

Nov. 16, 1971

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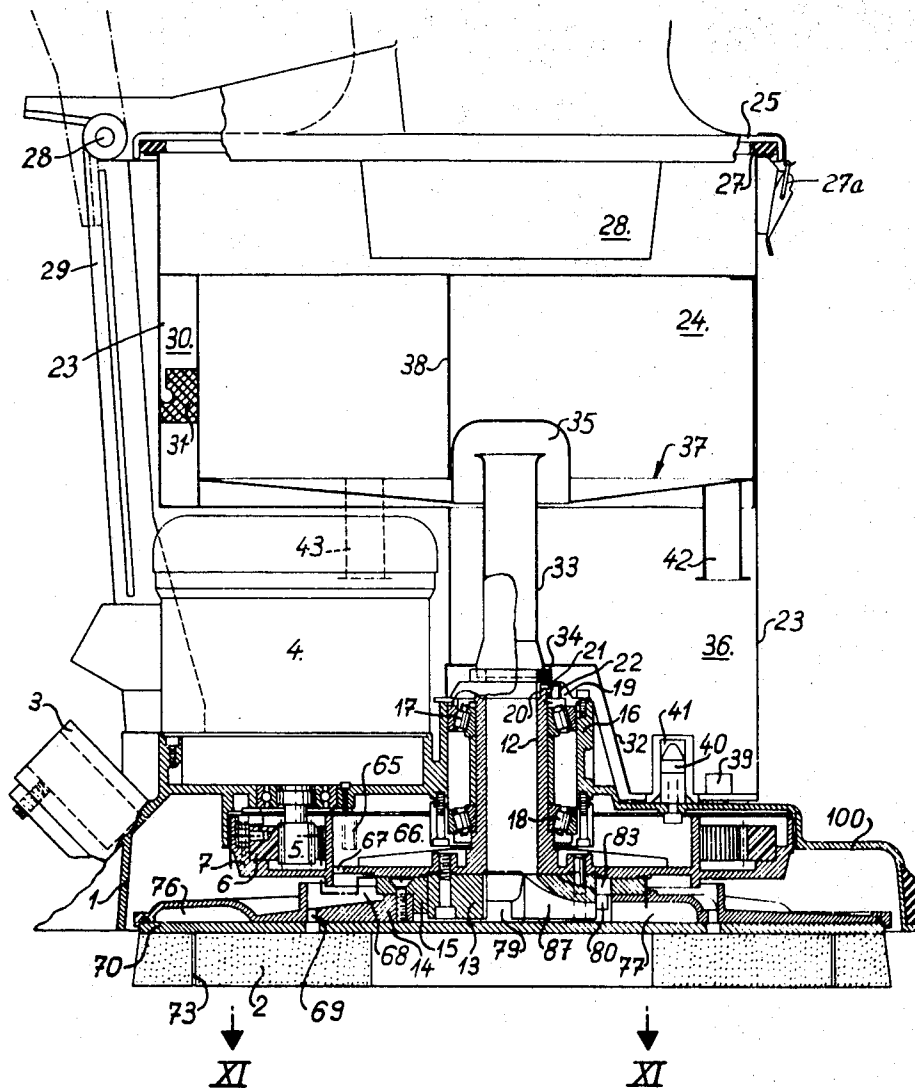
3,619,848

