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(54) SURFACE CLEANING MACHINE

(57) A surface cleaning machine (10) comprises : a suction device (2); a cleaning base (12) suitable for moving on a surface to be cleaned, the cleaning base (12) comprising a cleaning roller (18) capable of rotating; a cleaning liquid supply unit (3); and a dirty liquid recovery tank (4), the dirty liquid recovery tank (4) being in fluid communication with the suction device (2); wherein the cleaning base (12) further comprises a transfer chamber adjacent to a rear side of the cleaning roller (18) and capable of temporarily holding a solid-liquid mixture, the transfer chamber configured to be in fluid communication with the suction device (2), so that the surface cleaning machine (10) can transfer at least a part of liquid or at least a part of a solid-liquid mixture from the transfer chamber to the dirty liquid recovery tank (4) by means of the suction device (2), thereby achieving a low energy consumption operation.

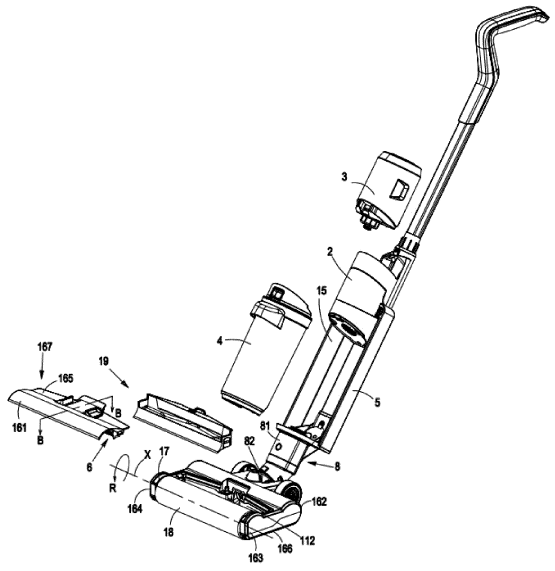

FIG.5

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Description

TECHNICAL FIELD

[0001] The present invention relates to a surface cleaning machine, and in particular, to a surface cleaning machine that cleans a surface to be cleaned by applying a cleaning fluid to the surface to be cleaned and recovers the dirty liquid after cleaning.

BACKGROUND

[0002] It is well known that floor cleaning machines are known, for example, in the form of a floor cleaner, in which one or more cleaning rollers rotating around a horizontal axis are used as cleaning tools, which contact with the floor to be cleaned and clean the floor with the aid of a cleaning fluid. The cleaning liquid is held in a cleaning liquid supply container and is applied to the floor during cleaning operations. The applied cleaning liquid together with the dirt (which may include filter, dust, stains, mud, hair and other debris) is then sucked up from the floor and transferred to the dirty liquid recovery container by the action of the cleaning rollers as well as the suction device.

[0003] CN209463915U discloses a surface cleaning equipment comprising an upright handle assembly; a cleaning head mounted on the upright handle assembly and adapted to move on a surface to be cleaned; a fluid delivery system and a fluid recovery system for extracting fluid and debris from the surface. The fluid recovery system typically includes a recovery tank, a nozzle adjacent to the surface to be cleaned and in fluid communication with the tank through a working air path, and a suction source that is in fluid communication with a working air path to draw up cleaning fluid from the surface to be cleaned and through the nozzle and working air duct to the recovery tank. The recovery tank periodically empties the collected fluid and debris, such as by removing the recovery tank from the equipment and emptying the collected fluid and debris into a sink, toilet or other discharge device.

[0004] The above-mentioned equipment is increasingly used because of its ability to combine the functions of dry vacuuming and wet cleaning. However, this type of surface cleaning equipment also has an important drawback, that is, the suction source power in the equipment is relatively large. If it is used in a battery-powered surface cleaning equipment, the single workable time of the equipment is usually very short. This is a significant disadvantage when users need to use workable s to clean large-area surfaces.

[0005] The patent document WO2017059600A1 discloses a floor cleaner with a cleaning roller, a water container, a clean water chamber, a clean water supply device, a waste water chamber, and an air pump. The water container is sealed and fastened to a surface of the cleaning roller. The clean water chamber, clean water supply device, and the water container are in mutual communication, and the clean water supply device enables clean water in the clean water chamber to flow into the water container. The waste water chamber has a cavity configured to store and recycle waste water, and the cavity is provided with a waste water inlet and a vent. The waste water inlet is in communication with the water container, and an air suction opening of the air pump in communication with the vent of the waste water chamber. This cleaner replaces the use of a suction motor as the power for pumping the waste water from the waste water chamber by using a separate air pump as the power for pumping the waste water from the waste water chamber. Since the power of the air pump is low, the energy consumption per unit time is much lower than that of the suction motor, so this floor cleaner can work much longer when used on battery-powered apparatus.

[0006] However, the above-mentioned floor cleaner also has drawbacks, as the surface to be cleaned relies entirely on the rotating cleaning roller to carry the dirt and garbage, which treats the dirty liquid and solid dirt separately, and the containers for the dirty liquid and solid dirt are also separate, which will make the cleaner require a lot of cleaning work from the user after use.

[0007] Therefore, although wet type surface cleaning devices have come a long way in various aspects, consumers still expect improved surface cleaning devices to be used to reduce the power of the motor during cleaning operations, while maintaining the efficacy of the surface cleaning operation and reducing the cleaning time of the cleaning devices themselves.

SUMMARY

[0008] In response to the above technical problems, an object of the invention is to provide a surface cleaning machine with long running time and high cleaning efficiency by improving the above-mentioned surface cleaning machine.

[0009] In order to achieve the object of the invention, the present invention provides a surface cleaning machine comprising: a suction device capable of providing a suction force; a cleaning base adapted to move on a surface to be cleaned and comprising a cleaning roller capable of rotation; a cleaning liquid supply unit; and a dirty liquid recovery tank being in fluid communication with the suction device; wherein the cleaning base further comprises a transfer chamber adjacent to a rear side of the cleaning roller and capable of temporarily holding a solid-liquid mixture , and the transfer chamber is configured to be in fluid communication with the suction device to enable the surface cleaning machine to transfer at least part of the liquid or at least part of the solid-liquid mixture in the transfer chamber to the dirty liquid recovery tank by means of the suction device during performing a surface cleaning operation.

[0010] In a preferred embodiment, the transfer chamber comprises an input port for the solid-liquid mixture to

enter therein, and wherein the input port is adjacent to the cleaning roller. In a particularly preferred embodiment, the transfer chamber is at least partially located below an axis of rotation of the cleaning roller.

[0011] In a preferred embodiment, the cleaning base comprises a guide ramp adjacent to the cleaning roller, and wherein the guide ramp has an upper end extending to the input port and a lower end near the lower portion of the cleaning roller.

[0012] In a particularly preferred embodiment, the guide ramp is arranged at the front of the transfer chamber.

[0013] In a particularly preferred embodiment, the lower end of the guide ramp is flexible, and wherein the lower end of the guide ramp is at least partially pressed against the surface to be cleaned during the movement of the cleaning base over the surface to be cleaned.

[0014] In a preferred embodiment, the transfer chamber includes at least one bottom wall and a circumferential side wall surrounding the bottom wall.

[0015] It is particularly advantageous if the transfer chamber is provided with at least one suction port on the bottom wall or the lower portion of the circumferential side wall, and wherein the suction port is in fluid communication with the dirty liquid recovery tank.

[0016] It is particularly advantageous if the suction port is arranged at the intersection of the rear portion of the circumferential side wall and the rear portion of the bottom wall of the transfer chamber.

[0017] It is particularly advantageous if an inner surface of the bottom wall is a sloping surface, and wherein the sloping surface is at its lowest position near the suction port.

[0018] In a preferred embodiment, the cleaning base comprises a detachable dirty liquid bin, and wherein the transfer chamber is formed within the dirty liquid bin.

[0019] In a preferred embodiment, the cleaning base also comprises a scraping roller device, and wherein the scraping roller device is in contact with a portion of the cleaning roller to enable removing at least partially of the excess dirty liquid from the cleaning roller soaked by the dirty liquid.

[0020] It is particularly advantageous if the scraping roller device is arranged to be located above the transfer chamber so that the excess dirty liquid removed at least partially from the cleaning roller can be transferred by gravity to the transfer chamber.

[0021] It is particularly advantageous if the scraping roller device is provided with an airflow connection to the transfer chamber so that the excess dirty liquid removed at least partially from the cleaning roller can be transferred to the transfer chamber by means of the suction force of the suction device.

[0022] It is particularly advantageous if the scraping roller device is constructed to simultaneously accommodate to remove at least a portion of the solid dirt from the cleaning roller which is in a position to be adhered to the solid dirt.

[0023] It is particularly advantageous if the scraping roller device comprises at least one scraping member in contact with a portion of the cleaning roller, and wherein the scraping member extends at least partially parallel to the axis of rotation of the cleaning roller and interferes with a portion of the cleaning roller during rotation of the cleaning roller.

[0024] It is particularly advantageous if the cleaning liquid supply unit comprises a cleaning liquid supply tank for holding a cleaning liquid and a liquid dispenser provided on the cleaning base, and wherein the liquid dispenser constructed to deliver the cleaning liquid to the cleaning roller and/or the surface to be cleaned is in fluid communication with the cleaning liquid supply tank.

[0025] It is particularly advantageous if the liquid dispenser is constructed to deliver the cleaning liquid to the cleaning roller; and wherein the liquid dispenser is located downstream of the scraping roller device with respect to the direction of rotation of the cleaning roller so as to apply the cleaning liquid to the cleaning roller from which the excess dirty liquid is scraped.

[0026] It is particularly advantageous if the surface cleaning machine further comprises: a body with a handle on the top, and wherein the cleaning base is rotationally coupled to the lower portion of the body, the suction device is fixed on the body, and the dirty liquid recovery tank and the cleaning liquid supply tank detachably mount on the body.

[0027] In a preferred embodiment, the cleaning base has an opening located in the lower portion and facing the surface to be cleaned, and wherein the cleaning roller is at least partially arranged at the opening.

