **[0003] [0004]**