Sept. 24, 1968 D. D. SCHAEFFER 3,402,420

CARPET CLEANING DEVICE

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FIG. 1.

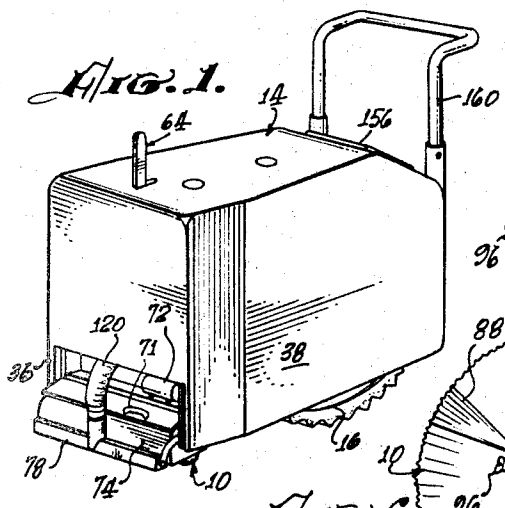


FIG. 5.

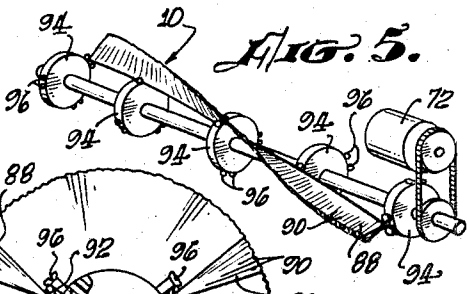


FIG. 6.

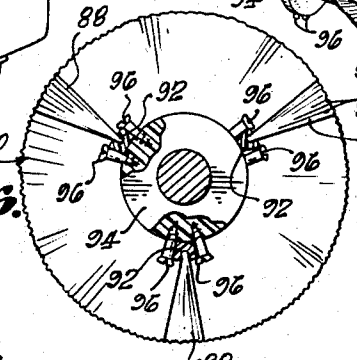


FIG. 2.

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FIG. 3.

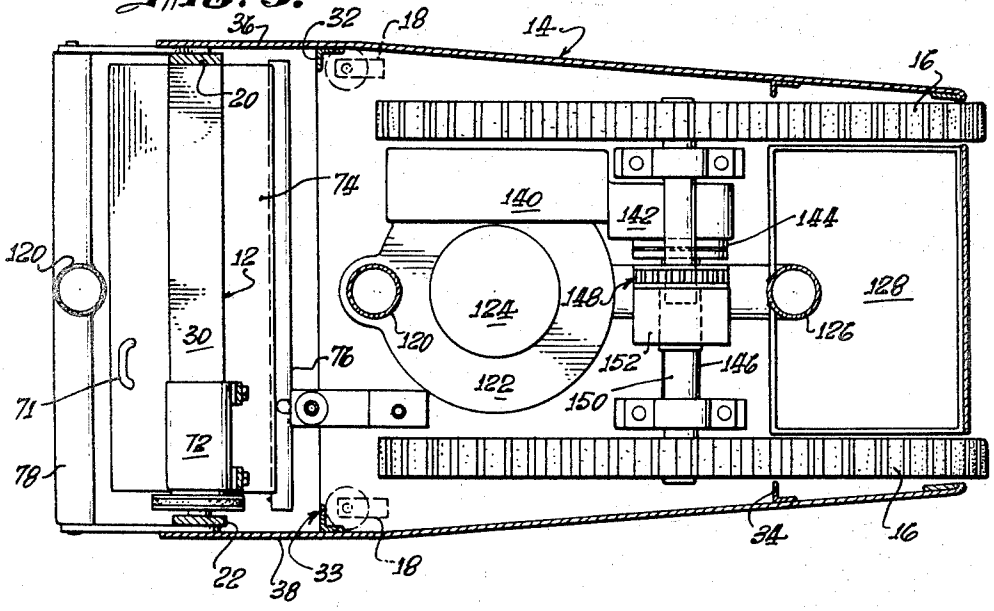


FIG. 4.