[0028] In a preferred embodiment, the suction device includes a suction motor, the transfer chamber, the dirty liquid recovery tank and the suction motor are in sequential fluid communication, and wherein the surface cleaning machine is constructed to pick up and transfer the dirty liquid and solid dirt from the surface to be cleaned to the transfer chamber by the combined action of the suction motor and the rotating cleaning roller.

[0029] In a preferred embodiment, the suction device includes a pump arranged between the transfer chamber and the dirty liquid recovery tank, and the surface cleaning machine is constructed to pick up and transfer the dirty liquid and the solid dirt from the surface to be cleaned to the transfer chamber by means of the rotating cleaning roller.

[0030] In a preferred embodiment, a capacity of the dirty liquid recovery tank is greater than a capacity of the transfer chamber.

[0031] It is particularly advantageous if the capacity of the dirty liquid recovery tank is more than 3 times the capacity of the transfer chamber.

[0032] The surface cleaning machine of the present invention is equipped with a transfer chamber, so that the surface cleaning machine can sweep at least part of the dirty liquid and solid dirt directly into the transfer chamber by the cleaning roller, and then the suction de-

vice can suction at least part of the dirty liquid from the transfer chamber to the dirty liquid recovery tank; In this way, the suction device of the surface cleaning machine can operate at a relatively low power to transfer surface dirty liquid and solid dirt, and the surface cleaning machine can thus achieve a low energy consumption.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033]

Figure 1 is a perspective view I of a surface cleaning machine according to an embodiment of the present invention, wherein the body is in an upright stored position;

Figure 2 is a perspective view II of a surface cleaning machine according to an embodiment of the present invention, wherein the body is in a backward inclined use position;

Figure 3 is an exploded view I of a surface cleaning machine according to an embodiment of the present invention, wherein the cleaning liquid supply tank and the dirty liquid recovery tank are separated from the housing;

Figure 4 is a sectional view of the cleaning base of the surface cleaning machine of Figure 2;

Figure 5 is an exploded view II of the surface cleaning machine according to an embodiment of the present invention, wherein the cleaning liquid supply tank and the dirty liquid recovery tank are separated from the housing, and the upper cover and the dirty liquid bin are separated from the housing of the cleaning base;

Figure 6 is a perspective view of the upper cover of Fig. 5 in the elevational perspective;

Figure 7 is an enlarged view of Figure 6 at A;

Figure 8 is a sectional view of the upper cover along line B-B in Figure 5;

Figure 9 is a perspective view of a dirty liquid bin according to an embodiment of the present invention;

Figure 10 is a sectional view of the dirty liquid bin along line C-C in Figure 9;

Figure 11 is a schematic diagram of a cleaning liquid supply unit of a surface cleaning machine according to an embodiment of the present invention;

Figure 12 is a schematic diagram of a dirty liquid recovery unit of a surface cleaning machine according to an embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

[0034] In order to illustrate in detail the technical content, the constructional features, the purpose achieved and the efficacy of the invention, the following will be described in detail in conjunction with the embodiments and with the accompanying drawings.

[0035] FIGS.1 and 2 are schematic diagrams illustrating a surface cleaning machine according to an embodiment of the present invention. The surface cleaning machine 10 comprises a body 11 and a cleaning base 12. The surface cleaning machine 10 of this embodiment is an upright cleaning equipment, and the machine can be held upright after use.

[0036] The cleaning base 12 is supported on the surface to be cleaned and capable of moving along the surface to be cleaned during the cleaning of the surface to be cleaned by the surface cleaning machine. The lower portion of the body 11 is pivotally mounted to the cleaning base 12, and the body 11 can be rotated relative to the cleaning base 12 between an upright stop position (See FIG. 1) and a backward inclined use position (See FIG. 2).

[0037] In other embodiments, the surface cleaning machine is not limited to being an upright type, but can also be horizontal, portable and other types of equipment.

[0038] The surface cleaning machine 10 is provided with a cleaning liquid supply unit and a dirty liquid recovery unit. The cleaning liquid supply unit is used for holding the cleaning liquid and supplying the cleaning fluid to the outside. The cleaning liquid supply unit includes at least a cleaning liquid supply tank 3 for storing the cleaning fluid. The dirty liquid recovery unit is used to remove the dirty liquid converted from the spent cleaning liquid from the surface to be cleaned and remove the solid dirt on the surface to be cleaned, and store the dirty liquid and the solid dirt over a period of time. The dirty liquid recovery unit includes at least a dirty liquid recovery tank 4 for storing the dirty liquid and the solid dirt over the period of time.

[0039] For the purpose of description related to the drawings, the terms "top", "bottom", "left", "right", "front", "rear", "vertical", "horizontal", " internal ", "external " as well as their derivatives from the defined positional relationship and their derivatives are used relative to the direction in which the user pushes the surface cleaning machine 10 on the surface to be cleaned (that is, the pushing direction from back to front). As used herein, the term "rear side" refers to a position behind at least another component, but does not necessarily mean behind all other components. It should be understood, however, that the invention may take various alternative orientations unless the opposite orientation is explicitly indicated.

[0040] Referring to FIG.1, a handle 13 is mounted on the top of the body 11 for the user to hold. The handle

13 has an arcuate-shaped grip 14 with which the operator can hold the surface cleaning machine 10 with one hand and thereby move the cleaning base 12 of the surface cleaning machine 10 back and forth over the surface to be cleaned in the position of FIG. 2. In other embodiments, the handle may also have a user interface composed of one or more operating elements, which may be such as, but not limited to, buttons, triggers, trigger components, switches, etc., by which the surface cleaning machine can control the operation of all controlled components in the surface cleaning machine, such as for cleaning operation to be turned on or off, delivery adjustment of the cleaning liquid, power adjustment of the suction device, etc. In other embodiments, the user interface may also be located elsewhere on the surface cleaning machine, such as on the top or side walls of the body below the handle.

[0041] Referring to FIG.3, the body 11 further includes a housing 15, which is the skeleton part of the body 11 and which mainly serves to store or carry the rest of the parts on the body 11, Such as carrying the suction device, the handle, the cleaning liquid supply tank, the dirty liquid recovery tank, etc. In this embodiment, the central part of the housing 15 is fixed with a suction device 2. The cleaning fluid supply tank 3 and the dirty fluid recovery tank 4 are each detachably mounted at the upper and lower portions of the housing 15.

[0042] The suction device 2 is a suction force generating component of the dirty liquid recovery unit, which is used to generate a force for the flow of the dirty liquid. The suction device 2 in this embodiment comprises a suction motor consisting of a motor/wheel assembly arranged in the housing 15. The suction motor provides a suction force that extends to the cleaning base. The suction device 2 is in fluid communication with the dirty liquid recovery tank 4 via an upper suction path 21 (See FIG. 12). In addition to the upper suction path 21, the dirty liquid recovery unit further comprises a lower suction path 22 (See FIG. 12) from the dirty liquid recovery tank 4, through the housing 15 and to a transfer chamber 190 (See FIG.12) of the cleaning base 12. That means the suction device 2, the upper suction path 21, the dirty liquid recovery tank 4, the lower suction path 22 and the transfer chamber 190 of the cleaning base 12 are in sequential fluid communication.

[0043] In other embodiments, the suction device may comprise a pump. The transfer of the dirty liquid or solid-liquid mixture from the transfer chamber mentioned below to the dirty liquid recovery tank is achieved by the action of this pump. In the other embodiments, the pump will be arranged between the transfer chamber and the dirty liquid recovery tank.

[0044] The cleaning liquid supply tank 3 includes at least one chamber for holding the cleaning liquid. In other embodiments, the cleaning liquid supply tank may include a plurality of chambers. The cleaning liquid may be water or a mixed detergent mixture solution mixed with detergent. The cleaning liquid supply tank 3 in this embodiment is detachably mounted on the housing 15. The user can replenish the cleaning liquid supply tank 3 at any time as required.

[0045] The dirty liquid recovery tank 4 is mounted on the lower front side of the housing 15, and the dirty liquid recovery tank 4 is detachably mounted to the front of the housing 15. This structure allows the user to easily empty the dirty liquid recovery tank 4 at any time as needed. In other embodiments, the dirty liquid recovery tank can be mounted on other locations, even at any location on the housing 15.

[0046] The body 11 includes, in addition to the above components, a rechargeable battery pack 5 mounted on the housing 15. In this embodiment, the battery pack 5 is mounted on the lower rear side of the housing 15, i.e. on the rear side of the dirty liquid recovery tank 4. The battery pack 5 can power all components on the surface cleaning machine 10 such as the suction device 2 that need to consume electrical energy during operating. In other embodiments, a power plug can be provided on the body. The power plug can be electrically connected to an external power source, and the power consuming parts on the machine can be powered by the external power supply.

[0047] Referring to FIG. 3, a cleaning base 12 according to an embodiment of the present disclosure is shown and described. The cleaning base 12 includes a housing 16 having a front side wall 161, a rear side wall 162, a left side wall 163, a right side wall 164, a top wall 165, and a bottom wall 166, i.e., the housing 16 is substantially box-shaped.

[0048] Referring to FIG. 4, the inner wall of the housing 16 defines an interior space in which the cleaning roller 18, the dirty liquid bin 19, and the drive device 7 are at least partially admitted. The front portion of the housing 16 has an opening 110 (See FIGS. 1 and 2) extending from the front side wall 161 to the bottom wall 166. In other embodiments, the opening may be located only at the front of the bottom wall, and the front side wall of the housing is a complete wall extending from the top wall to the bottom wall.

[0049] As shown in FIGS. 3 and 5, the housing 16 is pivotally held at the lower portion of the body 11 by a pivoting joint 8. The pivoting joint 8 includes an upper pivoting portion 81 and a lower pivoting portion 82, and the upper rotating portion 81 and the lower rotating portion 82 enable the body 11 to rotate between an upright stop position and a backward inclined use position.