APPLIANCE FOR CLEANING FLOORS

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5 Sheets-Sheet 1

FIG 1



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5 Sheets-Sheet 2

FIG. 5



FIG. 2

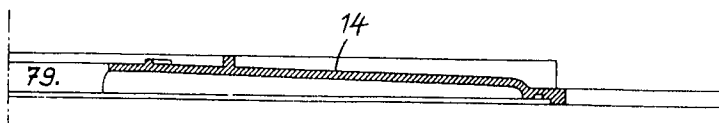
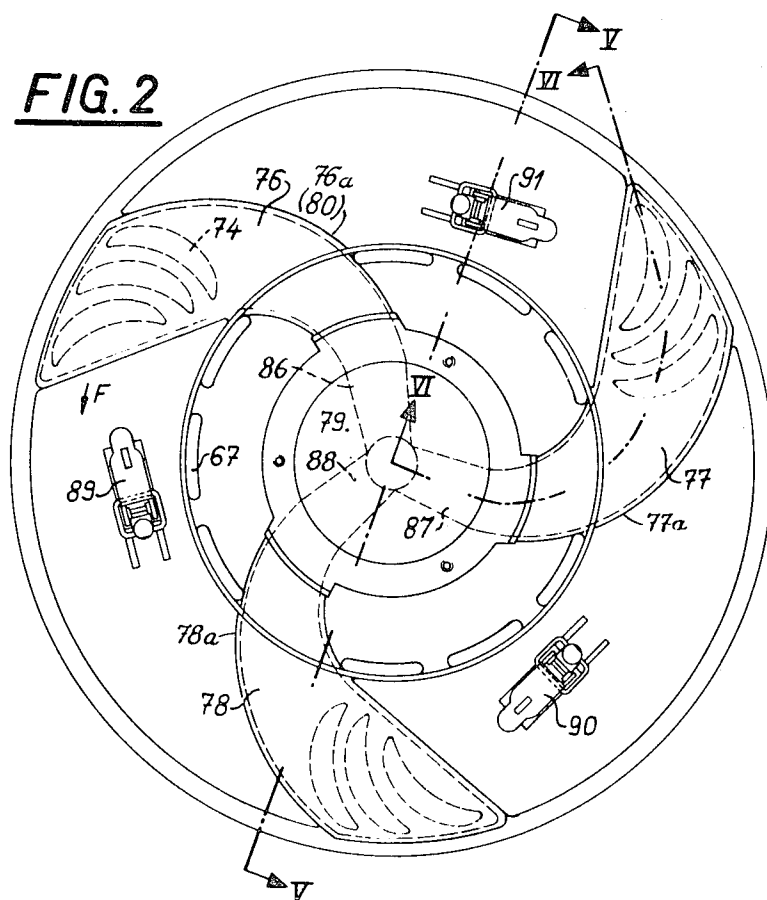


FIG. 6

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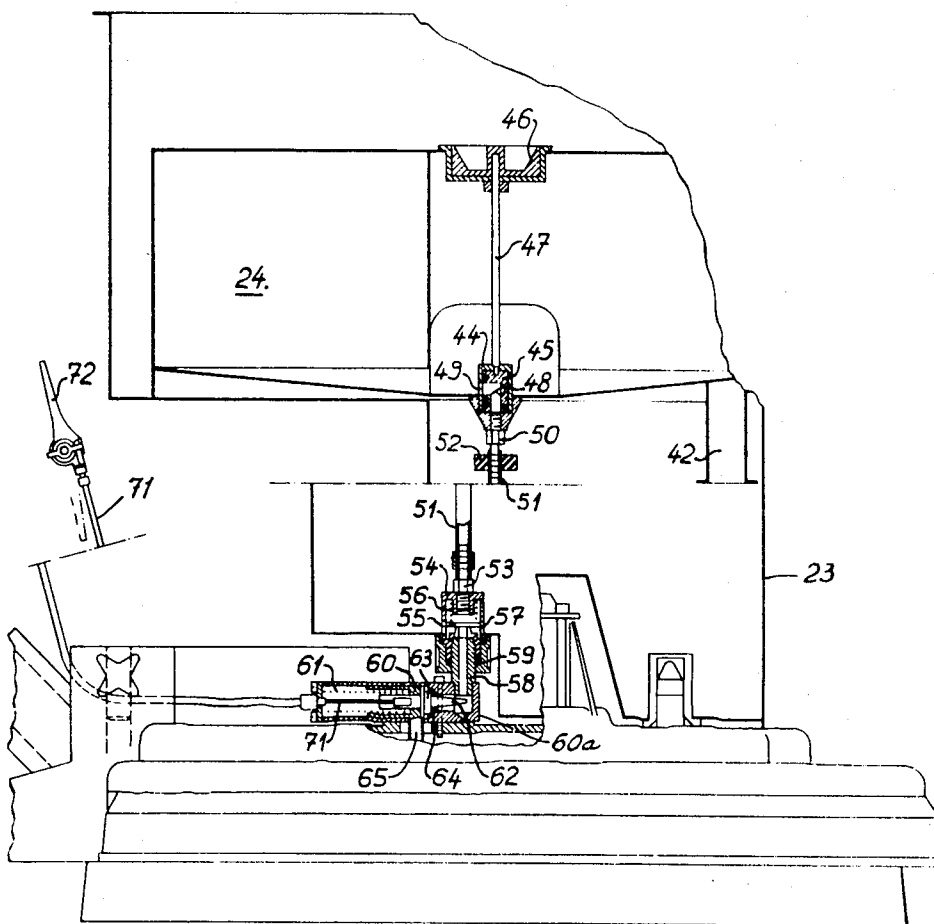
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APPLIANCE FOR CLEANING FLOORS