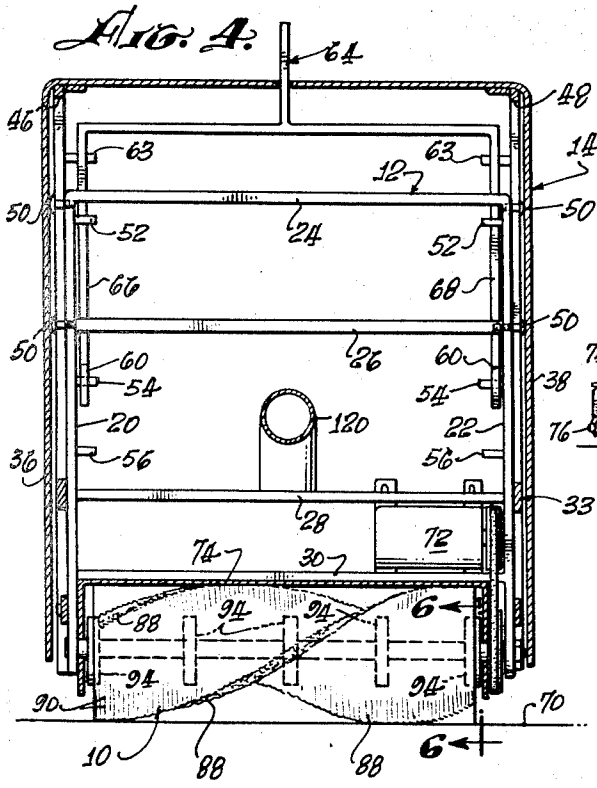
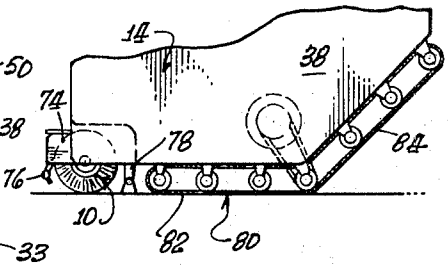


FIG. 7.



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CARPET CLEANING DEVICE

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ABSTRACT OF THE DISCLOSURE

A carpet cleaning machine including nozzle means and a suction head on opposite sides of a horizontally disposed brush mounted for up and down movement in a main frame supported on a unique transport means.

This invention relates to an improvement in carpet cleaning machines and more particularly is concerned with a carpet cleaning machine especially suitable for cleaning carpets and the like without an excessive amount of moisture and with a minimum removal of nap and no apparent depression of the carpet pile.

Automatic cleaning machines have been proposed heretofore and are of two general types. The more conventional machine has employed a disc-like brush powered by a vertical drive and having vertical bristles. Typically, the brush is located so as to transmit a substantial portion of the weight of the cleaning device to the underlying carpet with the result that the carpet pile is compressed and as a result excessively large amounts of nap are frequently removed from the carpet in the operation of the heavy machine. The second general type of cleaning machine employs a cylindrical horizontally-disposed brush. Frequently, the cleaning machine of this type will be propelled through power supplied by rotation of the brush; that is, the brush serves not only to clean the carpet being traversed but also acts as a sole or principal means of propelling the device over the floor. Here, as in the other version, the brush is not free to move in a vertical direction independently of the machine proper and will under the weight of the device tend to depress the carpet pile.

It is an object of the invention to provide an improved carpet cleaning machine which operates without depression of the carpet pile.

It is a further object of the invention to provide a carpet cleaning machine which may be used with minimum removal of carpet nap.

It is a still further object of the invention to provide a carpet cleaning device which cleans without an undue amount of moisture and which may be successfully operated by an unskilled person.

It is a further object of the invention to provide a carpet shampooing machine characterized by a relatively simple structure and which is adapted to apply a cleaning mixture to a carpet and to remove dirt and grime therefrom.

It is a further object of the invention to provide a carpet cleaning device which will lay the nap of the carpet in one direction.

It is a still further object of the invention to provide an improved carpet cleaning device adapted to clean stair carpeting.

It is a further object of the invention to provide a carpet cleaning device utilizing a free floating brush arrangement which is self-adjusting to the height of the carpet pile.

These and other objects and advantages of the cleaning device of the invention will become more apparent in view of the following description and drawings wherein:

FIG. 1 is a perspective view of the carpet cleaning device of the invention;

FIG. 2 is a longitudinal sectional view of the cleaning device of FIG. 1;

FIG. 3 is a cross-sectional view taken along line 3—3 of FIG. 2;

FIG. 4 is a vertical sectional view taken along line 4—4 of FIG. 2;

FIG. 5 is a perspective view of the brush of the device of FIGS. 1–4 with a portion of its components removed;

FIG. 6 is a cross-sectional view of the brush element of the cleaning device of the invention; and

FIG. 7 is a fragmentary side elevational view of still another embodiment of the device of the invention employing a different propulsion means.

