

Oct. 20, 1964

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3,153,251

SURFACE TREATING MACHINE

Original Filed Oct. 4, 1960

4 Sheets-Sheet 1

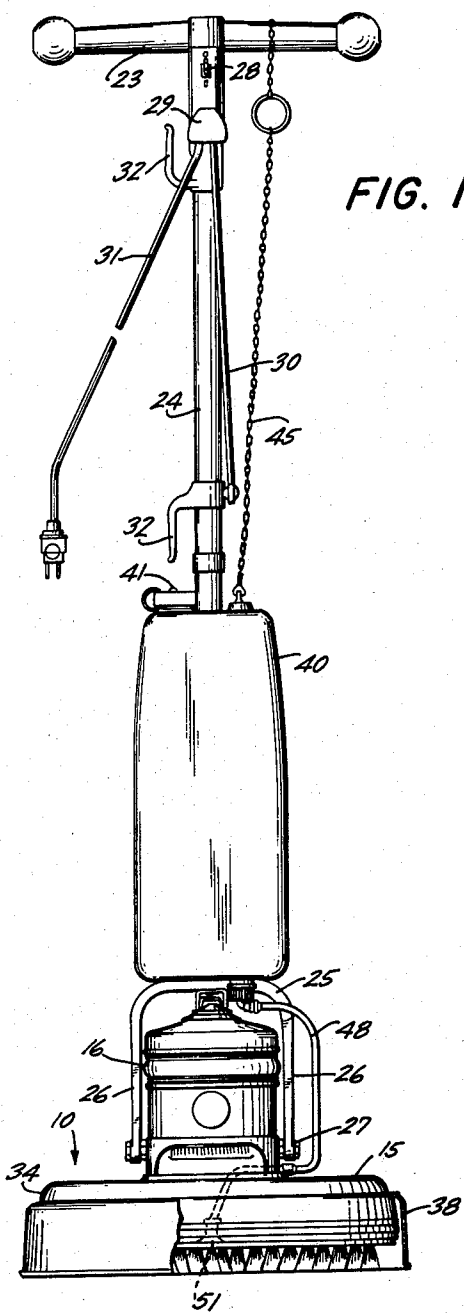


FIG. 1