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5 Sheets-Sheet 3

FIG. 3



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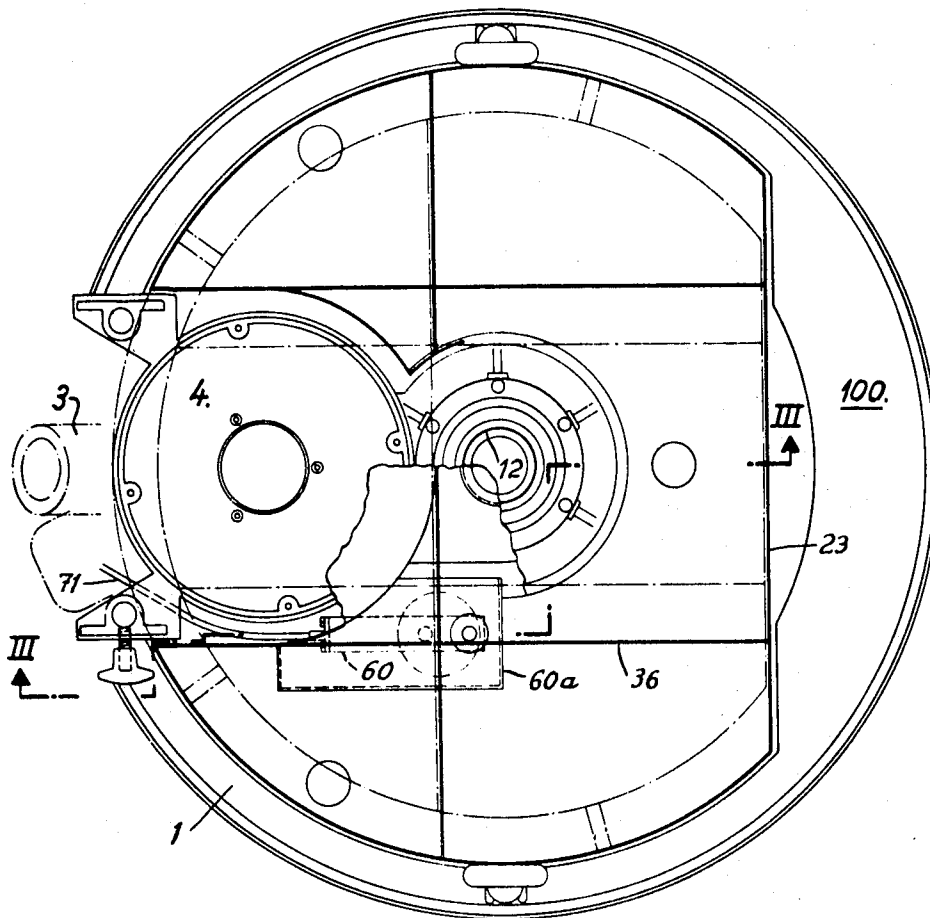
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APPLIANCE FOR CLEANING FLOORS