[0050] A portion of the lower suction path 22, a portion of a cleaning liquid output pipe, and a portion of the power supply circuit penetrate through the pivoting joint 8. The dirty liquid and solid dirt can be transported upward from the cleaning base 12 to the dirty liquid recovery tank 4 via the lower suction path 22. The cleaning liquid can be sent downward from the cleaning liquid supply tank 3 to the cleaning base 12 by the cleaning liquid output pipe. The power supply circuit can deliver power from the battery pack 5 on the upper side down to the power con-

suming parts of the cleaning base 12.

[0051] As shown in FIGS. 4 and 5, the front side wall 161 and the front portion of the top wall 165 constitute a detachable upper cover 167. The cleaning roller 18 is provided at the front of the cleaning base 12 and is housed in a roller chamber 17 at the front of the interior space. The cleaning roller 18 can be rotationally supported by the left side wall 163 and the right side wall 164 of the housing 16, and the cleaning roller 18 is rotatable with respect to the housing 16 in the direction R around the axis of rotation X. In this embodiment, the roller chamber 17 is in fluid communication with the opening 110. As shown in FIGS. 1-2, the front side portion as well as the lower side portion of the cleaning roller 18 is located at the opening 110.

[0052] In this embodiment, the outer surface of the cleaning roller 18 is covered with cleaning elements that can have bristles, fabric or other, which are configured to be soaked by a cleaning-type liquid such as water, detergent mix solution, for example.

[0053] Continuing as shown in FIG. 4, in this embodiment, a driving device 7 is mainly composed of motor component mounted in a motor chamber 113 at the rear portion of the interior space. The cleaning roller 18 are operably coupled to the driving device 7 and driven to rotate by the driving device 7. In other embodiments, the motor chamber may not be provided, e.g., the drive device may be built into the interior of the cleaning roller.

[0054] Referring to FIGS. 5, 6, and 7, the cleaning base 12 includes a scraping roller device 6. The scraping roller device 6 is mounted on the inner surface of the upper cover 167 of the housing 16 and located in the upper position of the roller chamber 17, and the scraping roller device 6 is located on the upper side of the dirty liquid bin 19 at the same time. The scraping roller device 6 is configured to be in contact with a portion of the cleaning roller 18. The scraping roller device 6 is capable of removing excess dirty liquid and at least a portion of solid dirt from the cleaning roller 18 which is soaked by the dirty liquid and adhered to the solid dirt. The excess dirty liquid and solid dirt removed from the cleaning roller 18 by the scraping roller device 6 can then be eventually drawn into the dirty liquid recovery tank 4 via the lower suction path 22.

[0055] Referring to FIGS. 6 and 7, the scraping roller device 6 according to an embodiment of the present disclosure is shown and described. The scraping roller device 6 includes a first scraping member 61 and a second scraping member 62. The second scraping member 62 is located downstream of the first scraping member 61 with respect to the direction of rotation R of the cleaning roller 18. The first scraping member 61 and the second scraping member 62 are substantially parallel, and there is an interval space 63 between the first scraping member 61 and the second scraping member 62.

[0056] The first scraping member 61 includes a plurality of tooth-shaped protrusions 611 arranged along the direction parallel to the rotation axis X of the cleaning roller 18, and there is a gap 612 between two adjacent protrusions 611. The plurality of protrusions 611 are configured to penetrate partially into the cleaning roller 18. The rotation of the cleaning roller 18 enables the plurality of protrusions 611 on the first scraping member 61 to remove solid dirt such as hair, flocs, etc. adhering to the peripheral surface of the cleaning roller 18, and also to scrape off part of the dirty liquid on the cleaning roller 18. It should be understood that the shape of the protrusions 611 is not limited to those shown and/or described in the present application unless specifically so required.

[0057] The second scraping member 62 includes a sheet-shaped scraping strip 621 configured to contact a part of the cleaning roller 18 as the cleaning roller 18 rotates, and the scraping strip 621 extends continuously in a direction parallel to the rotation axis X of the cleaning roller 18.

[0058] In this embodiment, the hardness of the second scraping member 62 is greater than that of the first scraping member 61. For example, the first scraping member 61 is made of plastic material, and the second scraping member 62 is made of metal material.

[0059] Due to the structure of the first scraping member 61 and the second scraping member 62, it is achieved that the performance of the first scraping member 61 in removing solid dirt from the cleaning roller 18 is superior to the second scraping member 62, and the performance of the second scraping member 62 in removing excess liquid from the cleaning roller 18 is superior to the first scraping member 61; and the frictional force between the second scraping member 62 and the cleaning roller 18 is greater than the frictional force between the first scraping member 61 and the cleaning roller 18.

[0060] Referring to FIG. 8, it can be understood that when too much solid dirt is accumulated on the cleaning roller 18, which is also soaked with dirty liquid, if a scraping component similar to the second scraping member 62 is used directly, the presence of solid dirt will make the surface of the cleaning roller 18 slippery and thus make the efficiency of scraping off the dirty liquid reduced. If the first scraping member 61 is used to prescrape the solid dirt and a small part of the dirty liquid adhering to the cleaning roller 18 in advance according to the present proposal, it will be easier for the second scraping member 62 to scrape off the remaining dirty liquid from the cleaning roller 18 when the cleaning roller 18 rotates to the subsequent second scraping member 62. If the first scraping member 61 scrapes off the solid dirt and a small part of the dirty liquid that adheres to the cleaning roller 18, it is easier for the second scraping member 62 to scrape the remaining dirty liquid off the cleaning roller 18 when the cleaning roller 18 is rotated to the subsequent second scraping member 62. Moreover, the first scraping member 61 in this case is a multi-toothed like convex structure, similar to a "comb" or "rake" structure, which can break up and fluff the cleaning elements (such as bristles) on the surface of the cleaning roller 18 while scraping solid dirt, which will be more con-

ducive to the scraping of liquid by the second scraping member 62 at a later stage. The dirty liquid scraped off by the second scraping member 62, which may contain small particles of solid dirt, can flow to the outside of the scraping roller device 6 through the interval space 63, the gap 612 on the first scraping member 61. In this embodiment, the dirty liquid and solid dirt flowing out of the scraping roller device 6 will flow in the direction of the dirty liquid bin 19 on the lower side.

[0061] Referring to FIG. 4, a dirty liquid bin 19 according to an embodiment of the present disclosure is shown and described. The dirty liquid bin 19 is accommodated in a central position in the interior space and is located in an accommodating 112 between the roller chamber 17 and the motor chamber, and the dirty liquid bin 19 is arranged to receive dirty liquid and solid dirt transferred by the cleaning roller 18 as well as from the scraping roller device 6 and the suction device 2.

[0062] As shown in FIGS. 9 and 10, the dirty liquid bin 19 in this embodiment has a quadrangular structure with an open top, which includes a bottom wall 191 and a perimeter wall consisting of a front side wall 192, a rear side wall 193, a left side wall 194 and a right side wall 195, and the bottom wall 191 and the perimeter wall enclose a transfer chamber 190 that can temporarily store dirty liquid and dirt. In this embodiment, the capacity of the transfer chamber 190 is much smaller than the capacity of the dirty liquid recovery tank 4. In the preferred embodiment, the capacity of the dirty liquid recovery tank 4 is more than three times the capacity of the transfer chamber 190.

[0063] A suction port 196 is provided at the intersection of the lower portion of the rear side wall 193 and the rear of the bottom wall 191. The suction port 196 is in fluid communication with the dirty liquid recovery tank 4 through the lower suction path 22 passing through the pivoting joint 8 (See Fig. 12). With the suction effect of the suction device 2, the dirty liquid or solid-liquid mixture entering the transfer chamber 190 can be transferred to the dirty liquid recovery tank 4. In this embodiment, to facilitate the flow of the dirty liquid in the transfer chamber 190 to the suction port 196, the inner surface of the bottom wall 191 is provided with a backward sloping surface 1911, and the sloping surface 1911 is at the lowest point near the suction port 196.

[0064] Referring to FIGS. 4 and 10, the position of the dirty liquid bin 19 and the cleaning roller 18 according to the embodiment disclosed herein is shown and described. In this case, the front side wall 192 of the dirty liquid bin 19 is adjacent to the cleaning roller 18. The transfer chamber 190 has an input port 197 for the solid-liquid mixture to enter the transfer chamber 190. The input port 197 is arranged on the front side wall 192 and is provided adjacent to the cleaning roller 18.

[0065] The transfer chamber 190 of this embodiment is partially located below the rotation axis X of the cleaning roller 18. The mouth portion of the input port 197 is also partially located below the rotation axis X. The front side wall 192 has a guide ramp 1921 adjacent to the cleaning roller 18. The upper end 19211 of the guide ramp 1921 extends to the input port 197, and the lower end 19212 of the guide ramp 1921 is near the lower end 181 of the cleaning roller 18.

[0066] In this embodiment, the lower end of the guide ramp 192 is a flexible portion made of a flexible material. During the movement of the cleaning base 12 on the surface to be cleaned, the lower end 1922 of the guide ramp 192 is at least partially pressed against the surface to be cleaned. Thus, a stable inlet 1101 is formed between a port and the surface to be cleaned; the port is defined by the lower end 19212 of the guide ramp 192, the lower end 181 of the cleaning roller 18, the lower end of the left wall 163 and the lower end of the right wall 164.On the one hand, the inlet 1101 facilitates the use of the lower end 19212 of the guide ramp 192 to push the dirty liquid and solid dirt from the surface to be cleaned to the inlet 1101 using the lower end 19212 of the guide ramp 192.On the other hand, it is also convenient that the inlet 1101 always forms a "dynamic seal" with the surface to be cleaned, both of which ultimately improve the suction performance of the surface cleaning machine.

[0067] As shown in Fig.4 and 8, the scraping roller device 6 is located above the input port 197, the second scraping member 62 is located above the first scraping member 61, and the lower part of the first scraping member 61 is close to the input port 197 of the dirty liquid bin 19. In this embodiment, the dirty liquid or solid dirt scraped by the first scraping member 61 and the second scraping member 62 will enter the transfer chamber 190 through the input port 197.

