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(71) Applicant: **IP Cleaning S.p.A.**
30026 Portogruaro (VE) (IT)

(72) Inventor: **Reccanello, Francesco**
30026 Portogruaro (Venezia) (IT)

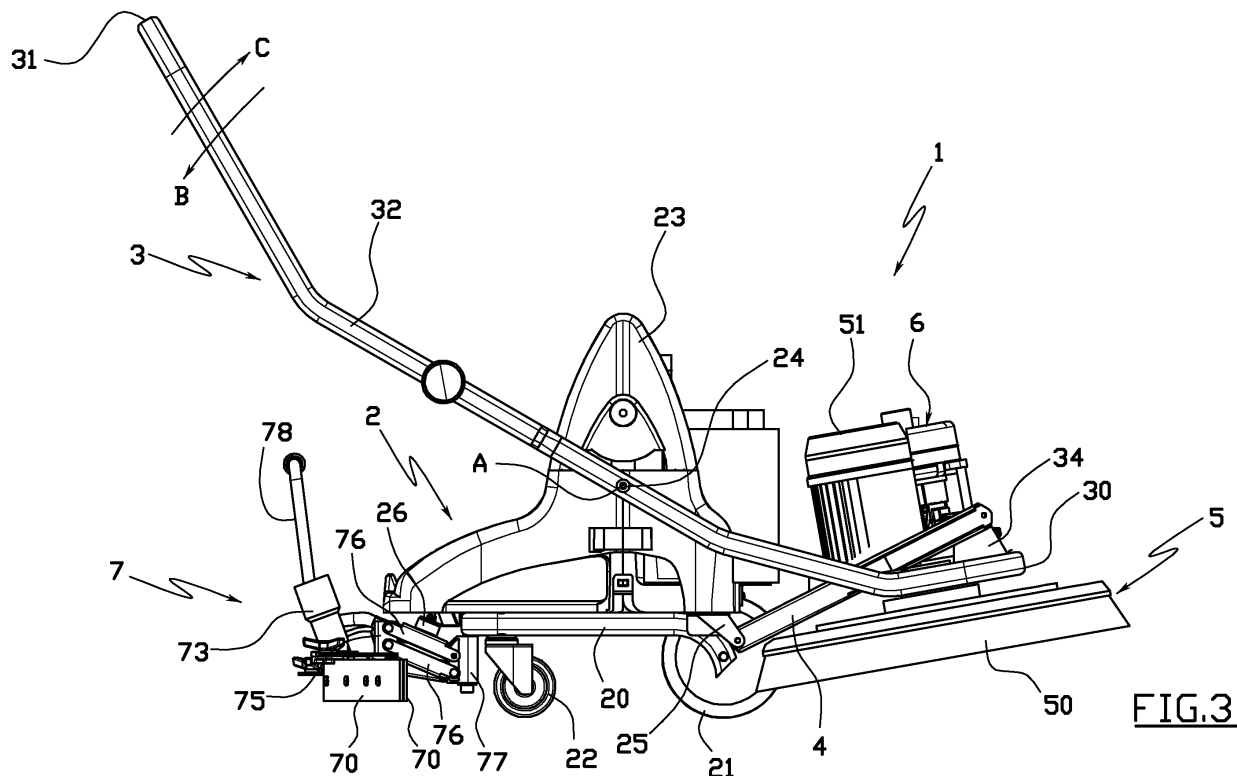
(74) Representative: **Corradini, Corrado et al**
Ing. C. Corradini & C. S.R.L.
4, Via Dante Alighieri
42100 Reggio Emilia (RE) (IT)

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(54) A floor-cleaning machine

(57) A floor-cleaning machine comprising a support trolley (2), on which support trolley (2) at least a floor-cleaning group (7) is installed, which floor-cleaning group (7) is provided with at least a flexible blade (70) and is mobile on board the support trolley (2) between a work

position, in which the flexible blade (70) is in contact with a floor, and a rest position, in which the flexible blade (70) is distanced from the floor, the floor-cleaning machine comprising magnetic means (26) which are destined to block the floor-cleaning group (7) in the rest position.