Filed Oct. 6, 1969

5 Sheets-Sheet 4

FIG. 4



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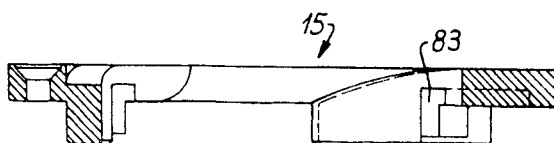
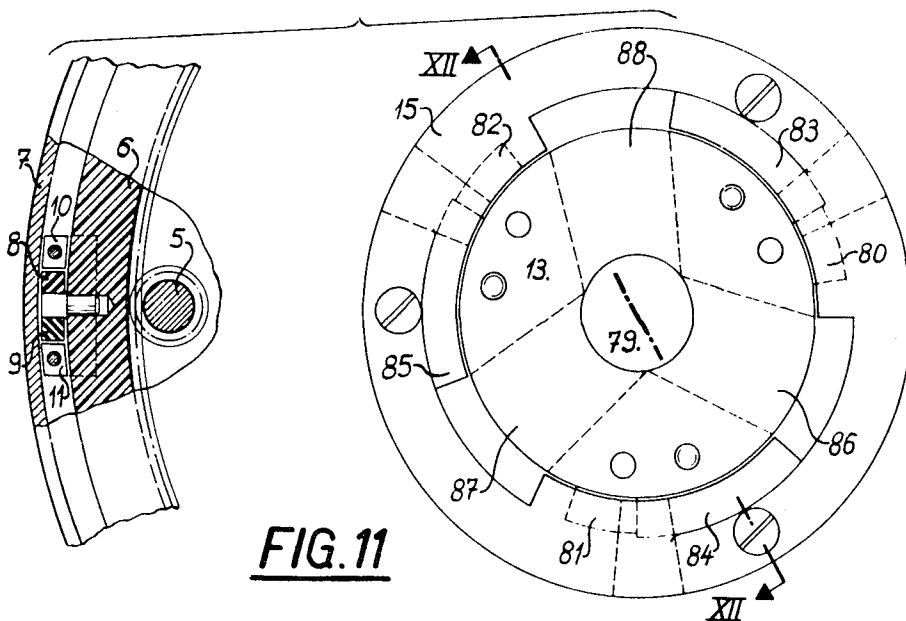
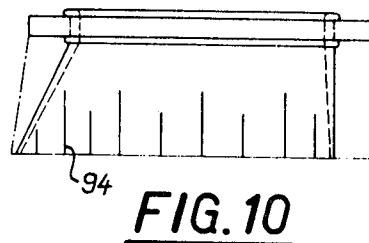
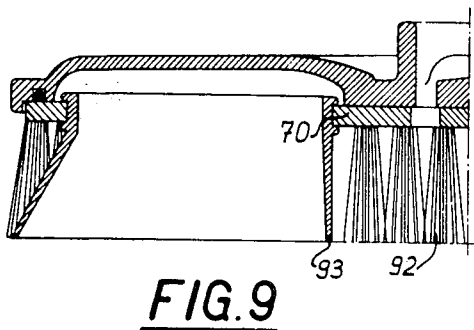
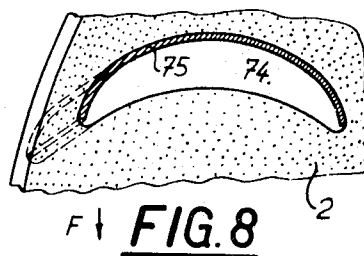
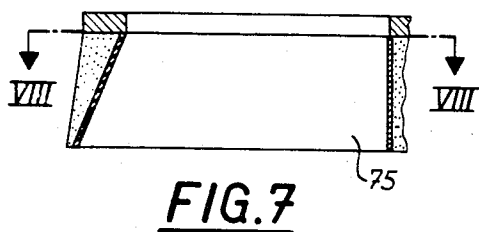
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APPLIANCE FOR CLEANING FLOORS

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5 Sheets-Sheet 5



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1

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APPLIANCE FOR CLEANING FLOORS

