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(54) **CLEANING HEADS AND VACUUM CLEANERS COMPRISING SAME**

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TÊTES DE NETTOYAGE ET ASPIRATEURS LES COMPRENANT

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Description

Field

[0001] The present disclosure relates to cleaning heads, and more particularly to vacuum cleaning heads having a roller cleaner, and vacuum cleaners comprising same.

Disclosure

[0002] A cleaning head of or for use with a vacuum cleaner is disclosed. The cleaning head is a brush head comprising a roller brush, a motor for driving the roller brush, a washer liquid tank, a washer liquid applicator, a waste liquid collection arrangement, a waste liquid tank, control circuitry, a rigid housing and a suction inlet; wherein the control circuitry is to operate the motor to drive the roller brush into brushing rotation and to operate the washer liquid applicator to apply washer liquid to the roller brush and the waste liquid collection arrangement is to collect waste washer liquid from the roller brush and to deliver collected waste washer liquid to the waste liquid collector for storage therein during operations when the suction inlet is connected to a suction power source.

[0003] The brush head may be part of a vacuum cleaner, for example, a detachable vacuuming head of a vacuum cleaner such as a stick-type or tower-type vacuum cleaner.

[0004] CN108553035A discloses a cleaning device. The cleaning device comprises a dust suction assembly comprising a roller brush arranged inside a dust collection chamber, a wet-mopping assembly comprising a wet-mopping roller brush mounted in an installation chamber, and a drying assembly.

Figures

[0005] The present disclosure will be described and/or illustrated with reference to the accompanying Figures in which:

Figure 1 is a perspective view of an example brush head according to the present disclosure,

Figures 1A and 1B are top perspective views of the example brush head of Figure 1 with the tank cover and the tank assembly removed respectively,

Figure 1 B1 is a bottom perspective view of the tank assembly of the example brush head of Figure 1,

Figure 1C is an exploded view of the example brush head of Figure 1,

Figure 2 is a top plan view of the example brush head of Figure 1,

Figures 3A and 3B are, respectively, a first, left, side view and a second, right, side view of the example brush head of Figure 1,

Figures 3C and 3D are, respectively, front view and rear view of the example brush head of Figure 1,

Figure 3A1 is a longitudinal cross-sectional view of the example brush head of Figure 2 taken along a longitudinal axis X-X',

Figure 4 is a bottom perspective view of the example brush head of Figure 1 taken from underneath the bottom surface of the brush housing,

Figures 4A and 4B are bottom plan views, in line drawing and photographic representation respectively, of the example brush head of Figure 1,

Figure 4C is a bottom plan view of the example brush head of Figure 1 with the roller brush and bottom cover plate removed,

Figures 5A to 5F are various views showing use and operation of the example brush head of Figure 1,

Figures 6A to 6C are various views of a stick-type vacuum cleaner comprising a brush head of the present disclosure,

Figure 6D shows the stick-type vacuum cleaner of Figure 6A in an alternate configuration,

Figure 7 is a perspective view of another example brush head according to the present disclosure,

Figures 7A and 7B are, respectively, top and bottom views of the example brush head of Figure 7,

Figure 8A is a perspective view of the example brush head of Figure 7 with the bottom cover plate removed,

Figure 8B is a perspective view of the bottom cover plate of the example brush head of Figure 7,

Figure 8C is a perspective view of the example brush head of Figure 7 with the movable portion partly removed,

Figure 8D is a perspective view of the example brush head of Figure 7 with the movable portion and roller brush removed,

Figures 9A and Figure 10A perspective views of the rigid housing of the example brush head of Figure 7,

Figure 9B and Figure 10B are, respectively, enlarged views of portion A in Figure 9A and portion B in Figure 10A,

Figures 11A and 11B are perspective views of the tank assembly of the example brush head of Figure 7,

Figure 12 is a longitudinal cross-sectional view of the example brush head of Figure 7A taken along a longitudinal axis Y-Y',

Figure 13 is a perspective view of the example brush head of Figure 7 with upper housing portions and tank covers removed,

Figure 14 is a perspective view of the example brush head of Figure 13 with a liquid distribution plate removed,

Figure 15 is a perspective view of the example brush head of Figure 14 with a control board further removed, and

Figure 16 is an exemplary system block diagram of the brush head of Figure 7.

Description

[0006] An example brushing apparatus is a brush head **100** comprising a rigid housing **110** on which a roller brush **120,** a tank assembly **130** comprising a first tank **140** defining a first reservoir and a second tank **150** defining a second reservoir, a first liquid delivery path to deliver washer liquid from the first reservoir to the roller brush, a second liquid delivery path for transporting used liquid from the roller brush to the second tank, and a suction connector **190** having a suction inlet are mounted depicted in Figures 1, 1A, 1B, 1C, 2, 3A-3D, 3A1, 4, 4A, 4B and 4C. The brush head may be a vacuum cleaner accessory which is detachably attachable to a vacuum cleaner or an integral part of a vacuum cleaner.

[0007] The housing **110** comprises a forward housing portion ("forward portion") **112,** a rearward housing portion ("rear portion") **114,** an intermediate housing portion ("intermediate portion") **116** which interconnects the forward portion and the rearward portion. A tank receptacle **118** is formed on the intermediate housing portion and occupies substantial portion of the intermediate housing portion. The tank receptacle **118** defines a tank receptacle compartment which is opened on and accessible from the upper side of the rigid housing. The example housing has a generally T-shaped profile, having a wider forward portion and a narrower rear portion which projects rearwards from middle of the forward portion, when viewed from above. The housing comprises an upper housing portion (or top housing portion) and a lower housing portion (or bottom housing portion) which cooperate to define an internal housing compartment of the brush head having an upper side (or a top side) and a lower side (or a bottom side). The example lower housing portion comprises a rigid cover plate which is a bottom cover plate **111** attached to the upper housing portion by fastening means such as screws. The example rigid cover plate is a steel plate which closes the bottom side internal housing compartment and defines the bottom surface of the housing and the brush aperture when mounted on the upper housing portion.

[0008] The housing has a longitudinal axis **X-X'** defining a longitudinal direction. The longitudinal axis **X-X'** extends along the longitudinal direction between a first longitudinal end where the forward portion is located and a second longitudinal end where the rearward portion is located. In the present example, the longitudinal axis **X-X'** is a center axis of the housing about which the housing is laterally symmetrical or substantially laterally symmetrical. The longitudinal

direction when extending from the rearward portion towards the forward portion defines a forward direction and the longitudinal direction when extending from the forward portion towards the rearward portion defines a rearward direction.

[0009] The roller brush **120** is mounted on a roller brush receptacle ("brush receptacle" in short) which is formed on the forward housing portion. The brush receptacle **122** is elongate and extends along a lateral axis which is orthogonal to the longitudinal axis in this example. The brush receptacle comprises a first side wall, a second side wall and a peripheral wall interconnecting the first side wall and the second side wall which cooperate to define a brush receptacle compartment. The first side wall and the second side wall are on opposite lateral sides of the longitudinal axis and are on the same vertical level above a supporting surface when the brush head is working or resting on a planar supporting surface. The brush receptacle peripheral wall is arcuate and curves to extend in the longitudinal direction to follow the shape of the brushing surface of the roller brush on extending along the longitudinal direction.

[0010] The roller brush **120** comprises a rigid main body which defines a roller axis or a rotation axis about which the roller brush is to rotate during operations and a brush portion which extends around the rotation axis to surround the main body and to define a brushing surface. The rigid main body is attached to the brush receptacle to define an axle so that the roller brush is to rotate about the rotation axis relative to the brush receptacle during operations. The roller brush is mounted such that a major portion of the roller brush is received inside the brush receptacle compartment while a minor portion protrudes from a brush aperture to encounter or engage a surface to be brushed or cleaned. The example roller brush is substantially cylindrical and defines a substantially cylindrical brushing surface which surrounds the rotation axis and which surrounds the roller brush main body. The example roller brush has a felt brushing surface to facilitate contact or agitated cleaning of a surface to be cleaned.

[0011] The brush aperture is an elongate aperture which is formed on the bottom side of the housing and is define between a first long-edge which is a forward edge and a second long-edge which is a rear edge that is parallel to the forward edge. The lateral extent of the brush aperture is defined by a pair of lateral edges which interconnects the first and second long edges at their lateral ends. Each of the example long edges extends transversely to the longitudinal axis to define a transversely extending brush aperture and a plurality of washer dispensing nozzles **142** is distributed along the forward edge. The washer dispensing nozzles **142** are arranged to discharge washer liquid towards a forward-facing surface of the roller brush, for example, at the forward-facing surface of the roller brush near the bottom of the brushing surface which is proximal the contact surface to be cleaner. The washer dispensing nozzles are connected to the first tank **140** which is a washer tank for storing washer liquid and the washer liquid is delivered to the washer dispensing nozzles by a motor-driven water pump which is mounted on a pump compartment of a pump receptacle.

[0012] The example roller brush is driven by a drive motor and operation of the drive motor is controlled by a control circuitry, for example, a microprocessor-based or logic-array-based control circuitry. The drive motor is mounted on a motor compartment of a motor receptacle which is in the forward housing portion and immediately behind the brush receptacle. The example motor receptacle is formed on a lateral side of the forward housing portion and projects laterally from the tank receptacle. The example pump receptacle is on another lateral side of the forward housing portion and projects laterally away from the tank receptacle and away from the motor receptacle. The disposing of the motor receptacle and pump receptacle on diametrically opposite lateral sides of the forward portion provides a more balanced weight to press the brushing surface of the roller brush on the surface to be brush cleaned. In the example, the drive motor is mounted on the left side of the forward housing portion, with the drive motor axis parallel to the roller axis, and the pump motor is mounted on the right side of the forward housing portion, with the pump motor axis parallel to the roller axis.

[0013] The tank assembly **130** is mounted on the tank receptacle **118.** The tank assembly comprises a first tank portion **140** defining a washer liquid tank, a second tank portion **150** defining a waste liquid tank, a waste liquid inlet duct, a liquid separator, an exhaust air duct, and a tank cover. The example tank assembly, as depicted in Figure 1A, comprises a tank housing comprising a bottom tank surface **132** (or "bottom surface" in short) and a peripheral tank wall **134** surrounding the bottom surface. The bottom tank surface is also the bottom surfaces of the first and second tank portions. The peripheral tank wall extends upwardly along an outer boundary of the bottom surface and defines a portion of the peripheral walls of the first and second tank portions. The example tank assembly is molded, for example, of plastics such as clear plastics. The bottom tank surface is a first surface (or upper surface) of a sheet-like member which forms the bottom portion of the tank housing. The sheet-like member has a lower surface which is to seat in abutment with an upward facing surface of the tank assembly receptacle **118.**

[0014] The example tank housing is partitioned, vertically, into a first tank compartment defining the washer liquid tank and a second tank compartment defining the waste liquid tank, for example, by a partition wall. The first tank compartment is on a first lateral side of the longitudinal axis and the second tank compartment is adjacent to and abuts the first tank compartment. The example first tank compartment is substantially smaller than the second tank compartment and has an effective volume of 50% or less of the second tank compartment in this example. In the example, the first tank compartment is on right side of the longitudinal axis and the second tank compartment is on left side of the first tank compartment. In some embodiments, the first tank compartment may be on right side of the longitudinal axis and the second tank compartment is on left side of the first tank compartment. In some embodiments, the first tank compartment may surround the second tank compartment or vice versa.

[0015] The second tank portion **150** comprises a first riser duct **152** and a second riser duct **154.** Each one of the riser ducts **152, 154** comprises a tubular portion which rises from the bottom tank surface **132** and surrounds a through aperture which is formed on the bottom tank surface so that the riser duct defines a fluid passageway to facilitate fluid communication between the second tank portion **150** and the outside across the bottom tank surface when the tank assembly is closed with the tank cover **136** in due place. In this example, the first riser duct **152** is a waste liquid inlet duct which is located forward of the second riser duct **154** so that the waste liquid inlet duct **152** is intermediate the second riser duct **154** and the brush aperture or brush receptacle.

[0016] An air-liquid separator (or "liquid separator" in short) **156** is disposed above the first riser duct **152** to form a ceiling of the second tank portion **150** to facilitate separation of air and waste liquid from an air stream coming in from the waste liquid collector which contains both air and collected waste liquid. The liquid separator comprises a baffle plate portion having a baffle surface which is disposed above and proximal the top end or outlet of the first riser duct **152.** The baffle plate portion is located at a vertical distance above the outlet of the first riser duct **152** so that an air-waste-liquid stream exiting from the first riser duct **152** will impinge the baffle plate to facilitate air-liquid separation. The baffle plate portion is inclined so that the waste liquid separated from an incoming air-waste-liquid stream will move along the inclined baffle surface and be collected in the waste liquid tank. In this example, the baffle surface **156A** is included towards a forward portion of the peripheral tank wall **134** which is intermediate the first riser duct **152** and the roller brush or the brush receptacle. The example liquid separator comprises a non-water permeable separator plate having a perforated region and a non-perforated region. The non-perforated region includes the impinging region where the incoming air-liquid stream is to impinge the separator plate and the surrounding region, especially the region which is forward of the impinging region. The perforated region is away, distal from and/or rearward of the impinging region so that air can freely move between the space which is below and the space which is above the separator plate. The example separator plate is a hard-plastic plate.

[0017] The tank assembly **130** comprises a top cover **136.** The example top cover is detachably attachable to the tank housing so that washer liquid can be added to the washer tank and collected and stored waste liquid can be removed from the waste liquid tank. The top cover **136** comprises a lid portion and a peripheral lip portion surrounding the lid portion. When the top cover 136 is attached to the tank housing and fastened with the tank housing using the fastening means provides, which is a pair of clasps comprising clasps on opposite diametric sides of the tank housing, the second tank portion **150** will become effectively airtight and air can only effectively enter or exit through the riser ducts **152, 154.** When the top cover is in fastening engagement with the tank housing, the peripheral lip portion of the top cover is in air-sealed engagement with the peripheral tank wall **134.**

[0018] The second tank compartment comprises two sub-portions, namely a first sub-portion **150A** containing the first riser duct **152** and a second sub-portion **150B** containing the second riser duct **154.** The first sub-portion **150A** of the second tank compartment defines a first waste liquid tank portion which has a bottom surface **158A** which is proximal to bottom cover plate **111** and below the roller axis. The second sub-portion **150B** of the second tank compartment defines a second waste liquid tank portion which has a bottom surface **158B** which is elevated above the bottom surface **158A** of the first sub-portion **150A** and is above the roller brush, as depicted in Figure 3A1.

[0019] The first sub-portion **150A** and the second sub-portion **150B** cooperate to define a waste liquid reservoir having a multi-level surface. In this example, the first level is defined by the first bottom surface **158A** and the second level is defined by the second bottom surface **158B.** The example waste liquid reservoir has a smaller cross-sectional area at the first sub-portion **150A** between the first bottom surface **158A** and the second bottom surface **158B,** and a substantially larger cross-sectional area above the elevated second bottom surface **158B** of the second sub-portion **150B.** In example embodiments, the first sub-portion **150A** has a cross-sectional area of about 50%-60% of the cross-section area of the second tank compartment immediately above the second bottom surface **158B.** In example embodiments, the second bottom surface **158B** is at about half the height of the first riser duct **152.** In some embodiments, the second bottom surface **158B** is slightly higher or slightly lower than half the height of the first riser duct **152.** The example second tank compartment has a stepped design and, in some embodiments, the maximum allowable waste liquid level may be set at a level which is slightly higher than the second bottom surface **158B.** For example, the maximum allowable waste liquid level may be set at a fraction of the distance between the waste liquid outlet and the second bottom surface **158B,** and the fraction may be between 40%-60% as a convenient example.

[0020] The internal housing compartment comprises a first side compartment which is on a first lateral side of the washer tank receptacle and a second side compartment which is on a second lateral side of the washer tank receptacle. The first side compartment and the second side compartment are on different lateral sides of the longitudinal axis and both the first side compartment and the second side compartment projects rearwards from the roller brush and from the brush compartment.

[0021] The washer liquid tank and the washer nozzles are connected by a washer liquid delivery duct (or "washer duct" in short). A washer pump is mounted inside the first side compartment and is to operate to deliver washer liquid from the washer tank to the washer nozzles through the washer duct. The washer nozzles, the washer liquid delivery duct and the washer pump collectively define a washer applicator. In some embodiments, the brush head has a single

washer nozzle, for example, a slot-type nozzle.

[0022] A drive motor is mounted inside the second side compartment. The example drive motor is mounted with its driving shaft parallel to the rotation axis of the roller brush and is in driving engagement with the roller brush.

[0023] The example upper housing portion and lower housing portion cooperate to define the brush receptacle, the drive motor receptacle and the pump receptacle. The upper housing portion is molded of hard plastics and defines the tank receptacle.

[0024] In example embodiments such as the present, the apparatus comprises electronic circuitry which synchronizes operations of the washer pump and the drive motor such that when the drive motor is switched on to rotate the roller brush, the washer pump will begin to operate to deliver washer liquid to the washer nozzles and vice versa. The electronic circuitry may be installed in the internal housing compartment between the side compartments as a convenient example.