[0068] Referring to FIG. 11, a schematic diagram of a cleaning fluid supply unit according to an embodiment of the present disclosure is shown and described. According to the FIG. 11, it can be seen that the cleaning liquid supply unit includes, in addition to the cleaning liquid supply tank 3, a first liquid pump 44, a second liquid pump 45, a control unit 46 controlling the operation of the first liquid pump 44 and the second liquid pump 45, a first cleaning liquid dispenser 42 comprising a plurality of first outlet holes 421 and a second cleaning liquid dispenser 43. The second cleaning liquid dispenser 43 comprises a pair of outlet holes 198 (See Fig. 9) located in the lower part of the dirty liquid bin 19 and opposite to each other. The first liquid pump 44, the second liquid pump 45 and the control unit 46 can form a flow path control device 41 for supplying the cleaning liquid in the cleaning liquid supply tank 3 to the first cleaning liquid dispenser 42 and the second cleaning liquid dispenser 43.The flow path control device 41, when performing its work, may supply the cleaning liquid in the cleaning liquid supply tank 3 to the first cleaning liquid dispenser 42 only, or may supply the cleaning liquid in the cleaning liquid supply tank 3 to the second cleaning liquid dispenser 43, or may supply the cleaning liquid in the cleaning liquid supply tank 3 to both the first cleaning liquid dispenser 42 and the second cleaning liquid dispenser 43.

[0069] In this embodiment, the first cleaning liquid dispenser 42 is used to apply the clean cleaning liquid to the cleaning roller 18, and then the clean cleaning liquid is applied to the floor to be cleaned by means of the rotating cleaning roller 18.The second cleaning liquid dispenser 43 can use the clean cleaning fluid to rinse the inner surface of the dirty liquid bin 19, and this rinsing function can effectively remove the solid dirt adhering to the inner surface of the dirty liquid bin 19.

[0070] As shown in FIG. 9, the pair of outlet holes 198 in this embodiment are located in the lower portion of the left side wall 194 and the right side wall 195 of the dirty liquid bin 19.The outlet holes 198 are constructed to direct the spray of cleaning liquid downward at an angle of 10° to 80° from the horizontal, so that the cleaning liquid can be sprayed into the inner lower region of the dirty liquid bin 19. The first liquid pump 44 is provided in the housing 15 of the body 11, while the second liquid pump 45 is provided in the housing 16 of the cleaning base 12. The control unit 46 is integrated on the control motherboard of the surface cleaning machine (not shown in the drawings). In other embodiments, the first cleaning liquid dispenser may also optionally deliver the cleaning liquid directly to the surface to be cleaned.

[0071] In this embodiment, the flow path control device 41 of the cleaning liquid supply unit is capable of supplying different flow rates of cleaning liquid to the first cleaning liquid dispenser 42 and the second cleaning liquid dispenser 43 as required, in addition to delivering cleaning liquid to the first cleaning liquid dispenser 42 and the second cleaning liquid dispenser 43 on demand. In this embodiment, in order to achieve as little residual dirty liquid as possible during floor cleaning and as high a flow rate as possible to rinse the inner surface of the dirty liquid bin 19, the flow path control device 41 is configured to provide a greater flow rate of liquid when supplying cleaning liquid from the cleaning liquid supply tank 3 to the second cleaning liquid dispenser 43 than when supplying cleaning liquid from the cleaning liquid supply tank 3 to the first cleaning liquid dispenser 42. In order to meet the different flow rate requirements, in this embodiment, the control unit 46 controls the second liquid pump 45 to operate at a greater flow rate than the first liquid pump 44.

[0072] In other embodiments, it is also possible to replace the above two fluid pumps by setting up a single fluid pump with a three-way valve in combination; and wherein the three-way valve enables free switching on two flow paths, and by controlling the flow rate of a single fluid pump to work in both in accordance with different flow rates.

[0073] Referring to FIG. 12, a schematic diagram of a dirty liquid recovery unit according to an embodiment of the present disclosure is shown and described. With respect to the rotation direction R of the cleaning roller 18, the first cleaning liquid dispenser 42 is located downstream of the scraping roller device 6. The scraping roller device 6 is located downstream of the input port 197and upstream of the first cleaning liquid dispenser 42.

[0074] With the rotation of the cleaning roller 18 around the direction of R, the first cleaning liquid dispenser 42 continuously applies cleaning liquid to the cleaning roller 18, and the cleaning roller 18 with the cleaning liquid absorbed achieves wet scrubbing of the surface 60 to be cleaned during contact with the surface 60 to be cleaned. During the scrubbing of the surface to be cleaned 60 by the cleaning roller 18, the used cleaning liquid is contaminated into a dirty liquid. Part of the dirty liquid is absorbed by the cleaning elements on the outer surface of the cleaning roller 60, and part of the dirty liquid is carried upward away from the surface 60 to be cleaned by the centrifugal force generated by the rotation of the cleaning roller 18 and the suction force of the suction device 2 acting on the inlet 1101.

[0075] At the same time, some of the solid dirt that cannot be dissolved in the cleaning liquid will adhere to the cleaning roller 18, and some will also be carried upwards away from the surface 60 to be cleaned by the centrifugal force generated by the rotation of the cleaning roller 18 and the suction force of the suction device 2 acting on the inlet 1101.The dirty liquid and solid dirt not loaded on the cleaning roller 18 will then be fed directly from the input port 197 into the transfer chamber 190 in the dirty liquid bin 19.While the dirty liquid absorbed by the cleaning roller 60 and the solid dirt adhering to the cleaning roller 60 will continue to move downstream (i.e., the upper side) after passing through the input port 197.When the dirty liquid and solid dirt move to the scraping roller device 6, the first scraping member 61 and the second scraping member 62 will rub against the cleaning roller 18 in turn, thereby removing the excess dirty liquid absorbed by the cleaning roller 60 and the solid dirt adhering to the cleaning roller 60 from the cleaning roller 18.This scraped off dirty liquid and solid dirt will flow back downward to the input port 197 and subsequently into the transfer chamber 190 within the dirty liquid bin 19 under the influence of gravity as well as the suction force of the suction device 2.In other embodiments, excess dirty liquid removed from the cleaning roller may also flow by gravity alone into the transfer chamber in the dirty liquid bin located below it.

[0076] At least part of the dirty liquid and solid dirt entering the transfer chamber 190 will flow to the suction port 196 and be transferred in time by the suction device 2 to the dirty liquid recovery tank 4 through the lower suction path 22.The dirty liquid and solid dirt will be trapped in the tank 4, and the clean air will flow from the upper suction path 21 to the suction device 2 , and eventually escape to the outside.

[0077] In this way, the dirty liquid recovery unit completes one stage of recovery of the dirty liquid and solid dirt. In the next stage, the clean cleaning roller 18, which have had excess dirty liquid and solid dirt removed by the scraping roller device 6, will continue to rotate around the axis X and the first cleaning liquid dispenser 42 will continue to deliver clean cleaning liquid to the cleaning roller 18. This is done until all surfaces 60 to be cleaned

have been cleaned.

[0078] The above embodiments are only to illustrate the technical conception and characteristics of the present invention, and are intended to enable those familiar with the technology to understand the content of the present invention and to implement it accordingly, and not to limit the scope of protection of the present invention. Any equivalent changes or modifications made in accordance with the spirit of the present invention shall be covered by the scope of protection of the present invention.

Claims

1. A surface cleaning machine, comprising:

a suction device capable of providing a suction force;
a cleaning base adapted to move on a surface to be cleaned and comprising a cleaning roller capable of rotation;
a cleaning liquid supply unit; and
a dirty liquid recovery tank being in fluid communication with the suction device;
wherein the cleaning base further comprises a transfer chamber adjacent to a rear side of the cleaning roller and capable of temporarily holding a solid-liquid mixture , and the transfer chamber is configured to be in fluid communication with the suction device to enable the surface cleaning machine to transfer at least part of the liquid or at least part of the solid-liquid mixture in the transfer chamber to the dirty liquid recovery tank by means of the suction device during performing a surface cleaning operation.

2. The surface cleaning machine according to claim 1, wherein the transfer chamber comprises an input port for the solid-liquid mixture to enter therein, and wherein the input port is adjacent to the cleaning roller.

3. The surface cleaning machine according to claim 2, wherein the transfer chamber is at least partially located below an axis of rotation of the cleaning roller.

4. The surface cleaning machine according to claim 1, wherein the cleaning base comprises a guide ramp adjacent to the cleaning roller, and wherein the guide ramp has an upper end extending to the input port and a lower end near a lower portion of the cleaning roller.

5. The surface cleaning machine according to claim 4, wherein the guide ramp is arranged at the front of the transfer chamber.

6. The surface cleaning machine according to claim 4, wherein a lower end of the guide ramp is flexible, and wherein the lower end of the guide ramp is at least partially pressed against the surface to be cleaned during the movement of the cleaning base over the surface to be cleaned.

7. The surface cleaning machine according to claim 1, wherein the transfer chamber includes at least one bottom wall and a circumferential side wall surrounding the bottom wall.

8. The surface cleaning machine according to claim 7, wherein the transfer chamber is provided with at least one suction port on the bottom wall or a lower portion of the circumferential side wall, and wherein the suction port is in fluid communication with the dirty liquid recovery tank.

9. The surface cleaning machine according to claim 8, wherein the suction port is arranged at the intersection of a rear portion of the circumferential side wall and a rear portion of the bottom wall of the transfer chamber.

10. The surface cleaning machine according to claim 8, wherein an inner wall surface of the bottom wall is a sloping surface, and wherein the sloping surface is at its lowest position near the suction port.

11. The surface cleaning machine according to claim 1, wherein the cleaning base comprises a detachable dirty liquid bin, and wherein the transfer chamber is formed within the dirty liquid bin.

12. The surface cleaning machine according to claim 1, wherein the cleaning base also comprises a scraping roller device, and wherein the scraping roller device is in contact with a portion of the cleaning roller to enable removing at least partially of the excess dirty liquid from the cleaning roller soaked by the dirty liquid.

13. The surface cleaning machine according to claim 12, wherein the scraping roller device is arranged to be located above the transfer chamber so that the excess dirty liquid removed at least partially from the cleaning roller can be transferred by gravity to the transfer chamber.

14. The surface cleaning machine according to claim 12, wherein the scraping roller device is provided with an airflow connection to the transfer chamber so that the excess dirty liquid removed at least partially from the cleaning roller can be transferred to the transfer chamber by means of the suction force of the suction device.