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16 Claims

ABSTRACT OF THE DISCLOSURE

A floor cleaning appliance has a brush rotating about a hollow vertical spindle and a feed tank located in a recovery tank above the brush. Cleaning fluid fed from the feed tank to a central portion of the brush is dispersed radially outwardly through the brush by centrifugal force but its outward movement is checked by a vertical annular wall spaced inwardly from the periphery of the brush. In a peripheral portion of the brush outside the wall there are liquid-recovery cavities which are connected by passageways with the hollow vertical spindle which leads to the recovery tank. Liquid collected in the cavities is conducted to the recovery tank by the evolute shape of the connecting passageways and a suction turbine in the recovery tank.

BACKGROUND OF THE INVENTION

It has already been suggested to combine the brush and the suction appliance on one and the same carriage. A very bulky assembly is obtained however, which does not render it possible to clean the corners of a room, particularly if it is necessary to pass under a piece of furniture or a radiator.

SUMMARY OF THE INVENTION

The present invention has the object of embodying an appliance performing both the brushing and liquid recovery operations, which has a compact structure and can be produced in any size.

More specifically, the invention relates to an appliance for floor cleaning comprising a brush rotatable around a vertical spindle, arranged on a brush carrier driven by a motor, a tank situated above the brush and intended to hold a cleaning fluid and a pipe connecting the tank to the central part of the brush, characterised in that the brush comprises means of absorbing the kinetic energy of the liquid whirled around in the brush, in an area situated close to the periphery of the brush, and cavities for recovery of the said liquid, these cavities being connected to passages provided in the brush carrier, converging towards the axis of the appliance whilst describing a curve and opening at the base of a vertical duct opening into a recovery tank, and means of engendering a negative pressure in this vertical duct.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in detail with reference to the accompanying drawings which illustrate a preferred embodiment of the invention, but in no restrictive sense.

FIG. 1 illustrates a view in elevation of a floor cleaning appliance in accordance with the invention with parts shown in axial cross-section.

FIG. 2 illustrates a plan view of the same as seen from above, at the level of the brush carrier, without the spindle or the driving gear.

FIG. 3 illustrates another view of the same, partly in

2

elevation and partly in cross-section approximately along line III—III of FIG. 4.

FIG. 4 illustrates a plan view as seen from above, at the level of the recovery tank, without the motor, and with particular parts removed.

FIG. 5 illustrates a view in cross-section of a brush holding plate approximately along line V—V of FIG. 2.

FIG. 6 illustrates a developed cross-section of the brush holding plate approximately along line VI—VI of FIG. 2.

FIG. 7 illustrates a view in elevation and in cross-section of a cavity of the brush.

FIG. 8 illustrates a cross-section along line VIII—VIII of FIG. 7.

FIG. 9 illustrates a partial view in cross-section of a modified form comprising a bristle brush.

FIG. 10 illustrates an unsectioned elevational view of this modified form.

FIG. 11 illustrates a view in cross-section along line XI—XI of FIG. 1.

FIG. 12 illustrates a partial cross-section along line XII—XII of FIG. 11.

The appliance essentially comprises a frame 1 extending horizontally above the brush 2 and equipped with a projection 3 possessing a cylindrical bore or recess for removable fastening of a handle. On this frame is secured an electric motor 4 whose spindle carries a pinion 5 meshing with an annular gear on the crown wheel 6 of synthetic material coaxially fastened to a flange 7 with interposition of resilient damping elements 8 and 9, shown in FIG. 11, held between two stops 10 and 11 of the flange, the damping device serving the purpose of obtaining progressive increases of the driving torque on the crown gear 6. The flange 7 is integral with a hollow spindle 12 and on its lower surface carries an element 13 on which the brush is secured by means of a device of the bayonet type. To this end, the brush 2 is fastened beneath a plate 14 to the centre of which is screwed a ring 15 (FIG. 12) having bearing surfaces co-operating with ramps of the element 13 for automatic fastening of the brush to the machine, which is locked by the said bayonet type device.

