

Nov. 11, 1969

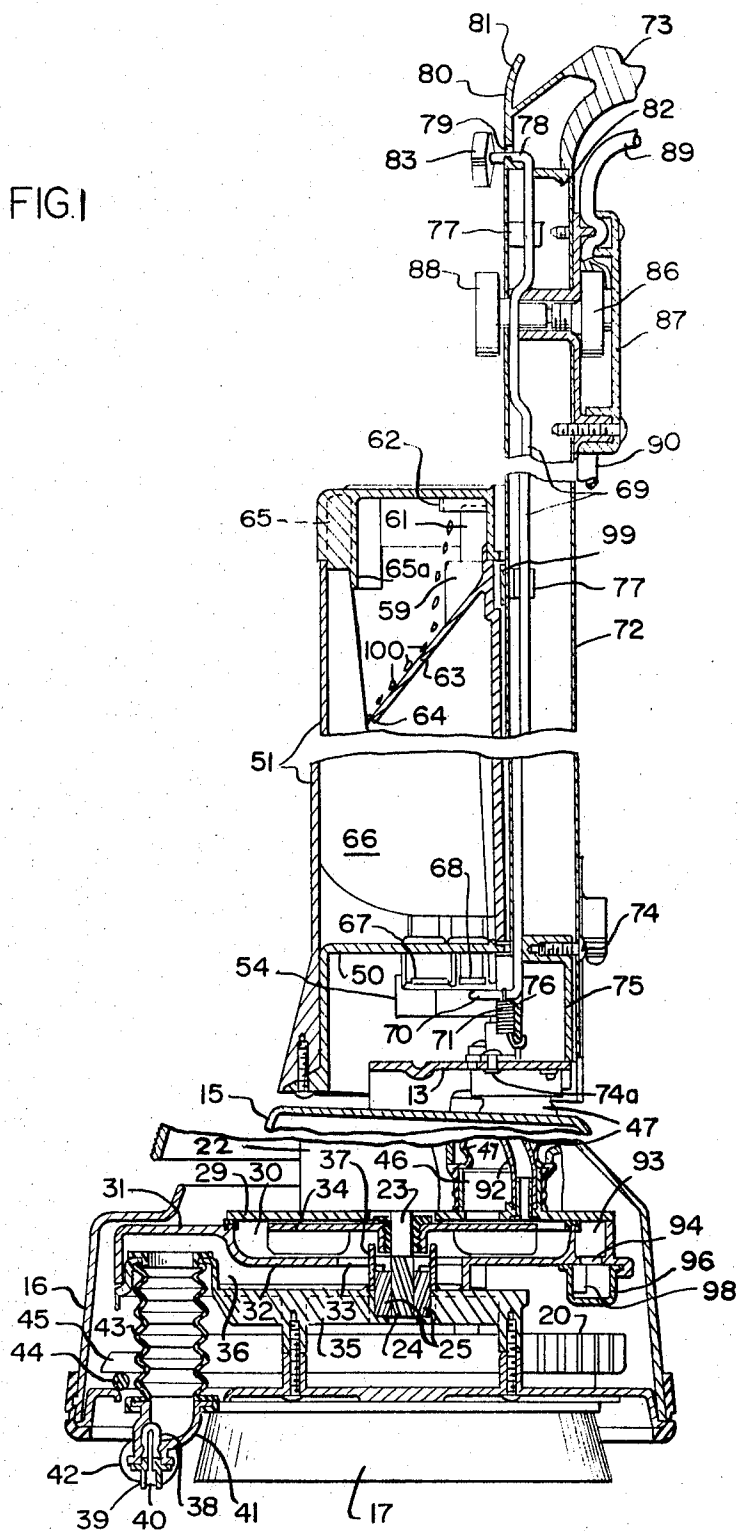
T. F. EGGERT ET AL
FLOOR SCRUBBER SHAFT SEAL