15. The surface cleaning machine according to claim 12, wherein the scraping roller device is constructed to simultaneously accommodate to remove at least a portion of solid dirt from the cleaning roller which is in a position to be adhered to the solid dirt.

16. The surface cleaning machine according to claim 12, wherein the scraping roller device comprises at least one scraping member in contact with a portion of the cleaning roller, and wherein the scraping member extends at least partially parallel to the axis of rotation of the cleaning roller and interferes with a portion of the cleaning roller during rotation of the cleaning roller.

17. The surface cleaning machine according to claim 12, wherein the cleaning liquid supply unit comprises a cleaning liquid supply tank for holding a cleaning liquid and a liquid dispenser provided on the cleaning base, and wherein the liquid dispenser constructed to deliver the cleaning liquid to the cleaning roller and/or the surface to be cleaned is in fluid communication with the cleaning liquid supply tank.

18. The surface cleaning machine according to claim 17, wherein the liquid dispenser is constructed to deliver the cleaning liquid to the cleaning roller; and wherein the liquid dispenser is located downstream of the scraping roller device with respect to the direction of rotation of the cleaning roller so as to apply the cleaning liquid to the cleaning roller from which the excess dirty liquid is scraped.

19. The surface cleaning machine according to claim 17, further comprising: a body with a handle on the top, and wherein the cleaning base is rotationally coupled to a lower portion of the body, the suction device is fixed on the body, and the dirty liquid recovery tank and the cleaning liquid supply tank detachably mount on the body.

20. The surface cleaning machine according to claim 1, wherein the cleaning base has an opening located in the lower portion and facing the surface to be cleaned, and wherein the cleaning roller is at least partially arranged at the opening.

21. The surface cleaning machine according to claim 1, wherein the suction device includes a suction motor; the transfer chamber, the dirty liquid recovery tank and the suction motor are in sequential fluid communication, and wherein the surface cleaning machine is constructed to pick up and transfer the dirty liquid and solid dirt from the surface to be cleaned to the transfer chamber by the combined action of the suction motor and the rotating cleaning roller.

22. The surface cleaning machine according to claim 1, wherein the suction device includes a pump arranged between the transfer chamber and the dirty liquid recovery tank, and the surface cleaning machine is constructed to pick up and transfer the dirty liquid and the solid dirt from the surface to be cleaned to the transfer chamber by means of the rotating cleaning roller.

23. The surface cleaning machine according to claim 1, wherein a capacity of the dirty liquid recovery tank is greater than a capacity of the transfer chamber.

24. The surface cleaning machine according to claim 23, wherein the capacity of the dirty liquid recovery tank is more than 3 times the capacity of the transfer chamber.