The spindle 12 is carried by a vertical cylindrical part 16 of the frame with interposition of two roller bearings 17 and 18. On the part 16 is secured a flange 19 axially pierced by a hole 20 of the same diameter as the internal diameter of the spindle 12 and having a groove 21 in which is housed a reinforced joint or seal 22, of the Simmering type (registered trademark), ensuring a seal between the rotary spindle and the stationary frame.

On the frame is removably arranged moreover a recovery tank 23 of non-circular shape comprising a relief for the motor 4, and in which is removably housed a feed tank 24 intended to contain the cleaning fluid for supply to the brush. The tank 23 which extends above the tank 24 and is closed off by a lid 25 hinged on a spindle 26, equipped with a sealing joint 27 and secured by a catch 27a. At the center of the lid 25 there is housed a turbine 28 driven by an electric motor and intended to engender a negative pressure above the recovery tank, which turbine is known per se and will not be described in detail herein. The lid 25 is secured on a finned or grooved upright 29 of the frame. Along a part of the perimeter of the tank 24, the sides of this tank and of the recovery tank 23 are separated by a space 30 allowing air to pass, but in which is situated a ring 31 of porous material allowing air to pass but arresting liquid and solid particles, for example soap lather.

On the bell-shaped base 32 of the recovery tank 23 is fastened a chimney 33 in communication with the spindle 12 and resting on the flange 19 with interposition of a foam rubber joint 34 ensuring a sealed connection between the flange 19 and the chimney 33. The top of this

3

chimney opens into a bell-shaped cavity 35 wrought in the bottom of the tank 24, this bell being in communication with the recovery tank.

To prevent an inopportune movement of the liquid in the tank 23 and in the tank 24, these two enclosures comprise vertical partitions acting as baffles for the liquid, like 36 in the tank 23, and 37 and 38 in the tank 24. In the case in which these partitions extend down to the bottom of the vessel like the partition 36, cut-outs are wrought in the lower portion to establish communication between the different compartments thus formed. The tank 23 is held and positioned on the frame by means of a peg 40 fitting into a seat 41 of the tank. As for the tank 24, it is positioned in the tank 23 by means of three branches or feet, of which two marked 42 and 43 are apparent from FIG. 1. The feet rest on the partitions 36 in the tank 23.

The device for supplying liquid to the brush from the tank 24 has its upper portion illustrated in FIG. 3 and its lower portion in FIG. 1. In the tank 24, this device comprises a valve 44 having a rotary cylindrical valve member or shutter 45 driven or entrained by means of a knob 46 situated on the tank 24, this knob being connected to the shutter by a rod 47. The shutter 45 has a curved passage 48 whose horizontal orifice coincides, in the open position, with a stationary opening 49 of the barrel of the valve 44. The outlet of the valve is connected to a nozzle 50 on which is secured a pliable tube 51, for example of polyethylene, held on the nozzle by means of a rubber ring 52 rendering it possible to remove and secure the top extremity of the tube 51 without delay. The lower extremity of this tube is secured to a nozzle 53 by means of a clamping collar. This nozzle is secured on a valve 54 whose case is fastened to the bottom of the recovery tank 23. This valve, of a construction known per se, comprises a valve member or shutter 55 in the form of a small impermeable plate exposed to the action of a coil spring 56 which, when the recovery tank is removed from the frame, forces the small plate against an opening 57 of the valve to close the valve. When the recovery tank is secured on the appliance, the small plate 55 is pushed back and the valve is thereby opened by the slotted upper end of a pipe 58 which fits in a sealing joint 59. The pipe 58 at its lower end is joined to a valve 60a on the bottom of the tank controlling the passage of the cleaning fluid into the brush. This valve comprises a piston 60 exposed to the action of a coil spring 61, the active extremity of the piston being formed by a cone 62 whose axial position determines the flow section for the liquid. In the closed position, as illustrated in FIG. 3, a bearing surface 63 of the piston bears against a sealing ring 64. The outlet of the valve is formed by a pipe extremity 65 opening freely into a circular chamber 66 formed in the flange 7 (FIG. 1). At its periphery, this chamber has nine arcuate openings 67 (FIG. 2) through which the cleaning fluid can flow into an annular recess 68 (also see FIG. 5) having an outwardly sloping base and itself in communication with the brush through openings 69, the back 70 of the brush having corresponding openings for this purpose. The piston 60 of the valve 60a is controlled by a handle 72 fastened on the handle of the appliance and acting on the piston 60 by a sheathed cable 71.