3,477,088

Filed May 9, 1967

2 Sheets-Sheet 1

FIG. 1



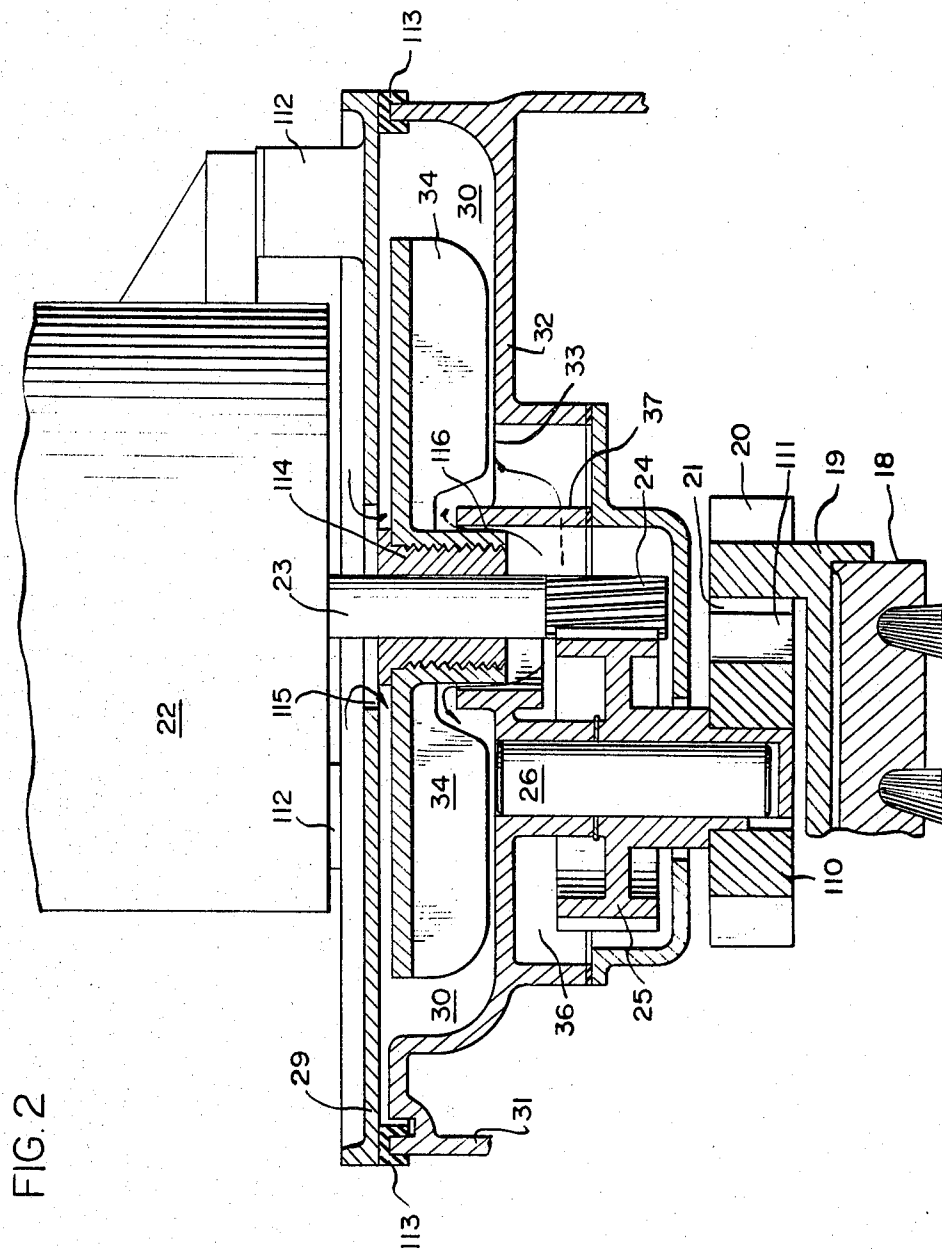
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FLOOR SCRUBBER SHAFT SEAL

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1 Claim

ABSTRACT OF THE DISCLOSURE

A floor cleaning apparatus for drawing and receiving liquid from a floor surface that has a receptacle in the apparatus above the floor for receiving liquid, an energizable pump such as an electric motor operated pump for drawing the liquid up by suction and forcing it above the pump into the receptacle with a sump means in the liquid conduit upstream from the entrance thereto in order to collect liquid from this conduit on deenergizing the pump to prevent the liquid back-flowing onto the floor, and such an apparatus where small air vent gaps are provided around the rotatable portion of the pump to replace the ordinary fluid seals and to provide electric insulation.

CROSS REFERENCES TO RELATED DISCLOSURES

Further structural details of the apparatus of this invention are disclosed in greater detail in the following copending applications assigned to the assignee of this application:

Pauler et al. Ser. No. 504,546, filed Oct. 24, 1965 (now Patent No. 3,344,455) which, relates to the motor drive for the brushes,

D. G. Koland Ser. No. 637,177, filed May 9, 1967, which relates to the flow control means for controlling the flow of liquids from the apparatus onto the floor, and

Schmitz et al. Ser. No. 637,178, filed May 9, 1967; which relates to the liquid flow means generally for flowing liquid from a combination floor scrubber and polisher to the floor and for removing cleaning liquid from the floor.

