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(54) Title: WET CLEANING DEVICE

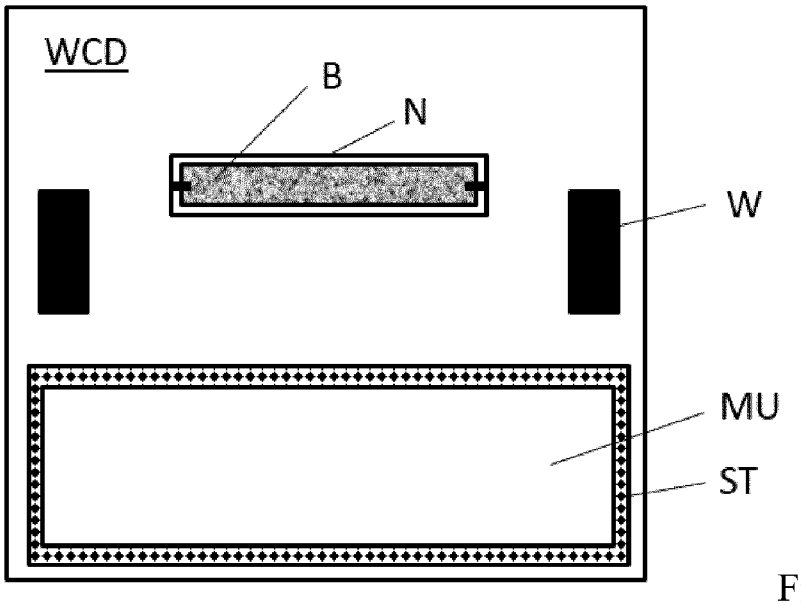

Fig. 1

(57) Abstract: A wet cleaning device (WCD) comprises a mopping unit (MU) for wet cleaning a surface, and an arrangement (ST) for increasing a pressure of the mopping unit (MU) to the surface by means of suction. The arrangement includes a hose at a side of the mopping unit (MU), the hose having an opening for applying suction to the surface. The hose may be present at opposite sides of the mopping unit (MU). Alternatively, the hose may be present around the mopping unit (MU). Preferably, a suction power of the arrangement is controllable. Advantageously, the suction power is controllable in dependence on a detection of stains, a speed of the wet cleaning device (WCD), and/or a type of the surface. If the wet cleaning device (WCD) is formed by a mopping robot vacuum cleaner, the suction for the arrangement (ST) is advantageously a part of a suction generated for vacuum cleaning.

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Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:

— *with international search report (Art. 21(3))*

Wet cleaning device

FIELD OF THE INVENTION

The invention relates to a wet cleaning device.

BACKGROUND OF THE INVENTION

Hard floor cleaning is traditionally done by first vacuuming the floor, followed by mopping it. Vacuuming removes the coarse dirt, while mopping removes the stains. These days there are more and more appliances on the market that claim to vacuum and mop in one go. Also robot vacuum cleaners offer the solution of vacuum cleaning and mopping the floor. For this a water tank with mop is attached towards the (vacuum cleaning) robot.

US2014033468 discloses a floor tool in the context of a vacuum cleaning appliance that has a dual functionality. Firstly, the floor tool provides a suction cleaning function and, secondly, the floor tool has the capability to carry a cleaning element, preferably in the form of a wiping sheet, to wipe the floor surface at the same time as vacuuming the floor surface. The suction nozzle is configured to float relative to the connecting neck of the floor tool which confers several benefits. Firstly, the downwards force applied to the user via the neck is transmitted directly to the support member, but not to the suction nozzle, the downwards pressure improving the cleaning performance of the wipe sheet carried on the support member. Secondly, since very little downwards force is applied to the suction nozzle, it is able to ride lightly across the floor surface which benefits the pickup performance of the suction nozzle.