[0025] A waste liquid collector is disposed on the forward housing for collecting waste liquid at the rear edge of the brushing aperture. The waste liquid collector comprises an elongate inlet which is opposite facing the brushing surface and which extends along the rear edge to form a waste liquid suction inlet (waste liquid inlet). The waste liquid inlet tapers to narrow transversely to connect to a waste liquid collection duct (or "waste liquid duct" in short) for guiding waste liquid to move from the brushing aperture to the waste liquid tank. The waste liquid duct **182** comprises a forward duct portion which extends rearwards from the rear edge of the brushing aperture. The example waste liquid collector comprises a scraper. The example scraper comprises a flexible scraper having a forward flexible lip portion which projects from the rear edge of the brush aperture and extends into the brush receptacle to interfere with the brushing surface. The example lip portion is made of rubber, for example, natural rubber or synthetic rubber such as silicone rubber or other flexible, non-washer liquid permeable materials without loss of generality. The scraper is connected to the waste liquid suction inlet and the waste liquid collected at the waste liquid suction inlet is delivered to the waste liquid tank by moving through the waste liquid duct and the first riser duct **152.**

[0026] During operations, the roller brush rotates and the portion of the brushing portion which carries liquid is rotated into physical interference with the scraper. As a result of the physical interference between the scraper and the brushing surface, liquid carried on the brushing surface is transferred from the scraper to the waste liquid suction inlet and the suction power appearing at the waste liquid suction inlet will transport the collected waste liquid into the first riser duct and into the waste liquid tank **150.**

[0027] The forward duct portion of the waste liquid duct is inside the intermediate housing portion and extends rearwards from the brushing aperture and underneath the tank receptacle. The waste liquid duct joins the first riser duct **152** at its bottom end. The riser duct portion extends to a level which is above the maximum allowable liquid level of waste liquid inside the waste liquid tank. The maximum allowable liquid level divides the waste liquid tank into two portions vertically, namely, a waste liquid reservoir at or below the maximum allowable waste liquid level and an air space above the maximum waste liquid level. In the present example, the top end of the riser duct portion is well above the maximum waste liquid level and is close to the tank cover.

[0028] The suction connector **190** is for facilitating physical interconnecting of the brush head and a main unit. The main unit comprises a vacuum suction generator and a connector for making physical interconnecting with the suction connector **190** of the brush head **100.** The example suction connector **190** is at the rear end of the brush head. The suction connector comprises a tubular portion having a first end and a second end. The first end is an outlet end which is for connection to a suction source such as the vacuum suction generator of a vacuum cleaner and the second end is an inlet end which is connected to an exhaust dust arrangement. The exhaust duct arrangement comprises an exhaust duct portion which interconnects the second riser duct and the suction connector. The example exhaust duct portion is installed underneath the second sub-portion **150B** of the waste liquid tank **150** and extends rearwardly to join the suction connector **190.** A physical and electrical connector for making physical and electrical connection with a corresponding physical and electrical connector is provided on the suction connector **190** proximal the inlet end.

[0029] The suction connector **190** is articulated to the rear portion of the rigid housing and extends upwardly and away from the rear portion. The suction connector is articulated to the rear portion of the rigid housing and is pivotally movable relative to the rigid housing between a first angle and a second angle which defines an angular movement range of the suction connector. The example angular movement range is slightly smaller than 90 degrees, for example, between a near level first angle of slightly larger than zero degree and a near vertical angle of slightly smaller than 90 degrees from the vertical. To facilitate angular relative movement between the suction connector and the rigid housing, the exhaust duct portion comprises a flexible duct portion, for example, a bellows-type duct portion to connect the second riser duct and the suction connector. The suction connector **190** comprises an electrical power connector which is to electrically engage with a corresponding electrical power connector on a main unit when the brush head and the main unit is physically connected and duly engaged when the suction connector is duly connected with a corresponding connector on the main unit.

[0030] A pair of wheels is mounted on the rearmost end of the rear housing so that a user can move the brush ahead along a contact surface.

[0031] To use the brush head, a user will remove the tank cover and fill the washer tank **140** with a washer liquid

and/or remove waste liquid. After the washer tank **140** has been filled with a washer liquid and the waste liquid in the waste liquid tank emptied, the user is to cover the tank assembly to make it air-tight, as depicted in Figures 5A and 5B. The brush head is then attached to a vacuum power source (not shown) by connecting the suction connector to the vacuum power source. To operate, a user will operate a switch to turn on the drive motor to rotate the roller brush. When the drive motor is in driving operation, the user may selectively activate the washer applicator to apply washer liquid to the roller brush and the washer liquid will be discharged through the plurality of washer dispensing nozzles and ejected towards the roller brush, as depicted in Figures 5C and 5D. The example control circuitry synchronizes operation of the drive motor and the vacuum power source such that the vacuum power source operates to supply vacuuming suction to the brush head when or whenever the drive motor is in driving operation. In this example, the roller brush is to rotate anticlockwise. When the roller brush rotates, the brushing portion which was in contact with the surface to be agitated and brush cleaned will be rotated to an interference position at which the scraper is in scraping encounter with the brushing surface. When the roller brush is in rotational scraping encounter with the scraper, the liquid which is carried on the brushing surface will be scraped off and transferred to the scrapper. Operation of the suction power source will generate a vacuuming suction which will cause the liquid collected by the waste liquid inlet to move through the waste liquid duct and then into the waste liquid tank. When an incoming air-liquid stream which comes into the waste liquid tank via the first riser duct encounters the liquid separator, the incoming air-liquid stream will be separated into liquid and air and the separated liquid and air will travel along different courses. The liquid which is separated from the incoming mixture stream will move along the inclined separator plate, travel downwards and move into the waste liquid reservoir due to gravity. The air which is separated from the incoming mixture stream will move into the space above the separator plate, then enter the exhaust inlet of the second riser duct, move downwards along the second riser duct which is an exhaust air duct, and finally enter the exhaust duct arrangement and to exit from the brush head at the air suction inlet end of the suction connector, as depicted in Figures 5E and 5F.

[0032] In an example embodiment, the brush head is physically and electrically connected to a main unit to form a stick-type vacuum cleaner, as depicted in Figures 6A to 6D. The example stick-type vacuum cleaner comprises an elongate main body having a lower end on which a physical and electrical connector for making physical and electrical connection with the brush head is formed. The elongate rigid main body of the main unit has an upper portion on which a handle portion is defined. The physical and electrical connector may comprise a control connector such that control signals can be wire transmitted to operate the drive motor and the water pump, so that the control circuit of the brush head is not necessary or by-passed. In some embodiments, the control circuitry of the brush head may have a wireless frontend to receive wireless control signals to facilitate operation of the drive motor, the washer, and possible other devices without loss of generality.

[0033] In example embodiments such as the present, the elongate main body of the main unit comprises a hand-held vacuum cleaner receptacle and a hand-held vacuum cleaner is detachably mounted in the vacuum cleaner receptacle to provide the required vacuuming suction power.

[0034] A cleaning head of the present disclosure comprises a suction portion, a waste removal portion and a storage portion.

[0035] The suction portion comprises a suction compartment, a suction interface which is configured for making fluid connection to a suction power source, and a suction network interconnecting the suction compartment and the suction interface.

[0036] The suction compartment comprises a compartment housing, an entry aperture through which waste enters the suction compartment, and an exit aperture through which waste leaves the suction compartment.

[0037] The suction network comprises a first fluid communication arrangement which interconnects the exit aperture of the suction compartment and the second container and a second fluid communication arrangement which interconnects the second container and the suction interface.

[0038] The waste removal portion comprises a roller cleaner having a roller axis and mounted inside the suction compartment, a cleaning-liquid applicator for applying cleaning liquid to the roller cleaner, a waste removal arrangement, a drive mechanism configured to drive the roller cleaner into rotation about the roller axis and relative to the waste removal arrangement, and an electrical interface configured for making electrical connection to an electrical power source to obtain electrical power to operate electrical parts, such as the drive mechanism and the cleaning-liquid applicator, of the cleaning head.

[0039] The storage portion comprises a first container which is configured as a cleaning liquid container for storing a cleaning liquid and a second container which is configured as a waste container for storing waste collected by the suction portion. The waste container is configured to store solid waste and liquid waste and waste herein comprises waste and liquid waste unless otherwise specified. The waste container comprises a separator for separating waste from the air stream which carries the waste. The waste container comprises an air filter which is configured to block solid waste from leaving the waste container after being separated from the waste liquid.

[0040] The cleaning liquid applicator is configured to draw cleaning liquid from the first container and to apply the cleaning liquid to the roller cleaner. The roller cleaner comprises a water absorbent outer layer which is configured to

agitate a surface to be cleaned to perform contact cleaning. The outer layer of the roller cleaner may be configured to have a generally cylindrical shape, with the roller axis being coaxial with the cylindrical axis. The water absorbent outer layer may be a felt layer, a fabric layer or a layer of suitable liquid absorbing material, and may be configured as a roller brush or a porous roller. The cleaning liquid may be water, an antiseptic aqueous solution, or any cleaning liquid suitable for floor or surface cleaning and/or sanitization.

[0041] To enhance effective cleaning contact between the roller and the surface and to facilitate cleaning by wiping or agitation, the entry aperture is formed as an elongate aperture at the bottom of the suction compartment. The elongate aperture has a length which is sufficient to permit the entire length of the roller to protrude below the entry aperture. The length of the roller and the length of the elongate aperture are both measured in the direction of the roller axis. The elongate aperture may have a width which is slightly larger than the width of the portion of the roller at the entry aperture to permit suction of solid waste in the vicinity of the roller contact surface. The roller contact surface being the portion of the roller which is in physical contact with the surface to be cleaned. The outer layer of the roller cleaner may be resilient to enhance contact cleaning effectiveness.

[0042] During cleaning operations, the roller is configured to be driven by the drive mechanism so that each circumferential portion of the roller is to repeatedly reciprocate between an upstream position which is before the entry aperture and a downstream position which is after the entry aperture.

[0043] The cleaning liquid applicator is configured to apply cleaning liquid to the roller cleaner (or "roller" in short). The circumferential portion of the roller becomes an upstream portion when it reaches a position juxtaposing the cleaning liquid applicator or after it has been applied with the cleaning liquid and before reaching the entry aperture. The upstream portion of the roller is then driven towards the entry aperture. When the upstream portion of the roller reaches the entry aperture, that portion of the roller will expose through the entry aperture and will enter into cleaning contact with the surface to be cleaned. Driven rotation of the roller relative to the surface while the roller is in contact therewith will result in cleaning agitation of the surface by the roller. The circumferential portion of the roller becomes a downstream portion once it passes the entry aperture.

[0044] The waste removal arrangement is configured to remove waste from the downstream portion of the roller by physical contact therewith before the roller reaches the upstream position, that is, the position juxtaposing the cleaning liquid applicator, again. The waste collection arrangement may comprise a waste remover which is configured to physically interact with the downstream portion to help remove solid and liquid waste from the cleaning head. An example waste remover may comprise a waste scraper which is configured to be in contact with a downstream portion of the roller.

[0045] The waste removal arrangement is in fluid communication with the suction network such that waste removed by the waste removal arrangement will be collected by suction and enters into the suction network. The suction network comprises a waste collection port which is a suction port formed at an upstream end of the suction network and which is in abutment with the exit aperture of the suction compartment. The waste collection port is configured such that suction power applied at the suction interface will appear as suction power at the waste collection port and the suction compartment. The waste collection port is formed on a periphery of the suction compartment and defines a waste inlet through which solid waste and liquid waste are to leave the suction compartment.

[0046] An example cleaning head comprises a main housing having a main axis which defines a rolling direction along the main axis to perform roller cleaning operations. The main housing comprises a first portion defining a first end of the cleaning head, a second portion defining a second end of the cleaning head, and an intermediate portion which is intermediate the first portion and the second portion. The cleaning head is configured to be driven to move in a first rolling direction such that the first portion is a forward portion having a forward end and the third portion is a rearward portion having a rearward end. In some embodiments, the cleaning head is also configured to move in a second rolling direction opposite to the first rolling direction such that the second portion is a forward portion having a forward end and the first portion is a rearward portion having a rearward end.

[0047] The suction compartment is elongate and extends along a direction which is parallel to the roller axis. The suction compartment comprises an upper housing portion which is closed at least during operations and a bottom housing portion on which an entry aperture having an aperture axis is defined. The cleaning roller is mounted inside the suction compartment with the roller axis parallel to the aperture axis and with a circumferential portion exposed at and protruding from the entry aperture so that when the cleaning head is placed on a surface to be cleaned, the roller axis is parallel to the surface and the exposed circumferential portion of the cleaning head is in frictional and compressive contact with the surface to be cleaned.

[0048] The machine compartment is configured to receive electrical and mechanical components such as the drive mechanism, parts for driving the cleaning liquid applicator and electronic circuitry. In example embodiments, the machine compartment abuts the suction compartment and shares a partitioning wall with the suction compartment.

[0049] In example embodiments, the first portion, the intermediate portion and the second portion are disposed sequentially along the rolling direction.

[0050] In example embodiments, the first portion defines a suction compartment, the second portion defines a storage receptacle, and the intermediate portion defines a machine compartment.

[0051] In example embodiments, the storage receptacle is configured to receive the first container and the second container.

[0052] In example embodiments, the suction interface is connected to the main housing, and more particularly, connected to the third portion of the main housing.

[0053] An example cleaning head comprises a suction portion, a waste removal portion, a storage portion, and a main housing, as described herein and as shown in Figures 7A to 16. The example cleaning head **200** comprises features which are substantially identical to that of the brush head **100** and the description thereon is incorporated by reference and applied mutatis for the benefit of succinctness, with like numerals representing like features but increased by 100.

[0054] The example storage portion comprises a tank assembly. The tank assembly **230** comprises a first tank **240** as an example of a first container defining a first reservoir and a second tank **250** as an example of a second container defining a second reservoir. The cleaning head comprises a first liquid delivery path which is configured to deliver washer liquid from the first reservoir to the roller brush and a second liquid delivery path which is a waste collection path configured for transporting waste liquid from the roller brush to the second tank. The example cleaning head comprises a suction connector **290** which is an example suction interface. The suction connector **290** comprises a tubular portion having a first end which is a free end defining a suction inlet and a second end which is mounted on the main housing and in fluid-tight communication with the second tank **250.** In example embodiments such as the ones depicted herein, the suction interface is hinge-connected to the main housing. The hinge may for example be a pivotal hinge or a universal hinge so that the suction interface can change its inclination with respect to the main housing. The cleaning head is configured to operate in a first rolling direction such that the suction compartment is forward of the suction interface.

[0055] In this example configuration, the main housing **210** comprises a first portion which is a forward housing portion ("forward portion") **212** defining a suction compartment, a second portion which is a rearward housing portion ("rear portion") **214** defining a storage receptacle, and an intermediate housing portion ("intermediate portion") **216** which interconnects the forward portion and the rearward portion and defining a machine compartment **260,** as depicted in Figures 9A and 10A. The main housing **210** comprises an upper housing portion (or top housing portion) and a lower housing portion (or bottom housing portion) which cooperate to define an internal housing compartment of the brush head having an upper side (or a top side) and a lower side (or a bottom side).

[0056] The portion of the main housing which defines the suction compartment comprises a fixed portion and a movable portion **212A** which is movable relative to the fixed portion. The fixed portion is integrally formed with the intermediate portion and cooperates with the movable portion to define a re-closable suction compartment to facilitate removal of the roller cleaner for replacement or for cleaning. The suction compartment comprises an elongate entry aperture which extends along an aperture axis which is parallel to the roller axis. The elongate aperture is a suction aperture which provides a suction interface between the cleaning head and the surface to be cleaned. The fixed portion comprises a pair of holding arms which is configured for retaining the roller cleaner in its operational position. The pair of holding arms comprises a first holding arm which is configured for holding a first axial end of the roller and a second holding arm for holding a second axial end of the roller. The pair of holding arms is configured so that when the roller is held in the operational position, the roller axis and the aperture axis are parallel and the roller is rotatable relative to the suction compartment. Each of the holding arms projects away from the intermediate portion of the main housing so that the roller is cantilevered above the elongate entry aperture of the suction compartment.

[0057] The suction network comprises a riser duct portion and a suction channel which interconnects the waste collection port and the riser duct portion. The suction channel is underneath the intermediate compartment and is defined between a bottom wall portion of the machine compartment and a bottom cover **211** of the cleaning head. The riser duct extends through the machine compartment and has an inlet end which is integrally formed on the bottom wall of the machine compartment. The suction channel comprises a first end which defines the waste collection port **284** and a second end which abuts the inlet end of the riser duct portion. The waste collection port defines an elongate inlet aperture juxtaposing the roller. The elongate inlet aperture is a narrow slit having a length comparable to the length of the roller and a width which is very small, for example, a width equal to a small fraction of the diameter of the roller, say less than 5-10%. The suction channel tapers to narrow as it extends from the waste collection port towards the riser duct portion. The suction channel defines a suction plane which is parallel to a plane defined by the main axis **Y-Y'** and the roller axis **Z-Z'.** The suction plane has a fan-shaped configuration so that suction power coming from the riser duct portion is distributed along the length of the waste collection port. The waste collection port has a small width so that a working suction can be maintained at the waste collection port. To maintain a good working suction, the slit of the waste collection portion should have an area which is smaller than the passage area of the riser duct portion. The suction channel is intermediate the machine compartment and the surface to be cleaned during vacuum cleaning operations.

[0058] The bottom cover of the main housing which cooperate with the bottom wall portion of the machine compartment has a first end which is fitted with a scraper blade **211A.** The scraper blade is configured to be in compressive contact with the roller along its length to facilitate removal of waste from the roller when the roller is driven to rotate against the blade. The scraper blade is configured as a "squeegee" to squeeze the roller whereby waste is detached from the roller. A plurality of ribs is disposed on an inner surface of the bottom cover which defines the suction channel. The ribs are

arranged to guide waste coming in from the waste collection port to move towards the riser duct **252.** The ribs are arranged to extend radially from the inlet end of the riser duct portion, as shown in Figure 8B.

[0059] Referring to Figures 8A and 8B, the roller brush **220** as an example roller cleaner is mounted inside the suction compartment. An elongate portion of the roller brush **220** is exposed through the elongate opening defined between the scraper and a forward end of the main housing. The exposed portion of the roller cleaner is a circumferential portion of the roller cleaner which protrudes to extend beyond the elongate suction aperture defined by the bottom cover in cooperation with the forward portion of the main housing. The bottom portion of the machine compartment defines a recess having a forward end where the waste collection port is located and a rearward end where the riser duct portion is located. The recess is defined by a bottom portion of the machine compartment and a peripheral wall which defines the rearward end of the recess. The recess has a depth which progressively increases on extending towards the rearward end so that the depth of the recess at the rearward end is at a maximum and the depth at the forward end is at a minimum. The bottom cover **211** is attached to the peripheral wall by, for example, friction fit or other fastening means such as screws. The bottom cover **211** has a generally triangular profile complementary to the shape of the recess on the lower housing portion. One side **211A** of the bottom plate has substantially the same length as the width of the opening and is to be arranged facing the roller brush to receive used liquid therefrom. The peripheral wall extends downwardly from the rearward boundary of the recess. The ribs strengthen the bottom cover **211** and facilitate the used liquid to flow evenly towards an angle portion. When the bottom cover is mounted on the lower housing portion, the angle portion is directly below the duct inlet. After the used liquid enters the bottom cover from the side **211A,** it is guided towards the angle portion opposite the side **211A,** and leaves the bottom cover through the duct inlet.