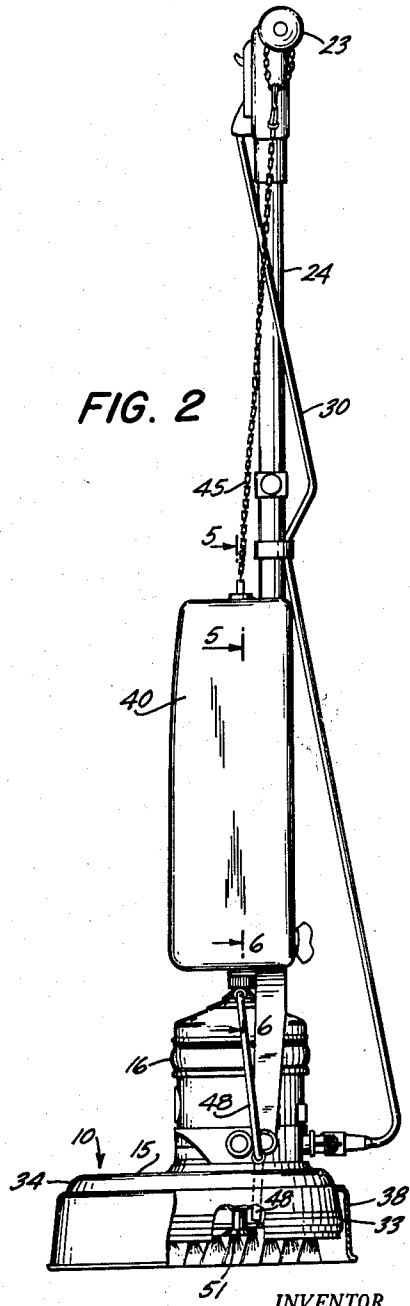


FIG. 2

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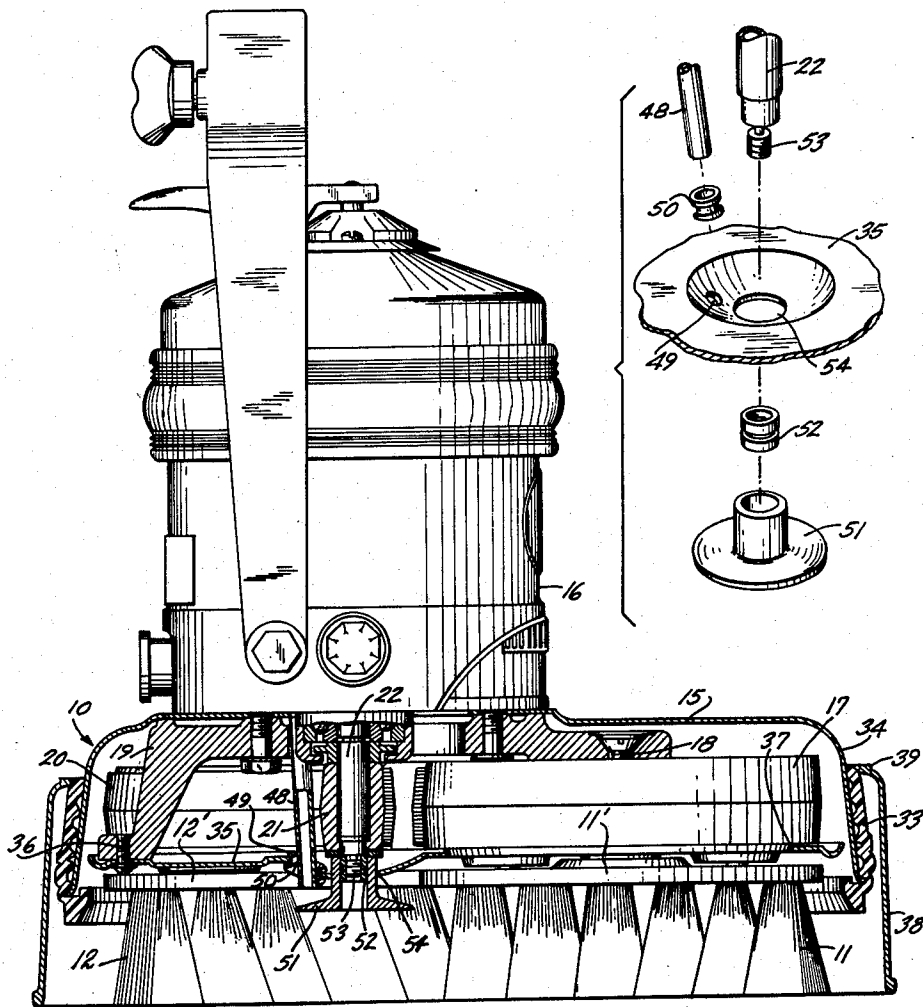
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FIG. 3

