Oct. 10, 1967 R. D. WILSON ETAL 3,345,671

FLOOR SCRUBBING AND POLISHING MACHINE

Filed Jan. 11, 1966

3 Sheets-Sheet 1

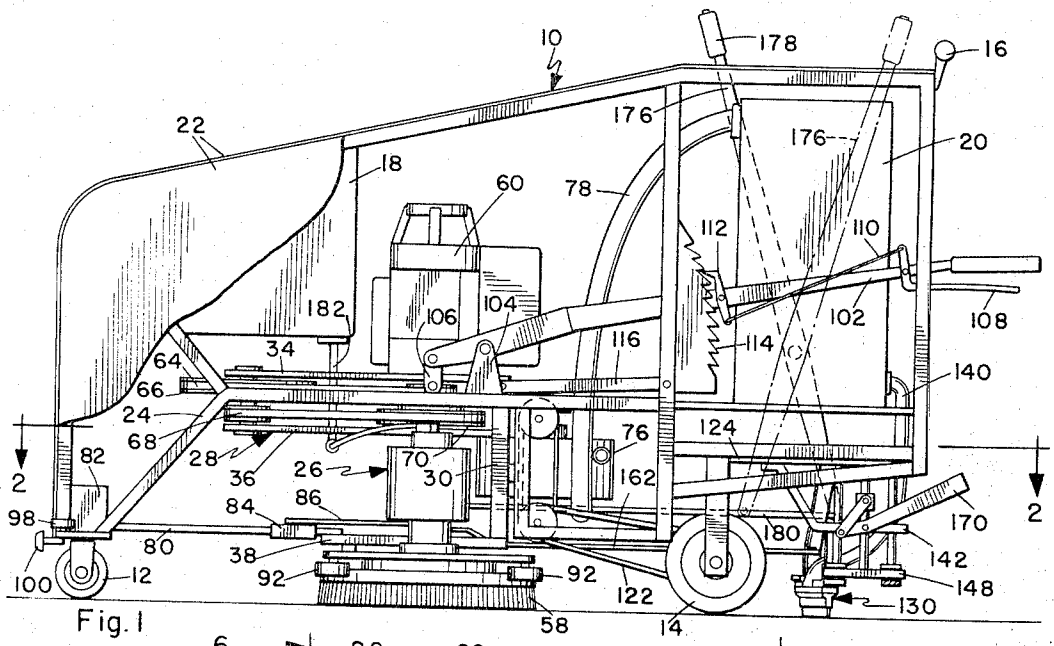
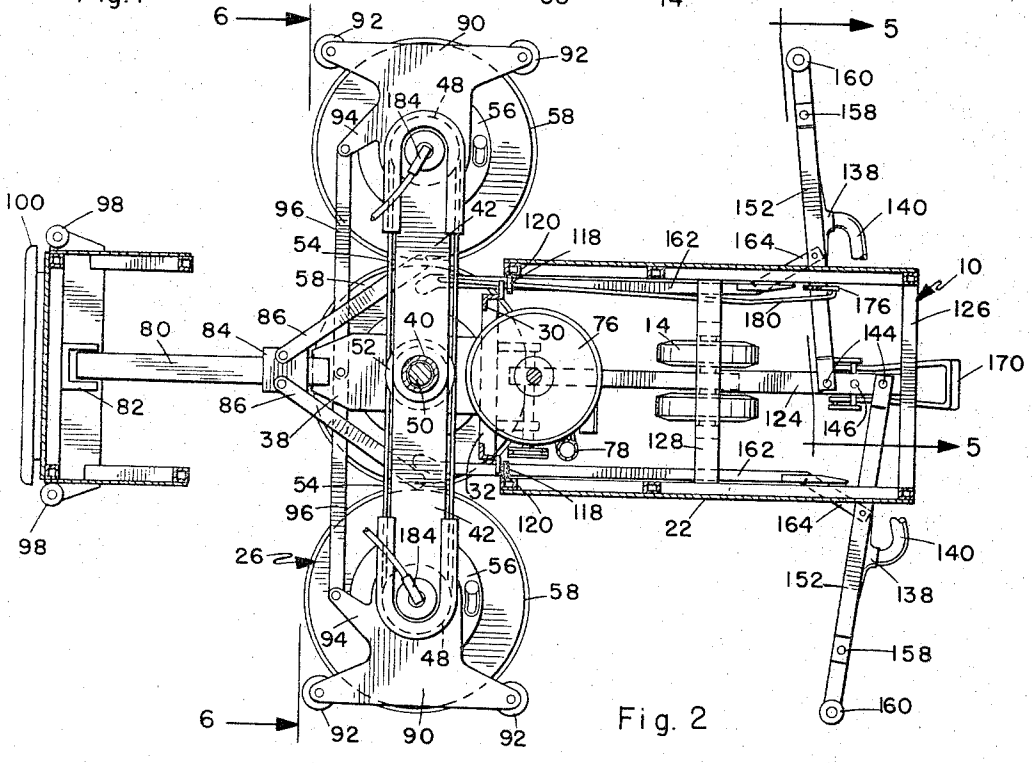