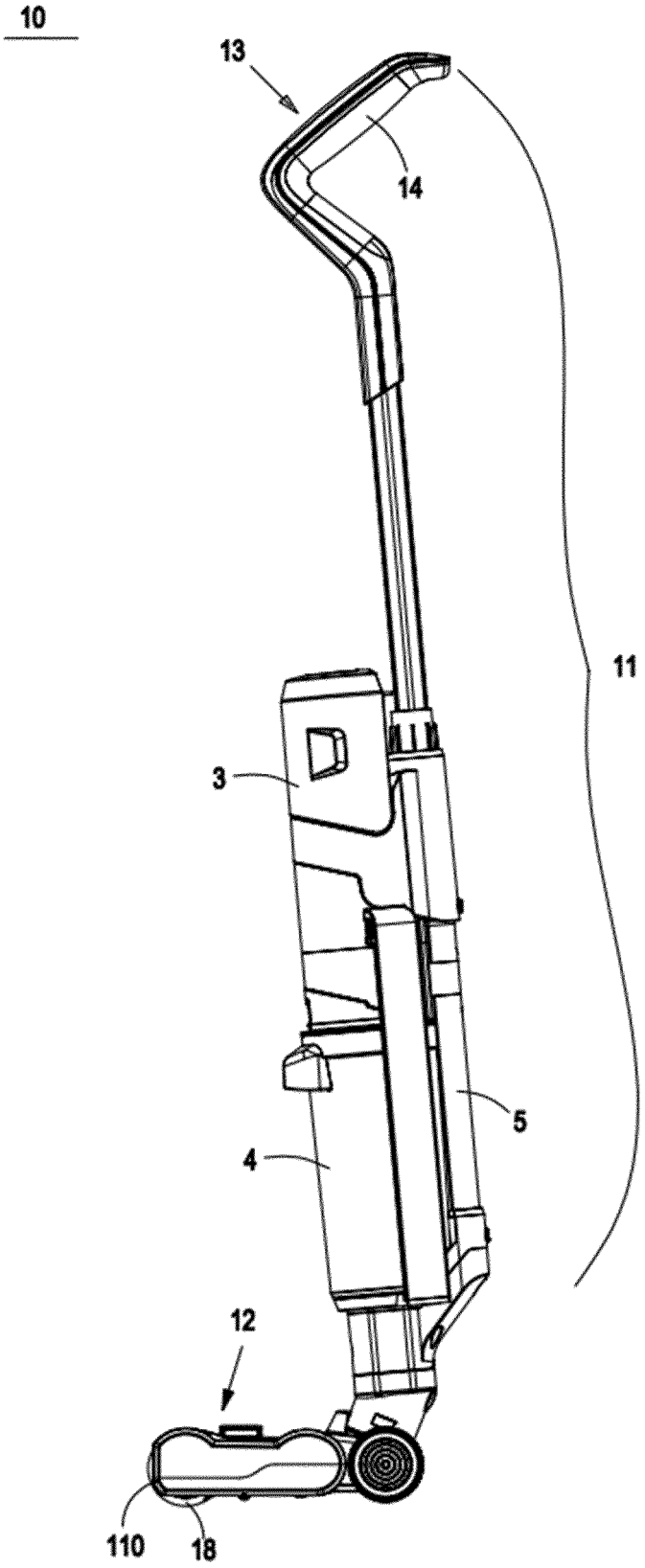

FIG.1

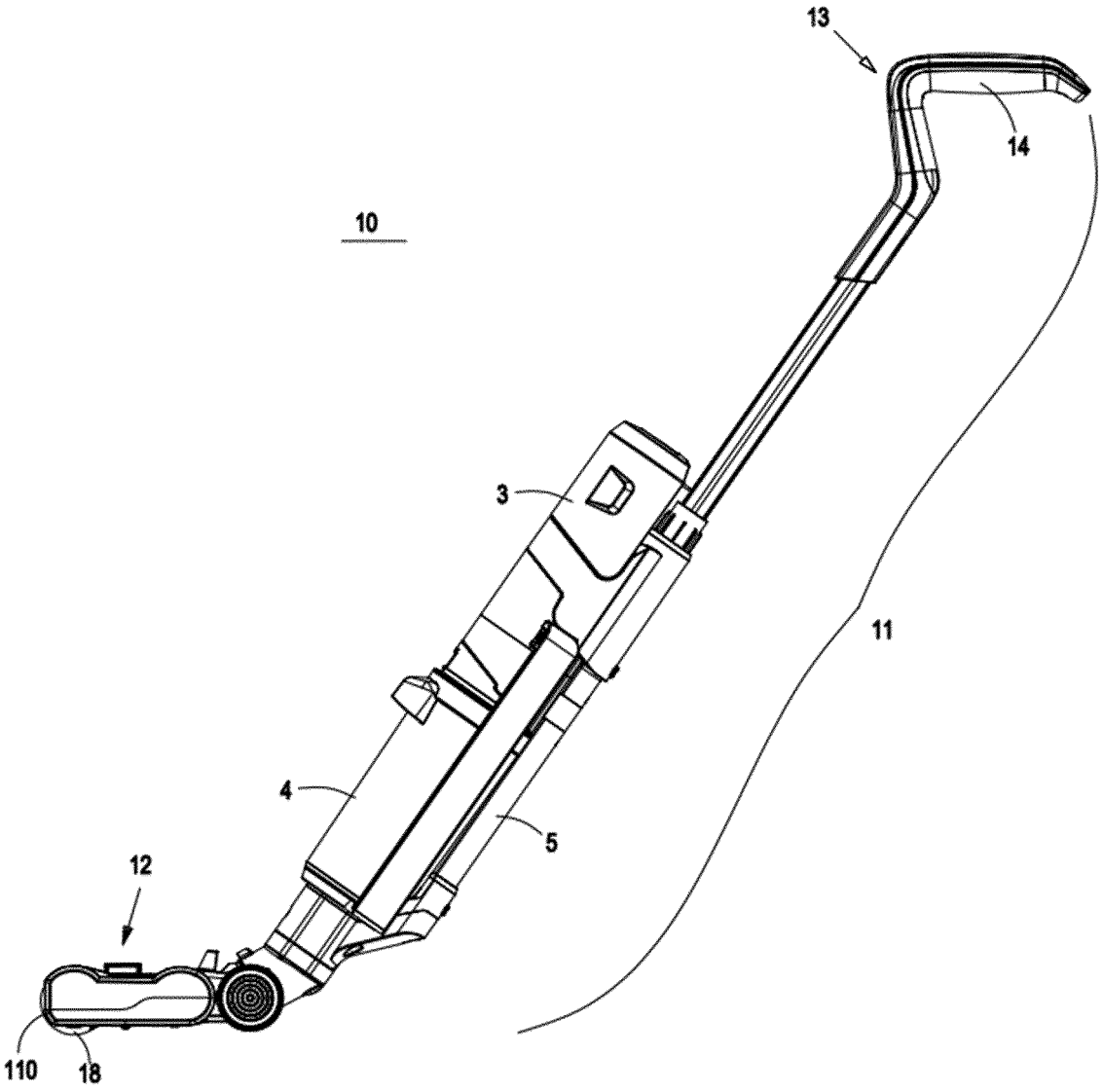

FIG.2

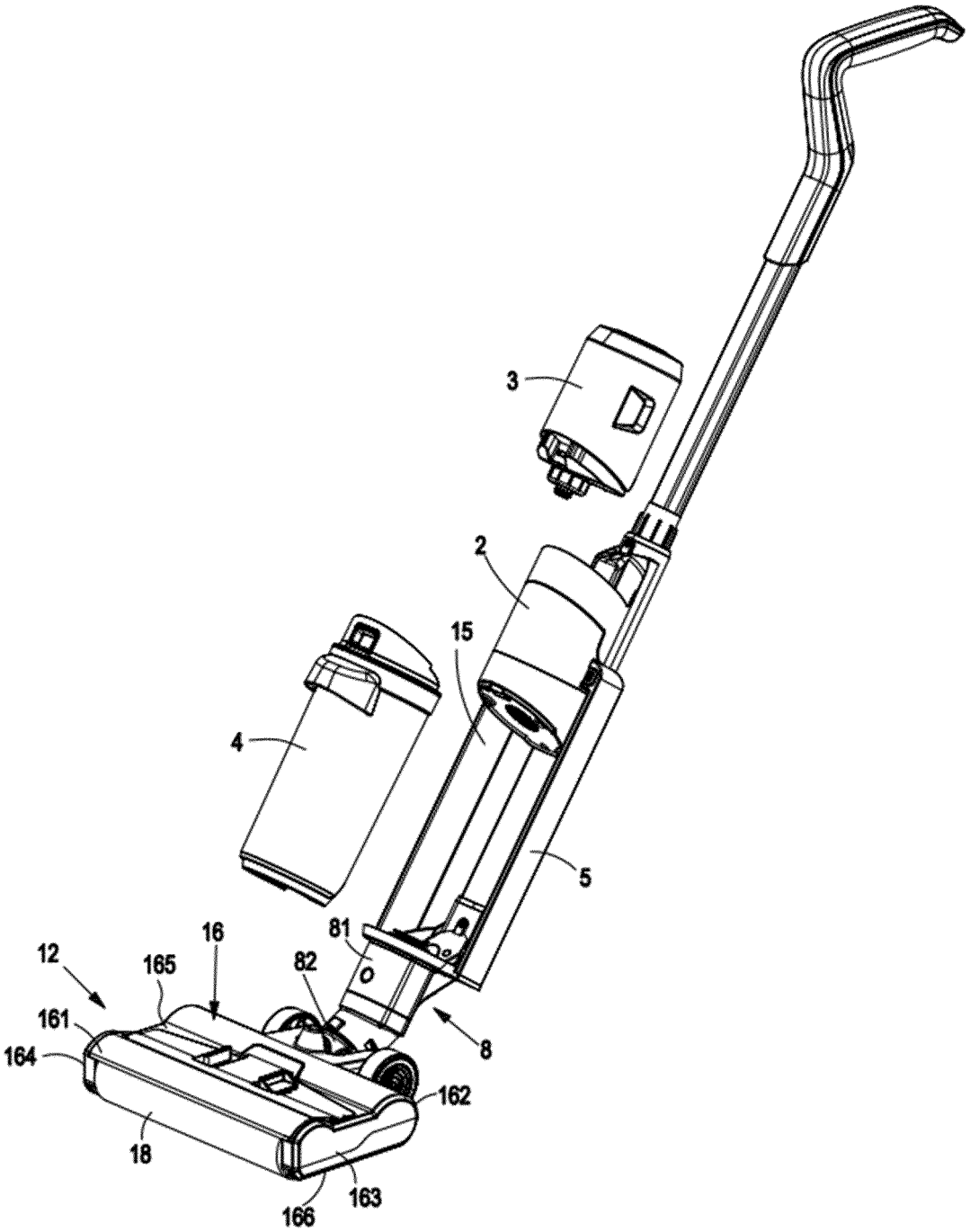

FIG.3

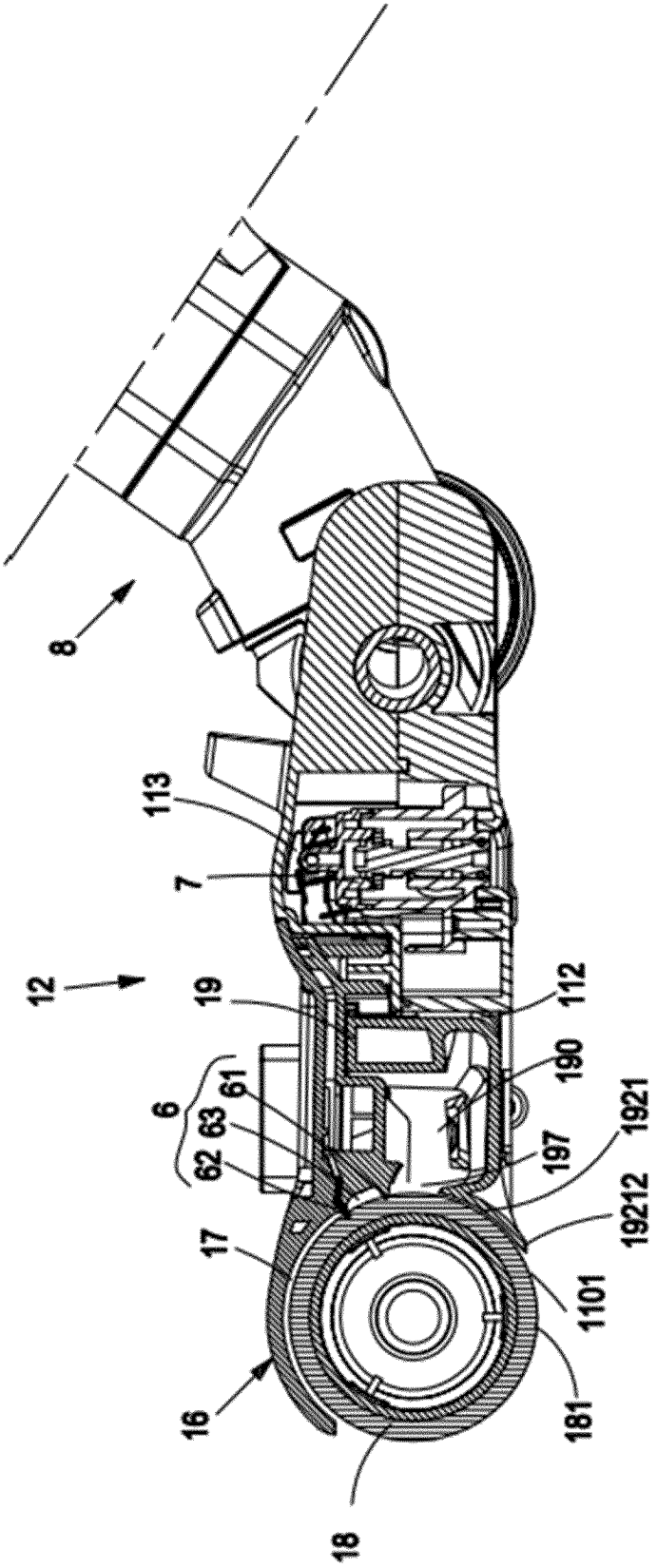

FIG.4

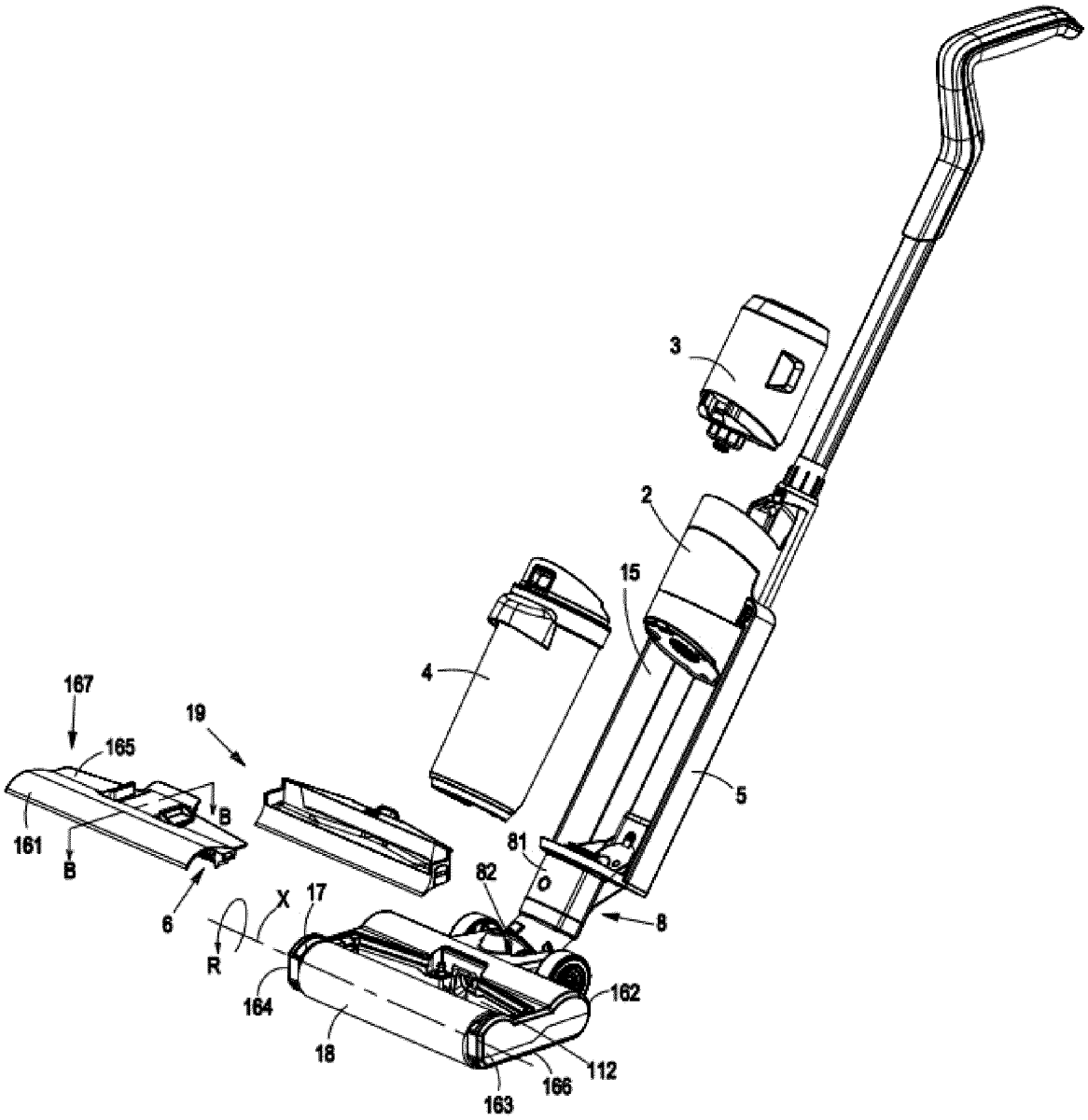

FIG.5

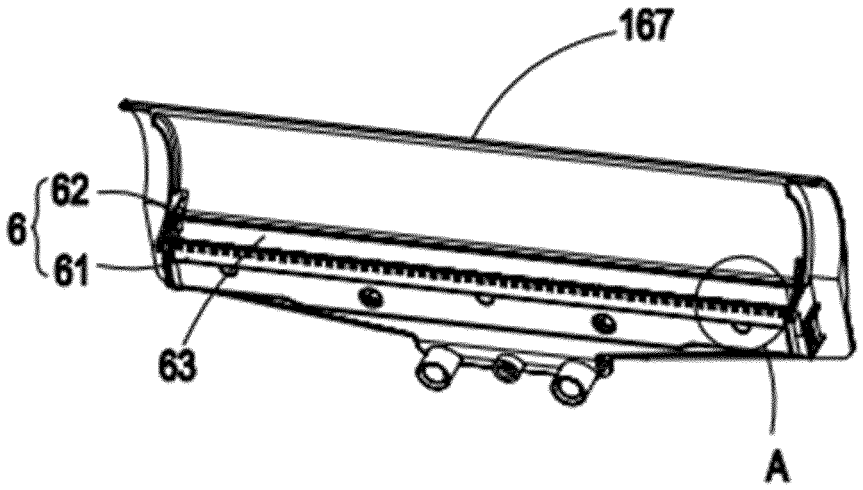

FIG.6

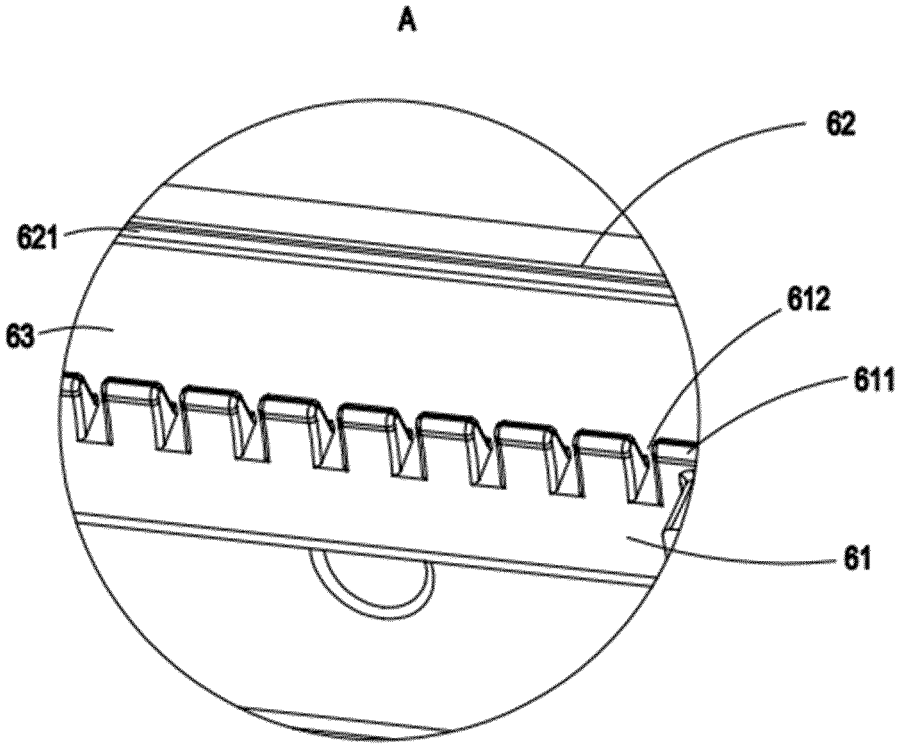