FIG. 7



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FIG. 4

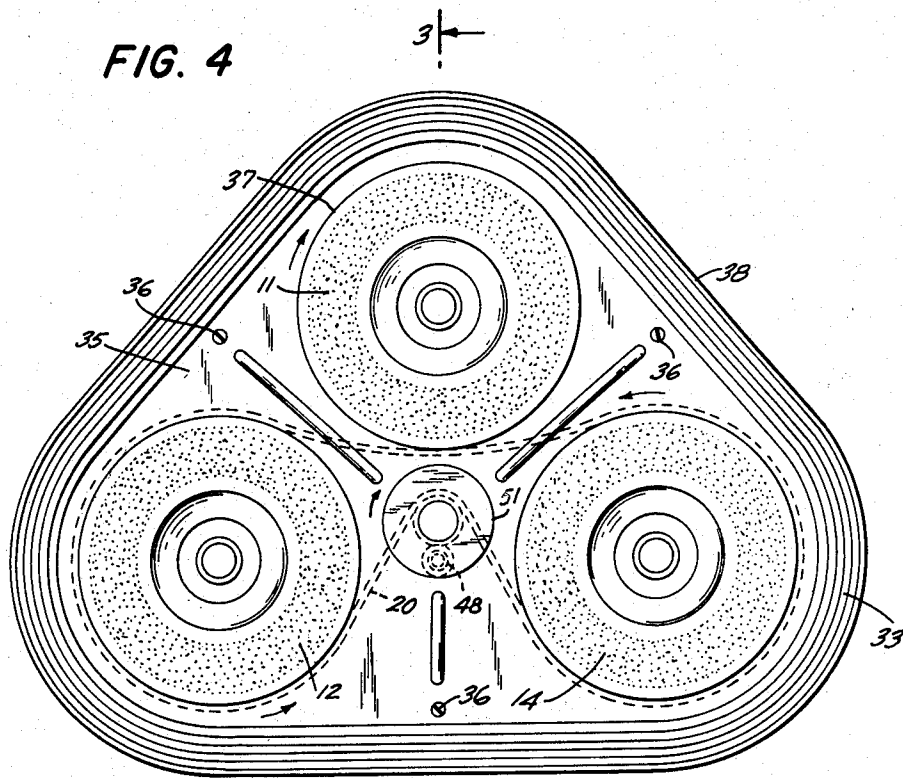


FIG. 5

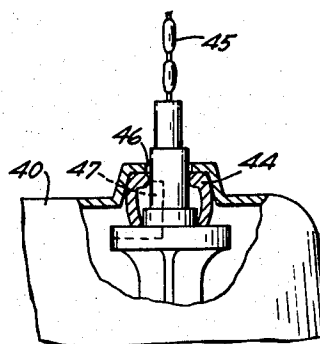
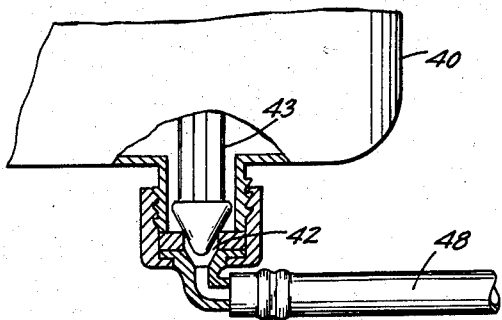


FIG. 6



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SURFACE TREATING MACHINE

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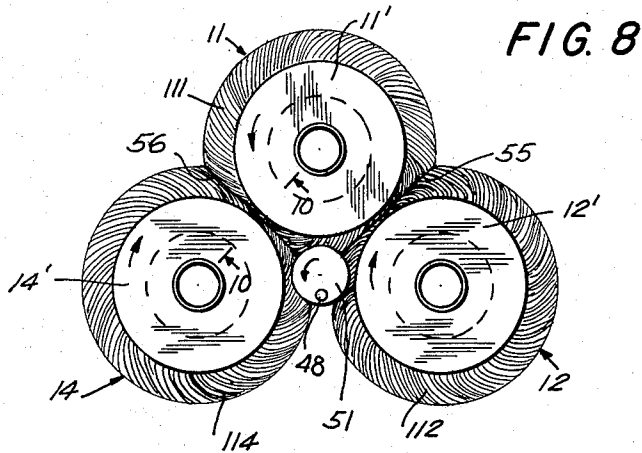