Fig. 1



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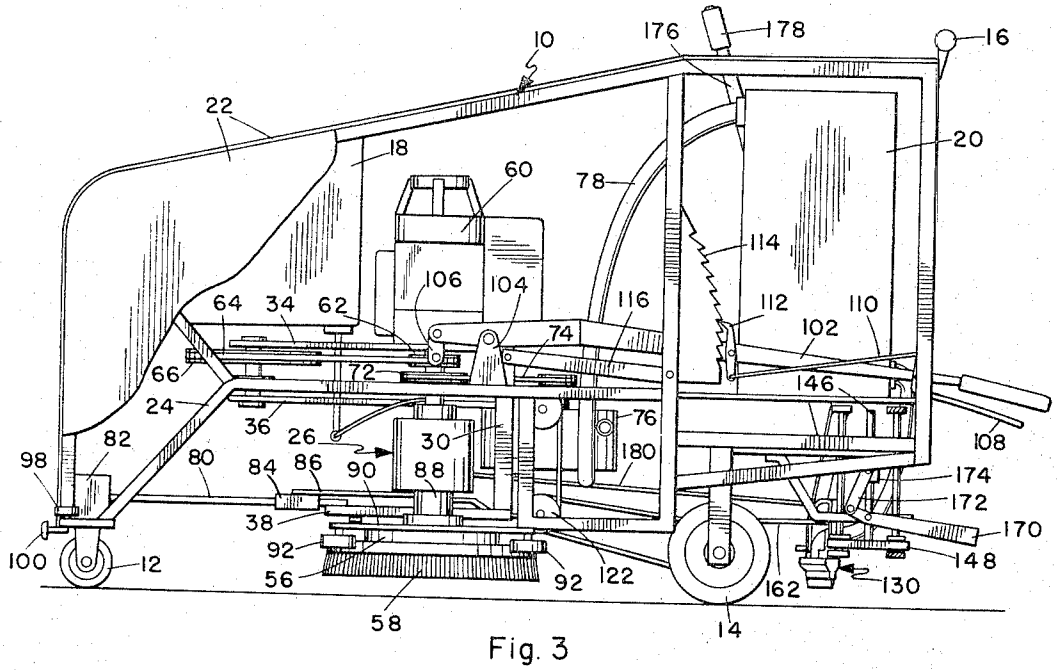