FIG.7

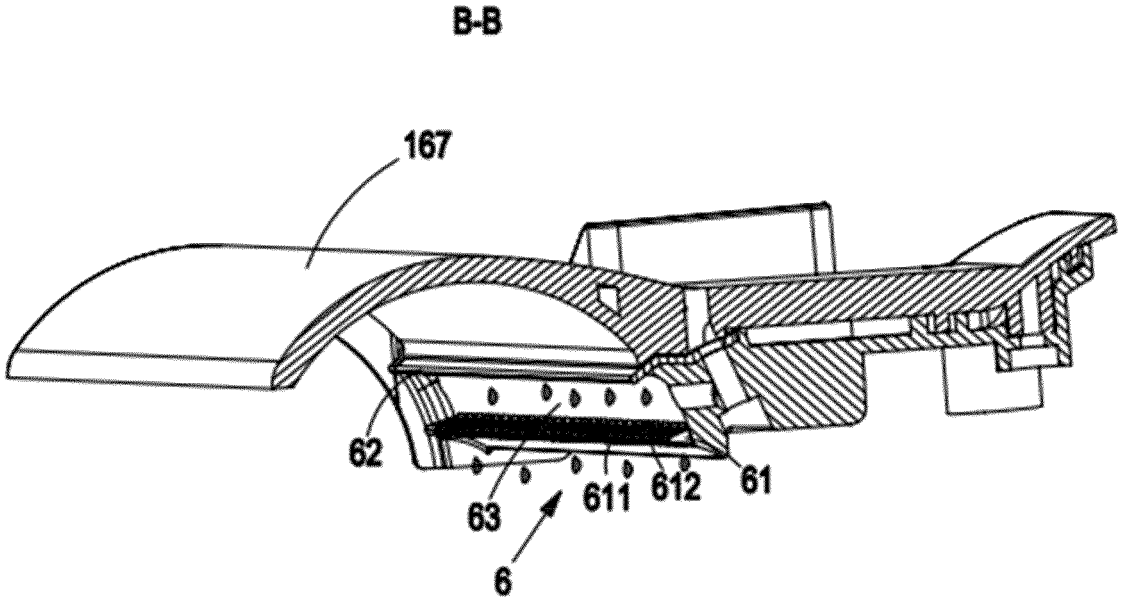
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FIG.8

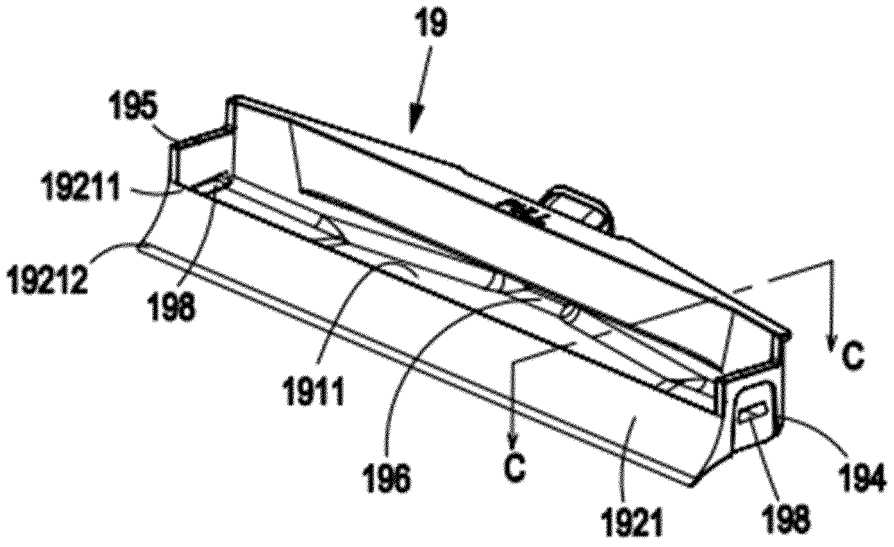
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FIG.9

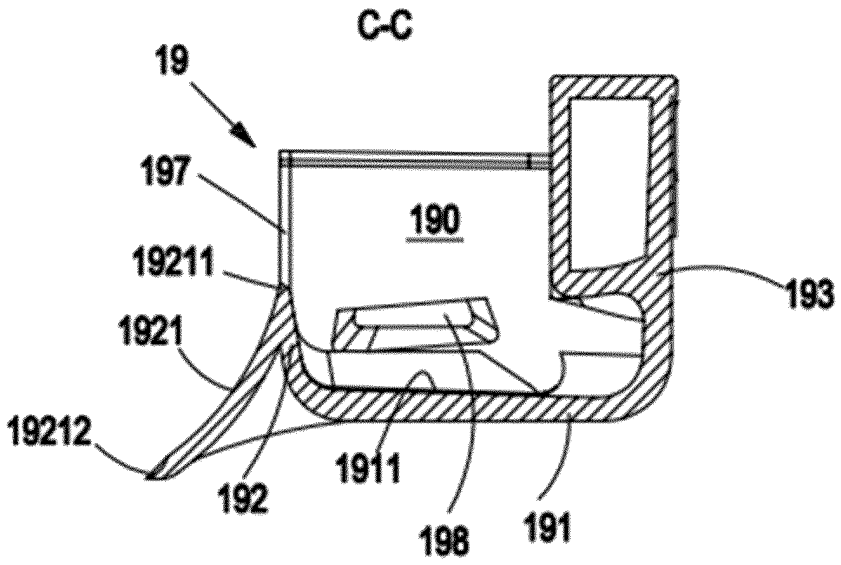
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FIG.10