FIG. 8

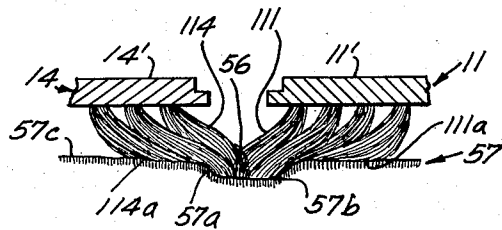


FIG. 10

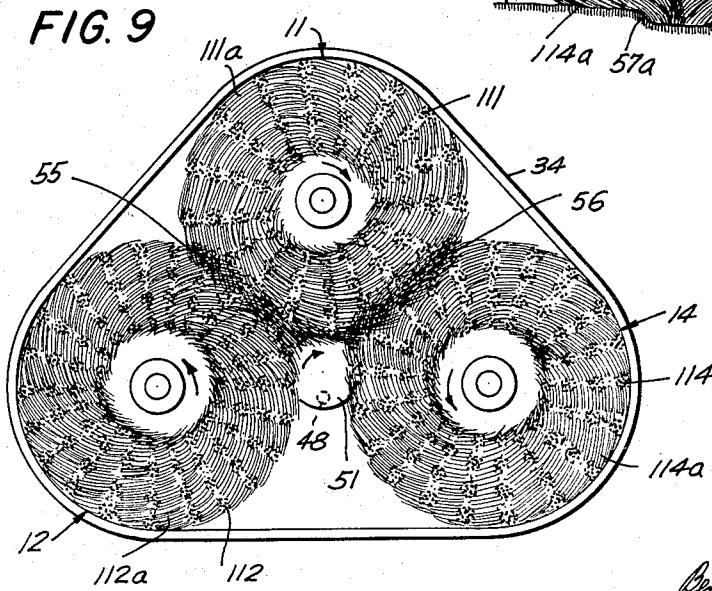


FIG. 9

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3,153,251

## SURFACE TREATING MACHINE

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Continuation of application Ser. No. 60,342, Oct. 4, 1960.

This application Aug. 15, 1961, Ser. No. 131,677

Claims priority, application Canada, Aug. 27, 1960,

806,055

8 Claims. (Cl. 15—50)

My invention relates to surface treating machines having a plurality of rotatable members adapted to be moved over a surface to be treated. This application is a continuation of my application Serial No. 60,342, filed October 4, 1960, now abandoned.

Surface treating machines are often provided with a device for applying a suitable liquid to a surface while the rotatable members are being driven and moved over the surface.

It is an object of my invention to provide an improved surface treating machine having provisions for atomizing treating liquid and initially directing the atomized liquid onto the rotatable members to promote the uniform distribution of the liquid on the surface being treated.

Another object is to provide a surface treating machine of this type having a plurality of rotatable brushes against the outer peripheries of which atomized liquid is initially thrown by centrifugal force from a feed point.

A further object is to provide an improved surface treating machine provided with rotatable brushes having flexible bristles which are sufficiently long for the bristles of adjacent brushes to interlock and mesh during rotation of the brushes and while they carry the deadweight of the machine.

A still further object is to provide an improved surface treating machine of this type in which the bristles will become compressed at the zone at which the bristles of adjacent brushes mesh and interlock and when the machine passes over low-lying areas of a surface being treated, a downward thrust will be imparted to the bristles under compression and they will reach down and promote treating of low-lying areas.

The above and other objects and advantages of the invention will be better understood from the following description, taken in connection with the accompanying drawing forming a part of this specification, and of which:

FIG. 1 is a front elevation of a surface treating machine embodying the invention;

FIG. 2 is a side elevation of the surface treating machine illustrated in FIG. 1;

FIG. 3 is a fragmentary view of the surface treating machine shown in FIGS. 1 and 2, the bottom sectional part being taken at line 3—3 of FIG. 4;

FIG. 4 is a bottom plan view of the surface treating machine shown in FIGS. 1, 2 and 3;

FIGS. 5 and 6 are fragmentary sectional views taken at lines 5—5 and 6—6, respectively, of FIG. 2;

FIG. 7 is an exploded perspective view of parts illustrated in FIG. 3;

FIG. 8 is a top plan view of the brushes of the surface treating machine shown in FIGS. 1 to 4 more or less diagrammatically illustrating the manner in which the flexible bristles of adjacent brushes interlock and mesh when the brushes are being rotated during operation of the machine and the bristles are carrying the deadweight load of the machine;

FIG. 9 is a bottom plan view of the brushes shown in FIG. 8 more or less diagrammatically illustrating the interlocking and meshing of the flexible bristles of adjacent brushes when the brushes are being rotated during operation of the machine and the bristles are carrying the deadweight load of the machine; and

FIG. 10 is a fragmentary vertical sectional view, taken at line 10—10 of FIG. 8, more or less diagrammatically illustrating the brushes treating a surface having a low-lying area.

