United States Patent

Putt

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[54] **CARPET CLEANING APPARATUS**

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[52] **U.S. Cl.** **15/320**

[51] **Int. Cl.** **A47l 7/00**

[58] **Field of Search** ..... 15/320, 321, 322, 182, 49 C, 15/50 C

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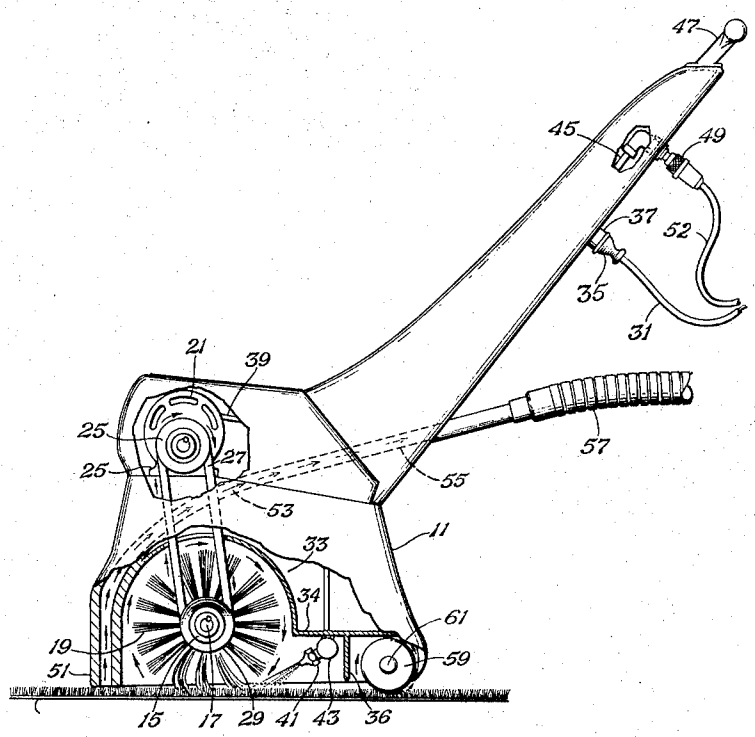
[57] **ABSTRACT**

Apparatus for cleaning floor surfaces, especially carpets, with a cylindrical brush, a plurality of fluid nozzles directed tangentially adjacent the brush near floor level, and a vacuum nozzle for retracting the fluid from the floor surface, all of which are arranged cooperatively to retract a surprisingly large percentage of the moisture from the floor surface.

15 Claims, 3 Drawing Figures



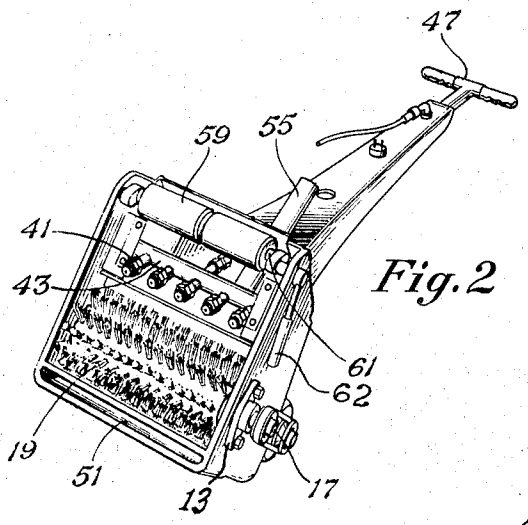


Fig. 2

Fig. 1

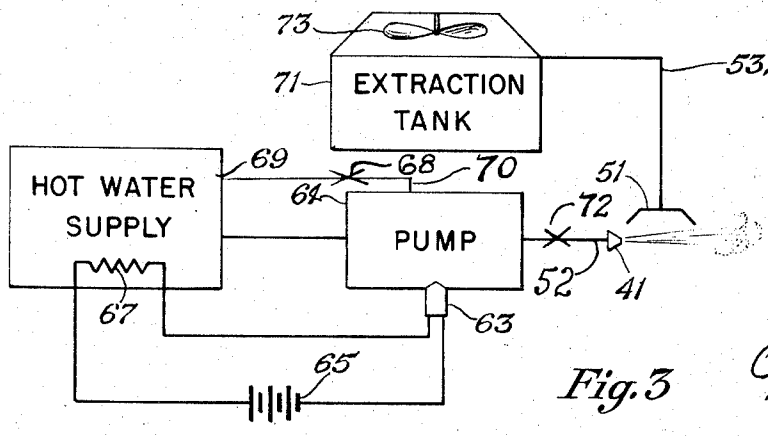


Fig. 3

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CARPET CLEANING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to floor cleaning apparatus in general, but in particular to apparatus utilizing hot water sprayed against the floor surface to be cleaned, the water thereafter being retracted with a suction nozzle and brush arrangement to an extraction tank.