[0060] Referring to Figures 9A to 11B, the tank assembly **230** is configured to be mountable on the intermediate portion **216** of the housing **210.** The first tank **240** has a water outlet **244A,** which is continuous to a water inlet **244B** of the first liquid delivery path inside the housing **210.** An air pore **246** may be provided on the cover of the first tank for air to enter the tank. The second tank **250** comprises a connection portion for connection to the intermediate portion **216** and a container portion for retaining the used liquid. The container portion has a greater depth than the connection portion. A water inlet and an air outlet are provided on the connection portion on the side facing the intermediate portion **216.** When the second tank **250** is mounted on the housing **210,** the water inlet is continuous to the duct inlet on the lower housing portion, and the air outlet is continuous to the suction connector **290.** An air-liquid separator **256** is disposed on the air outlet on the connection portion to facilitate separation of air and waste liquid from an air stream coming in from the second tank which contains both air and collected waste liquid.

[0061] Referring to Figures 12 to 13, a tube is provided inside the second tank **250.** The tube extends from the water inlet of the connection portion to the container portion. It facilitates fluid communication between the duct inlet on the lower housing portion and the container portion of the second tank. The tube rises vertically from the water inlet and then extends transversely away from the connection portion.

[0062] Figures 14 and 15 show components inside the rigid housing **210.** A control board **262** is provided inside the rigid housing **210** to control the operation of the brush head. The control board **262** is to operate a water pump **264** and a motor **266.** The water pump **264** is arranged to drive liquid from the first tank **240** to the roller brush via the liquid distribution plate **268** and the associated tubing. The motor **266** is arranged to drive the roller brush into brushing rotation.

[0063] Figure 16 shows the control circuitry of the brush head. The control circuitry comprises the control board **262,** which comprises a processing unit, such as a microprocessor. The microprocessor receives input power from a power source of, for example, DC 15-35V. The microprocessor receives and processes input signal from various sensors **S1-S6;** and output signal to drive the water pump **264,** the motor **266** and various LED indicators **L1-L5.** Referring to Figures 9A-10B, various sensors are provided on the rigid housing **210.** A liquid detection sensor **S1** and a dirty water tank position sensor **S2** are arranged on the side in close proximity to the second tank **250.** A liquid detection sensor **S3** and a clean water tank position sensor **S4** are arranged on the side in close proximity to the first tank **240.**

[0064] The liquid detection sensor **S1** is located at a position close to the maximum allowable water level of the container portion of the second tank **250.** It sends a signal to the microprocessor when the liquid in the second tank **250** reaches the maximum allowable water level. Upon receiving the signal, the microprocessor outputs signal to stop operation of the motor **266** and instructs LED **L1** to light up. The dirty water tank position sensor **S2** is located at a position near the bottom of the second tank **250.** It detects the presence of the second tank **250,** and send the corresponding signal to the microprocessor, which prevents the motor from operation and lights up LED **L2** if the second tank is not in place. The liquid detection sensor **S3** is located at a position close to the minimum allowable water level of the first tank **240.** It sends a signal to the microprocessor when the liquid in the first tank **240** reaches the minimum allowable water level. Upon receiving the signal, the microprocessor outputs signal to stop operation of the water pump **264** and instructs LED **L3** to light up. The clean water tank position sensor **S4** is located at a position near the bottom of the first tank **240.** It detects the presence of the first tank **240,** and send the corresponding signal to the microprocessor, which prevents the water pump from operation and lights up LED **L4** if the first tank is not in place.

[0065] In some embodiments, the brush head is provided with at least one safety sensor, which sends a signal to the microprocessor to stop the operation of the system, including the motor and the water pump, when the brush head is

not ready for use. For example, a safety sensor **S5** is provided to detect if the user lifts the brush head off the floor. A safety sensor **S6** is provided to detect if the brush head is in a slanting position, for example, is slanted for over 30 degrees.

[0066] In some embodiments, the liquid detection sensor **S1** and/ or liquid detection sensor **S3** may be a single-point photoelectric level sensor. The dirty water tank position sensor **S2** and the clean water tank position sensor **S4** may be a micro-switch. The safety sensor **S6** may be a tip over sensor.

[0067] In some embodiments, the LEDs are surface mounted diode (SMD) type LEDs. The LEDs light up in the following event:-

LED	Event
L1	The second tank is full
L2	The second tank is missing
L3	The first tank is out of water
L4	The first tank is missing
L5	Safety events, for examples, the brush head is lifted off the floor or slanted for over 30 degrees

[0068] While examples and embodiments have been described herein, persons skilled in the art would understand and appreciate that the examples and embodiments are to assist understanding and are not intended to be limiting or restrictive. Ordinal numbers such as 'first', 'second', 'third', etc., are used herein only as labels and do not carry or intend to carry a meaning of order or level of significance. The term cleaning liquid is also referred to as a washer liquid herein. The expression orthogonal herein includes substantially or generally orthogonal.

Table of numerals

Brush head or Cleaning head	100		
Rigid housing or Main housing	110, 210	Bottom cover plate	111
Forward housing portion (forward portion)	112, 212	Rearward housing portion (rear portion)	114, 214
Intermediate housing portion (intermediate portion)	116, 216	Tank receptacle	118
Roller brush	120, 220	Brush receptacle	122
Tank assembly	130, 230	Bottom tank surface	132
Peripheral tank wall	134	Tank cover	136
First tank	140, 240		
Washer dispensing nozzles	142		
Second tank portion	150, 250	First sub-portion	150a
Second sub-portion	150b	First riser duct, Waste liquid inlet duct	152, 252
Second riser duct	154	Air-liquid separator (liquid separator)	156, 256
Baffle surface	156a	First bottom surface	158a
Second bottom surface	158b		
Waste liquid duct	182	Waste collection port	284
Suction connector, 290	190		
Movable portion	212A		
Bottom cover	211	Scraper blade	211A
Water outlet	244A	Water inlet	244B
Air pore	246		
Machine compartment	260		
Control board	262	Water pump	264

(continued)

Motor	266	Liquid distribution plate	268

Claims

1. A cleaning head (100) comprising:

- a suction portion including a suction compartment, a suction interface, and a suction network interconnecting the suction compartment and the suction interface, wherein

  ◦ the suction interface comprises a tubular portion configured for connection to a suction power source and an electrical interface,
  ◦ the suction network is connected to the suction interface, the suction network comprising a waste collection port (284) forming an upstream end of the suction network and a waste container (150, 250) interconnecting the suction interface and the waste collection port, and
  ◦ the suction compartment is in fluid communication with the waste collection port (284), the suction compartment comprising an elongate entry aperture having an aperture axis, and the waste collection port is configured such that suction power applied at the suction interface will appear as suction power at the waste collection port and the suction compartment;

- a roller cleaner (120, 220) mounted inside the suction compartment, the roller cleaner having a roller axis (Z-Z') parallel to the aperture axis and an elongate outer surface portion protruding through the elongate entry aperture;
- a machine compartment inside which a drive mechanism (266) and electronic circuitry are mounted, the drive mechanism being configured to drive the roller cleaner (120, 220) to rotate about the roller axis to perform agitated cleaning;
- a storage portion comprising a cleaning liquid container (140, 240) and the waste container (150, 250) mounted on a storage receptacle (118);
- a cleaning liquid applicator configured to draw cleaning liquid from the cleaning liquid container (140, 240) and to apply the cleaning liquid to the roller cleaner (120, 220); and
- a waste remover (211A) configured to physically interact with the roller cleaner to remove waste therefrom;
- wherein the waste collection port (284) is configured to collect waste removed from the roller cleaner (120, 220) by suction and the suction network is configured to move the collected waste to the waste container (150, 250), and
- wherein the waste container comprises a separator (156, 256) for separating waste from a waste carrying air stream.

2. The cleaning head (100) of claim 1, wherein the electrical interface is configured for connection to an electrical power source to obtain electrical power and control signals to operate electrical parts of the cleaning head, wherein the tubular portion of the suction interface comprises a free end for attaching to a vacuum power source, and wherein the electrical interface terminates at or near the free end; and/ or wherein the electrical interface comprises conductors extending along the tubular portion of the suction interface, the conductors comprising signal conductors which are configured to transmit control signals to the electronic circuitry of the drive mechanism.

3. The cleaning head (100) according to claims 1 or 2, wherein the cleaning head has a main axis (X-X') defining a rolling direction which is orthogonal to the roller axis (Z-Z'), wherein the suction compartment is on a first end of the main axis and the suction interface is on a second end of the main axis and wherein the suction compartment comprises a compartment housing, an entry aperture through which waste enters the suction compartment, and an exit aperture through which waste leaves the suction compartment.

4. The cleaning head (100) according to claim 3, wherein the cleaning liquid container (140, 240) and the waste container (150, 250) are disposed on two lateral sides of the main axis (X-X') such that the main axis is intermediate the cleaning liquid container and the waste container; and/or the tubular portion of the suction interface has a tubular axis and the main axis is a center axis which intersects the tubular axis.

5. The cleaning head (100) according to any of the preceding claims, wherein the cleaning head comprises a main

housing (110, 210) which defines the suction compartment, the machine compartment and the storage receptacle (118); wherein the storage receptacle is intermediate the machine compartment and the suction interface; and wherein the cleaning liquid container (140, 240) and the waste container (150, 250) are detachably mounted on the storage receptacle (118).

6. The cleaning head (100) according to claim 5, wherein the suction compartment comprises a first arm and a second arm which project away from the machine compartment and extend in a direction orthogonal to the roller axis (Z-Z') and which cooperate to hold the roller cleaner (120, 220) in its operation position such that the roller axis is parallel to the aperture axis.

7. The cleaning head (100) according to claim 6, wherein the main housing (110, 210) comprises a movable portion (212A) which is movable between an open state and a close state, wherein the movable portion in the closed state cooperates with the first arm and the second arm to define the entry aperture; wherein the movable portion in the open state permits removal of the roller cleaner (120, 220) from the suction compartment; and/or wherein the movable portion is movable about a pivotal axis between the open state and the closed state, the pivotal axis being parallel to the roller axis.

8. The cleaning head (100) according to claims 6 or 7, wherein the suction compartment and the machine compartment share a partitioning wall, the partitioning wall extending in a direction parallel to the roller axis (Z-Z') and between the first arm and the second arm.

9. The cleaning head (100) according to any preceding claim, wherein the suction network comprises a riser duct portion (152, 252), an air-liquid separator (156, 256) disposed above the riser duct portion, and a suction channel interconnecting the riser duct portion and the waste collection port (284), and wherein the riser duct portion extends through the machine compartment and the suction channel is underneath the machine compartment, the air-liquid separator is configured such that when an incoming air-liquid stream which comes via the riser duct portion encounters the air-liquid separator, the incoming air-liquid stream will be separated into liquid and air, and the separated liquid and air will travel downwards and move into the waste container (150, 250) due to gravity.

10. The cleaning head (100) according to claim 9, wherein the suction channel flares to widen on extending towards the suction compartment to define the waste collection port (284), and wherein the waste collection port has a width comparable to the length of the roller cleaner (120, 220), the length being measured along the roller axis (Z-Z').

11. The cleaning head (100) according to claim 10, wherein the waste collection port (284) is slit having a slit axis which is parallel to the roller axis (Z-Z'); and/or wherein the waste container (150, 250) interconnects the suction interface and the riser duct portion (152, 252), and wherein the riser duct portion has a duct axis which is orthogonal to the roller axis (Z-Z') and which defines the direction of extension of the riser duct portion (152, 252) through the machine compartment.

12. The cleaning head (100) according to any of claims 9 to 11, wherein the suction channel has an internal clearance which increases on extending from the waste collection port (284) to the riser duct portion (152, 252), the internal clearance being measured in a direction parallel to the direction of extension of the riser duct portion; and/or wherein the suction channel and the waste collection port are defined by a bottom portion of the machine compartment in cooperation with a bottom cover (211) of the cleaning head.

13. The cleaning head (100) any preceding claim, wherein the cleaning liquid applicator is configured to apply cleaning liquid to an upstream portion of the roller cleaner (120, 220) and the waste remover (211A) is configured to remove waste from a downstream portion of the roller cleaner so that waste removed by the waste removal arrangement is to be collected by suction and to enter into the suction network.

14. A vacuum cleaner comprising a cleaning head (100) according to any preceding claim.

15. A vacuum cleaner according to claim 14, wherein the vacuum cleaner comprises an elongate body defining a handle portion on a first longitudinal end and a tubular portion at a second longitudinal end distal from the first longitudinal end, wherein a suction power source is received inside the elongate body, and wherein the tubular portion is in fluid connection with the suction interface and is pivotally movable relative to the cleaning head (100).

Patentansprüche

1. Reinigungskopf (100), umfassend:

- einen Ansaugteil, der eine Saugkammer, eine Saugschnittstelle und ein Saugnetzwerk, welches die Saugkammer und die Saugschnittstelle verbindet, umfasst, wobei

  ◦ die Saugschnittstelle einen rohrförmigen Teil umfasst, der für den Anschluss an eine Saugkraftquelle und eine elektrischen Schnittstelle konfiguriert ist,
  ◦ das Saugnetzwerk mit der Saugschnittstelle verbunden ist, wobei das Saugnetzwerk einen Abfallsammelanschluss (284), der ein stromaufwärts gelegenes Ende des Saugnetzwerks bildet, und einen Abfallbehälter (150, 250), der die Saugschnittstelle und den Abfallsammelanschluss miteinander verbindet, umfasst, und
  ◦ die Saugkammer sich in fluider Verbindung mit dem Abfallsammelanschluss (284) befindet, wobei die Saugkammer eine längliche Eintrittsöffnung mit einer Öffnungsachse umfasst und der Abfallsammelanschluss so konfiguriert ist, dass die an die Saugschnittstelle anliegende Saugkraft als Saugkraft am Abfallsammelanschluss und an der Saugkammer erscheint;

- einen Walzenreiniger (120, 220), der im Inneren der Saugkammer befestigt ist, wobei der Walzenreiniger eine Walzenachse (Z-Z') parallel zur Öffnungsachse und einen länglichen Außenflächenabschnitt, der durch die längliche Eintrittsöffnung hindurchragt, besitzt;
- einen Maschinenraum, in dessen Innerem ein Antriebsmechanismus (266) und elektronische Schaltungen montiert sind, wobei der Antriebsmechanismus so konfiguriert ist, dass er den Walzenreiniger (120, 220) so antreibt, dass dieser um die Walzenachse rotiert, um eine agitierte Reinigung durchzuführen;
- einen Lagerungsteil, umfassend einen Reinigungsflüssigkeitsbehälter (140, 240) und den Abfallbehälter (150, 250), montiert auf einem Lagerungsfach (118);
- einen Reinigungsflüssigkeitsapplikator, der so konfiguriert ist, dass er Reinigungsflüssigkeit aus dem Reinigungsflüssigkeitsbehälter (140, 240) zieht und die Reinigungsflüssigkeit auf den Walzenreiniger (120, 220) aufträgt; und
- einen Abfallentferner (211A), der so konfiguriert ist, dass er physikalisch mit dem Walzenreiniger wechselwirkt, um von diesem Abfall zu entfernen;
- wobei der Abfallsammelanschluss (284) so konfiguriert ist, dass er Abfall, der vom Walzenreiniger (120, 220) entfernt wurde, durch Ansaugen sammelt, und das Saugnetzwerk so konfiguriert ist, dass der gesammelte Abfall an den Abfallbehälter (150, 250) geführt wird, und
- wobei der Abfallbehälter eine Trenneinrichtung (156, 256) zur Trennung von Abfall aus einem abfallführenden Luftstrom umfasst.

2. Reinigungskopf (100) nach Anspruch 1, wobei die elektrische Schnittstelle für den Anschluss an eine elektrische Stromquelle konfiguriert ist, um elektrischen Strom und Steuersignale zum Betreiben elektrischer Teile des Reinigungskopfes zu erhalten, wobei der rohrförmige Teil der Saugschnittstelle ein freies Ende zum Verbinden mit einer Vakuumkraftquelle umfasst, und wobei die elektrische Schnittstelle am freien Ende oder in der Nähe davon endet; und/oder wobei die elektrische Schnittstelle Leiter umfasst, die sich entlang des rohrförmigen Teils der Saugschnittstelle erstrecken, wobei die Leiter Signalleiter umfassen, die so konfiguriert sind, dass sie Steuersignale an die elektronische Schaltung des Antriebsmechanismus übertragen.

3. Reinigungskopf (100) gemäß Anspruch 1 oder 2, wobei der Reinigungskopf eine Hauptachse (X-X'), die eine Walzrichtung definiert, die orthogonal zur Walzenachse (Z-Z') liegt, wobei die Saugkammer an einem ersten Ende der Hauptachse liegt und die Saugschnittstelle an einem zweiten Ende der Hauptachse liegt, und wobei die Saugkammer ein Kammergehäuse, eine Eintrittsöffnung, durch die Abfall in die Saugkammer gelangt, und eine Austrittsöffnung, durch die Abfall die Saugkammer verlässt, umfasst.

4. Reinigungskopf (100) gemäß Anspruch 3, wobei der Reinigungsflüssigkeitsbehälter (140, 240) und der Abfallbehälter (150, 250) an zwei lateralen Seiten der Hauptachse (X-X') angeordnet sind, so dass die Hauptachse zwischen dem Reinigungsflüssigkeitsbehälter und dem Abfallbehälter liegt; und/oder der rohrförmige Teil der Saugschnittstelle eine rohrförmige Achse besitzt und die Hauptachse eine Mittelachse ist, die die rohrförmige Achse schneidet.