Referring to the drawing, I have shown my invention in connection with a surface treating machine 10 having three rotatable brushes 11, 12 and 14 which project downward beneath a hood or base 15 and are arranged to be driven by an electric motor (not shown) housed in an upright casing 16 positioned over an opening in the hood. The brushes 11, 12 and 14, having brush backs 11', 12' and 14', respectively, may be detachably secured in any suitable manner to disks 17 which are rotatable on shafts 18 provided on a frame 19 at the underside of the base 15 and driven by an endless belt 20. The belt 20, which may be formed of rubber or other suitable resilient material, is under tension and frictionally engages the rims of the disks 17 and a driving pulley 21 fixed to the lower end of motor shaft 22. In FIG. 4, the belt 20 is arranged to drive the brushes 12 and 14 in a counterclockwise direction and brush 11 in a clockwise direction.

The floor treating machine 10 is adapted to be manipulated by a handle 23 connected to the upper end of a rod 24 whose lower end is connected to the closed end of an inverted U-shaped yoke or fork 25 having spaced apart arms 26, the lower ends of which are pivoted at 27 to the casing 16. Upon the rod 24 is mounted a switch 28 and a connector 29 adapted to receive electrical conductors 30 and 31 each having two wires insulated from one another. The conductor 30 extends downward to the casing 16 for connection at its lower end to the electric motor housed therein. The conductor 31 desirably is of considerable length and adapted to be connected to a source of electrical supply. A pair of spaced apart hook-like elements 32 are provided on the rod 24 so that the conductor 31 may be looped about the elements 32 when the surface treating machine is not in use.

The hood or base 15, which is of rectangular shape, is provided with an annular member 33 of resilient material like rubber, for example, to prevent injury not only to the surface treating machine itself but also to furniture and wall baseboards which accidentally may be contacted by the machine while it is being manipulated over the floor being treated. As shown, the annular member 33 may be yieldingly held in place about a downwardly depending skirt 34 of the hood or base 15.

The surface treating machine 10 may be employed for shampooing rugs and for washing, waxing, polishing and buffing floors. When the machine 10 is employed for washing floors, it is desirable to employ brushes having relatively stiff bristles. For shampooing rugs and spreading liquid or paste wax on a floor, the brushes, though desirably hard, are not as stiff as those employed for a floor washing operation.

As best shown in FIGS. 3 and 4, the base 15 is provided with a bottom plate 35 removably secured by screws 36 to the frame 19 and formed with openings 37 to facilitate attachment of the brushes to the disks 17. Hence, when the machine 10 is being employed to treat a rug or floor with a substance in liquid form, the bottom plate 35 effectively prevents any liquid passing upward into the motor housing 16. This is so because the brushes 11, 12 and 14 are closely adjacent to the bottom plate 35 at the regions of the openings therein and contribute to providing a substantially liquid-tight compartment or space in the hood 15 above the plate 35.

When the machine 10 is employed to treat a surface with a substance in liquid or paste form, the action of the rotating brushes may often splatter the substance on furniture and walls. Therefore, in order that the machine

10 can be freely manipulated about a floor without danger of the substance being applied to the floor being splashed or scattered, I provide a guard or shroud 38 which is of annular form and encircles the brushes 11, 12 and 14 and moves over the surface being treated while the machine is being manipulated.

The splash guard 38 is of triangular form and snugly fits about the rounded corners of the triangular-shaped base 15. The guard 38 at the top is formed with an inwardly flared flange 39 which, in the lowest position of the guard, rests on the top part of the annular member 33, as best seen in FIG. 3. The guard 38 can move vertically upward from and back to its lowest position in FIG. 3 as it moves about a surface with the base 15 during manipulation of the machine 10. The splash guard confines the treating liquid at the immediate vicinities of the brushes, which results in rugs and floors being cleaned and treated more effectively.