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Description

[0001] The invention concerns a floor-cleaning machine, and in particular, a professional-type floor-cleaning machine which is mainly designed for cleaning relatively extensive floors, for example inside commercial and/or small industrial premises.

[0002] Professional floor-cleaning machines are usually divided into two different categories. Machines mounted on self-propelled vehicles, which are designed to be driven by an operative, are usually called "man on board" machines, while machines mounted on trolleys which are manually propelled by an operator walking behind the machine are referred to as "walk-behind" machines.

[0003] This invention concerns in particular "walk-behind" machines.

[0004] As is known, floor-cleaning machines of the walk-behind type comprise operating groups which perform specific floor-cleaning operations, among which, one or more motorised rotating brushes which scrub the surfaces, a dispenser group which dispenses a detergent liquid, and a suction group to which a floor-wiping group is associated. The floor-cleaning group normally comprises one or more flexible rubber blades, which drag on the floor to collect the detergent liquid and the dislodged dirt.

[0005] The operating groups are usually covered by suitable plastic or sheet-metal covers, and are mounted on board a sturdy, solid support trolley, usually of large dimensions, which is provided with handles or grips to be grasped by the operative in order to guide it in movement over the floor to be washed.

[0006] A common requirement in all profession floor-cleaning machines is to enable the floor-cleaning group to move vertically between a lowered work position, in which the blades are in contact with the floor, and a raised rest position, in which the blades are distanced from the floor such as not to scrape on it.

[0007] This movement is usually obtained by means of complicated kinematic activating systems, typically hinged systems having one or more jointed arms, which are mounted on the support trolley and to which the floor-cleaning group is coupled.

[0008] A drawback of professional floor-cleaning machines is therefore that they are rather expensive, not only because of the presence of the above-mentioned kinematic activating systems, but also because of the presence of all the motorisation organs and control organs which the kinematic systems require in order to function.

[0009] The aim of the present invention is to at least partly obviate the mentioned drawback, by providing a floor-cleaning machine which is so simple and rational as to enable a significant reduction in construction costs with respect to the floor-cleaning machines presently available.

[0010] The aim is attained by the characteristics of the

invention included in the independent claim. The dependent claims delineate preferred and/or particularly advantageous aspects of the invention.

[0011] In particular, the invention provides a floor-cleaning machine which comprises a support trolley on which at least a floor-cleaning group is installed, which group is provided with at least a rotating flexible blade and a motor for activating the blade, and gripping means which are destined to be held by a user in order to guide the trolley on the floor.

[0012] The gripping means are made available by a rigid frame, which is hinged to the support carriage and on which the operating group is directly fixed.

[0013] Thanks to this solution, by manually rotating the rigid frame about the hinge axis with the support trolley, the user is effectively able to raise the operating group with respect to the floor, displacing it from the lowered work position into a raised rest position, without any need for complicated kinematic activating systems or motors or command organs therefor, making the constructional solution provided very simple and consequently very economical.

[0014] Further, owing to the absence of the above-mentioned activating systems, the support trolley can advantageously be made smaller and less sturdy than the trolleys usually used for professional floor-cleaners, thus further contributing to the constructional simplicity and therefore to the relative inexpensiveness of the machine.

[0015] In a preferred aspect of the invention, the floor-cleaning machine comprises means for blocking the rigid frame in the configuration in which the operating group is in the raised rest position. The means for blocking preferably comprise at least a telescopic arm, which is hinged to the trolley and the tilting frame, and to which disengageable stop means are associated, which stop means are destined to block the arm in a predetermined extended position.

[0016] In a further preferred aspect of the invention, the floor-cleaning machine further comprises a floor-cleaning group, which is provided with at least a flexible blade and which is mobile on the support trolley between a work position, in which the flexible blade is in contact with the floor, and a rest position, in which the flexible blade is distanced from the floor.