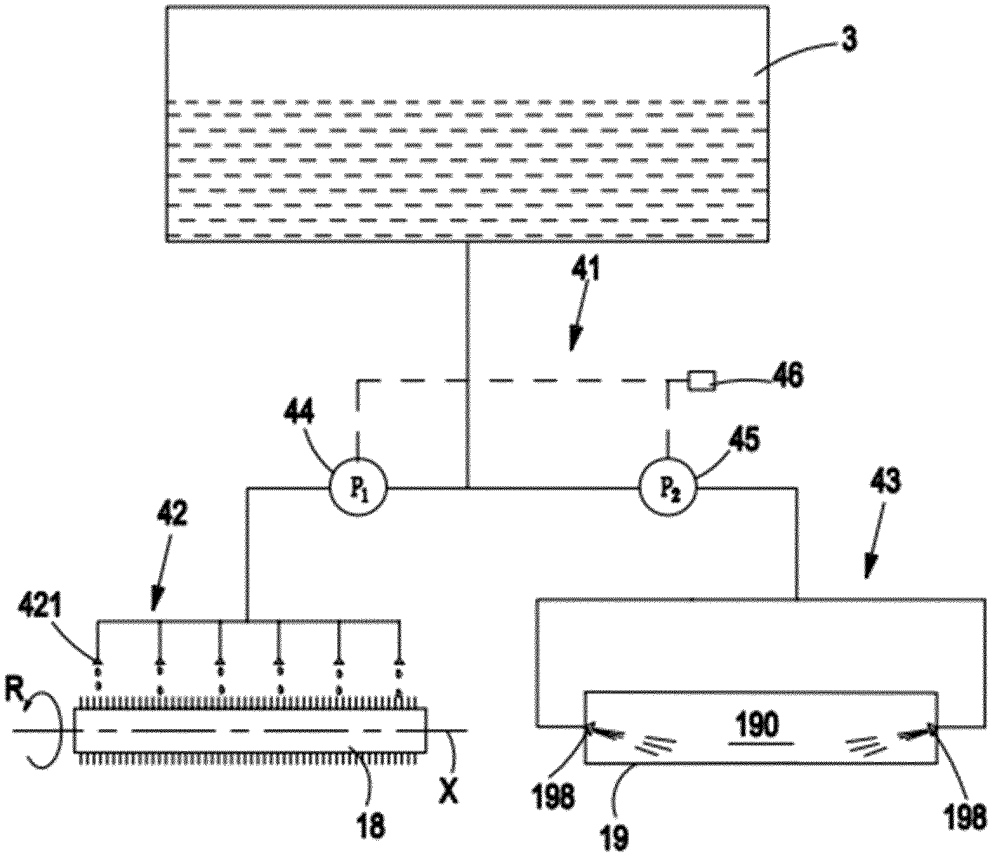
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FIG.11

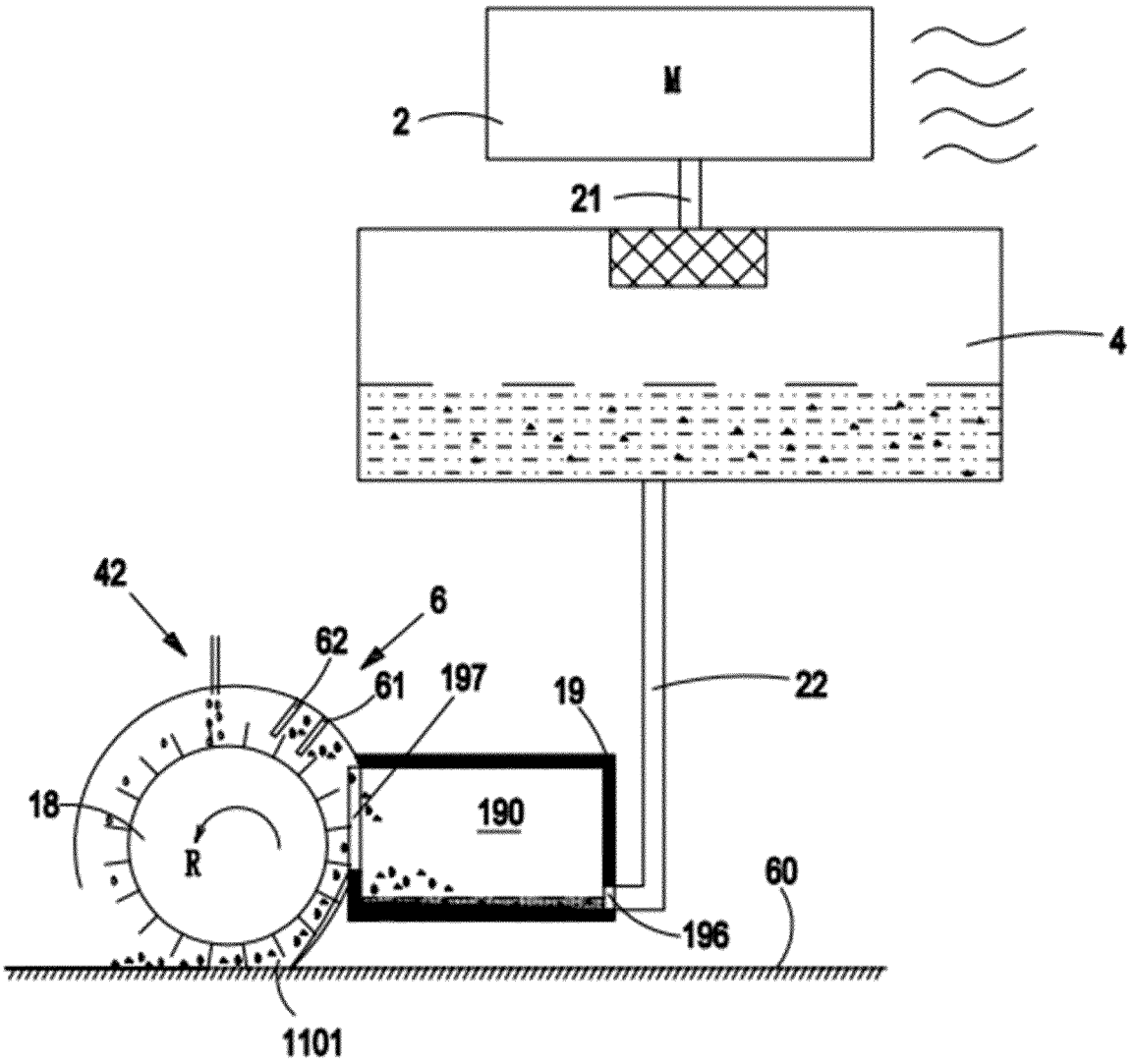

FIG.12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2020/099896

A. CLASSIFICATION OF SUBJECT MATTER

A47L 11/26(2006.01)i; A47L 11/30(2006.01)i; A47L 13/22(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A47L11; A47L13

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, CNTXT, VEN: 辊, 吸, 箱, 罐, 容器, 污水, 污液, 中转, roller, sewage, tank, sink, suck

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 209220154 U (SUZHOU HAOANSHI ELECTRIC APPLIANCE TECHNOLOGY CO., LTD.) 09 August 2019 (2019-08-09) description, paragraphs 0029-0038, and figures 1-6	1-24
X	WO 2017059600 A1 (HIZERO TECHNOLOGIES CO., LTD.) 13 April 2017 (2017-04-13) description, paragraphs 0054-0073, figures 3, 11	1-24
A	CN 111093448 A (ALFRED KAERCHER SE & CO. KG.) 01 May 2020 (2020-05-01) entire document	1-24
A	CN 101657135 A (ELECTROLUX AB) 24 February 2010 (2010-02-24) entire document	1-24
A	JP 1057282 A (SHARP K. K.) 03 March 1998 (1998-03-03) entire document	1-24
A	CN 111067434 A (GUANGDONG BAISHENGTU TECH. CO., LTD.) 28 April 2020 (2020-04-28) entire document	1-24

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 February 2021	**25 February 2021**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088** **China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2020/099896

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	209220154	U	09 August 2019	WO	2020052177	A1	19 March 2020
				CN	109008834	A	18 December 2018
WO	2017059600	A1	13 April 2017	CN	108348123	A	31 July 2018
				JP	2018511476	A	26 April 2018
				KR	20180099632	A	05 September 2018
				EP	3238595	B1	08 May 2019
				PT	3238595	T	02 August 2019
				US	10039431	B1	07 August 2018
				US	10729303	B2	04 August 2020
				EP	3238595	A1	01 November 2017
				US	2018206689	A1	26 July 2018
				ES	2736100	T3	26 December 2019
				JP	6525222	B2	05 June 2019
				EP	3520666	A1	07 August 2019
				HU	E044586	T2	28 November 2019
				PL	3238595	T3	31 December 2019
				EP	3238595	A4	05 September 2018
				US	2018338660	A1	29 November 2018
				KR	102072512	B1	03 February 2020
				JP	2019115789	A	18 July 2019
CN	111093448	A	01 May 2020	WO	2019048496	A1	14 March 2019
				DE	102017120722	A1	14 March 2019
				EP	3678525	A1	15 July 2020
CN	101657135	A	24 February 2010	EP	2091401	A1	26 August 2009
				US	7979952	B2	19 July 2011
				CN	101657135	B	08 August 2012
				WO	2008071427	A1	19 June 2008
				EP	2117402	A2	18 November 2009
				MX	2009006351	A	12 October 2009
				US	2010083460	A1	08 April 2010
				US	8402600	B2	26 March 2013
				CN	101557748	A	14 October 2009
				CN	101557748	B	05 October 2011
				WO	2008074014	A9	12 September 2008
				BR	PI0720239	A2	31 December 2013
				EP	2117402	B1	27 May 2015
				EP	2091401	B1	20 February 2013
				US	8595897	B2	03 December 2013
				US	2009276975	A1	12 November 2009
				WO	2008074014	A2	19 June 2008
				WO	2008074014	A3	31 July 2008
				BR	PI0720239	B1	25 September 2018
				EP	2117402	A4	15 May 2013
				US	2008148512	A1	26 June 2008
JP	1057282	A	03 March 1998		None		
CN	111067434	A	28 April 2020	CN	211582946	U	29 September 2020

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 209463915 U **[0003]**
- WO 2017059600 A1 **[0005]**