2. Description of the Prior Art heating

It is known in the prior art to utilize nozzles for discharging hot water against the surface of a carpet, for example, to dislodge unwanted foreign material such as dirt. Commonly, the fluid and dirt are extracted by a suction nozzle. Hot water is generated in a heating tank that includes usually an electrical heating element, and is fed to the nozzles by a pump. Moreover, the extraction tank has a fan or other vacuum generation means in its upper surface and is connected to the vacuum nozzle on the floor unit by a flexible hose. Such devices have a number of significant disadvantages, including the difficulty in withdrawing sufficient amounts of moisture from the carpet to prevent a prolonged period of moisture and excessive shrinkage in some types of carpets. Also, complete dirt and soil extraction is not always effected even though the nozzle velocity of the fluid may be high.

SUMMARY OF THE INVENTION

This invention utilizes in addition to the fluid nozzles and vacuum nozzles, a brush mounted to a frame for rotation generally about a horizontal axis. It has been discovered that the use of a brush that is too small with bristles that are too stiff damages many types of carpet, but on the contrary, utilization of a large brush with long bristles may produce insufficient cleansing action. The brush should, therefore, have bristles in a range from one and one-half to five inches of a composition equivalent to polyester fiber. Moreover, the speed of rotation is correlated with the bristle size such that the rotational speed lies in the range from substantially 400 to 650 r.p.m. For the purpose of improving the suction, and therefore removing greater percentages of moisture from the carpets, the cleaning apparatus preferably has a peripheral construction extending substantially to the floor level to encompass the vacuum nozzle, the fluid nozzle and the brush. In addition, an inner shield is provided around the brush and the fluid nozzle to confine the movements of the fluid that entrains the foreign particles such that they are not spread over large areas of previously cleaned carpet.

The above and other objects and advantages of the invention will become more fully apparent in the following detailed description.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side elevation view, partially is section, illustrating carpet cleaning apparatus constructed in accordance with the principles of the invention;

FIG. 2 is a perspective view showing the apparatus in FIG. 1, principally from the bottom; and

FIG. 3 is a schematic diagram of a preferred fluid and electrical system for generating and extracting hot water from a carpet.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The numeral **11** in the drawing designates a frame, which in this instance is constructed of laminated fiber glass and epoxy to form the exterior of a portion of the carpet cleaning apparatus referred to as a cleaning head.

Mounted to the frame by bearings **13** (see FIG. **2**) is a cylindrical brush having an interior core **15** that preferably is constructed of wood or plastic such as polyurethane. A central shaft **17** extends through the frame and into communication with bearing means **13**.

Extending radially from the core **15** are a plurality of rows of polyester fibers that preferably have a diameter of 0.010 to 0.015 inches. Using bristles that are too short or too stiff has been discovered at excessive rotational speeds damages the fibers of many carpets. For this reason, the bristles of the brush should have a length in the range from one to five inches, with overall diameter of the brush being not less than about three inches. The speed of rotation of the brush should not exceed 650 r.p.m., and preferably is in a range from substantially 400 to 650 r.p.m. for optimum results.

As viewed in FIG. **1**, the rotation of the brush should be clockwise. For rotating the brush, an electric motor **21** is mounted to a suitable support **23** and drives a pulley **25** and v-belt **27** connected with a pulley **29** carried by the shaft **17** inside the core **15** of the brush. An electrical cable **31** having a removable plug **25** engaging a socket **37** carried by the frame **11** supplies electric energy to the motor **21** through an interior conductor cable **39**.

A plurality of fluid nozzles **41** are carried by the frame **11**, being attached in a parallel row that is horizontal and defined by a hollow fluid conduit **43** that is in fluid communication with a conduit **45** extending upward and parallel to the handle **47** that extends obliquely and rearwardly from the apparatus. A quick disconnect coupling **49** connects a flexible hose **52** that introduces hot water to the apparatus, ultimately to the nozzles **41**. The outlets of the nozzles are substantially tangential to the brush near its engagement with the floor and faces in the direction of rotation of the brush. Preferably, the angle of the axis of the nozzle with the floor surface is approximately 45°. The discharge from the nozzle engages the intersection of the brush and the floor surface as shown in FIG. **1**.