The brush consists of a disc of agglomerated fibrous material, for example of Scotch-Brite (registered trademark), into which the cleaning fluid is able to penetrate and to be dispersed radially by the action of centrifugal force. In the brush, at a definite distance from its periphery, is arranged a hermetic vertical wall 73 encircling the brush, against which the liquid comes into abutment, thus losing its kinetic energy. In the same peripheral area are situated moreover recovery cavities 74 (FIG. 2) which in plan view and horizontal cross-section are of crescent-shaped form (FIG. 8), these cavities being cut from the brush 2, their concave sides directed in the opposite direction to the direction of rotation F of the brush and

4

clad with a hermetic plate 75, the opposite side being unsealed however. These recovery cavities are distributed in three groups of three (FIG. 2) and in their upper portion open into three passages 76, 77 and 78 which describe a curve in the direction of the centre of the brush, these passages opening into the space 79 situated at the opening of the hollow spindle 12. The walls 76a, 77a and 78a of passages converge towards the centre and is an evolute of a circle. FIG. 6 shows a developed section along the neutral axis of the passage 77.

The device for automatic fastening of the brush will be described in detail with reference to FIGS. 1, 11 and 12. The brush holding element 13 in unit with the spindle 12, on its periphery has three projections 80, 81 and 82 on which are engaged three arcuate bearing surfaces 83, 84 and 85 of the element 15 in unit with the brush. The inner faces of the bearing surfaces 83, 84 and 85 slope in such manner as to form a ramp ensuring the locking of the brush on the appliance. To secure the brush it is thus sufficient to place its base on the floor, then to place the appliance on the brush in such manner that the bearing surfaces 83, 84 and 85 enter between the projections 80, 81 and 82, then to start the motor of the appliance, the projections 80, 81 and 82 being caught automatically under the ramps 83, 84 and 85. To remove the brush, it is sufficient to set the same in rotation, then to stop the motor, the brush being released by inertia.

The presence is also pointed out, of clearances 86, 87 and 88 in the element 13, forming the extension of the passages 76, 77 and 78, as well as that of the fastening devices employing tensioners 89, 90 and 91 allowing or removable fastening of the plate 70 of the brush to the plate 14.

FIGS. 9 and 10 illustrate a modified form comprising a bristle brush 92. Since it is impossible in this case to form a cavity in the material of the brush itself, provision is made to incorporate inset tubular elements 93 fastened to the plate 70 carrying the bristles 92. The sleeves 93 are of pliable material and in cross-section have the same shape as the cavities 74. Their sides which are convex, seen from the inside, are slit by a series of slots 94 which are alternately long and short, delimiting flexible strips allowing the cleaning fluid to pass into the cavities.

To summarise, the circuit of the fluid is the following:

From the feed tank 24, it flows through the valve 44 controlling the draining of the tank, the flexible tube 51, the tap 62, the pipe 65, the chamber 66, the openings 67, the groove 68, the openings 69, into the brush and consequently on to the floor to be cleaned. The liquid braked by the baffle 73 then passes at reduced speed into the recovery cavities 74 in which prevails a negative pressure engendered by the turbine 28. Partly due to this negative pressure, and partly owing to the shape of the walls of the cavities, the liquid then passes into the recovery passages 76, 77 and 78, whose arcuate shape already ensures the mechanical generation of a centripetal motion of the liquid, complemented by the suction effect of the turbine. The liquid is then drawn by suction into the spindle 12 and into the chimney 33, escaping to drop back into the recovery tank 36, either directly or indirectly after striking the walls of the bell shaped cavity 35.