[0017] Magnetic means are preferably associated to the floor-cleaning group which block the group in the rest position.

[0018] In this way, production costs of the floor-cleaning machine are further reduced with respect to those presently available, in which the floor-cleaning group is generally associated to complicated automatic raising and blocking systems.

[0019] Further characteristics and advantages of the invention will emerge from the following detailed description provided by way of a non-limiting example, with the aid of the appended figures of the drawings.

[0020] Figure 1 is a side view of a floor-cleaning machine of the invention, with some components removed

in order better to illustrated the aspects of the invention, and shown with the operating group 5 and the floor-cleaning group 7 both in the work position.

[0021] Figure 2 is a plan view of the floor-cleaning machine of figure 1.

[0022] Figure 3 is a side view of the floor-cleaning machine of figure 1, shown with the operating group 5 and the floor-cleaning group 7 both in the rest position.

[0023] Figure 4 is a side view of the machine of figure 1 complete with all components, and shown with the operating group 5 in the work position and the floor-cleaning group 7 in the rest position.

[0024] Figure 5 is larger-scale detail of figure 1.

[0025] Figure 6 is a schematic view of the section of the floor-cleaning group 7 made according to line VI-VI denoted in figure 2, in which a broken line shows the flexion of the blades 70 during the dragging thereof on the floor.

[0026] The floor-cleaning machine 1 comprises a rather compact, lightweight support trolley 2 which exhibits a horizontal base 20 and is provided with three support wheels, two of which are coaxial, fixed-axle, forward wheels 21, and one of which is a pivoting rear wheel 22.

[0027] Two oppositely-positioned salient side elements 23, which are identical in shape and preferably made of plastic, are fixed to the mobile support trolley 2 and laterally delimit the loading space of the mobile support trolley 2.

[0028] A rigid frame 3, which is preferably made from sheet steel, is hinged to the side elements 23.

[0029] As shown in figure 2, the frame 3 has rounded corners and exhibits two transverse bars, a forward transverse bar 30 and a rear transverse bar 31, which are connected by two oppositely-positioned, identical, shaped longitudinal bars 32.

[0030] The rigid frame 3 is inserted externally on the side elements 23 of the mobile support trolley 2, to which mobile support trolley 2 it is hinged by means of two hinge joints 24 which singularly join a respective side element 23 to the adjacent longitudinal bar 32.

[0031] The hinge joints 24 are perfectly coaxial, such as to define a single axis of rotation A of the rigid frame 3 with respect to the mobile support trolley 2.

[0032] As shown in figure 1, the axis of rotation A is oriented such as to be horizontal when the mobile support trolley 2 is resting on the floor, and is arranged in an intermediate position along the longitudinal bars 32, such that the rigid frame 3 is hinged to the mobile support trolley 2 like a reciprocating lever.

[0033] In this way, when the rear transverse bar 31 is lowered, the forward transverse bar 30 is raised, and vice versa.

[0034] In more detail, the longitudinal bars 32 of the frame 3 develop in a downwards direction, such that the forward transverse bar 30 is before the base 20 and is located substantially at a same height as the base 20, while the rear transverse bar 31 is at a higher level.

[0035] The rear transverse bar 31 functions as a grip

for the user pushing the floor-cleaning machine 1, and is therefore positioned at a height at which it can be comfortably gripped. The longitudinal bars 32 are extensible in the tract comprised between the axis of rotation A and the rear transverse bar 31, such as to enable height-regulation of the rear transverse bar 31 according to the user's needs.

[0036] A support plate 33 is further attached to the rigid frame 3 (see figure 2) at the forward transverse bar 30 position, on which support plate 33 a vertical bar 34 is welded.

[0037] A first end of a telescopic arm 4 (see figure 1) is hinged to the vertical bar 34, while a second end thereof is hinged to a fork 25 fixed below the base 20 of the trolley 2.