5. Reinigungskopf (100) gemäß einem der vorhergehenden Ansprüche, wobei der Reinigungskopf ein Hauptgehäuse (110, 210) umfasst, das die Saugkammer, den Maschinenraum und das Lagerungsfach (118) umgrenzt; wobei das

Lagerungsfach zwischen dem Maschinenraum und der Saugschnittstelle liegt; und wobei der Reinigungsflüssigkeitsbehälter (140, 240) und der Abfallbehälter (150, 250) abnehmbar am Lagerungsfach (118) angebracht sind.

6. Reinigungskopf (100) gemäß Anspruch 5, wobei die Saugkammer einen ersten Arm und einen zweiten Arm umfasst, die vom Maschinenraum weg ragen und sich in einer Richtung orthogonal zur Walzenachse (Z-Z') erstrecken, und die zusammenwirken, um den Walzenreiniger (120, 220) in seiner Betriebsposition so zu halten, dass die Walzenachse parallel zur Achse der Öffnung liegt.

7. Reinigungskopf (100) gemäß Anspruch 6, wobei das Hauptgehäuse (110, 210) einen beweglichen Teil (212A) umfasst, der zwischen einem offenen Zustand und einem geschlossenen Zustand beweglich ist, wobei der bewegliche Teil im geschlossenen Zustand mit dem ersten Arm und dem zweiten Arm zusammenwirkt, um die Eintrittsöffnung zu definieren; wobei der bewegliche Teil im offenen Zustand das Entfernen des Walzenreinigers (120, 220) aus der Saugkammer ermöglicht; und/oder wobei der bewegliche Teil um eine Schwenkachse zwischen dem offenen Zustand und dem geschlossenen Zustand beweglich ist, wobei die Schwenkachse parallel zur Walzenachse liegt.

8. Reinigungskopf (100) gemäß Anspruch 6 oder 7, wobei die Saugkammer und der Maschinenraum eine gemeinsame Trennwand besitzen, wobei die Trennwand sich in einer Richtung parallel zur Walzenachse (Z-Z') und zwischen dem ersten Arm und dem zweiten Arm erstreckt.

9. Reinigungskopf (100) gemäß einem vorhergehenden Anspruch, wobei das Saugnetzwerk einen Steigrohrteil (152, 252), eine Luft-Flüssigkeits-Trenneinrichtung (156, 256), der oberhalb des Steigrohrteils angeordnet ist, und einen Saugkanal, der den Steigrohrteil und den Abfallsammelanschluss (284) miteinander verbindet, umfasst, und wobei der Steigrohrteil sich durch den Maschinenraum hindurch erstreckt und der Saugkanal sich unterhalb des Maschinenraums befindet, wobei die Luft-Flüssigkeits-Trenneinrichtung so konfiguriert ist, dass wenn ein ankommender Luft-Flüssigkeits-Strom, der über den Steigrohrteil kommt, auf die Luft-Flüssigkeits-Trenneinrichtung trifft, der ankommende Luft-Flüssigkeit-Strom in Flüssigkeit und Luft getrennt wird und die getrennte Flüssigkeit und Luft aufgrund der Schwerkraft stromabwärts und in den Abfallbehälter (150, 250) wandern.

10. Reinigungskopf (100) gemäß Anspruch 9, wobei der Saugkanal sich in Richtung der Saugkammer verbreitert, um den Abfallsammelanschluss (284) zu definieren, und wobei der Abfallsammelanschluss eine Breite besitzt, die der Länge des Walzenreinigers (120, 220) entspricht, wobei die Länge entlang der Walzenachse (Z-Z') gemessen wird.

11. Reinigungskopf (100) gemäß Anspruch 10, wobei der Abfallsammelanschluss (284) ein Schlitz mit einer Schlitzachse ist, die parallel zur Walzenachse (Z-Z') liegt; und/oder wobei der Abfallbehälter (150, 250) die Saugschnittstelle und den Steigrohrteil (152, 252) miteinander verbindet, und wobei der Steigrohrteil eine Rohrachse besitzt, die orthogonal zur Walzenachse (Z-Z') ist und die die Richtung des Verlaufs des Steigrohrteils (152, 252) durch den Maschinenraum definiert.

12. Reinigungskopf (100) gemäß einem der Ansprüche 9 bis 11, wobei der Saugkanal einen inneren Abstand besitzt, der sich vom Abfallsammelanschluss (284) zum Steigrohrteil (152, 252) hin vergrößert, wobei der innere Abstand in einer Richtung parallel zur Richtung des Verlaufs des Steigrohrteils gemessen wird; und/oder wobei der Saugkanal und der Abfallsammelanschluss durch einen unteren Teil des Maschinenraums in Zusammenwirkung mit einer unteren Abdeckung (211) des Reinigungskopfs begrenzt werden.

13. Reinigungskopf (100) nach einem vorhergehenden Anspruch, wobei der Reinigungsflüssigkeitsapplikator so konfiguriert ist, dass er Reinigungsflüssigkeit auf einen stromaufwärts gelegenen Teil des Walzenreinigers (120, 220) aufträgt, und der Abfallentferner (211A) so konfiguriert ist, dass er Abfall aus einem stromabwärts gelegenen Teil des Walzenreinigers entfernt, so dass durch die Abfallentfernungsanordnung entfernter Abfall durch Ansaugen gesammelt wird und in das Saugnetzwerk gelangt.

14. Staubsauger, umfassend einen Reinigungskopf (100) gemäß einem vorhergehenden Anspruch.

15. Staubsauger gemäß Anspruch 14, wobei der Staubsauger einen länglichen Körper umfasst, der einen Griffteil an einem ersten longitudinalen Ende und einen rohrförmigen Teil an einem zweiten longitudinalen Ende distal vom ersten longitudinalen Ende definiert, wobei eine Saugkraftquelle im Inneren des länglichen Körpers aufgenommen ist, und wobei der rohrförmige Teil sich in fluider Verbindung mit der Saugschnittstelle befindet und relativ zum Reinigungskopf (100) schwenkbar ist.

Revendications

1. Tête de nettoyage (100) comprenant :

- une portion d'aspiration incluant un compartiment d'aspiration, une interface d'aspiration, et un réseau d'aspiration raccordant mutuellement le compartiment d'aspiration et l'interface d'aspiration,
dans laquelle

  - o l'interface d'aspiration comprend une portion tubulaire configurée pour un raccordement à une source d'énergie d'aspiration et à une interface électrique,
  - o le réseau d'aspiration est raccordé à l'interface d'aspiration, le réseau d'aspiration comprenant un orifice de collecte de déchets (284) formant une extrémité amont du réseau d'aspiration et un contenant de déchets (150, 250) raccordant mutuellement l'interface d'aspiration et l'orifice de collecte de déchets, et
  - o le compartiment d'aspiration est en communication fluidique avec l'orifice de collecte de déchets (284), le compartiment d'aspiration comprenant une ouverture d'entrée allongée ayant un axe d'ouverture, et l'orifice de collecte de déchets est configuré de telle sorte qu'une puissance d'aspiration appliquée à l'interface d'aspiration apparaîtra comme une puissance d'aspiration au niveau de l'orifice de collecte de déchets et du compartiment d'aspiration ;

- un nettoyeur à rouleau (120, 220) monté à l'intérieur du compartiment d'aspiration, le nettoyeur à rouleau ayant un axe de rouleau (Z-Z') parallèle à l'axe d'ouverture et une portion de surface externe allongée faisant saillie à travers l'ouverture d'entrée allongée ;
- un compartiment machine à l'intérieur duquel un mécanisme d'entraînement (266) et une circuiterie électronique sont montés, le mécanisme d'entraînement étant configuré pour entraîner le nettoyeur à rouleau (120, 220) pour qu'il tourne autour de l'axe de rouleau pour effectuer un nettoyage agité ;
- une portion de stockage comprenant un contenant de liquide de nettoyage (140, 240) et le contenant de déchets (150, 250) montés sur un réceptacle de stockage (118) ;
- un applicateur de liquide de nettoyage configuré pour puiser le liquide de nettoyage du contenant de liquide de nettoyage (140, 240) et pour appliquer le liquide de nettoyage au nettoyeur à rouleau (120, 220) ; et
- un dispositif de retrait de déchets (211A) configuré pour interagir physiquement avec le nettoyeur à rouleau afin d'en retirer les déchets ;
- dans laquelle l'orifice de collecte de déchets (284) est configuré pour collecter les déchets retirés du nettoyeur à rouleau (120, 220) par aspiration et le réseau d'aspiration est configuré pour déplacer les déchets collectés vers le contenant de déchets (150, 250), et
- dans laquelle le contenant de déchets comprend un séparateur (156, 256) pour séparer les déchets d'un flux d'air porteur de déchets.

2. Tête de nettoyage (100) selon la revendication 1, dans laquelle l'interface électrique est configurée pour un raccordement à une source d'énergie électrique afin d'obtenir de l'énergie électrique et des signaux de commande pour faire fonctionner les parties électriques de la tête de nettoyage, dans laquelle la portion tubulaire de l'interface d'aspiration comprend une extrémité libre pour fixation à une source d'énergie à vide, et dans laquelle l'interface électrique se termine à l'extrémité libre ou à proximité de celle-ci ; et/ou dans laquelle l'interface électrique comprend des conducteurs s'étendant le long de la portion tubulaire de l'interface d'aspiration, les conducteurs comprenant des conducteurs de signal qui sont configurés pour transmettre des signaux de commande à la circuiterie électronique du mécanisme d'entraînement.

3. Tête de nettoyage (100) selon les revendications 1 ou 2, la tête de nettoyage ayant un axe principal (X-X') définissant une direction de roulement qui est orthogonale à l'axe de rouleau (Z-Z'), dans laquelle le compartiment d'aspiration est sur une première extrémité de l'axe principal et l'interface d'aspiration est sur une seconde extrémité de l'axe principal et dans laquelle le compartiment d'aspiration comprend un logement de compartiment, une ouverture d'entrée à travers laquelle les déchets entrent dans le compartiment d'aspiration, et une ouverture de sortie à travers laquelle les déchets quittent le compartiment d'aspiration.

4. Tête de nettoyage (100) selon la revendication 3, dans laquelle le contenant de liquide de nettoyage (140, 240) et le contenant de déchets (150, 250) sont disposés sur deux côtés latéraux de l'axe principal (X-X') de telle sorte que l'axe principal est intermédiaire entre le contenant de liquide de nettoyage et le contenant de déchets ; et/ou la portion tubulaire de l'interface d'aspiration a un axe tubulaire et l'axe principal est un axe central qui coupe l'axe tubulaire.

5. Tête de nettoyage (100) selon l'une quelconque des revendications précédentes, la tête de nettoyage comprenant un logement principal (110, 210) qui définit le compartiment d'aspiration, le compartiment machine et le réceptacle de stockage (118) ; dans laquelle le réceptacle de stockage est intermédiaire du compartiment machine et de l'interface d'aspiration ; et dans laquelle le contenant de liquide de nettoyage (140, 240) et le contenant de déchets (150, 250) sont montés de manière amovible sur le réceptacle de stockage (118).

6. Tête de nettoyage (100) selon la revendication 5, dans laquelle le compartiment d'aspiration comprend un premier bras et un second bras qui font saillie à l'opposé du compartiment machine et s'étendent dans une direction orthogonale à l'axe de rouleau (Z-Z') et qui coopèrent pour maintenir le nettoyeur à rouleau (120, 220) dans sa position de fonctionnement de telle sorte que l'axe de rouleau est parallèle à l'axe d'ouverture.

7. Tête de nettoyage (100) selon la revendication 6, dans laquelle le logement principal (110, 210) comprend une portion mobile (212A) qui est mobile entre un état ouvert et un état fermé, dans laquelle la portion mobile dans l'état fermé coopère avec le premier bras et le second bras pour définir l'ouverture d'entrée ; dans laquelle la portion mobile dans l'état ouvert permet le retrait du nettoyeur à rouleau (120, 220) du compartiment d'aspiration ; et/ou dans laquelle la portion mobile est mobile autour d'un axe de pivotement entre l'état ouvert et l'état fermé, l'axe de pivotement étant parallèle à l'axe de rouleau.

8. Tête de nettoyage (100) selon les revendications 6 ou 7, dans laquelle le compartiment d'aspiration et le compartiment machine partagent une paroi de séparation, la paroi de séparation s'étendant dans une direction parallèle à l'axe de rouleau (Z-Z') et entre le premier bras et le second bras.

9. Tête de nettoyage (100) selon une quelconque revendication précédente, dans laquelle le réseau d'aspiration comprend une portion de conduit de montée (152, 252), un séparateur air-liquide (156, 256) disposé au-dessus de la portion de conduit de montée, et un canal d'aspiration raccordant mutuellement la portion de conduit de montée et l'orifice de collecte de déchets (284), et dans laquelle la portion de conduit de montée s'étend à travers le compartiment machine et le canal d'aspiration est en dessous du compartiment machine, le séparateur air-liquide est configuré de telle sorte que, lorsqu'un flux air-liquide entrant qui vient par la portion de conduit de montée rencontre le séparateur air-liquide, le flux air-liquide entrant sera séparé en liquide et en air, et le liquide et l'air séparés avanceront vers le bas et rentreront dans le contenant de déchets (150, 250) en raison de la gravité.

10. Tête de nettoyage (100) selon la revendication 9, dans laquelle le canal d'aspiration s'évase pour s'élargir en s'étendant vers le compartiment d'aspiration pour définir l'orifice de collecte de déchets (284), et dans laquelle l'orifice de collecte de déchets a une largeur comparable à la longueur du nettoyeur à rouleau (120, 220), la longueur étant mesurée le long de l'axe de rouleau (Z-Z').

11. Tête de nettoyage (100) selon la revendication 10, dans laquelle l'orifice de collecte de déchets (284) est fendu avec un axe de fente qui est parallèle à l'axe de rouleau (Z-Z') ; et/ou dans laquelle le contenant de déchets (150, 250) raccorde mutuellement l'interface d'aspiration et la portion de conduit de montée (152, 252), et dans laquelle la portion de conduit de montée a un axe de conduit qui est orthogonal à l'axe de rouleau (Z-Z') et qui définit la direction d'extension de la portion de conduit de montée (152, 252) à travers le compartiment de machine.

12. Tête de nettoyage (100) selon l'une quelconque des revendications 9 à 11, dans laquelle le canal d'aspiration a un jeu interne qui augmente en s'étendant de l'orifice de collecte de déchets (284) à la portion de conduit de montée (152, 252), le jeu interne étant mesuré dans une direction parallèle à la direction d'extension de la portion de conduit de montée ; et/ou dans laquelle le canal d'aspiration et l'orifice de collecte de déchets sont définis par une portion de fond du compartiment de machine en coopération avec un couvercle de fond (211) de la tête de nettoyage.

13. Tête de nettoyage (100) selon une quelconque revendication précédente, dans laquelle l'applicateur de liquide de nettoyage est configuré pour appliquer du liquide de nettoyage sur une portion amont du nettoyeur à rouleau (120, 220) et le dispositif de retrait de déchets (211A) est configuré pour retirer les déchets d'une portion aval du nettoyeur à rouleau de telle sorte que les déchets retirés par le dispositif de retrait de déchets sont destinés à être collectés par aspiration et à entrer dans le réseau d'aspiration.

14. Aspirateur comprenant une tête de nettoyage (100) selon une quelconque revendication précédente.

15. Aspirateur selon la revendication 14, l'aspirateur comprenant un corps allongé définissant une portion de poignée sur une première extrémité longitudinale et une portion tubulaire à une seconde extrémité longitudinale distale de

la première extrémité longitudinale, dans lequel une source d'énergie d'aspiration est reçue à l'intérieur du corps allongé, et dans lequel la portion tubulaire est en raccordement fluidique avec l'interface d'aspiration et est mobile en pivotement par rapport à la tête de nettoyage (100).