Fig. 3

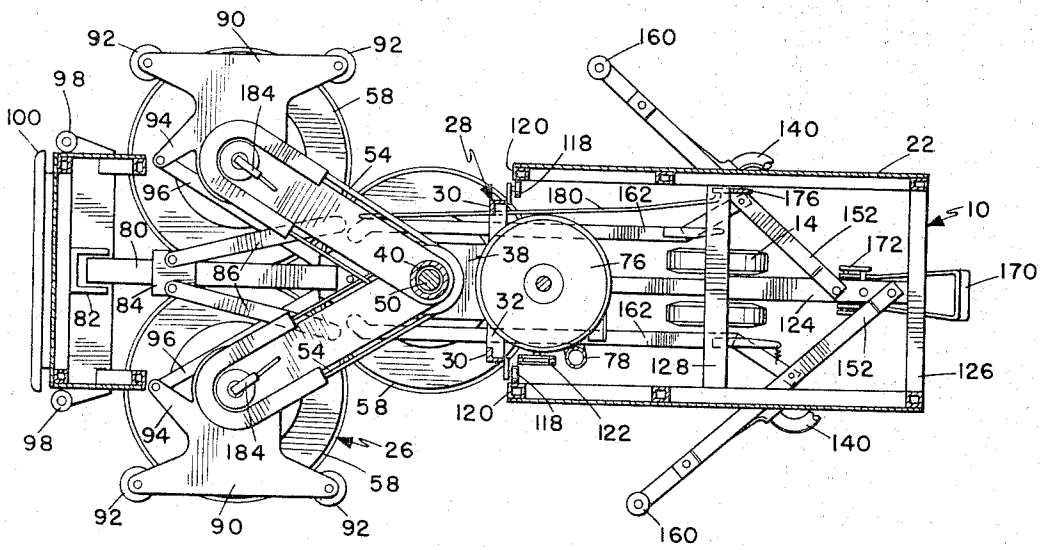


Fig. 4

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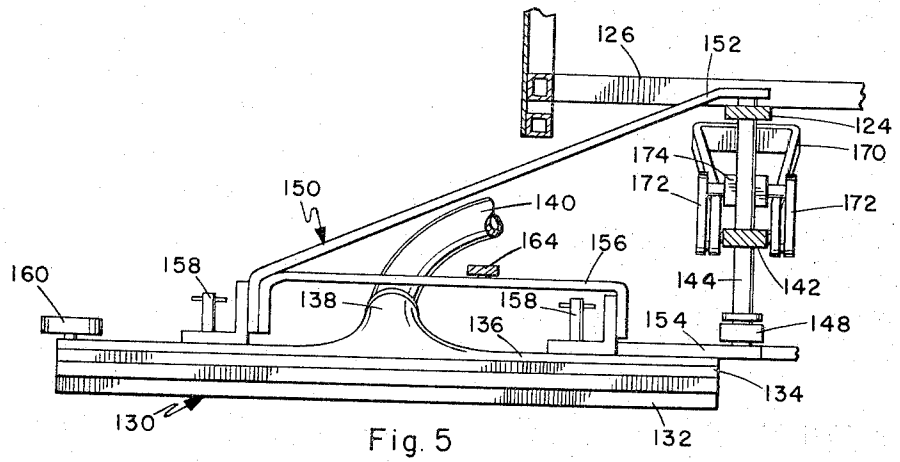


Fig. 5

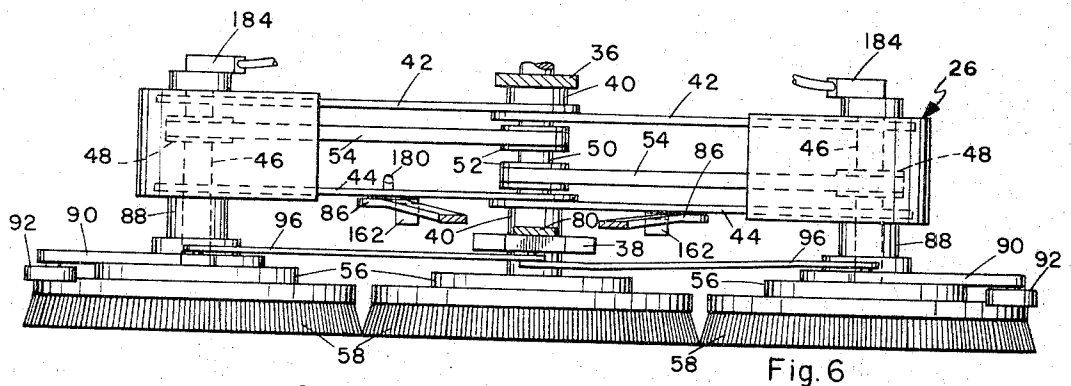


Fig. 6

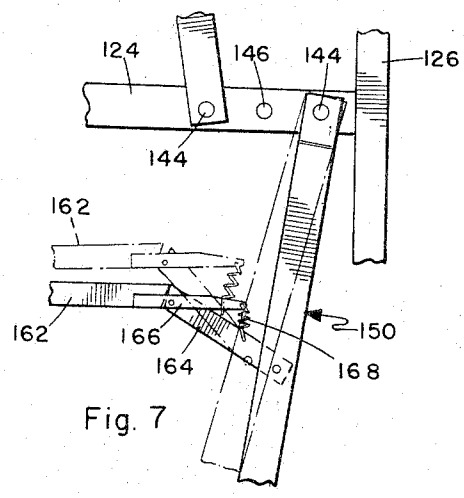


Fig. 7

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3,345,671

FLOOR SCRUBBING AND POLISHING MACHINE

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8 Claims. (Cl. 15—320)

The present invention relates to maintenance equipment and specifically to a floor scrubbing and polishing machine.