SUMMARY OF THE INVENTION

This invention relates particularly to a floor cleaning apparatus for drawing and receiving liquid from a floor surface after it has been supplied to the surface as from the apparatus itself with the apparatus of this invention comprising a receptacle in the apparatus above the floor for receiving the liquid, liquid conduit means having an entrance adjacent the floor and emptying into the receptacle for conveying liquid from the floor to the receptacle and energizable pump means in the conduit between the conduit entrance and the receptacle for drawing fluid into the entrance and forcing the liquid through the conduit into the receptacle together with sump means in the conduit upstream from the entrance thereto for collecting liquid from the conduit means on deenergizing of the pump means to prevent the liquid flowing back by gravity onto the floor. The invention also provides air gap vent means for venting air into a housing for the pump adjacent a rotatable shaft and impeller mounted on the shaft in order to provide electrical insulation and to avoid the necessity of having fluid tight seals such as the usual packing.

One embodiment of the invention is disclosed in the accompanying drawing of which:

FIGURE 1 is a shortened sectional view through an apparatus embodying the invention taken from front to back thereof.

FIGURE 2 is an enlarged sectional fragmentary view taken at right angles to the section of FIGURE 1 and lying substantially on the axis of motor shaft 23 of FIGURE 1.

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The floor cleaning apparatus, specifically disclosed as a combination floor scrubber and polisher apparatus in the accompanying drawings, comprises a housing 16 having a maneuvering bail 13 as described in detail in the above Schmitz et al. application.

Located within the housing 16 are a pair of rotatable brushes 17 that are circular and arranged side-by-side. The brush bases 18 are each releasably held in a circular mounting 19 each of which is provided on its outer periphery with gear teeth 20 and on its inner periphery with gear teeth 21.

The brushes 17 are driven by an electric motor 22 located within the hood 15. The motor 22 rotates a motor shaft 23 which has an outer helical gear area 24. The gear 24 drives a circular helical gear 25 mounted on a pinion shaft 26 for rotation therewith. Keyed to the pinion shaft 26 is a spur gear 110 which engages the inner teeth 21 of one brush mounting 19. The outer teeth 20 of each brush mounting are inter-engaged so the brushes 17 are driven in opposite directions as explained in greater detail in the above-mentioned Pauler et al. copending application.

The motor 22 is mounted on brackets 112 on a cover 29 for a pump or fan chamber 30 with the cover 29 being supported on a base 31 and sealed thereto by a gasket 113. The top of the fan chamber 30 as shown in FIGURE 2 is defined by the cover 29 and the bottom of the chamber is defined by a wall 32 to define a pump housing. The wall 32 is provided with a fan inlet opening 33 to the pump impeller or fan 34 that is within the chamber 30. The fan 34 is mounted on the motor shaft 23 for rotation therewith and the inlet 33 surrounds the shaft 23 adjacent the hub 114 of the fan 34.

The fan inlet 33 has a bottom cover 35 spaced downwardly therefrom to define a chamber 36 which acts as a liquid collecting sump as explained in detail hereinafter. The gear area 24 of the motor shaft 23 and the helical gears 25 for driving the pair of brushes are located within a cover 37 adjacent the fan inlet opening 33.

Located at one side of the pair of brushes 17 and within the housing 16 is a vertically movable floor contacting nozzle means that is illustrated as a squeegee nozzle 38. This nozzle 38 has a bottom flexible blade 39 for contact with the floor and it is preferably made of rubber. The blade 39 has an interior opening 40 and is held in a rigid hollow housing 41. The nozzle 38 is supported when in contact with the floor or in lowered position as shown in FIGURE 1 by end supporting wheels 42.

The upper end of the nozzle housing 41 or the end opposite the bottom blade 39 is connected to an extensible and retractable bellows tube 43 whose upper end is attached to the fan inlet cover 35 to communicate with the sump chamber 36. In FIGURE 1 the nozzle 38 is shown in lowered floor engaging position. It may be raised from the floor by a lever (not shown) such as a foot pedal which raises a lift rod 44. The lift rod 44 raises the nozzle 38 by means of a lift bracket 45.