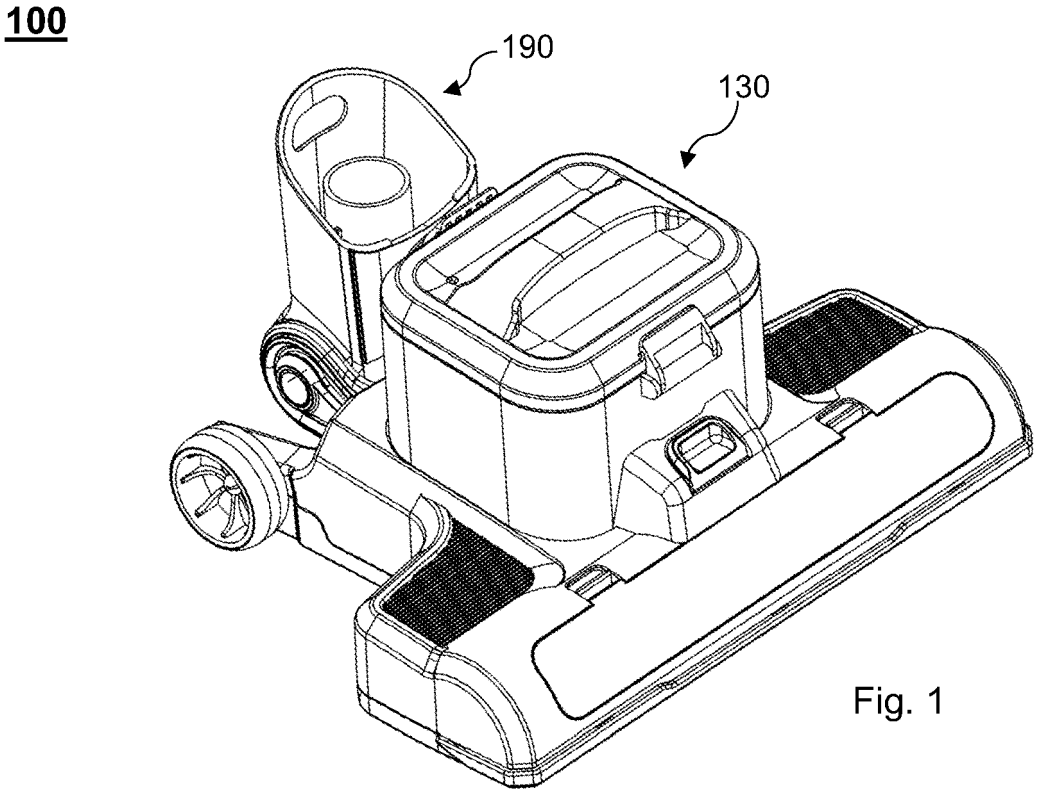

Fig. 1

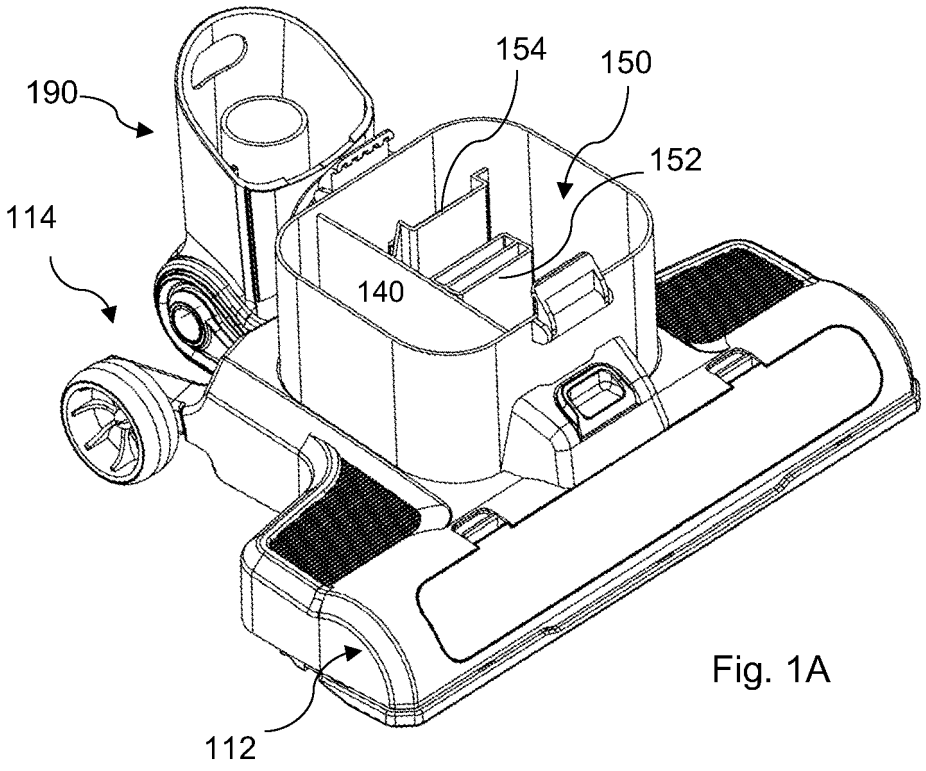

Fig. 1A

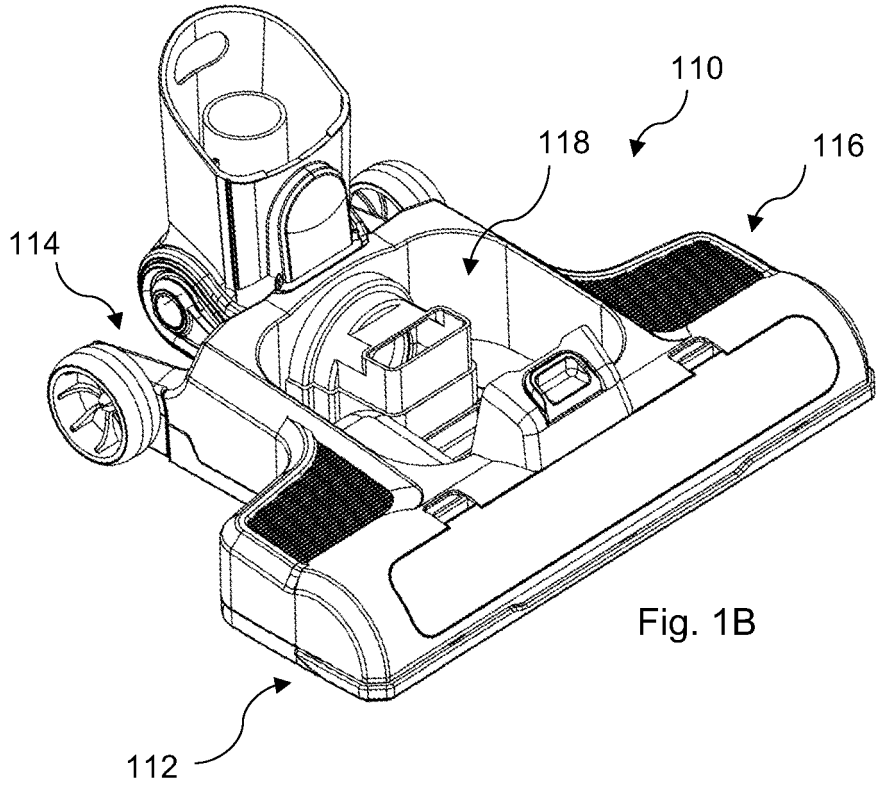

Fig. 1B

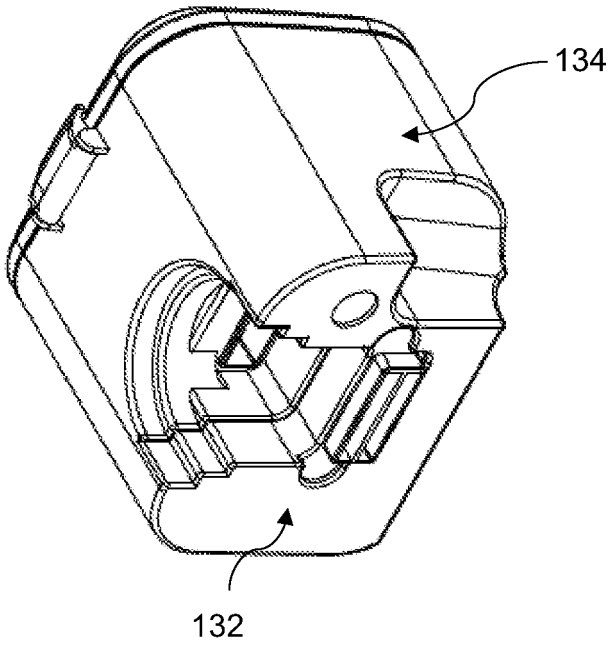

Fig. 1B1

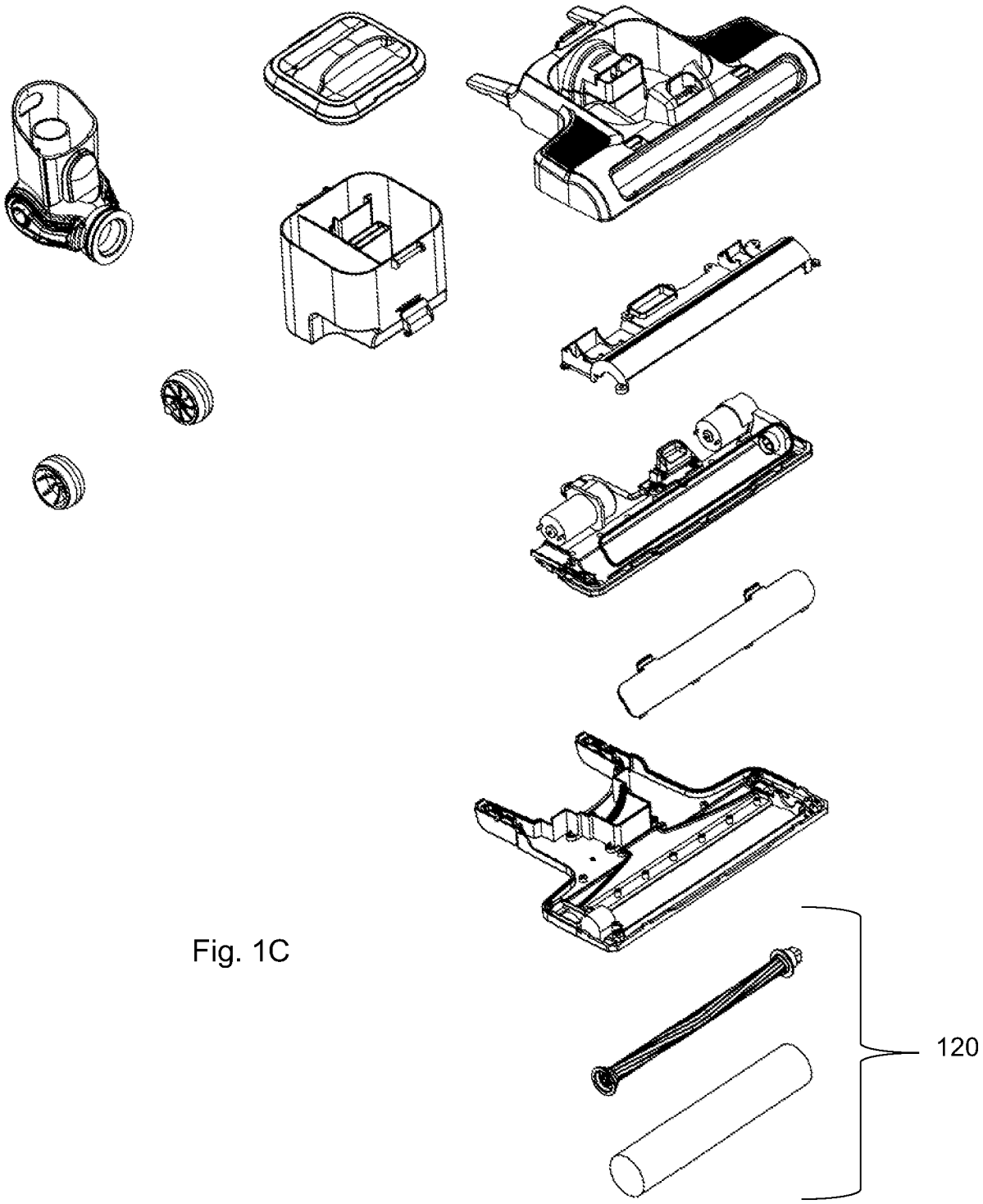

Fig. 1C

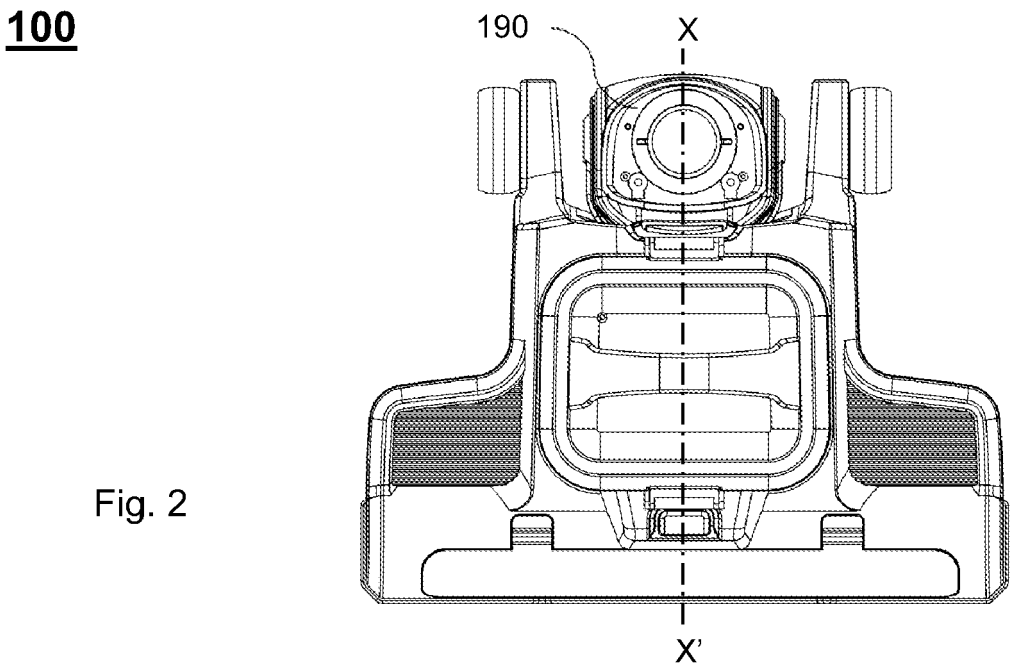

Fig. 2

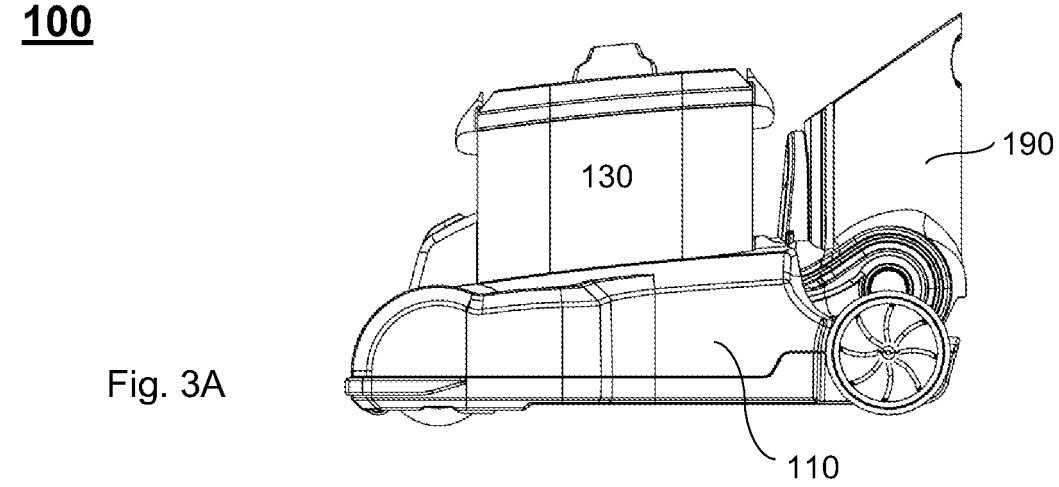

Fig. 3A

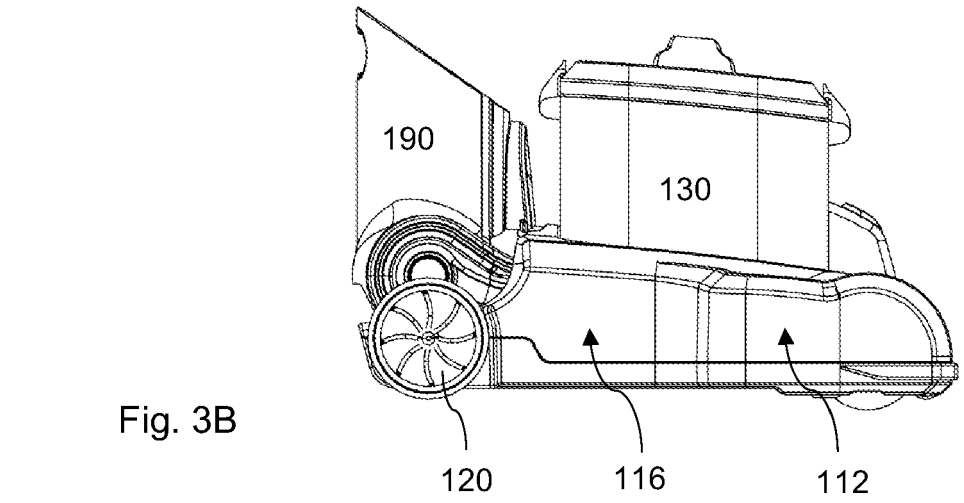

Fig. 3B

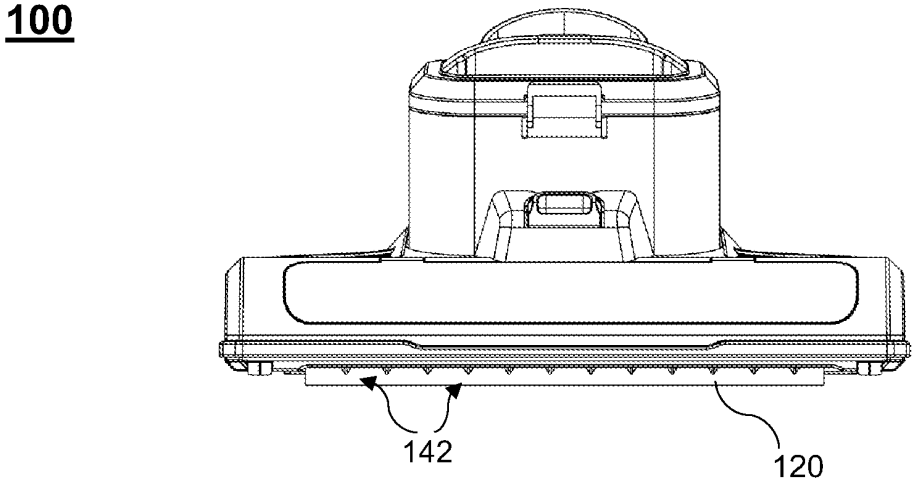

Fig. 3C

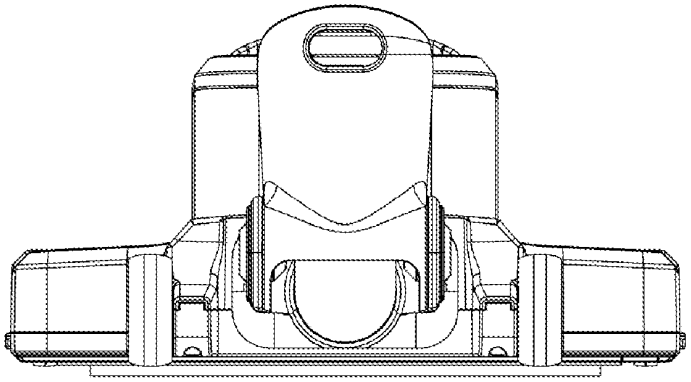

Fig. 3D

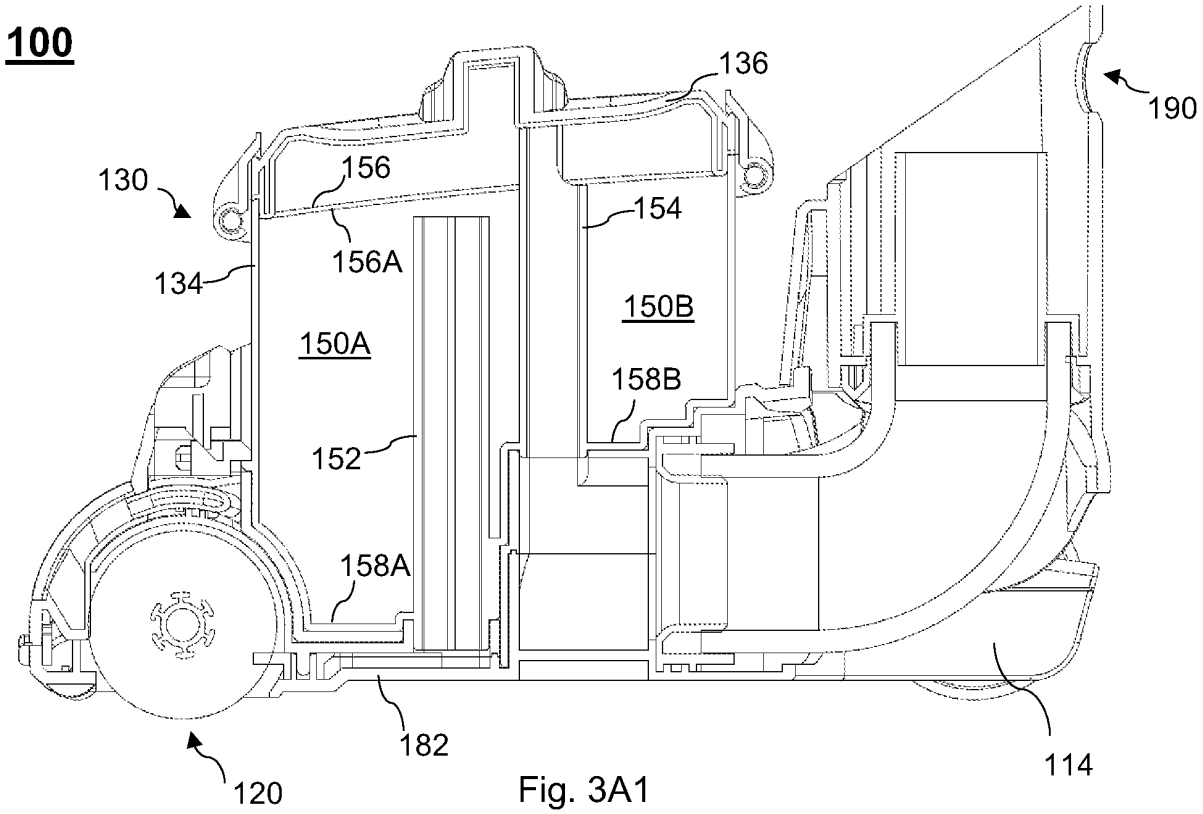