A preferred embodiment of the cleaning device of the invention is illustrated in the drawings and as best seen in the sectional views of FIGS. 2, 3, and 4, includes an elongated, cylindrical, horizontally-disposed brush **10** which is rotatably journalled at the lower end of a vertically movable brush frame assembly **12** which is located at the forward end of the device within an outer readily removable shell **14**. The weight of the carpet cleaning device is carried by a transport means, here exemplified as including two oversize wheels **16** which are partially enclosed within the shell **14** and two spaced casters **18** which are swiveled to the underside of the device. The wheels **16** and casters **18** support the cleaning machine and the brush **10** which is substantially free-floating to adjust to the height of the carpet pile.

The brush-carrying frame assembly **12** is generally rectangular as best seen in FIG. 4 and comprises two vertically-extending side members **20** and **22** which are connected by four horizontally-extending, vertically-spaced, cross members **24**, **26**, **28**, and **30**. The brush frame assembly **12** is slidably held to two spaced upright guides shown as skirt support members **32** and **34** which are closely spaced to the respective longitudinal sides **36** and **38** of the shell **14**. The skirt support members **32** and **34** are integral structural members of the main frame **33** of the carpet cleaning machine. The skirt support members **32** and **34** have narrow elongated vertical slots **46** and **48** which are sized to receive retaining pins **50** which are fixed to the outer faces of the vertically-extending side members **20** and **22** of the brush frame assembly **12**, thus providing an arrangement which permits vertical movement of the brush frame assembly and the brush carried thereby.

In the particular embodiment illustrated, the brush **10** and its supporting frame assembly **12** may be positioned in any one of three positions and in each position vertical movement of the brush frame assembly and brush above the selected position is provided for, to permit adjustment to the height of the carpet pile. In the particular embodiment illustrated each of the vertical side members **20** and **22** of the frame assembly **12** carriese on its inner face three inwardly extending latch engaging pins **52**, **54**, and **56**. The latch engaging pins are disposed to cooperate with a notch element or hook **60** carried at the lower end of a latch lever **64**. The latch lever **64** is bifurcated (FIG. 4) to provide a yoke having two downwardly extending arms **66** and **68** each of which carries a notch element **60** at its lower end for receiving the respective latch engaging pins.

The arms **66** and **68** of the latch lever **64** at their upper ends are pivotally held about pivot pins **63** to the respective skirt support members **32** and **34** of the cleaning machine. It will be seen that the upper end of the latch lever **64** is fastened to a spring **65** which urges the notch elements **60** of the latch lever arms **66** and **68** against their respective latch engaging pins. In order to

unlock the frame assembly 12 in preparation for a change in brush position, a handle 71 is lifted upwardly to move the frame assembly 12 clear of the notch elements 60 of the arms 66 and 68 of the latch lever 64 at which time the upper end of the latch lever 64 is moved to overcome the tension of spring 65.

The frame assembly 12 is illustrated in the drawings in its first position wherein the horizontally disposed cleaning brush 10 engages the carpet 70 on a flat floor. In the latter carpet engaging first position, it will be seen that the latch engaging pins 54 of the vertically-extending side members 20 and 22 of the frame assembly 12 rest in the notch elements 60 of the respective latch lever arms 66 and 68. The frame assembly and brush may be moved upwardly away from the carpet 70 by grasping and lifting the handle 71 into a second elevated position wherein the lower latch receiving pins 56 reset in the respective notch elements 60 of the latch lever arms 66 and 68. In the particular embodiment of the carpet cleaning device of the invention illustrated, the frame assembly 12 may assume a third position wherein the upper latch engaging pins 52 rest in the respective notch elements 60 of the latch lever arms 66 and 68. With the third position it is possible to clean the carpet covering a stair step while the cleaning device of the invention is being moved downwardly of the steps. The brush will follow the contour or profile of the stair under the influence of gravity. It will be noted that in all three positions the frame assembly 12 and brush 10 are free to float or move vertically which permits the brush to adjust to the height of the carpet pile. This is a special feature of the machine of the invention and assures that there will be minimum depression of the carpet pile with the operation of the device. In some embodiments, depending on the weight of the brush frame assembly 12, it may be desirable to provide a tension or compression spring between the brush frame assembly 12 and the main frame 33 of the machine.