It will moreover be noted that the tanks 23 and 24 are set back of a recessed part 100 of the frame 1 (FIGS. 1, 3 and 4) which renders it possible to insert this part under furniture, radiators or any other item of furniture of a room, so that it is possible to clean the entire surface of the floor of this room.

The recovery tank 23 and the tank 24 are removable and separate, and they may easily be removed and separated to clean the machine.

What I claim is:

1. An appliance for cleaning floors, comprising a frame, a brush rotatable around a hollow vertical spindle, arranged on a brush carrier driven by a motor, a feed tank and a recovery tank situated above the brush, said

5

feed tank being intended to contain a cleaning fluid and a feed duct connecting the feed tank to the central part of the brush, in which the brush comprises means of absorbing the kinetic energy of the liquid whirled around by the brush, in an area situated close to the periphery of the brush, and cavities in a peripheral portion of the brush for recovery of the said liquid, said cavities being connected to passages provided in the brush carrier, converging towards the axis of the appliance whilst describing curves and leading to the base of a vertical duct opening into said recovery tank, and means for producing a negative pressure in said vertical duct to convey said recovered liquid to said recovery tank.

2. An appliance as claimed in claim 1, in which said means of absorbing the kinetic energy of the liquid is an annular wall extending through the depth of the brush.

3. An appliance as claimed in claim 1, in which said cavities are of crescent shape, whereof the part which is concave as seen from the inside, is directed in the opposite direction to that of the rotation of the brush.

4. An appliance as claimed in claim 3, comprising a brush made of agglomerated material, in which the cavities are wrought in the actual material of the brush, the said concave parts being covered by a hermetic wall.

5. An appliance as claimed in claim 3, comprising a bristle brush in which the said cavities consist of a tubular element inset and made of pliable material whereof the part which is convex as seen from the inside is slit in such manner as to form strips.

6. An appliance as claimed in claim 1, in which the curvature of said passages is at least approximately a circle evolute.

7. An appliance as claimed in claim 1, in which said feed tank is disposed in said recovery tank and said recovery tank is closed by a cover.

8. An appliance as claimed in claim 7, in which the said vertical duct has its lower portion formed by the hollow spindle of the brush carrier and its upper part formed by a stationary chimney in unit with the recovery tank.

9. An appliance as claimed in claim 8, in which the upper portion of the chimney is engaged in a bell-shaped cavity formed in the base of the feed tank, against the wall of which are flung the droplets and other solid or liquid particles drawn into the chimney by suction.

10. An appliance as claimed in claim 1, in which a brush holder fixed on said spindle has brush securing projections and the brush bears a fastening ring possessing ramps co-operating with said brush securing projections

6

in the manner of a bayonet joint so as to ensure an automatic and immediate fastening of the brush.

11. An appliance as claimed in claim 8, in which a sealed fit between moving and stationary parts of the vertical duct is assured, on the one hand, by means of a sealing joint of U-shape in cross-section which is arranged between a flange fastened to the frame of the appliance and the rotary spindle and, on the other, by a sealing joint compressed between the said flange and the lower rim of said chimney.

12. An appliance as claimed in claim 7, in which said recovery tank and the said feed tank are positioned asymmetrically with respect to the axis of the brush in such manner that the space situated above a segment of the brush is entirely cleared.

13. An appliance as claimed in claim 7, in which said means producing a negative pressure comprises a suction turbine situated in the recovery tank above the feed tank, said feed tank and the recovery tank being separated along at least a part of the perimeter of the feed tank, by a space allowing air to pass, a filter of porous material being arranged in this space to trap the solid and liquid particles.

14. An appliance as claimed in claim 1, in which the recovery tank is divided into compartments by vertical partitions forming baffles and possessing openings for the circulation of liquid between the compartments.

15. An appliance as claimed in claim 1, in which the feed tank is divided into compartments by partitions forming baffles.

16. An appliance as claimed in claim 7, in which the recovery tank is secured removably on the frame of the appliance which comprises a device for positioning of the feed tank and a device for connection including automatic sealing of the brush feed duct from the feed tank.

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U.S. Cl. X.R.

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