[0038] The hinge axes of the telescopic arm 4 with the vertical bar 34 and the fork 25 are both parallel to the axis of rotation A of the frame 3, and are positioned such that the telescopic arm 4 extends following a rotation of the frame 3 in an anticlockwise direction B which corresponds to the raising of the forward transverse bar 30.

[0039] The telescopic arm 4 is provided with stop means (not visible in the figures and of known type) which block the telescopic arm 4 in a predetermined extended position, and which can be commanded such as to free the block in order to enable a successive shortening of the telescopic arm 4.

[0040] In more detail, the stop means act during an extension of the telescopic arm 4, blocking it when it reaches a predetermined length. With the block inserted the telescopic arm 4 cannot shorten and remains in the position reached.

[0041] In order to free the block, it is generally necessary to cause a further short extension of the telescopic arm 4, following which the stop means disengage, enabling the telescopic arm 4 to freely shorten.

[0042] Telescopic arms provided with such stop means are commercially available and are widely used for example in the furniture industry to keep the swinging doors of cupboards open.

[0043] An operating group denoted in its entirety by reference numeral 5 is installed upon the support plate 33, which operating group comprises a rotating brush with frontal bristles 50 to which a gear reducer 51 is associated.

[0044] In particular, the brush 50 is positioned below the support plate 33, with the rotation axis substantially vertical, such as to be able to rest the bristles frontally on the floor, while the gear reducer 51 is located above the support plate 33, at a hole (not visible) which enables mechanical connection with the brush 50.

[0045] The gear reducer 51 is controlled by a command lever 52 which is mounted on the rear transverse bar 31 of the frame 3 and which is connected to the gear reducer 51 via flexible cables (not illustrated).

[0046] A suction group, denoted in its entirety by 6, is also mounted on the support plate 33, which suction group 6 schematically comprises a pump with the relative

activating motor.

[0047] The suction group 6 is also controlled by manual organs (not illustrated) which are preferably mounted on the rear transverse bar 31 of the frame 3, such as to be easily operated by the user.

[0048] As illustrated in figure 4, the suction group 6 is connected via a first flexible pipe 60 to a closed collecting reservoir 61, preferably made of plastic, which is arranged on board the mobile support trolley 2, and is in turn connected, via a second flexible pipe 62, to a floor-cleaning group 7.

[0049] The collecting reservoir 61 rests upon a lower reservoir 63, which is mounted on the base 20 of the mobile support trolley 2, which reservoir 63 contains a washing liquid, typically water or possibly water mixed with a detergent substance.

[0050] The lower reservoir 63 is connected via a flexible tube 64 to one or more dispensing nozzles of the cleaning liquid (not shown), which are attached to the rigid frame 3 at the cleaning organ 50. The dispensing nozzles are connected to the lower reservoir 63 by at least a flexible conduit, denoted by 64 in figure 4, along which a manual check valve (not visible) is generally located for regulating the flow of cleaning liquid which normally flows from the lower reservoir 63 towards the dispensing nozzles, simply by force of gravity.

[0051] As illustrated in figure 5, the floor-cleaning group 7 comprises two thin flexible blades 70, made of a coherent material, preferably rubber, which are oriented vertically so as to be arranged with edges thereof against the floor.

[0052] The flexible blades 70 are perfectly facing one another and have horizontal lower edges located substantially at a same height, such as to be contemporaneously in contact with the floor along the whole longitudinal development thereof.

[0053] As illustrated in figure 2, the flexible blades 70 develop transversally with respect to the trolley 2, from which they project on both lateral flanks, and exhibit a plan profile which is substantially crossbow-shaped, with the concavity thereof facing in the forwards direction.

[0054] The flexible blades 70 are joined together at the ends and are kept separate by a rigid framework 71, which defines a space that is open at a bottom thereof and closed at the top thereof (see figure 6).