Fig. 3A1

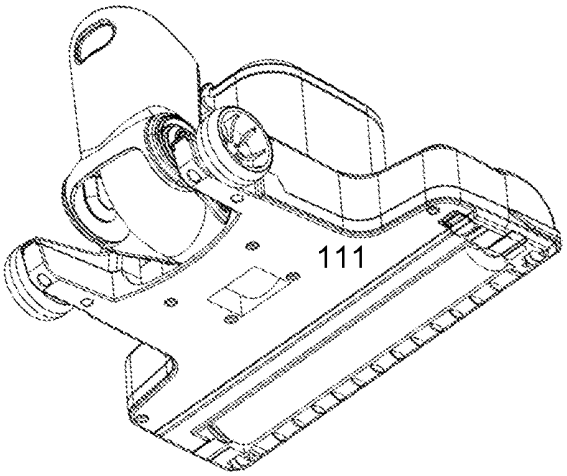

Fig. 4

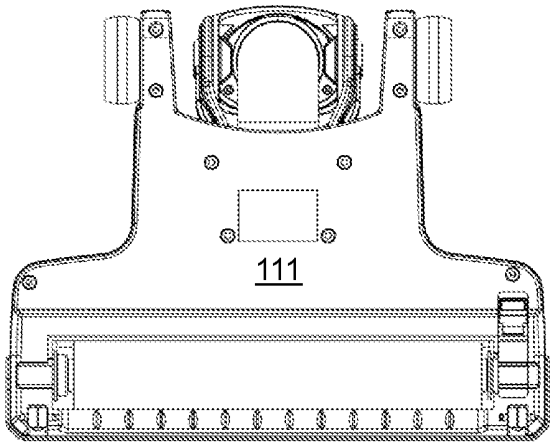

Fig. 4A

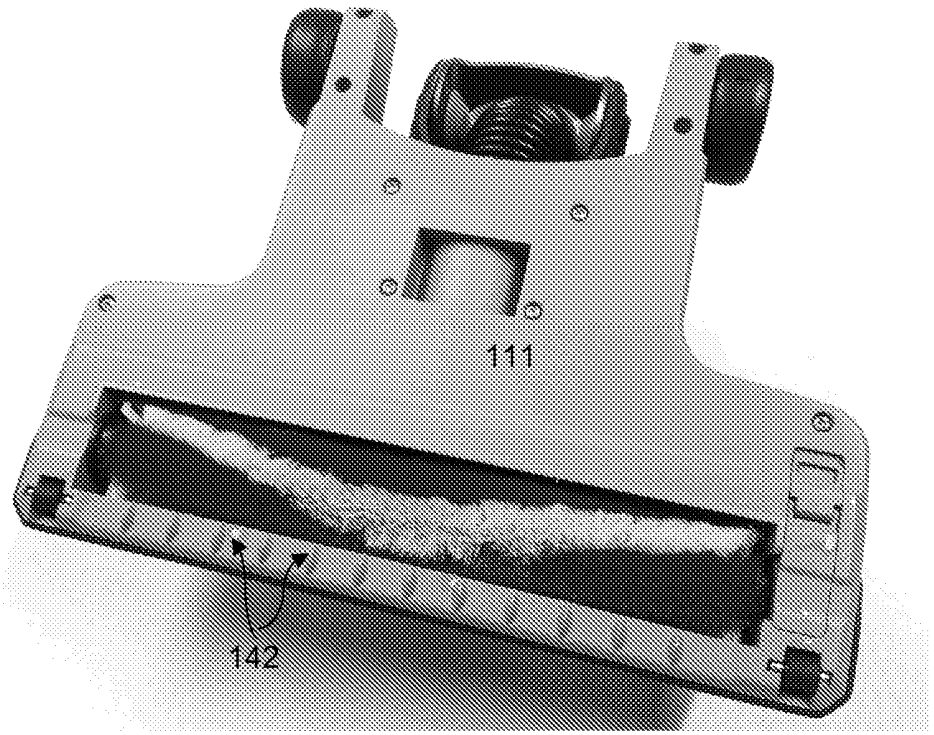

Fig. 4B

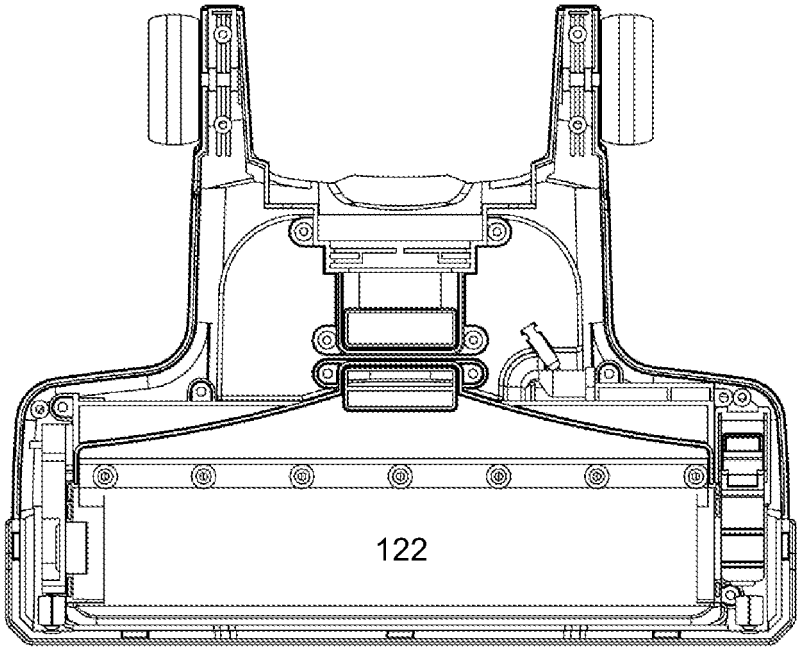

Fig. 4C

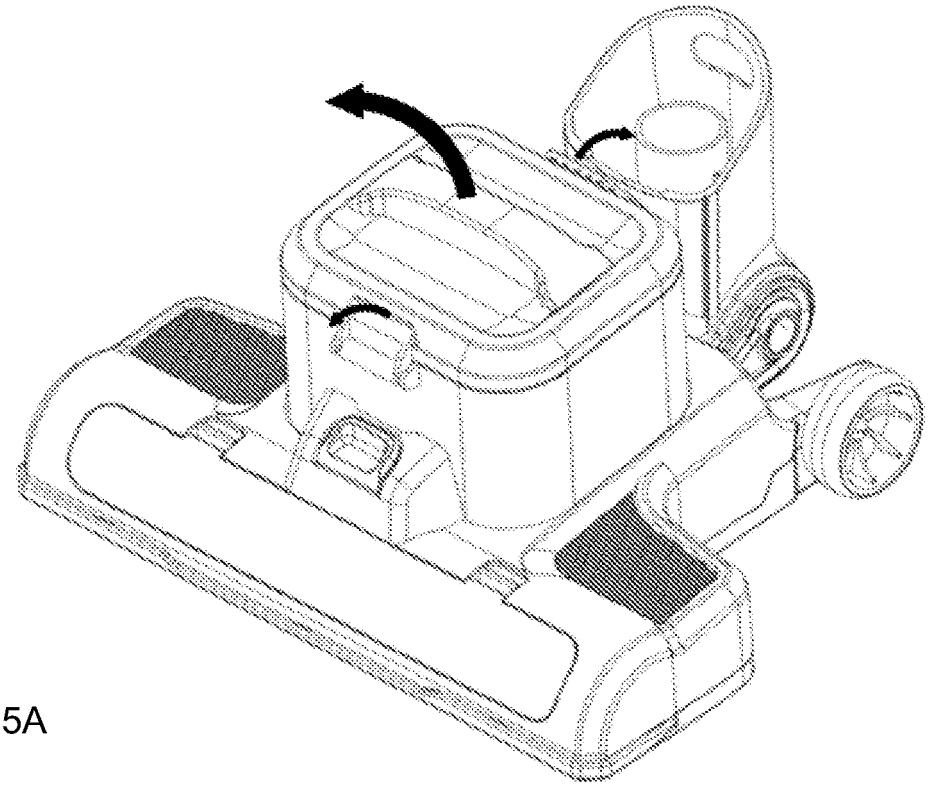

Fig. 5A

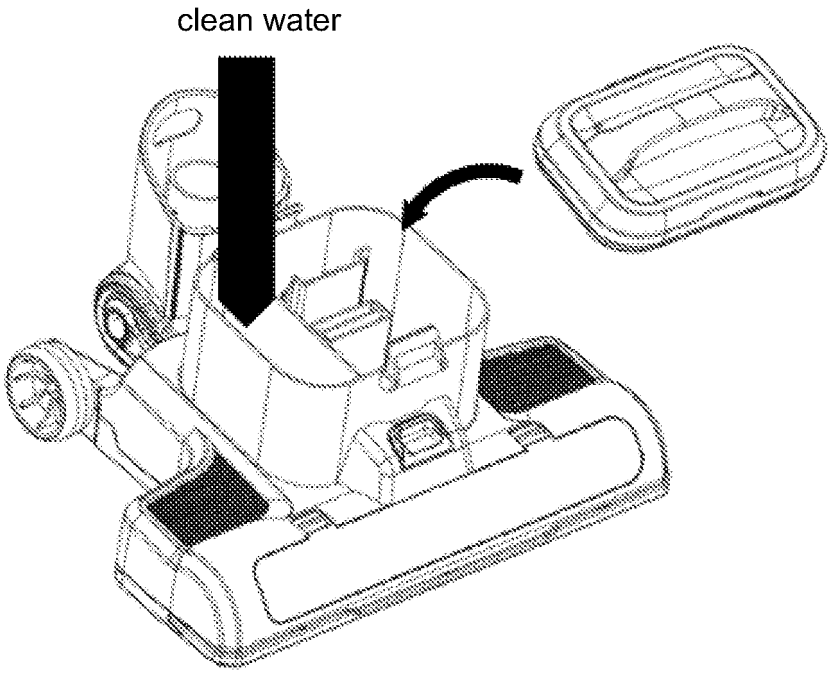

Fig. 5B

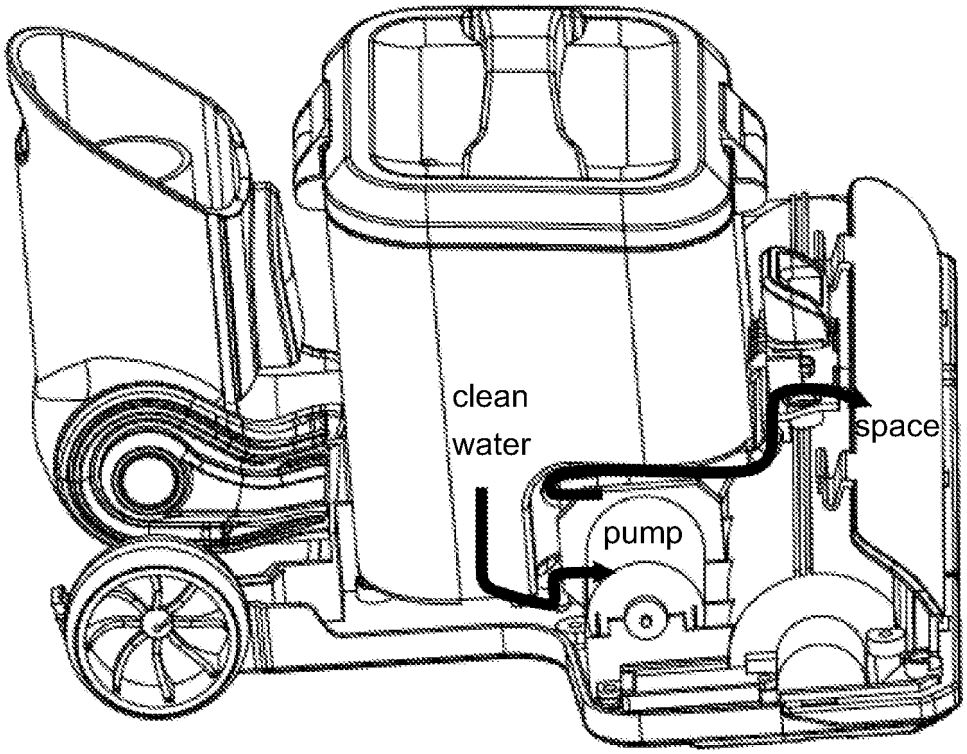

Fig. 5C

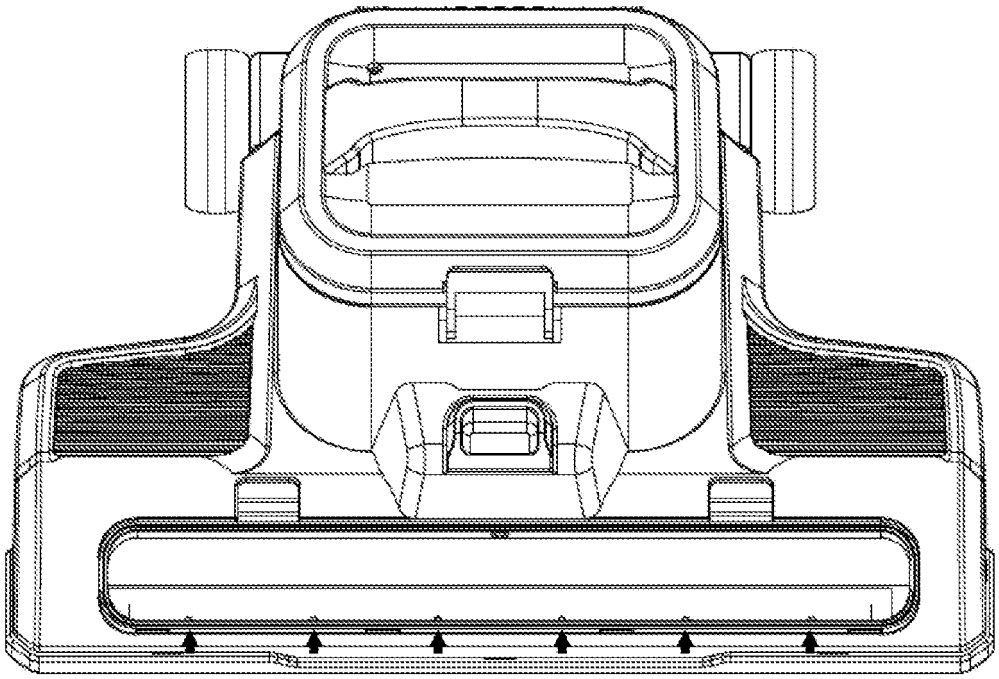

Fig. 5D

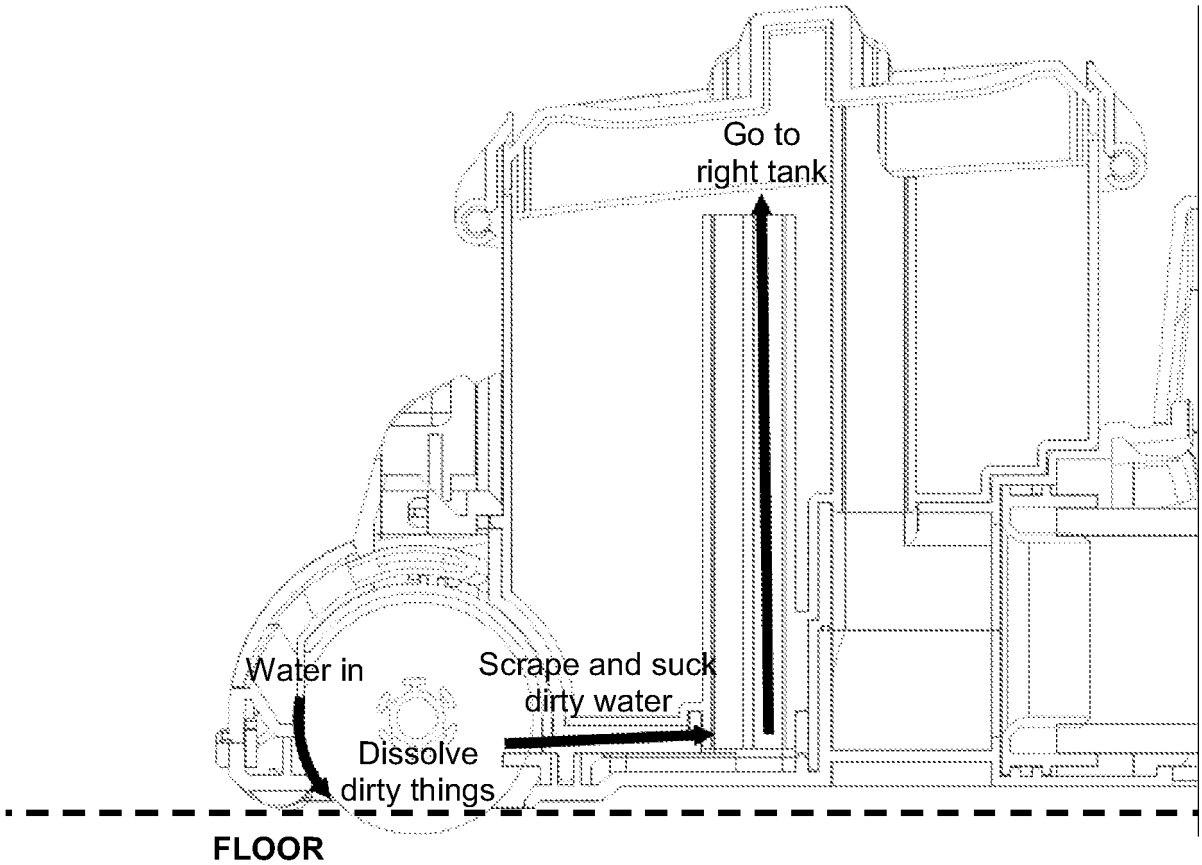
Go to
right tank
Water in
Scrape and suck
dirty water
Dissolve
dirty things
FLOOR