Some types of floor cleaning machines presently available utilize a power driven brush or brushes for scrubbing with water and detergent, and a squeegee with a vacuum attachment to pick up excess water. The machine can be made narrow to pass through normal doorways, but is then limited in its coverage of the floor. If multiple brushes are used to cover a wide strip of floor the machine will not pass through a normal doorway unless portions are dismantled.

The primary object of this invention, therefore, is to provide a floor cleaning machine having multiple brushes in a compact assembly, which is adjustable over a considerable range of widths, enabling the machine to cover large floor areas rapidly, or to be adjusted to fit hallways and gangways and to pass through doorways.

Another object of this invention is to provide a floor cleaning machine having squeegee units which are coupled to the brush assembly to adjust in width together with the brushes, the width adjustment being controlled by a single lever.

Another object of this invention is to provide a floor cleaning machine in which the brushes and squeegee units are individually adjustable in height to clear the floor, so that polishing brushes may be used without the squeegees.

A further object of this invention is to provide a floor cleaning machine which is completely self-contained and fully controllable from the operator's handling position.

The construction and operation of the machine are illustrated in the drawings, in which:

FIGURE 1 is a side elevational view of the machine in operating position, side panels being cut away to expose the mechanism;

FIGURE 2 is a sectional view taken on line 2—2 of FIGURE 1, the brushes and squeegees being in maximum width setting;

FIGURE 3 is a side elevation view of the machine with the brushes and squeegees raised from the floor;

FIGURE 4 is a sectional view similar to FIGURE 2, but with the brushes and squeegees at minimum width setting;

FIGURE 5 is an enlarged fragmentary sectional view taken on line 5—5 of FIGURE 2;

FIGURE 6 is an enlarged sectional view taken on line 6—6 of FIGURE 2; and

FIGURE 7 is an enlarged top plan view of a portion of the squeegee linkage.

Similar characters of reference indicate similar or identical elements and portions throughout the specification and throughout the views of the drawing.

The machine is constructed in a box-like frame **10**, which can be constructed primarily of rectangular tubing, as shown, or from any other suitable material. The specific frame structure is exemplary only and may be arranged to suit particular components and materials. At the forward end the frame is supported at the corners on a pair of casters **12**, while the rear of the machine rides on drive wheels **14** located generally on the longitudinal center line thereof. The basically triangular support with two wheels castering makes the machine readily maneuverable. Hand grips **16** are attached to the upper rear portion of

the frame for ease of handling by the operator. In the upper front portion of the frame is a water or detergent tank **18**, and in the rear portion is a collection tank **20** to receive the water picked up from the floor. The sides, ends and top of the frame **10** may be enclosed by suitable cover panels, indicated at **22**, to conceal the mechanism and protect the operator. Frame **10** has an arched portion **24** at the forward end to provide clearance for the adjustable brushes.

Mounted in the frame is a brush unit **26**, having a carriage **28** with laterally spaced rear uprights **30** connected by cross members **32**, and a top plate **34**, intermediate plate **36** and bottom plate **38** extending forwardly therefrom in vertically spaced parallel relation. On the intermediate plate **36** and bottom plate **38** are opposed central bearings **40** on which are supported two pairs of radially extending arms, each pair including an upper arm **42** and a lower arm **44**. At the outer end of each pair of arms **42** and **44** is a vertical shaft **46** carrying a pulley **48** and journalled in bearings **40** is a central drive shaft **50** carrying pulleys **52**, from which drive belts **54** extend to pulleys **48**, so that the three shafts rotate in unison. At the lower end of each of the shafts **46** and **50** is a circular mounting plate **56** on which is mounted a circular brush **58**. The brush and its means of attachment to the mounting plate are well known and various types are available.

The spacing of the shafts is in accordance with the available standard sized brushes to be used, so that the peripheries of the brushes touch or overlap very slightly and no gaps are left.

When the arms **42** and **44** are extended laterally in parallel relation, as in FIGURE 2, the three brushes are in line and cover the maximum width of sweep. By swinging the arms forwardly about bearings **40** the outer brushes can be brought together, as in FIGURE 4, to reduce the width of sweep to a minimum.