A container 40, which is provided with a suitable filling cap 41 and adapted to hold a body of liquid for treating a surface, is mounted on the rod 24. The flow of liquid discharged through the bottom opening 42 in the container 40 is controlled by a needle valve 43 which is urged to its closed position by a resilient member 44 and is moved to its open position with the aid of a flexible pull chain 45 having its lower end connected to the needle valve 43 and its upper end mounted on the handle 23. The resilient member 44 provides a seal at the top opening 46 of the container through which the upper end of the needle valve 43 projects and is compressed when the needle valve is pulled upward to its open position.

When the needle valve 43 is moved from its closed position by an upward pull of the chain 45, an L-shaped notched section 47 at the exterior surface of the upper part of the needle valve 43 is raised sufficiently to provide an air vent past the sealing member 44 at the top opening 46 of the container 40, so that the inside of the container will be at atmospheric pressure to promote flow of liquid through the bottom opening 42.

A flexible tube 48 is connected at one end to the bottom discharge opening 42 of the container 40. The tube 48 passes through an opening in the bottom part of the casing 16 into the interior of the hood or base 15. The lower end of the tube 48 passes through an opening 49 in the bottom plate 35 and terminates at a zone closely adjacent to the underside of the plate 35. An eyelet 50 of resilient material is provided at the opening 49 to provide a liquid-tight seal at the region the tube passes through the plate 35 and to hold the lower end of the tube 48 in a fixed position.

In accordance with my invention, liquid falls by gravity from the lower end of the tube 48 on a rotatable disk 51 on which the liquid is atomized and from which the atomized liquid is thrown by centrifugal force against the peripheries of the brushes 11, 12 and 14. The disk 51, which may be formed of rubber or a suitable plastic like nylon, for example, is provided with a metal insert 52 which in turn is fixed at 53 to the extreme lower end of shaft 22. The upright part of disk 51 passes through an opening 54 in bottom plate 35 and the bottom flat part of the disk 51 is positioned below the lower end of the tube 48. As best shown in FIG. 3, the lower discharge end of the tube 48 is located at the rear of the shaft 22 and hence liquid falls by gravity from tube 48 at a zone which is laterally offset from the vertical axis about which the disk 51 rotates.

Since the disk 51 is connected to the motor shaft 22 and is being driven at a relatively high speed, liquid falling by gravity on the face the disk is rapidly accelerated and atomized and thrown from the periphery of the disk in spray form. The liquid in spray form strikes the brush bristles at regions intermediate their upper and lower ends and in this way the brushes become partially impregnated with liquid and promote spreading of the liquid on the surface being treated.

In a surface treating machine which has been built and embodies features like those illustrated in FIGS. 1 to 7, inclusive, and described above, the motor speed during shampooing of a rug varied from about 3200 to 4000 r.p.m. with a mean speed of about 3600 r.p.m., and the speed of the brushes varied from about 570 to 700 r.p.m. with a mean speed of about 635 r.p.m., the speed of rotation of the brushes being less than one-fifth of the motor speed. With these speeds the tangential exit velocity of the liquid spray from the disk 51 was about 1410 feet per minute and the peripheral velocity of the brushes was about 790 feet per minute.