An inner shell **33** extends across the width of the interior of the frame **11** and encompasses the brush with a section of a cylindrical form in addition to encompassing the nozzles **41** with a horizontal section **34** and a vertical section **36** to confine the flow pattern of foreign partical and fluid to prevent mixture with the clean fluid in the apparatus.

A vacuum nozzle **51** is formed interior of the frame **11** in a narrow passage extending across the width of the apparatus, but tapering gradually along an interior region **53** to a circular cross-sectional configuration **55** for connection with a flexible vacuum hose **57**. Thus, the vacuum nozzle is adjacent the floor surface on the side of the brush opposite the fluid nozzles **41** and retracts moisture and foreign material from the carpet as the apparatus is drawn backward by the handle **47**.

For the purpose of increasing the quantity and effectiveness of the vacuum generated through the nozzle **51**, the frame **11** comprises an exterior shell extending downward to define an exterior periphery at substantially floor level to cover the vacuum nozzle **51**, the brush and the fluid nozzles **41**. Ideally, the suction generated should be in a range from 6 to 9 inches of mercury, and the above described configuration of the frame and exterior shell often enables the generation of an additional vacuum of two inches of mercury while utilizing the same vacuum fan.

A roller **59**, preferably constructed of polyurethane plastic is supported on a horizontal shaft **61** connected with the frame **1**. The purpose of the roller is to support a portion of the weight of the apparatus, and preferably has adjustment levers **62** to vary its vertical position such that the spacing of the frame **11** to the floor may be conveniently varied.

As shown in FIG. **3** the nozzles **41** receive hot water from a pump **64** having an electrically controlled thermostat **63** that varies the energy output from an electric energy source **65** that energizes a heating element **67** disposed in a hot water supply or tank **69**. A valve **68** in a conduit **70** is opened to recirculate hot water back to the supply **69**, or alternatively, is closed and valve **72** connected with flexible hose **52** opened to supply hot water to nozzles **41**. The suction nozzle **51** is in fluid communication through the conduit **53**, **55** and **57** with an upper portion of an extraction tank **71** that supports in its upper region a fan **73** for generating the desired vacuum.

In operation water and a cleaning compound, if desired, are placed in the hot water supply tank **69**, and electrical energy supplied to the heating element **65** from the power source **67**. The thermostat **63** located inside the pump **64** communicates with hot water supplied by the pump to the fluid nozzles **41**, when valve **72** is opened. When the nozzles are inactive, valve **72** may be closed and valve **68** opened to recirculate water back to hot water supply **69**.

When valve **72** is opened, hot water discharges through nozzles **41** onto the carpet underneath the flexible fibers **19** of brush, which assist in urging water and dirt from the fibers of the carpet toward the vacuum nozzle **51**. From the vacuum nozzle water and dirt are urged into extraction tank **71**.

Best results are obtained by pulling the apparatus rearward such that the sequence of operation is: (1) laying down a stream of hot water, (2) brushing the hot water and dirt from the carpet, and (3) retracting with the vacuum the hot water and dirt from the vacinity of the floor.

It should be apparent to those skilled in the art that I have provided an invention having significant advantages. The combination of the brush, especially when utilizing the fiber geometry and construction previously discussed, with the fluid nozzles **41** and vacuum nozzle **51** produces an exceptional apparatus for effectively cleaning floor surfaces, especially carpets. Moreover, the utilization of the exterior frame as a peripheral shell extending to floor level increases the effectiveness of the system by enabling the generation of a larger vacuum with a given size fan. In addition, the utilization of an inner shelf that surrounds the brush and the fluid nozzles increases the cleaning effectiveness by preventing foreign particles and fluid from being spread indescriminately inside the apparatus.

While I have shown my invention in only one of its forms, it should be apparent to those skilled in the art that it is not so limited but is susceptible to various changes and modifications without departing from the spirit thereof.

What is claimed is:

1. Apparatus for cleaning floor surfaces, especially carpet, said apparatus comprising:

a. a frame having a handle extending generally obliquely therefrom;

b. a generally cylindrical brush with bristles mounted to the frame to engage the floor surface for rotation about a horizontal axis that is substantially perpendicular to said handle;

c. a plurality of fluid nozzles carried by the frame in a row parallel to said horizontal axis of the brush, and located on the side of the brush wherein its bristles rotate toward the floor surface as the brush rotates with the outlets of said nozzles positioned to spray fluid toward the floor surface near the engagement of the brush with the floor;

d. a vacuum nozzle carried by the frame to be positioned adjacent the floor surface and located on a side of the brush opposite said fluid nozzles for extracting fluid from the floor surface;

e. power means carried by the frame and connected with the brush for rotation thereof;

f. conduit means in fluid communication with the fluid nozzles for receiving and supplying pressurized fluid thereto;

g. means for supplying fluid under pressure to said conduit means for spraying fluid from said nozzles.