US2017367552 discloses a self-moving floor treatment device that comprises a machine body base and a water tank. A cleaning cloth is attached onto the bottom of the water tank, and the water tank is connected to the bottom surface of the machine body base in a manner of floating up and down. By mounting the water tank on the machine body base in. a floating manner to leave a certain gap therebetween, the water tank and the cleaning cloth can float up and down within a certain range of space. Because the force that actually acts on the floor is just the gravity of the water tank and the cleaning cloth themselves and does not comprise the gravity of the machine, compared with a common product, the friction force between the cleaning cloth and the floor is reduced, the phenomenon that the machine slips on

the floor with water can be effectively avoided, the floor cleaning efficiency is improved and the obstacle crossing ability of the machine with the water tank is improved.

SUMMARY OF THE INVENTION

It is, inter alia, an object of the invention to provide an improved wet cleaning device. The invention is defined by the independent claims. Advantageous embodiments are defined in the dependent claims.

One aspect of the invention provides a wet cleaning device, comprising a mopping unit for wet cleaning a surface, and an arrangement for increasing a pressure of the mopping unit to the surface by means of suction. This arrangement includes a hose at a side of the mopping unit, the hose having an opening for applying suction to the surface. The hose may be present at opposite sides of the mopping unit. Alternatively, the hose may be present around the mopping unit. Preferably, a suction power of the arrangement is controllable. Advantageously, the suction power is controllable in dependence on a detection of stains, a speed of the wet cleaning device, and/or a type of the surface. If the wet cleaning device is formed by a mopping robot vacuum cleaner, the suction for the arrangement is advantageously a part of a suction generated for vacuum cleaning.

The invention is based on the recognition that wet cleaning devices like robot vacuum cleaners are preferably not very heavy, so that a user can easily pick them up. For mopping a surface (e.g. a floor), often some pressure is needed on the surface to be able to remove hard stains. Here we encounter a contradiction. The wet cleaning device needs to be low in weight to be easily lifted, but on the other hand, it should provide enough pressure on the floor to enable the wet cleaning device to mop the surface properly. To overcome this contradiction, it is necessary to provide a way to apply force on the ground without making the wet cleaning device heavier.

One aspect of this invention will enable the wet cleaning device to give an increased pressure on the ground while mopping, while staying light in weight. Embodiments of the invention provide an area of under-pressure around the mopping unit so that the mopping unit will suck itself to the ground. In a robot vacuum cleaner embodiment, the under-pressure can advantageously be generated by leading a part of the airflow of the vacuum cleaner through a tube system around the mop.

These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a bottom view of an embodiment of a wet cleaning device in accordance with the invention; and

Fig. 2 shows a cross-section of the embodiment of Fig. 1.

DESCRIPTION OF EMBODIMENTS

The embodiment of Figs. 1 and 2 relates to a wet cleaning device WCD formed by a mopping robot vacuum cleaner. As usual, the mopping robot vacuum cleaner has wheels W, a nozzle N with an optional rotating brush B, and a mopping unit MU. The mopping unit MU has a liquid tank (not shown) and a (replaceable) cleaning cloth. In accordance with the invention, a suction tool ST is provided at a side of the mopping unit MU. In the embodiment shown, the suction tool ST is formed by a hose having multiple openings around the mopping unit MU. Alternatively, the hose may have a slit-shaped opening. The hose may be made of rubber or some suitable plastic or other suitable material. The hose may be glued to the mopping unit MU.

As shown in Fig. 2, as usual for vacuum cleaners, dirty air from the nozzle N is guided to a dirt separation and collection unit DC, through which an airflow is generated by a fan F. In accordance with an embodiment of the invention, part of the airflow generated by the fan F is used to generate suction for the suction tool ST. A valve V is present to control how much airflow can be used for the suction tool ST. The valve V may be formed by means of a clamp around a hose: if the hose is compressed by the clamp, less suction is available for the suction tool ST. Advantageously, the amount of suction available for the suction tool ST depends on a detection of stains (stain present => more suction), a speed of the wet cleaning device WCD (too low speed => reduce suction), and/or a type of the surface. To control the valve, a processor (anyway present in a robot cleaner) receives data (e.g. from a camera (not shown), and has software that can determine the presence of stains and the surface type from the camera image. This software may involve artificial intelligence based on a trained neural network. The wheel speed can be derived e.g. from an amount of current drawn by a motor that rotates the wheels W: if the current is relatively high, the motor has to work hard, so that it makes sense to reduce the suction for the suction tool to reduce friction.