The nozzle 38 is the floor contracting part of a fluid moving suction means that comprises the rotary impeller or fan 34, the fan chamber 30 functioning as a pump housing in which the fan (pump impeller) is located and having an inlet 33, sump chamber 36, the bellows tube 43 and the nozzle 38. This fluid moving suction means which has its entrance at the nozzle 38 has a pump outlet 46 that connects to a tube 47 which is arranged vertically within the hood 15. Liquid forced up the vertical tube 47 discharges out the top of a tube 61 at the top of a liquid receptacle or container means 51 having a liquid tight base 50.

Extending downwardly from the inner surface of the top of the receptacle 51 is a curved barrier wall 62 that has its bottom below the top of the short top tube 61.

Wall 62 changes the direction of air-water flow thereby separating the water 100 from the air.

Within the container or receptacle 51 is a downwardly inclined baffle 63 that extends across the upper part of the receptacle 51 from side-to-side thereof but with a bottom 64 spaced from the receptacle wall. This downwardly inclined baffle extends from the ledge 59 and is beneath the upper end of the tube 61 and the barrier 62.

At the top of the receptacle 51 and at the front thereof opposite the short upper tube 61 there are provided fluid outlet means in the form of a plurality of openings 65 that are above the inclined baffle 63. A vertical barrier wall 65a prevents direct flow of air across the top of container 51.

Located within the receptacle 51 of this embodiment is a source of cleaning liquid such as an aqueous detergent solution and a source of polish liquid. As these and their controls are the subject of the above-mentioned Koland application they will not be described in detail here. However, each of the pair of liquids is contained in a separate collapsible bag one of which is illustrated diagrammatically at 66 with the flow from each of the two bags being controlled by a spring valve 68 for the cleaning liquid and a spring valve 67 for the polish liquid. Each valve is adapted to be selectively opened by a longitudinally movable vertical control rod 69 that has a bottom valve engaging projection 70 on its lower end that is adapted to be moved beneath either of the valves 67 or 68 on rotation of the control rod 69 about its vertical longitudinal axis. Then, when the rod 69 is raised against the urging of a retracting spring 71 the particular valve 67 or 68 which overlies the projection 70 is opened.

The control rod 69 is positioned within an upwardly extending hollow handle 72 that is provided at its upper end with a hand grip 73.

The handle 72 is attached by means of screws 74 to a bracket 75 which in turn is mounted on the bail 13 by means such as rivets 74a. The lower end projection 70 on the control rod 69 extends forwardly through an opening 76 in this bracket 75.

The control rod 69 is guided in its vertical longitudinal movement by guide brackets 77. The upper end 78 of the rod 69 extends through the front of the handle 72 by way of an opening 79 in a hand operated pivot lever 80. This lever 80 has an upper operating part 81 adjacent the hand grip 73 so that the lever can be pivoted in a clockwise direction from the position shown in FIGURE 1 about its pivot point 82.

The outer end of the projecting part 78 of the rod 69 is provided with a knob 83 which may be grasped to move the projecting end 70 of the lever beneath either valve 67 or 68 to disperse the corresponding floor treating liquid, as described.

At the rear of the upper end of the handle 72 there is located a speed control switch 86 held within a switch housing 87. This switch 86 is operated by a control knob 88 at the front of the handle 72 so that the motor 22 and thus the fan or pump 34 and brushes 17 can be energized and rotated at any of a plurality of preselected speeds desired. Extending from the top of the switch housing 87 is an electric cord 89 which is adapted to lead to a power source such as an electric outlet while from the bottom of the housing 87 there is an electric cord 90 leading to the motor 22.

Each of the spring valves 67 and 68 when opened provides for liquid flow therethrough into a liquid dispenser tube 92 as described more fully in the above Koland application. This tube 92 comprises a common liquid conduit from both the above-mentioned sources of liquid and empties into a first trough 93 that is integral with the base 31. This first trough 93 empties through an aperture 94 into the center part of a second trough 96, all as described in detail in the above Schmitz et al. application.

The container 51 is releasably held on the handle 72 by means of a latch 99.

The operation of the apparatus is as follows. With the nozzle 38 in raised position from the position shown in FIGURE 1 or out of contact with the floor the motor 22 is energized at the desired speed by the control knob 88. The rotation of the motor rotates the pair of brushes 17 in opposite directions. The control rod 69 is raised from its position shown in the drawings against the urging of the spring 71 by rotating level 80 about its pivot point 82 in a clockwise direction (FIGURE 1) by thumb pressure on the operating portion 81 of this lever.