2. The apparatus defined by claim **1** which further comprises a roller connected with the frame and engaging the floor for supporting a portion of the weight of the apparatus.

3. The apparatus defined by claim **1** which said frame comprises an exterior shell extending downward to define an exterior periphery at substantially floor surface level to increase the suction of the vacuum nozzle.

4. The apparatus defined by claim **1** which further comprises an inner shield surrounding the brush and the fluid nozzles to confine fluid flow around the brush.

5. For use in cleaning floor surfaces, especially carpets, with apparatus that includes a hot water supply, a pump to transfer the hot water, and a vacuum means to retract the water, the combination of:

a. a frame;

b. a rotatable brush mounted to the frame to engage the floor surface while rotating about a substantially horizontal axis;

c. one or more fluid nozzles carried by the frame and located on the side of the brush wherein its bristles rotate toward the floor surface as the brush rotates, said fluid nozzles having outlets directed toward said brush and the floor surface for spraying hot fluid downward to the floor surface near the engagement of the brush with the floor surface;

d. a vacuum nozzle carried by the frame on a side of the brush opposite said fluid nozzles and positioned to extend adjacent the surface of the floor;

e. a portion of said frame extending downward in the form of a peripheral shell to substantially floor

level to enclose the fluid nozzles, the brush and the suction nozzles;

f. power means carried by the frame and connected with the brush for rotation thereof.

6. The apparatus defined by claim **5** which further comprises a roller connected with the frame and engaging the floor for supporting a portion of the weight of the apparatus.

7. The apparatus defined by claim **5** which further comprises an inner shield surrounding the brush and the fluid nozzles to confine water flow around the brush.

8. For use in cleaning floor surfaces, especially carpets, with apparatus that includes a hot water supply, a pump to transfer the hot water, and a vacuum means to retract the water, the combination of:

a. a frame;

b. a rotatable brush mounted to the frame to engage the floor while rotating about a substantially horizontal axis, the brush having a diameter of at least four inches, bristles at least one to five inches long and a composition equivalent to polyester fibers, the speed of rotation being in a range of substantially 400 to 650 r.p.m.;

c. fluid nozzles carried by the frame and located on the side of the brush wherein its bristles rotate toward the floor surface as the brush rotates, said fluid nozzles being directed to spray fluid toward the floor surface near the engagement of the brush with the floor surface;

d. a vacuum nozzle carried by the frame on a side of the brush opposite said fluid nozzles and positioned to extend adjacent the floor surface;

e. power means carried by the frame and connected with the brush for rotation thereof.

9. The apparatus defined by claim **8** which further comprises a roller connected with the frame and engaging the floor for supporting a portion of the weight of the apparatus.

10. The apparatus defined by claim **8** which said frame comprises an exterior shell extending downward to define an exterior periphery at substantially floor surface level to increase the suction of the vacuum nozzle.

11. The apparatus defined by claim **8** which further comprises an inner shield surrounding the brush and the fluid nozzles to confine water flow around the brush.

12. Apparatus for cleaning floor surfaces, especially carpets, comprising:

a frame having a front end and a handle extending from a back end thereof;

a brush mounted to engage the floor surface for rotation about a generally horizontal axis;

means carried by the frame for rotating said brush in a given direction relative to said frame;

a plurality of fluid nozzle means carried by the frame generally parallel to the axis of rotation of said brush and located on the back side of the brush wherein the brush bristles rotate toward the floor surface as the brush rotates;

said fluid nozzle mans having outlets positioned to direct fluid toward the floor surface near the engagement of the brush with the floor surface;

a vacuum nozzle fixedly carried by the frame on the front side of the brush opposite said fluid nozzle means and positioned to be located adjacent the floor surface for extracting fluid from the floor surface.

13. The apparatus of claim **12** comprising:

means for supplying fluid under pressure to said fluid nozzle means for spraying fluid toward the floor surface near the engagement of the brush with the floor surface, and

vacuum means for extracting fluid from the floor surface by way of said vacuum nozzle.

14. The apparatus of claim **13** wherein:

said frame comprises an exterior shell extending downward to define an exterior periphery to substantially floor surface level to increase the suction of said vacuum nozzle.

15. The apparatus of claim **14** comprising:

an inner shield surrounding said brush and said fluid nozzle means to confine fluid flow around said brush.

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