Fig. 5E

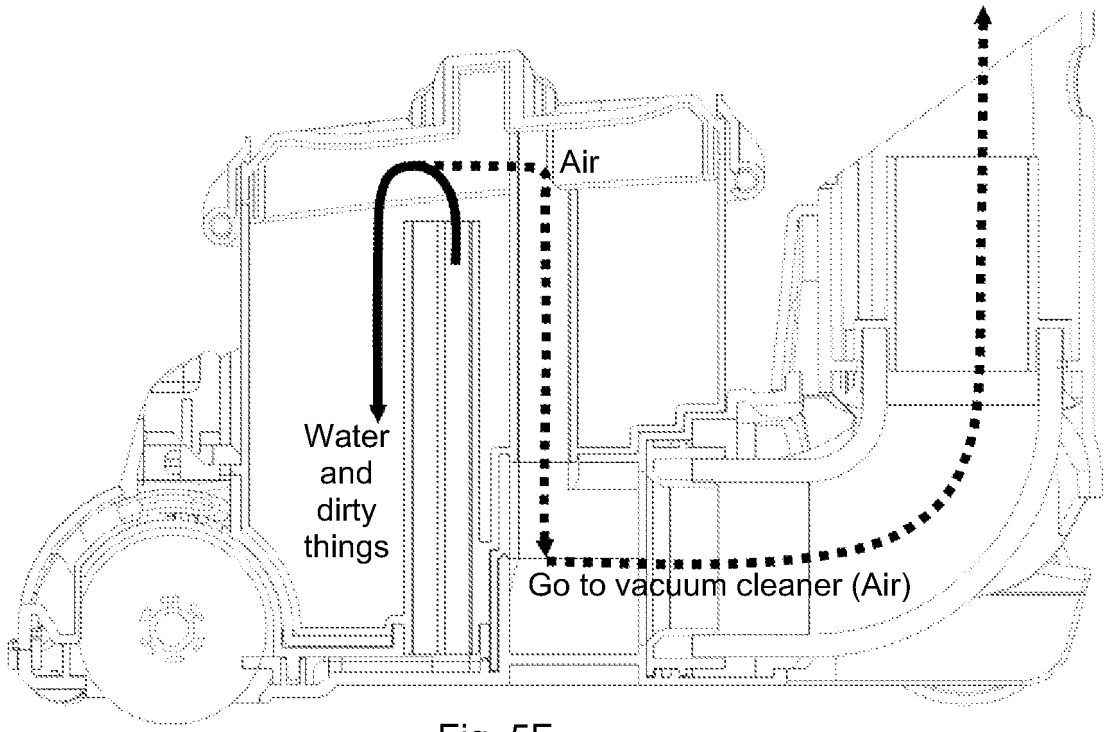

Fig. 5F

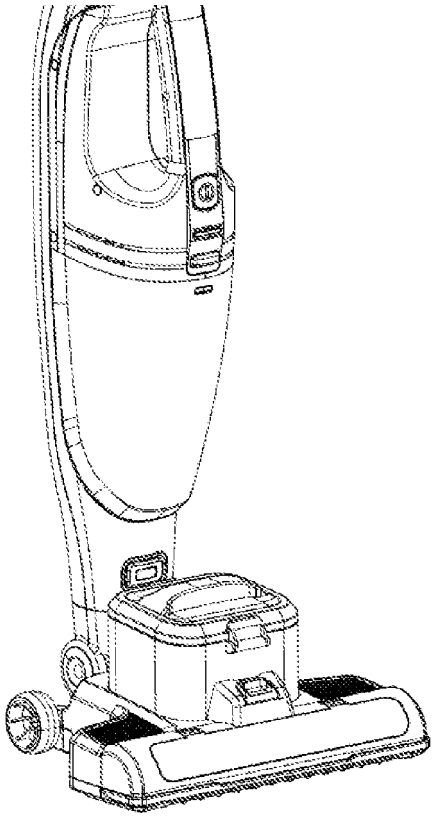

Fig. 6A

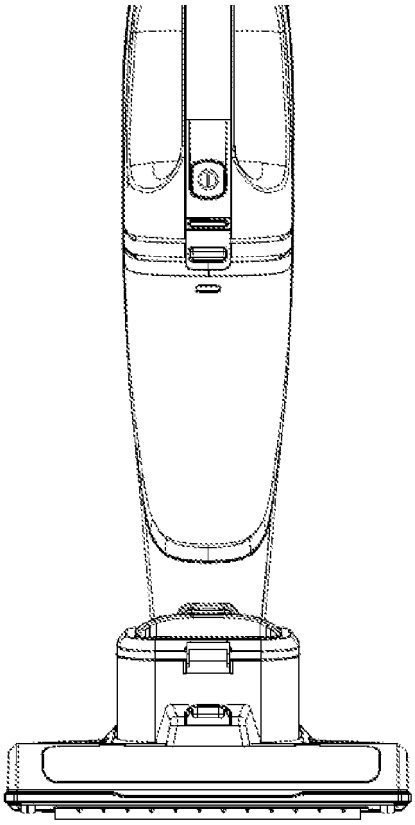

Fig. 6B

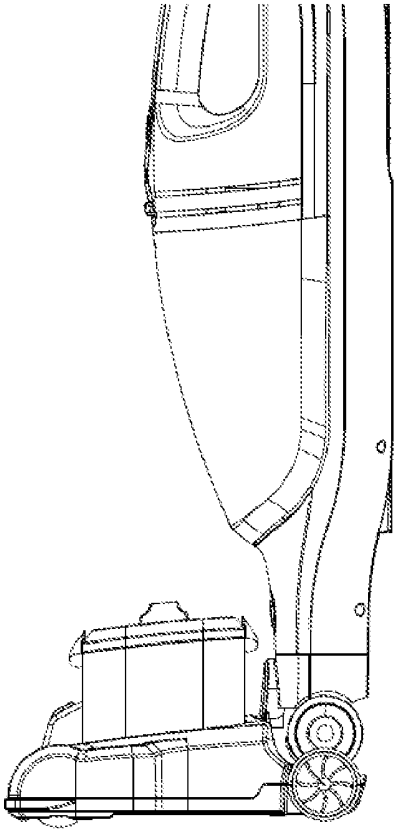

Fig. 6C

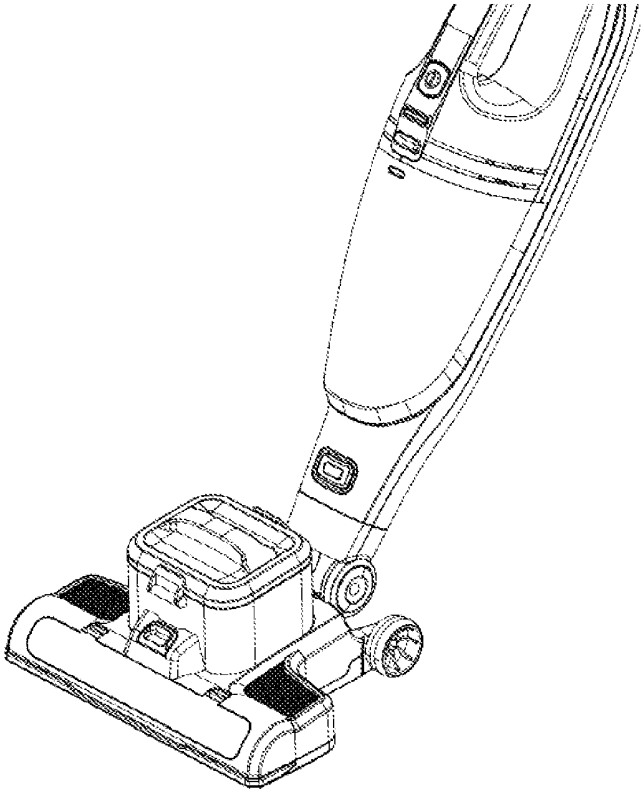

Fig. 6D

200

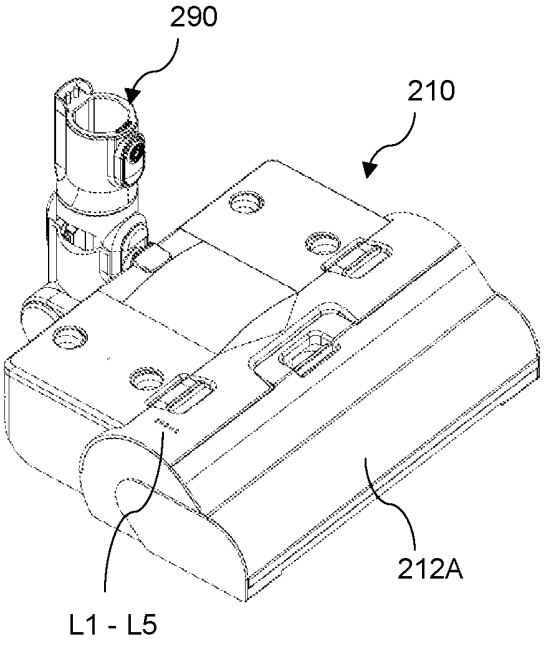

Fig. 7

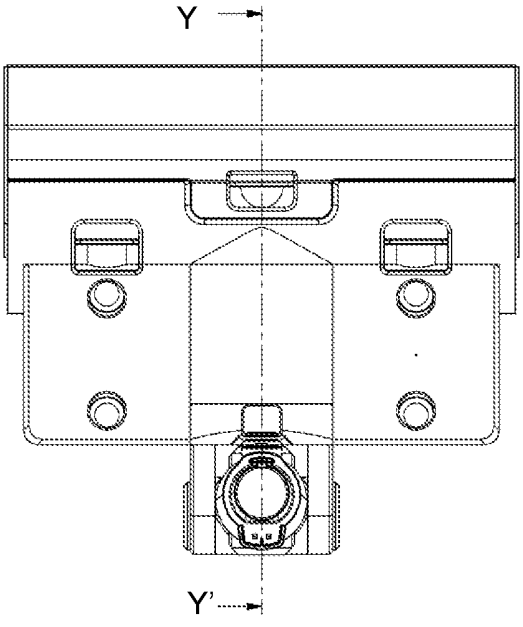

Fig. 7A

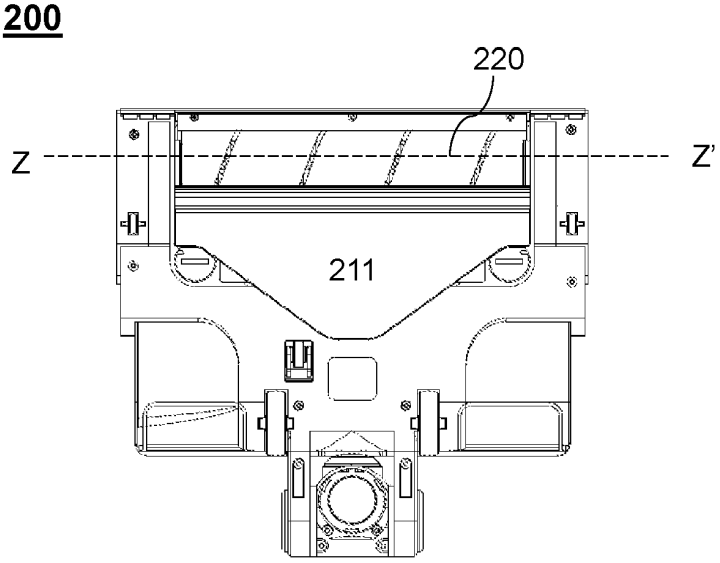

Fig. 7B

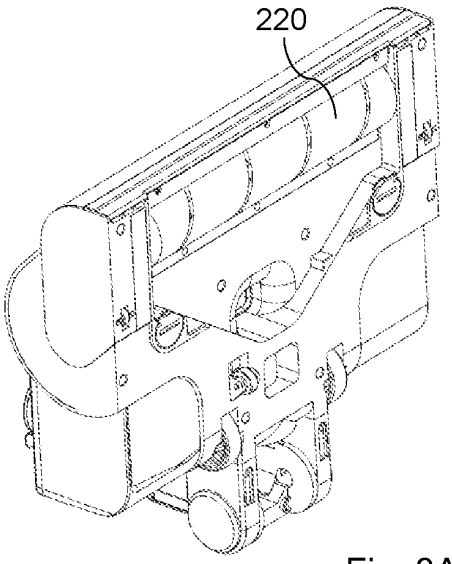

Fig. 8A

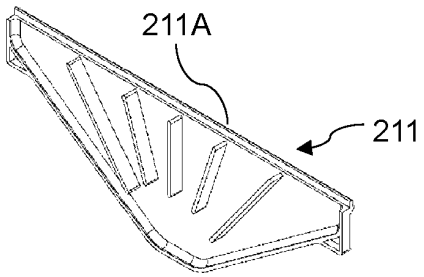

Fig. 8B

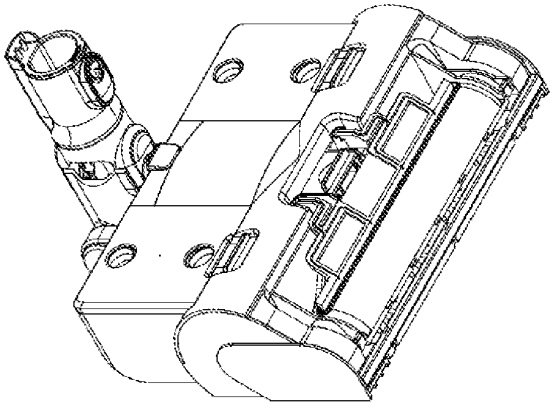

Fig. 8C

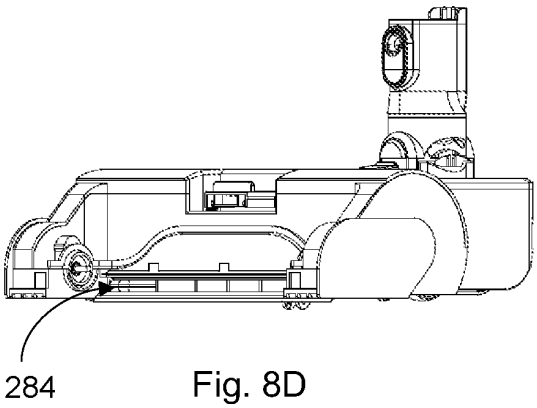

Fig. 8D

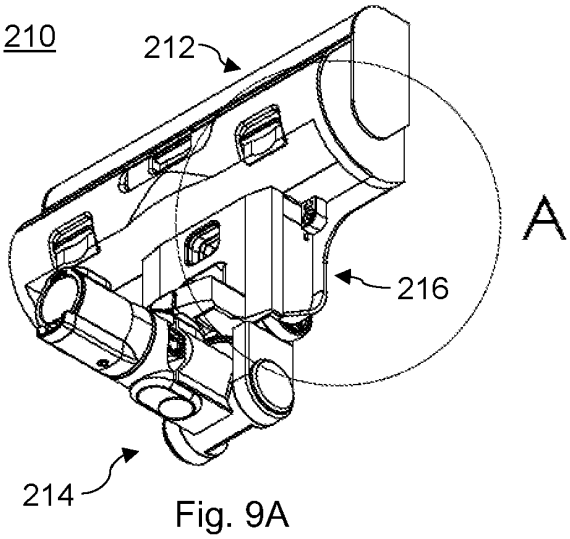

Fig. 9A

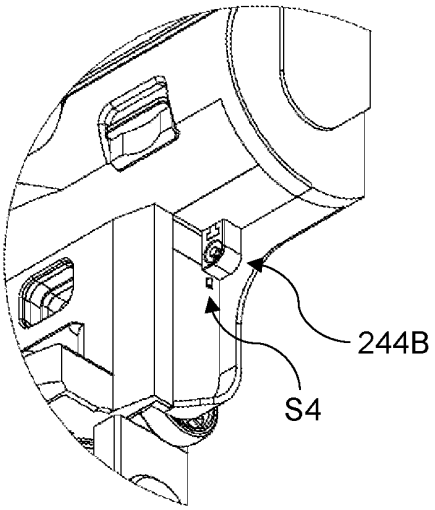