This opens the valve 68 so that cleaning liquid flows from its collapsible container illustrated by the container 66 through the dispenser tube 92 and through the troughs 93 and 96 to within the confines of the brushes 17. The combination of the cleaning liquid and the rotating brushes serves to clean the floor.

At the conclusion of the cleaning operation the nozzle 38 is lowered to the position shown where it is in contact with the wet floor. The pump 34 which during this time has been rotated by the rotating motor 22 so as to set up a suction through the nozzle 38 draws cleaning liquid from the floor through the nozzle opening 40, the bellows tube 43, the liquid collecting sump 36, the fan inlet opening 33 and the fan chamber or pump housing 30 into the outlet tube 47 by way of the outlet 46 to which the bottom end of this tube is connected. From the upper end of the outlet tube 47 the rotating fan 34 forces the mixture of soiled cleaning liquid and air up through the upper tube 61. From the top of this tube 61 the cleaning liquid overflows to fall onto the top surface of the inclined baffle 63 as indicated by the liquid droplets 100. In the meantime the air is separated from the overflowing liquid 100 and escapes into the atmosphere by way of the fluid openings 65.

When the cleaning liquid in the container 51 which of course surrounds the two collapsible bags 66 reaches a desired level it may be removed from the container as by tilting the container and pouring the liquid out the openings 65.

The motor 22 when energized after the cleaning liquid has been applied to the floor and the nozzle 38 lowered into the floor contacting position of FIGURE 1 serves to create a vacuum in the pump chamber 30 by rotation of the fan or pump impeller 34. Under the forces of this vacuum the liquid is drawn up through the nozzle 38 and bellows tube 43 into and through the sump 36. From here the suction draws the liquid through the pump inlet 33 and forces it from the chamber 30 up the tube 47 and the remainder of the conduit to overflow the top tube 61 as previously described and as indicated by the drops 100 so that the liquid is caught in the receptacle 51.

When the motor 22 and thus the pump is de-energized the liquid remaining in the conduit system would tend to reverse flow by gravity back onto the floor. In order to prevent this the sump 36 is provided. With this sump the backflowing liquid is retained therein and any liquid remaining in the sump at the beginning of the next operation when the pump is again energized is collected in the receptacle 51 as described.

The motor and pump shaft 23 which extend through the opposite walls 29 and 32 of the pump would ordinarily have to be sealed in order to avoid loss of liquid. The structure of this invention avoids the necessity of such seals, however, as it provides air gap vents illustrated at 115 and 116 around the rotatable part of the pump with these air gaps thereby providing both electrical insulation and avoiding the use of seals such as the customary packing. As can be seen in FIGURE 2, each of the air gaps 115 and 116 is annular with the top gap 115 being between the pump hub 114 and the top pump wall or cover 29. The bottom air gap vent 116 is also between this hub 114 and the cover 37 for the gears 24 and 25. This spacing 115 and 116 is identified as air gap vent means to indicate that these air gaps are quite small compared to the liquid flow passage into, through and out

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of the pump in order that the efficiency of the pump will not be materially reduced.

In the preferred apparatus as illustrated in the drawings the sump 36 is adjacent the inlet 40 to the liquid passage. It is of course also located adjacent the inlet 33 to the pump 34. It is therefore positioned between the entrance 40 to the liquid conduit system and the pump.

The embodiment of the invention in which an exclusive property or privilege is claimed is defined as follows:

We claim:

1. A floor cleaning apparatus for drawing and receiving liquid from a floor surface, comprising: a receptacle in said apparatus above said floor for receiving said liquid; liquid conduit means having an entrance adjacent said floor and emptying into said receptacle for conveying liquid from said floor to said receptacle; energizable fluid moving pump means in said conduit means between said entrance and said receptacle for drawing fluid in said entrance and forcing said fluid through said conduit means into said receptacle, said pump means comprising a pump housing having an inlet and an outlet; a motor shaft extending into said housing; an impeller on said shaft within said housing; sump means in said conduit means downstream from said entrance for collecting liquid from said conduit means on deenergizing of said pump means

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to prevent the liquid flowing back to the floor; and air gap vent means for venting air into said housing adjacent said shaft and impeller, the vent means separating said housing and shaft, said air gap vent means comprising a top air vent surrounding said shaft above the sump and a bottom air vent also surrounding said shaft and extending to above the top of said sump to prevent water leaking into said bottom air vent.

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