With the surface treating machine positioned on a glass-topped table and the disk 51 and brushes 11, 12 and 14 rotating in the directions indicated by the arrows in FIG. 4, it is observed that brush 12 appears to react first to the application of liquid spray discharged by centrifugal force from the disk 51 and that brushes 11 and 14 thereafter react successively to the application of liquid spray discharged from the disk 51. Hence, the zone from which liquid falls by gravity from the lower end of the tube 48, the direction and speed of rotation of the disk 51, and the position of the brush 12 are so inter-related that the brush 12 appears to react first to the application of atomized liquid and the principal part of the atomized liquid centrifugally discharged from the periphery of the disk 51 is received first by brush 12. In practice, the liquid spray appears to be distributed more or less uniformly between the brushes 11, 12 and 14 for the reason that liquid spray is not only received or "picked up" by the brushes 11, 12 and 14 at a peripheral velocity of about 790 feet per minute, but is also transferred from one brush to another at the same peripheral velocity of the brushes. Also, when rugs and carpets are being shampooed and cleaned, the brushes employed have relatively long bristles which are flexible and interlock and mesh during shampooing. This meshing of the brush bristles promotes spreading and uniform distribution of the treating liquid on the rug by the brushes.

While there may be some variation in the pattern of the liquid spray discharged from the disk 51 depending upon whether liquid falling by gravity from tube 48 strikes the disk while it is accelerating or decelerating, and upon variations in coefficient of friction of the top surface of the disk, these variations are not objectionable from a practical standpoint.

In FIGS. 8, 9 and 10 I have diagrammatically illustrated the manner in which the flexible bristles 111, 112 and 114 of the brushes 11, 12 and 14, respectively, interlock and mesh when the brushes are being rotated during operation of the machine and the bristles are carrying the deadweight load of the machine. Under these conditions, the brushes 11, 12 and 14 viewed from above assume the configuration or outline diagrammatically illustrated in FIG. 8, the zones between the bristles of brushes 11 and 12 and 11 and 14 being generally flattened along lines indicated at 55 and 56. The regions at 55 and 56 represent the areas at which the brush bristles 111, 112 and 114 in physical contact with one another are compressed due to the centrifugal force developed by the rotating brushes.

In FIGS. 9 and 10 I have shown the manner in which the brush bristles 111, 112 and 114 bend and flex against a surface 57 being treated due to the deadweight load of the machine which the brushes carry. In FIG. 9, which is a view in reverse of the brushes shown in FIG. 8, the bristles spread out radially and are meshed and interlocked at the zones or regions 55 and 56 responsive to the centrifugal force developed by the rotating brushes. The bristles 111, 112 and 114 desirably are of adequate length and sufficiently flexible so that they will bend and flex into physical contact with the surface 57 during operation of the machine with the extreme outer end portions 111a, 112a and 114a of the bristles almost parallel to the surface and at only a relatively small acute angle thereto.

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By providing bristles 111, 112 and 114 of the character just described, the brushes will not dig into a rug and tend to tear it, but instead will gently move in physical contact with the rug and subject it to a massaging action.

As shown in FIG. 10, the region 56 between brushes 11 and 14 is directly over a part of the surface 57 in a low-lying area 57a having a surface 57b at a lower level than the level 57c at an adjacent part of the surface. The bristles of brushes 11 and 14 in intimate physical contact with one another at the region 56 are compressed, as explained above. Hence, there will be a tendency for a great number of brush bristles to move into such regions responsive to the centrifugal force developed by the rotating brushes. When the region 56 moves over the part of the surface having the low-lying surface area 57a at a lower level 57b than the adjacent surface 57c, the compressed bristles at the region 56 will tend to yield and move downward into the free space at the low-lying area 57a. In this way, the brush bristles which are compressed at regions between the brushes will be forced downward into the pile of a rug, especially in rugs of the kind having uneven surfaces like carved Wilton rugs, for example.

It will now be understood that at regions like the regions 55 and 56 in FIGS. 8, 9 and 10, the bristles at the peripheral edges of adjacent brushes will interfere with one another when a rug is being shampooed, such interference being established along mutual arcs or zones at the brush peripheries where the bristles come into physical contact with one another. This interference of the bristles of adjacent brushes causes the bristles at the aforementioned zones to become more dense and compact than at other regions of the brushes removed from the peripheral edges, and this causes the compacted bristles to exert or impart a downward thrust which is over and above the downward thrust of other bristles which simply subject the rug to a massaging action. As explained above in describing the particular operating condition illustrated in FIG. 10, the resultant downward thrust developed by compacted bristles at the peripheral edges of adjacent brushes makes it possible to reach depressed or sub-flush carpet surfaces like the low-lying area 57a in FIG. 10 without the necessity of flooding the surface with a cleaning agent.