Fig. 9B

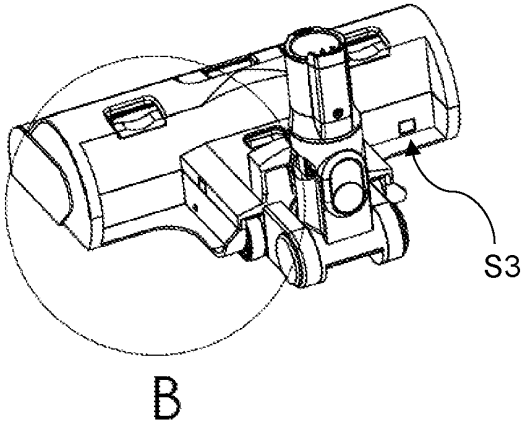

Fig. 10A

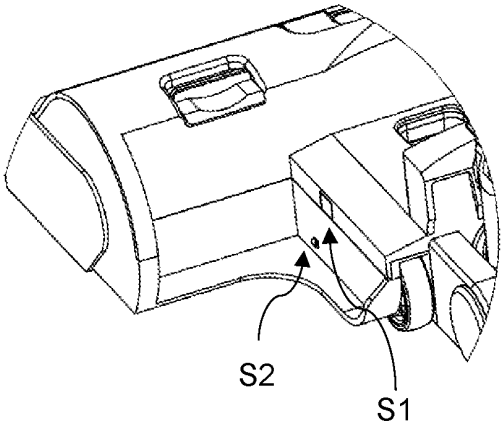

Fig. 10B

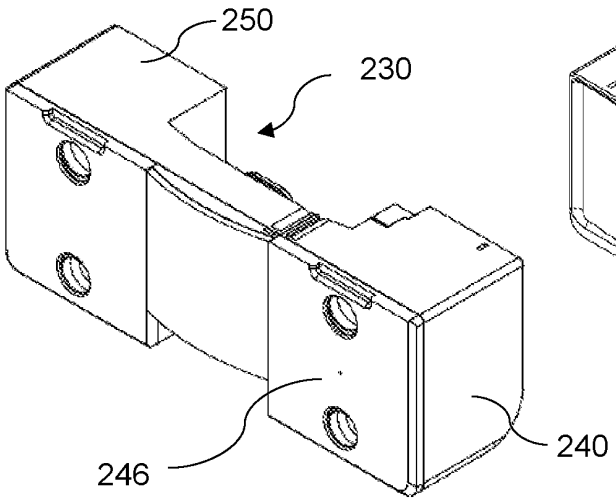

Fig. 11A

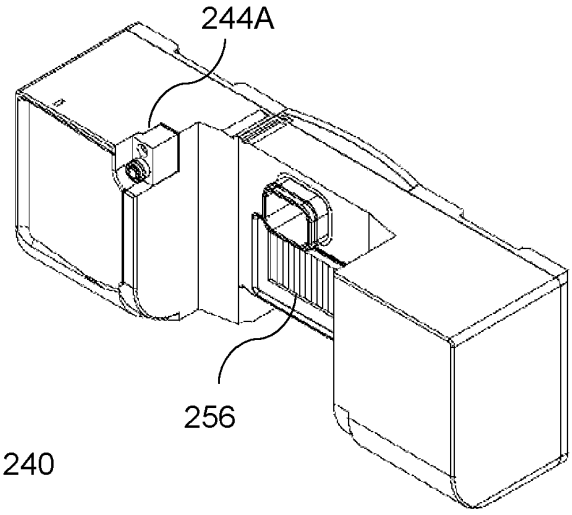

Fig. 11B

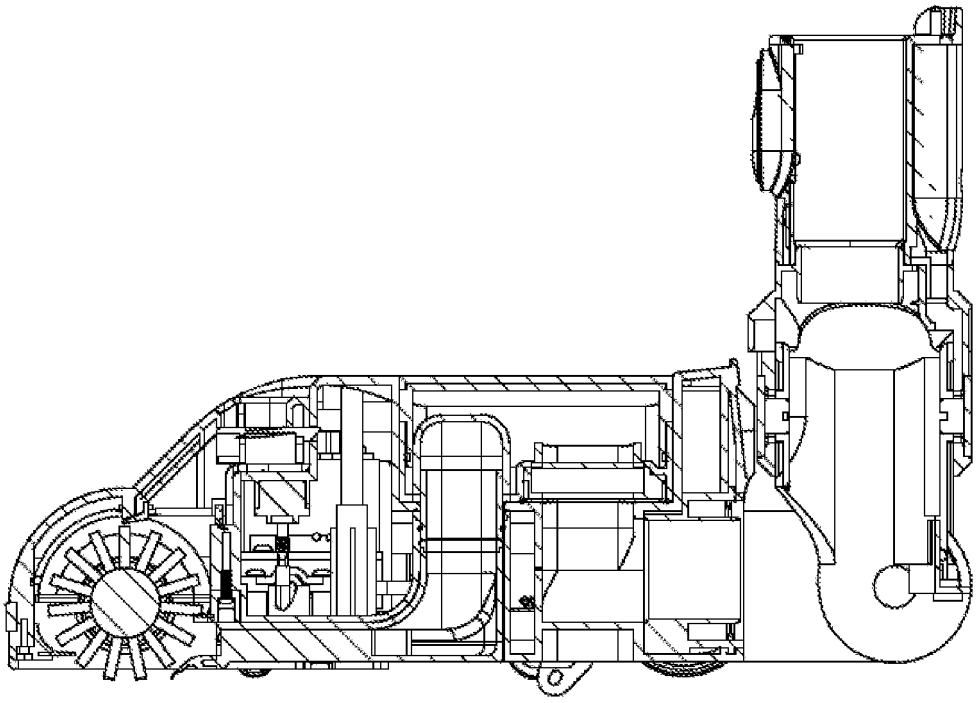

Fig. 12

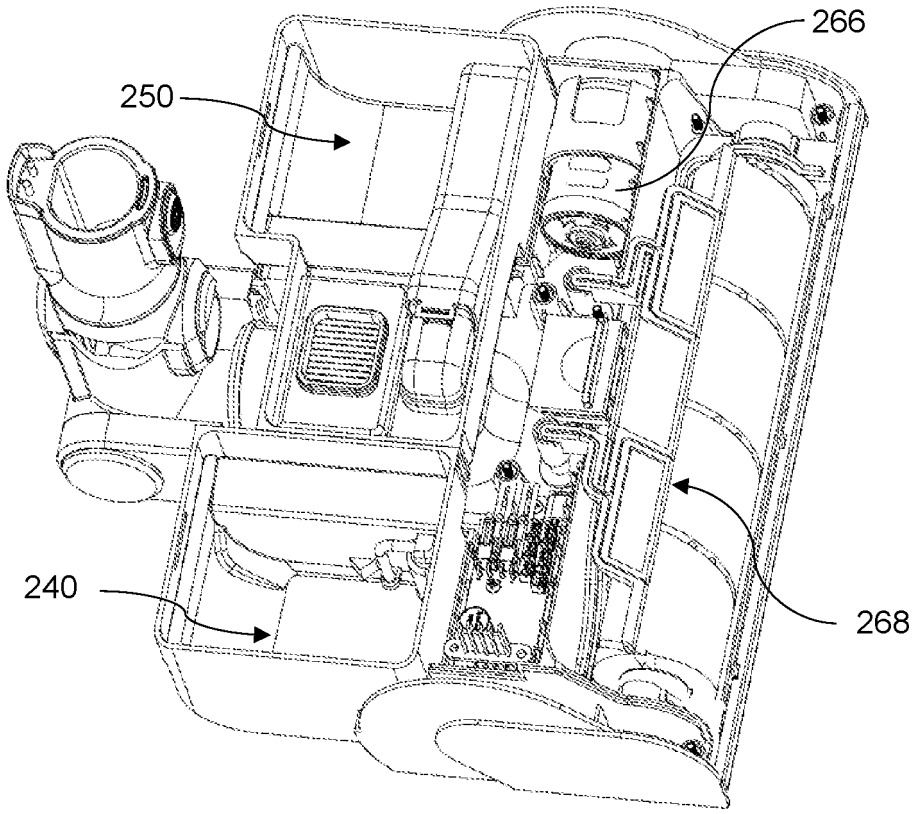

Fig. 13

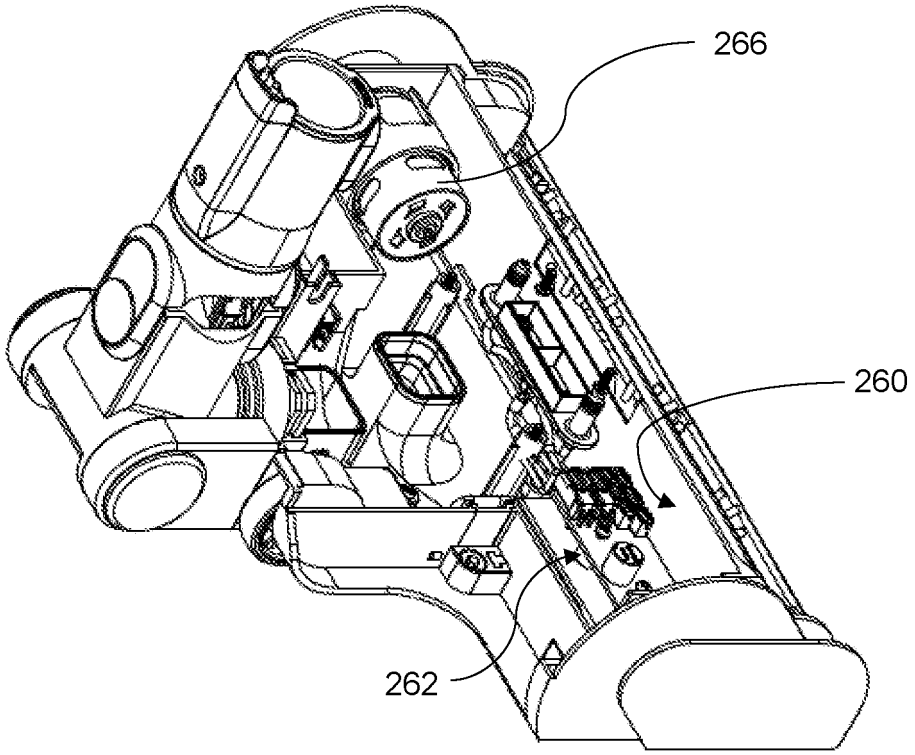

Fig. 14

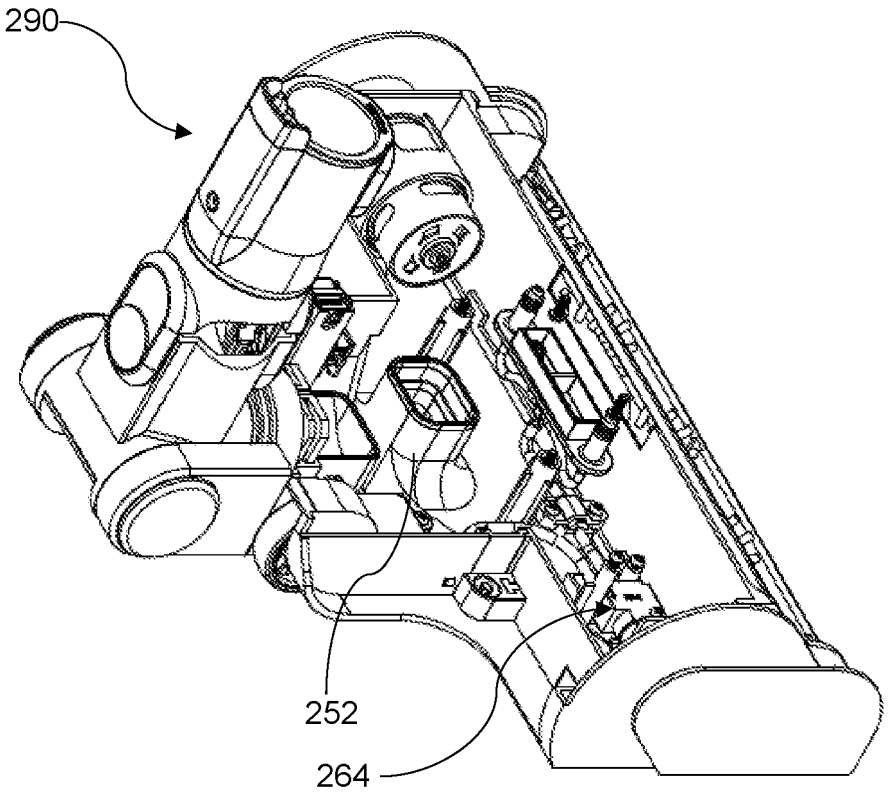

Fig. 15

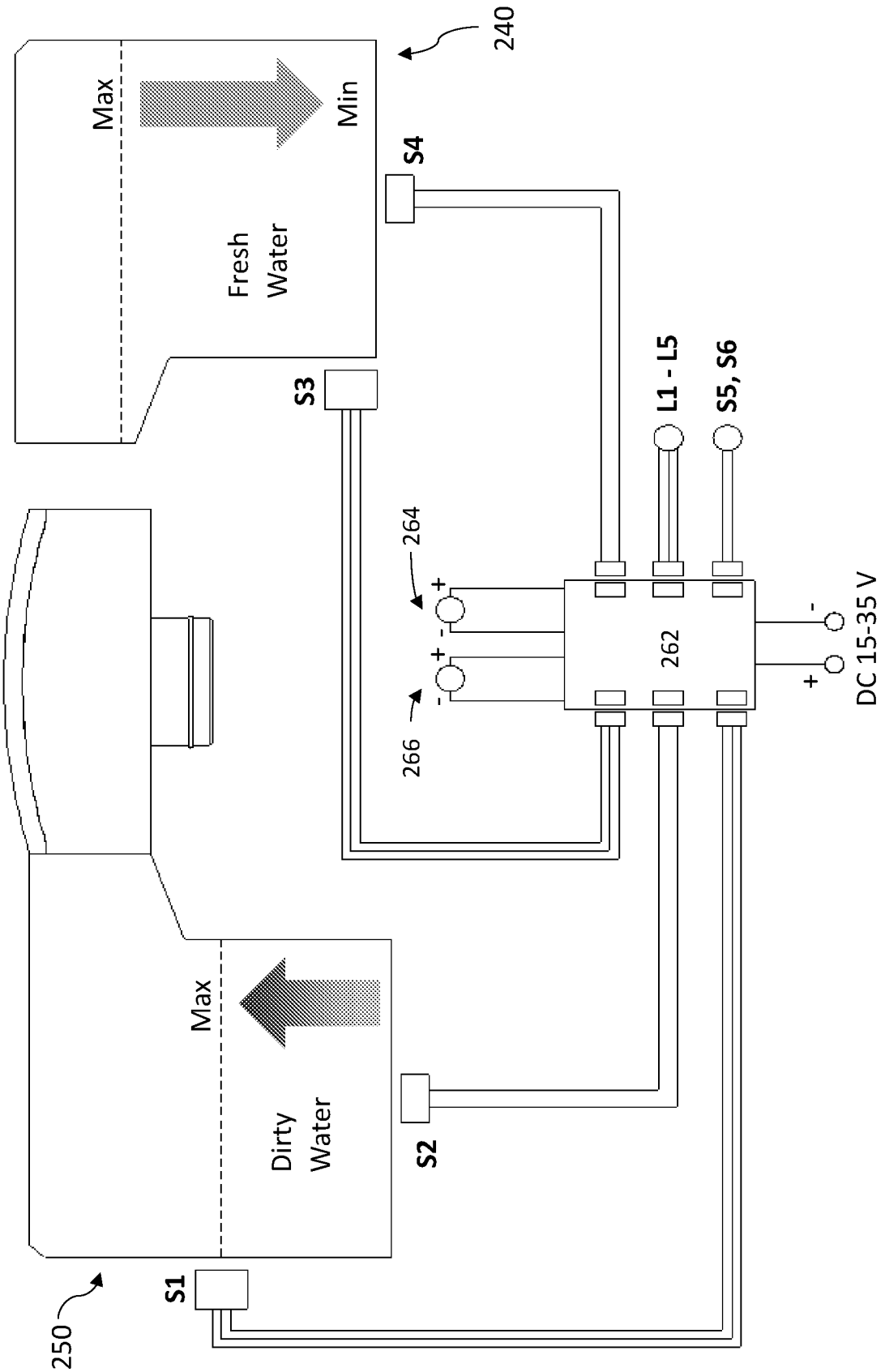
240
Max
Min
Fresh
Water
S4
S3
L1 - L5
S5, S6
264
+
-
+
-
266
262
-
+
DC 15-35 V
Max
Dirty
Water
S2
S1
250

Fig. 16

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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