[0055] A connector 73 is associated to the rigid framework, which connector 73 terminates within the space 72 and is connected to the second flexible pipe 62 coming from the collecting reservoir 61.

[0056] As shown in figure 2, the rigid framework 71 is borne on a central plate 74, to which it is removably joined in order to enable replacement of the floor-cleaning group 7 when the flexible blades 70 are worn.

[0057] A raised block 75 is welded to the central plate 74, to which the ends of two superposed con rods 76 are hinged, the con rods 76 being of equal length and parallel to one another, opposite ends of which are hinged to a support 77 fixed below the base 20 in the rear part of the

trolley 2 (see figure 5).

[0058] The hinge axes of the con rods 76 with the block 75 and the support 77 are horizontal, such that the con rods 76 define a four-bar hinge enabling the floor-wiping group 7 to perform vertical movements of the floor-cleaning group 7, keeping the flexible blades 70 parallel to themselves.

[0059] In detail, the four-bar hinge enables the floor-wiping group 7 to be moved between a work position, in which the flexible blades 70 are in contact with the floor, and a rest position, in which the flexible blades 70 are raised and are not in contact with the floor.

[0060] As illustrated in figure 5, a permanent magnet 26 is fixed on the trolley 2, which can be substituted by an electromagnet or like magnetic means, which magnet 26 is positioned such as to contactingly receive the upper con rod 76 of the four-bar hinge when the floor-cleaning group 7 is in the raised rest position.

[0061] In this way, the magnetic attraction exerted by the magnet 26 on the ferro-magnetic material of the con rod 76 enables the floor-cleaning group 7 to be effectively blocked in the rest position, for example when the floor-cleaning machine 1 is not being used.

[0062] Naturally the same result could be reached by mounting the magnet 26 on the con rod 76 and predisposing a ferro-magnetic stop on the trolley 2; or by mounting two magnets having opposite polarity respectively on the con rod 76 and the trolley 2, such that the magnets come into contact when the floor-cleaning group 7 is in the rest position.

[0063] Finally, the floor-cleaning group 7 comprises a shaped lever 78, which is fixed on the rigid frame 71 and develops in an upwards direction, such as to make available a comfortable grip for a user who, by acting on the shaped lever 78, can overcome the magnetic force exerted by the magnet 26 and unblock the floor-cleaning group 7 from the rest position, leaving it to rest by force of gravity on the floor, thus moving into the work position.

[0064] In use, the floor-cleaning group is guided on the floor by the user who walks behind it, gripping the rear transverse bar 31 of the tilting frame 3.

[0065] The tilting frame 3 is in the configuration illustrated in figure 1, where the operating group 5 is in a lowered work position in which the bristles of the rotating brush are frontally in contact with the floor.

[0066] This work position is maintained thanks to the weight of the operating group 5 and the suction group 6, which tend to cause the tilting frame 3 to rotate in a clockwise direction C, i.e. in the direction corresponding to a lowering of the forward transverse bar, pressing the rotating brush 50 down onto the floor.

[0067] The floor-cleaning group 7 is also in a lowered work position, with the flexible blades 70 both in contact with the floor.

[0068] The work position of the floor-cleaning group 7 is maintained thanks to the weight of the group itself, which acts in the direction of pressing the flexible blades 70 onto the floor.

[0069] During the cleaning operations, the rotating brush 50 is rotated by the gear reducers 51, and at the same time the suction group 6 is activated, which places the collecting reservoir 61 in depression and, via the flexible conduit 62, also the space 71 defined between the flexible blades 70 of the floor-cleaning group 7.

[0070] At the same time the command is given for the cleaning liquid to be dispensed from the lower reservoir 63.

[0071] The liquid is dispensed directly onto to bristles of the rotating brush 50 such that the scrubbing action of the brush 50 and the detergent action of the liquid enable the dirt to be removed from the floor.

[0072] The liquid mixed with dirt is then swept and collected by the flexible blades 70 which drag on the floor, and filters into the space 72, from where it is aspirated internally of the collecting reservoir 61.