It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. In the above examples, a rectangular robot vacuum cleaner has been shown with a rectangular mopping

unit MU. Obviously, the wet cleaning device may have a different shape (e.g. round), and the same holds for the mopping unit MU, which may e.g. have the shape shown in US2017367552. In the embodiment shown, the mopping unit MU is surrounded by the suction tool ST, but in other embodiments, the suction tool ST is just present at a side or at opposite side of the mopping unit MU. The suction tool ST does not need to be along a side, i.e. it does not need to have an elongated shape, as long as it results in the mopping unit MU exercising an increased pressure on the surface. The wet cleaning device of the present invention may also be arranged for cleaning (vertical) surfaces like windows or walls. The wet cleaning device of the present invention does not need to have a vacuum cleaner function. And if the wet cleaning device does have a vacuum cleaner function, it may or may not use the vacuum cleaner fan F for creating suction to increase a pressure of the mopping unit to the surface; a separate low-power fan may be used for this purpose, and this may result in the advantage that a better control of mopping pressure may be achieved, independent of vacuuming activities. A wet cleaning device having a vacuum cleaner function may have different operation modes: (1) only vacuum cleaning, (2) only wet cleaning, and (3) both vacuum cleaning and wet cleaning. In the second mode, use of a separate suction unit for generating under-pressure may result in the advantage that less energy is consumed. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. The word "comprising" does not exclude the presence of elements or steps other than those listed in a claim. The word "a" or "an" preceding an element does not exclude the presence of a plurality of such elements. The invention may be implemented by means of hardware comprising several distinct elements. In the device claim enumerating several means, several of these means may be embodied by one and the same item of hardware. Measures recited in mutually different dependent claims may advantageously be used in combination.

CLAIMS:

1. A wet cleaning device (WCD), comprising:
a mopping unit (MU) for wet cleaning a surface, and
an arrangement (ST) for increasing a pressure of the mopping unit to the surface by means of suction, wherein the arrangement (ST) includes a hose at a side of the mopping unit (MU), the hose having an opening for applying suction to the surface.

2. A wet cleaning device (WCD) as claimed in claim 1, wherein the hose is present at opposite sides of the mopping unit (MU).

3. A wet cleaning device (WCD) as claimed in claim 1, wherein the hose is present around the mopping unit (MU).

4. A wet cleaning device (WCD) as claimed in any of the preceding claims, wherein a suction power of the arrangement (ST) is controllable.

5. A wet cleaning device (WCD) as claimed in claim 4, wherein the suction power is controllable in dependence on a detection of stains.

6. A wet cleaning device (WCD) as claimed in claim 4 or 5, wherein the suction power is controllable in dependence on a speed of the wet cleaning device.

7. A wet cleaning device (WCD) as claimed in claim 4, 5 or 6, wherein the suction power is controllable in dependence on a type of the surface.

8. A wet cleaning device(WCD) as claimed in any of the preceding claims, wherein the wet cleaning device is formed by a mopping robot vacuum cleaner, the suction for the arrangement being a part of a suction generated for vacuum cleaning.