While I have shown and described a particular embodiment of my invention, it will be apparent to those skilled in the art that modifications and changes may be made without departing from the spirit and scope of the invention, and that certain features may be employed independently of other features. For example, spaced rotatable brushes having bristles that intermesh and interlock in the manner shown in FIGS. 8, 9 and 10 may be employed independently of the rotatable disk 51, and the latter may be employed with spaced rotatable brushes having bristles that remain out of physical contact during operation of the machine. I, therefore, do not wish to be limited to the embodiment shown in the drawing and described in the specification and aim in the following claims to cover all modifications and changes that fall within the true spirit and scope of the invention.

I claim:

1. In a surface treating machine of the class described having a plurality of brushes provided with bristles, means for mounting said brushes for rotation about spaced vertical axes, said brushes being adjacent to one another and movable over a surface to be treated, a disk, means for mounting said disk for rotation about a vertical axis at a region between the outer peripheral edges of said brushes and adjacent thereto, driving means including an electric motor for driving said brushes and said disk, means for conducting treating agent in liquid form to a zone which is above said disk and from which zone liquid flows by

gravity onto the top surface of said disk, said driving means being operable to drive said disk at a high enough speed to atomize liquid falling thereon from said zone and discharge the atomized liquid by centrifugal force from the periphery of said disk, and said disk being positioned vertically with respect to said brushes to direct the atomized liquid onto the bristles between their top and bottom ends during rotation of said brushes.

2. Apparatus as set forth in claim 1 in which said driving means is operable to drive said brushes at a high enough speed for the atomized liquid to be discharged by centrifugal force from the bristles at the outer peripheral edge of one brush onto the bristles at the outer peripheral edge of an adjacent brush during rotation of said brushes.

3. Apparatus as set forth in claim 2 in which said driving means includes provisions for driving said disk about its vertical axis at motor speed and for driving said brushes about their axes at a speed which is less than one-fifth of motor speed.

4. Apparatus as set forth in claim 1 in which said electric motor includes a vertical shaft, and said means for mounting said disk for rotation about a vertical axis comprises said shaft.

5. Apparatus as set forth in claim 1 in which the bristles of adjacent brushes interlock and mesh during rotation of said brushes on the surface, the bristles of adjacent brushes having adequate length and being sufficiently flexible for them to be compressed at the zone at which they mesh and interlock and for a downward thrust to be imparted thereto when the machine passes over low-lying areas of the surface so that they reach down and promote treating of the low-lying areas.

6. Apparatus as set forth in claim 5 in which the outer ends of the bristles are essentially parallel to the surface and at a slight acute angle thereto during rotation of said brushes on the surface whereby the surface being treated will be subjected to a gentle massaging action.

7. In a surface treating machine of the class described having a plurality of brushes provided with bristles, means for mounting said brushes for rotation about spaced vertical axes, said brushes being adjacent to one another and movable over a surface to be treated, a disk, means for mounting said disk for rotation about a vertical axis at a region between the outer peripheral edges of said brushes and adjacent thereto, driving means for rotating said brushes at one speed and said disk at a higher speed, means for conducting treating agent in liquid form to a zone which is above said disk and laterally removed from its vertical axis of rotation and from which zone liquid flows by gravity onto the top surface of the disk, said driving means including an electric motor for driving said disk at a high enough speed to atomize liquid falling thereon from said zone and discharge the atomized liquid by centrifugal force from the periphery of said disk, and said disk being positioned vertically with respect to said brushes to direct the atomized liquid onto the bristles between their top and bottom ends during rotation of said brushes.

8. Apparatus as set forth in claim 7 in which said zone and the direction of rotation of said disk and the position of one of said brushes are so inter-related and arranged that the principal part of the atomized liquid centrifugally discharged from the periphery of said disk is received first by said one brush.

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