Mounted on top plate **34** is a motor **60**, which may be an internal combustion engine to make the machine independent of power supply, or could be an electrical or other type of motor. The motor **60** has a drive pulley **62** from which a belt **64** extends to speed reducing idler pulleys **66**, mounted between top plate **34** and intermediate plate **36**, a further belt **68** returning to a pulley **70** on central shaft **50**. A further pulley **72** on the motor **60** is connected by a belt **74** to a vacuum blower **76** mounted on the rear of carriage **28**, a vacuum hose **78** leading from the intake side of said blower to the collection tank **20**.

Extending forward from the bottom plate **38** is a guide bar **80**, the forward end of which is vertically slidable in a guide channel **82** on the frame **10**. Longitudinally slidably mounted on a guide bar **80** is a coupling block **84**, from which pivoted equalizing links **86** extend to the lower arms **44** to synchronize the swing of the arms and ensure equal movement of the brushes.

Immediately above each outer mounting plate **56** is a sleeve **88**, to which is attached a guard plate **90** carrying a pair of longitudinally spaced rollers **92**, which are tangent to the tangent of the associated brush **58** extending parallel to the longitudinal axis of the machine. The rollers thus guide the brush along a wall or other surface and prevent the rigid portion of the brush from damaging the surface. To maintain this parallel relation, each guard plate has an offset arm **94** connected by a link **96** to the bottom plate **38**, the pivotal ends of each link and the centers of shafts **50** and **46** on each side forming a parallelogram. As the brushes are moved between the narrow and wide settings the rollers **92** stay in parallel relation to the sides of the machine, as in FIGURE 4.

For protective purposes bumper rollers **98** are mounted on the lower front corners of the machine and a resilient front bumper **100** is attached across the front end thereof.

The entire brush unit 26, including the carriage 28, the brushes and their drive means and the blower 76, can be raised and lowered as a complete unit to put the brushes in contact with the floor or raise them clear. This is accomplished by an elevation lever 102 pivotally mounted on a bracket 104 on the frame 10 adjacent the brush unit, one end of the lever being coupled to the carriage 28 by links 106. The other end of elevation lever 102 is considerably longer and extends from the rear end of the machine to provide a large mechanical advantage and facilitate manual lifting of the brush unit. Pivotally attached to the rear end of elevation lever 102 is a latch handle 108 connected by a tie rod 110 to a pawl 112, also pivotally mounted on the lever, the pawl engaging with a toothed rack 114 fixed to the frame 10 and extending vertically. The brush unit can thus be latched at any vertical position within its range of motion. To stabilize the brush unit 26, stabilizing arms 116 are pivotally connected between the carriage 28 and convenient portions of frame 10, while lateral stability is provided by rollers 118 mounted on uprights 30 and riding on the inside of vertical frame members 120.

Motor 60 may be coupled to drive wheels 14 by any suitable means, indicated by drive means 122, and any conventional clutch or drive control means, not shown, may be utilized.

At the rear end of the machine is a mounting bar 124 extending along the longitudinal center line between cross members 126 and 128 and from which are suspended the squeegees 130. In FIGURES 1 and 3 the squeegee on the near side is omitted for clarity. Each squeegee has a resilient blade 132 carried in a rigid spine 134, on top of which is a collection housing 136 with a hose connection 138, a hose 140 leading from the connection to collection tank 20. The squeegee with a vacuum attachment as illustrated is a commercially available item. Spaced below the mounting bar 124 and in fixed relation thereto is a guide bar 142, and passing through the mounting bar and guide bar are two vertically slidable hinge pins 144, longitudinally spaced. Also vertically slidable through the two bars and disposed between the hinge pins 144 is a jack pin 146, the lower ends of the three pins being interconnected by a tie bar 148.

Each squeegee 130 is attached to a support frame 150, having an upper arm 152 and a lower arm 154 extending from one end of the squeegee, with a cradle 156 straddling the hose connection 138 and secured to the housing 136 by lock means 158. The lock means can be screw or twist lock elements for easy detachment of the squeegee. The upper arm 152 and lower arm 154 are secured to the upper and lower ends, respectively, of a hinge pin 144, one squeegee being pivotally carried on each hinge pin to swing horizontally. At the outer end of each housing 136 is a freely rotatable bumper roller 160.

To swing the squeegees in synchronization with the brushes and maintain an equal width of sweep at all positions, connecting rods 162 are pivotally connected between the lower arms 44 of the brush unit and the cradles 156 in a parallel linkage arrangement. At the end adjacent the cradle, each connecting rod 162 has an outwardly offset portion 164 hinged at its inner end to a bracket 166 on the main portion of the connecting rod. A spring 168 is coupled between the offset portion 164 and bracket 166 to provide a shock absorbing break joint, in the event that the squeegee strikes an obstruction, as indicated in FIGURE 7.