The movable brush frame assembly 12 in addition to the brush 10 supports several other components including a motor 72 held by suitable brackets to the cross members 28 and 30, a downwardly opening hood 74, a nozzle means 76, and a suction head 78. The hood 74 encloses the brush 10 and carries on its outside front surface the aforementioned handle 71 which is used for movement of the frame assembly and brush into the several positions of the machine. The nozzle means 76 is disposed in front of the cylindrical brush 10 and serves to direct a cleaning solution in a longitudinal pattern onto the surface of the carpet immediately adjacent the length of the brush. The nozzle means 76 may take various forms and may be made up of several separate jet heads connected through a manifold to a supply line or alternatively may be an elongated head provided with many ports along its length. The particular suction head 78 illustrated has an elongated opening for collecting dirt and liquid from the surface of the carpet being cleaned. With the nozzle means 76 and suction head 78 located as illustrated in the drawings, the device when in operation will move in the direction of the large oversize wheels. It will be appreciated that the nozzle means and suction head may be interchanged as shown in the alternative embodiment of FIG. 7.

In the alternative embodiment of FIG. 7, the carpet cleaning machine is mounted on two spaced endless tracks 80 which respectively have a floor engaging length 82 on the underside and a stair climbing length 84 disposed at an obtuse angle to the floor engaging length. Each stair climbing length 84 has a vertical rise substantially larger than the rise of a conventional stair step. Typically, the vertical rise of the stair climbing length 84 will be within the range of 10 to 15 inches. The diameter of the oversize wheels 16 of the embodiment of FIGS. 1–6 will generally be within the range of 12 to 36 inches. The oversize wheels 16 of FIGS. 1 and 2 are serrated or notched to provide carpet traction and to facilitate stair climbing and desirably the notches have an opening in the range of 90° to 110°, preferably an angle of 100°. The wheels 16 are powered and because of their large size and notches, the machine is capable of climbing stairs. In forward climbing of the machine, handle 160 is pushed downwardly to elevate the front of the machine and to permit the wheels 16 to reach the stairs. It will be seen in rearward climbing, the wheels 16 are exposed to the staircase and the machine need not be tilted.

As best seen in FIG. 6 the brush 10 is provided with three spaced, helically extending rows or strands 88 of bristles 90. The bristles 90 are mounted or held in a backing member 92 which is secured to a plurality of spaced disc members 94 (FIGS. 4 and 5) of the brush 10 by several retaining screws 96. The helical bristle strands minimize carpet-brush friction and lifts the nap in a uniform manner, preventing unsightly rifts in carpet nap.

The mechanism for producing the water solution supplied to the nozzle means 76 is shown in one form in FIG. 2 where there is seen a water tank 100 from which water is drawn via line 101 to the inlet of a water pump 103. From the water pump 103 water is passed via line 105 and valve 106 to a heater 108. Downstream of the heater 108 a liquid detergent or shampoo solution will normally be introduced along with heated water to a mixing chamber 110. In some instances, heated rinse water or steam only will be supplied to the nozzle means 76 and in which case valve 116 from the shampoo tank will be closed. The shampoo is stored in a tank 112 from which it flows to the inlet of a pump 114. The shampoo is delivered by the pump 114 through a line 115 and valve 116 to the aforementioned mixing chamber 110. From the latter chamber 110, the cleaning mixture which will in most instances be made up in a large part of steam is delivered via supply line 118 to the nozzle head 76. Steam is far superior to hot water for carpet cleaning and will disintegrate and remove residue which water will not touch. The provision of the separate rinse described above is a particularly desirable feature as it permits the use of strong chemicals and their rapid removal.

The cleaning brush 10 is rotated at its point of contact with the carpet in an opposite direction to direction of travel of the cleaning device, that is, with the cleaning machining moving to the right of FIG. 2, the brush will rotate in a counterclockwise direction.

The dirt and grime removed from the carpet by the suction head 78 are transferred via a flexible conduit 120 to the inlet of a vacuum pump 122 driven by a motor 124. From the outlet of the vacuum pump the stream, made up of expended cleaning compounds and dirt, passes by a conduit 126 to the inlet of a receiving tank 128 where the entering stream engages a series of baffles 130. The receiving tank is periodically drained of its content through a large dumping valve 134 at the bottom thereof.

The carpet cleaning machine of the invention is self propelled with the oversize wheels 16 being powered by a drive motor 140 through a gear box 142 (FIG. 3), a magnetic clutch 144, a lower shaft 146, a chain transmission 148, a differential 152, and an upper shaft 150. A control panel 156 is provided on a sloping upper surface of the carpet cleaning machine. The latter panel is provided with suitable circuitry for operation of the several motors and valves in a conventional fashion.

The shell 14 is designed for ready removal from the main frame 33 of the machine to facilitate maintenance. The handle 160 is held by a quick release mechanism 162 to the machine.