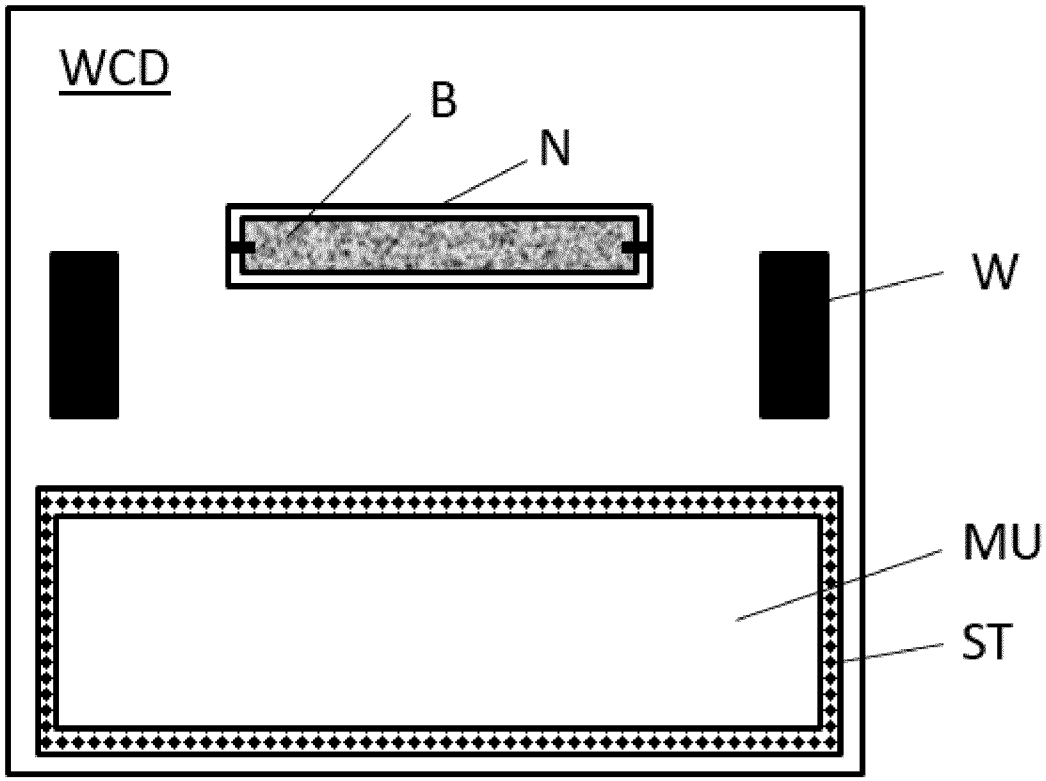

Fig. 1

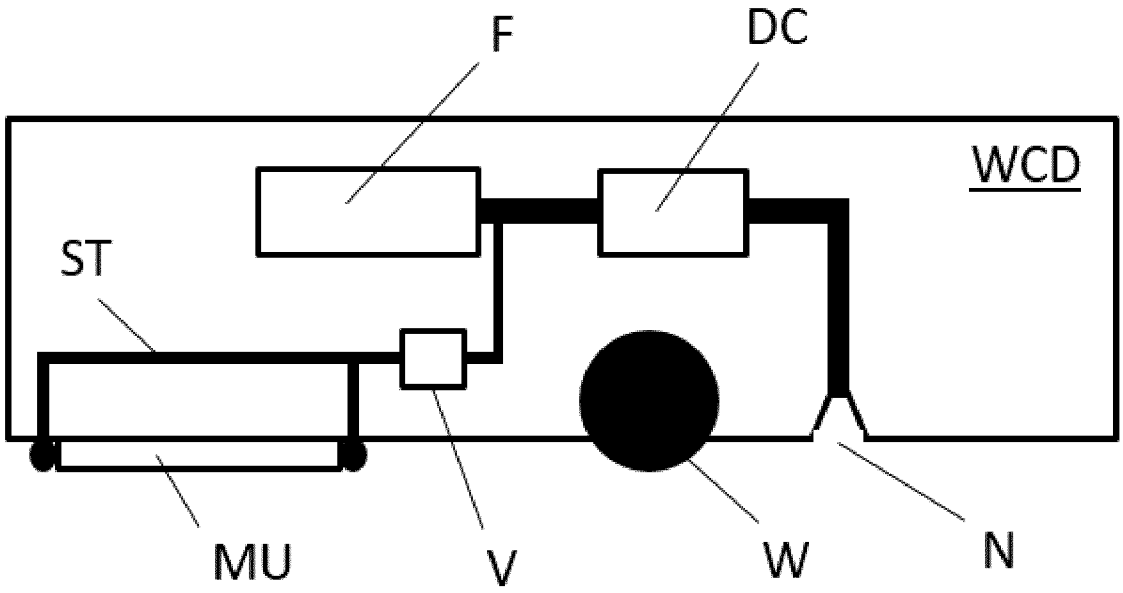

Fig. 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/070805

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47L9/06
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A47L

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 September 2019	30/09/2019

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/070805

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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