[0073] When washing operations are terminated, the user pushes the rear transverse bar 31 of the tilting frame 3 downwards, raising the forward transverse bar 30 and causing a progressive extension of the telescopic arm 4.

[0074] In this way, the operating group 5 and the suction group 6, which are solidly constrained to the forward transverse bar 30, are raised from the floor up to reaching the rest position illustrated in figure 3, in which the rotating brush 50 is not touching the floor.

[0075] On reaching this rest position, the telescopic arm 4 blocks by effect of the stop means thereof, such that the position is maintained even if the user lets go of the grip.

[0076] At this point, the user grips the lever 78 and raises the floor-cleaning group 7, returning it into the rest position in which it is blocked by the magnet 26.

[0077] To perform a new cleaning operation, it will be sufficient to unblock the telescopic arm 4 such that by force of gravity the operating group 5 returns into the work position, and to free the floor-cleaning group 7 from the magnet 26.

[0078] Obviously, a person skilled in the art might bring numerous technical and applicational modifications to the invention without forsaking the ambit of the invention as claimed herein below.

Claims

1. A floor-cleaning machine comprising a support trolley (2), on which support trolley (2) at least an operating group (5) is installed, which operating group (5) comprises at least a rotating brush (50) destined to go into contact with a floor and a motor (51) for activating the rotating brush (50), and gripping means (31) destined to be held by a user to guide the trolley (2) on the floor, **characterised in that** the gripping means (31) are provided by a rigid frame (3), which rigid frame (3) is hinged to the support trolley (2) and on which the operating group (5) is directly fixed.

2. The floor-cleaning machine of claim 1, **characterised in that** the rigid frame (3) is hinged to the support trolley (2) as a reciprocating lever.

3. The floor-cleaning machine of claim 2, **characterised in that** the operating group (5) and the gripping means (31) are on opposite sides of the rigid frame (3) with respect to the axis of rotation (A) thereof with respect to the trolley (2).

4. The floor-cleaning machine of claim 1, **characterised in that** it comprises blocking means for blocking the rigid frame (3) in a rest configuration, in which the brush (50) of the operating group (5) is distanced from the floor.

5. The floor-cleaning machine of claim 4, **characterised in that** the blocking means comprise a telescopic arm (4) hinged to the rigid frame (3) and to the trolley (2), which telescopic arm (4) is provided with disengageable stop means.

6. The floor-cleaning machine of claim 1, **characterised in that** a suction group (6) is further fixed on the rigid frame (3).

7. The floor-cleaning machine of claim 6, **characterised in that** the suction group (6) is connected to a collecting reservoir (61) located on a base (20) of the trolley (2).

8. The floor-cleaning machine of claim 1, **characterised in that** it comprises means (63, 64) for dispensing a cleaning liquid onto the floor.

9. The floor-cleaning machine of claim 8, **characterised in that** the means for dispensing the cleaning liquid comprise a reservoir (63) for containing the liquid, which reservoir (63) is located on the base (20) of the trolley (2).

10. The floor-cleaning machine of claim 1, **characterised in that** it comprises a floor-cleaning group (7), which is provided with at least a flexible blade (70) and which is mobile on board the support trolley (2) between a work position, in which the flexible blade (70) is in contact with the floor, and a rest position, in which the flexible blade (70) is distanced from the floor.

11. The floor-cleaning machine of claim 10, **characterised in that** it comprises magnetic means (26) which block the floor-cleaning group (7) in the rest position.

12. The floor-cleaning machine of claim 11, **characterised in that** the magnetic means comprise at least a magnet (26) fixed on the trolley (2).

13. The floor-cleaning machine of claim 10, **characterised in that** the floor-cleaning group (7) comprises a pair of flexible blades (70) separated by a space (72).

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14. The floor-cleaning machine of claims 13 and 7, **characterised in that** the space (72) is in communication with the suction group (6) via the collecting reservoir (61).

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