Although exemplary embodiments of the invention have been disclosed herein for purposes of illustration, it will be understood that various changes, modifications, and substitutions may be incorporated in such embodiments without departing from the spirit of the invention as defined by the claims which follow.

What is claimed is:

1. In a self-propelled carpet cleaning machine, the combination of:

a main frame;

a transport means engaging the carpet to be cleaned and supporting said main frame thereabove for movement therealong, said main frame supporting a drive motor, there being a drive means connecting said drive motor to said transport means;

a frame assembly having an elongated cylindrical horizontally-disposed rotatable brush journalled at its lower end adapted to engage the carpet, there being means for rotating said brush;

means for mounting said frame assembly for vertical movement in said main frame to accommodate variations in carpet surfaces engaged by said brush;

nozzle means disposed adjacent the cylindrical brush and extending longitudinally thereof for delivering a cleaning fluid to the surface of the carpet immediately adjacent the length of the brush to be scrubbed into the carpet by the rotation of the brush; and

a suction head located adjacent and disposed longitudinally of the brush near the surface of the carpet, said suction head providing an opening for collecting dirt and liquid from the surface being cleaned,

said suction head and nozzle means being located on opposite longitudinal sides of said brush and being supported by said frame assembly to move up and down therewith.

2. A carpet cleaning machine in accordance with claim 1 in which said means for mounting said frame assembly for vertical movement in said main frame includes upright guides carried by said main frame, said frame assembly being an upright frame assembly movable along said upright guides, and means stopping said frame assembly at selected elevations against further downward movement of said frame assembly and said brush while permitting upward free-floating movement of said frame assembly above each stop position.

3. A carpet cleaning machine in accordance with claim 2 in which the free-floating movement of said frame assembly is under the influence of gravity tending to move said frame assembly and said brush downwardly of said main frame, and in which said stop means includes means for stopping said frame assembly in a stair-cleaning position in which said frame assembly disposes said brush a substantial distance below said main frame, the brush and the frame assembly dropping from stair step to stair step to follow the contour of the steps as the machine is moved downwardly of the steps to clean a carpet thereon.

4. A carpet cleaning means in accordance with claim 1 in which said main frame has a front portion overhanging the transport means, and in which said frame assembly is mounted for vertical movement in said front portion of said main frame, said main frame providing upright guides in such front portion, said frame assembly being an upright frame assembly movable along said upright guides.

5. A carpet cleaning machine in accordance with claim 1 including a downwardly-open hood mounted on said frame assembly to move therewith, said hood having depending walls extending longitudinally of said cylindrical brush but stopping short of the carpet, said depending walls being respectively adjacent said suction head and said nozzle means, one of said depending walls being between the corresponding suction head or nozzle means and said brush.

6. A carpet cleaning machine in accordance with claim 1 including a drive motor for said brush, means for mounting said drive motor on said frame assembly for vertical movement therewith, and means for interconnecting said drive motor and said brush to turn same independently of any movement of said traction means.

7. A carpet cleaning machine in accordance with claim 1 including a mixing chamber feeding said nozzle means, said main frame supporting a water tank and a pump forcing water therefrom to said mixing chamber, said main frame supporting a shampoo tank and a pump forcing shampoo therefrom into said mixing chamber, and including valve means controlling the supply of water and shampoo to said mixing chamber from the respective tanks.

8. A carpet cleaning machine in accordance with claim 1 in which said main frame includes a rear portion and a front portion extending forward from said rear portion above said suction head and said nozzle means, said transport means including two carpet-engaging extended-periphery stair-climbing drive treads, there being rotary means carried by said rear portion of said main frame supporting said drive treads to dispose the latter on opposite sides of said main frame exclusively in the area of said rear portion thereof, there being a clutch operatively connecting at least one of said drive treads to said drive motor.

9. A carpet cleaning machine in accordance with claim 8 in which said drive treads are narrow endless belts each having a floor-engaging length on the underside of the carpet cleaning machine opposite said rear portion of said main frame and engaging the carpet in a narrow longitudinal zone of extensive length.

10. A carpet cleaning machine in accordance with claim 9 in which each endless belt has also a stair-climbing length disposed at one end of the carpet cleaning machine and extending at an obtuse angle to the floor-engaging length, said stair-climbing length having a vertical rise substantially greater than the rise of a stair step, said vertical rise being within the range of about 10 to 15 inches.

11. A carpet cleaning machine in accordance with claim 8 in which said transport means includes also two relatively small wheels on opposite sides of said main frame engaging the carpet to be cleaned at a location between said brush and said drive treads.

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