Pivotally mounted on the guide bar 142 is a foot pedal 170 extending from the rear of the machine, the forward end of the pedal being coupled by links 172 to a block 174 fixed on the jack pin 146. By pressing down on foot pedal 170 the jack pin 146 is raised, lifting the squeegees clear of the floor, as in FIGURE 3. The jack pin or other portions of the mechanism may be retained in the raised position of the squeegees by friction, or by any suitable lock means.

The adjustment between wide and narrow settings is made by a control lever 176 pivotally mounted on one side of frame 10 and having a handle 178 extending above the frame adjacent the rear end, accessible to the operator. The lower end of the control lever 176 is connected by a control rod 180 to one of the brush arms, such as to the lower arm 44. By pulling control lever 176 to the rear, as indicated in broken line in FIGURE 1, the control rod 180 is pushed forward and the brushes swing together. Position setting means such as that used for the lever 102, or other suitable means, may be used on lever 176 if necessary.

In operation, detergent is supplied from tank 18 through a feed pipe 182 to connections 184 on top of the brushes, the fluid being fed through a hollow shaft to the brush bristles, as in conventional scrubbing machines. The brushes scrub a strip of floor of the width at which the brush assembly is set, and the squeegees remove and pick up excess water over the same extent of floor, the dirty water being stored in collection tank 20 for subsequent disposal. When cleaning hallways or the like the brushes can be set to the particular width between the walls to perform the operation in one pass. To pass through a doorway narrower than the maximum width of brush extension the only action required is a motion of control lever 176 to retract the brushes.

By utilizing the individual elevation control the squeegees can be raised clear of the floor and the brushes operated by themselves with buffing or polishing heads to finish the floor treatment. The machine will operate completely up to the base of a wall and is accurately guided along the wall by the rollers 92 and 160.

It is understood that minor variation from the form of the invention disclosed herein may be made without departure from the spirit and scope of the invention, and that the specification and drawings are to be considered as merely illustrative rather than limiting.

We claim:

1. A floor scrubbing and polishing machine, comprising:
   - a frame having supporting wheels thereon;
   - a brush unit mounted in said frame, said brush unit having a central brush and at least one outer brush on each side thereof, each supported on said unit to rotate about a substantially vertical axis;
   - said outer brushes having supporting arms pivotally mounted on said frame to swing about an axis substantially on the center line of the frame, between a wide position with the three brushes in substantially linear arrangement transversely of the frame and a narrow position with the brushes in generally triangular arrangement;
   - and a source of power on said brush unit operatively connected to rotate said brushes simultaneously.

2. A machine according to claim 1 and including, elevating means connected to said brush unit to raise and lower the unit, and means to retain said elevating means at selected positions.

3. A machine according to claim 1 and including a lever mounted on said frame, said lever being connected to one of said supporting arms to move the outer brush thereon between said positions, said supporting arms being interconnected to move in unison.

4. A machine according to claim 1 and including a pair of squeegees pivotally mounted on said frame to swing horizontally on opposite sides thereof and being longitudinally spaced from said brush unit;
   - said squeegees being coupled to the brush supporting arms on the respective sides to move in unison with said outer brushes and to encompass substantially the same width of floor as the brushes.

5. A machine according to claim 4 and including elevating means coupled to said squeegees to raise and lower the squeegees simultaneously.

6. A machine according to claim 4 and including a source of vacuum connected to said squeegees.

7. A machine according to claim 1 and including a guard plate mounted on the outer end of each of said support arms, at least one roller freely rotatably mounted on the guard plate to rotate about an axis substantially parallel to the axis of the adjacent brush, said roller being in a plane substantially tangential to the adjacent outer brush and parallel to the longitudinal axis of the machine;

and link means interconnecting said guard plates in parallel linkage arrangement with said supporting arms, whereby the tangential relationship of the rollers is maintained at any position of said brushes.

8. A machine according to claim 7 and including a pair of squeegees pivotally mounted on said frame to swing horizontally on opposite sides thereof and being longitudinally spaced from said brush unit;

said squeegees being coupled to the brush supporting arms on the respective sides to move in unison with said outer brushes and encompass substantially the same width of floor as the brushes;

said squeegees each having a roller on the outer end thereof in generally coplanar arrangement with the roller on the respective guard plate.

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