

[54] **CLEANER ASSEMBLY**

744,466 2/1956 Great Britain 15/345

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1970, abandoned.

[52] **U.S. Cl.**..... **401/289**, 15/50 R, 239/251

[51] **Int. Cl.**..... **A47I 13/10**

[58] **Field of Search**..... 15/29, 50 R, 52,
15/98, 345, 346, 387; 239/225, 251, 286, 263;
401/15, 288, 289

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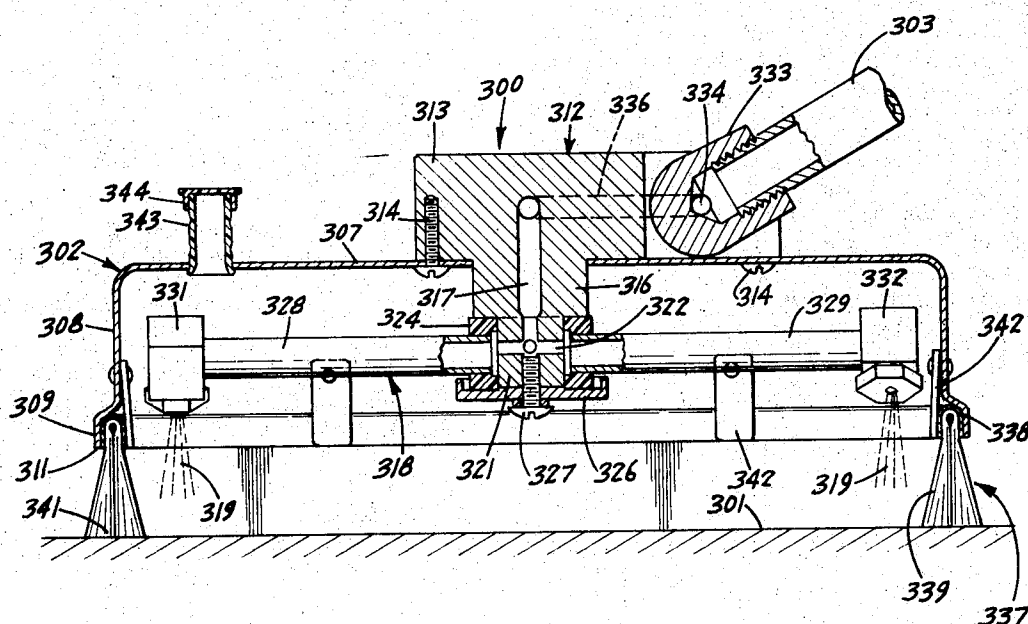
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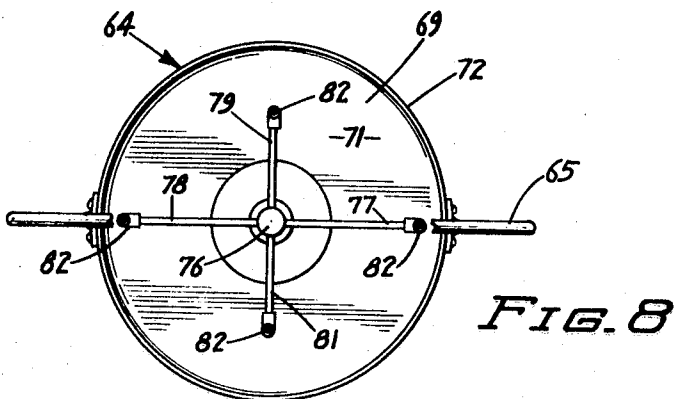
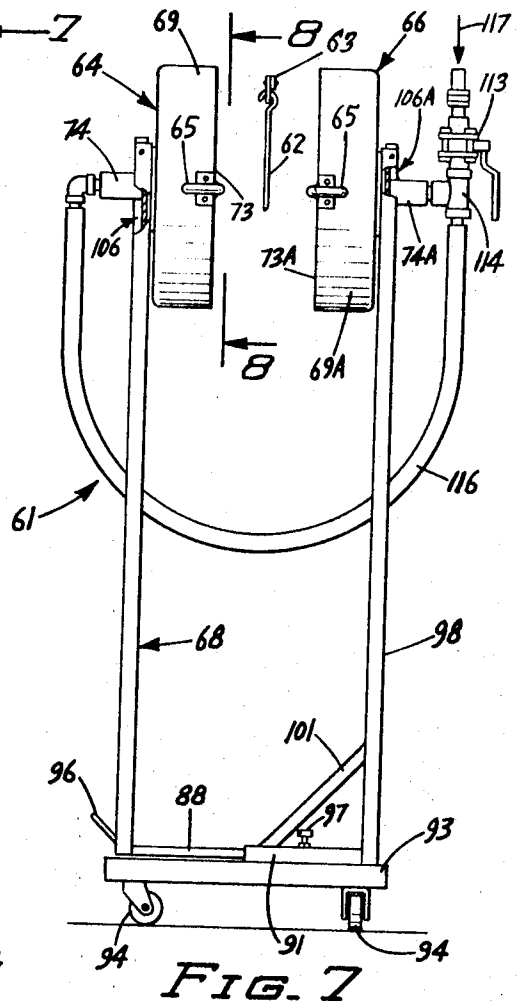
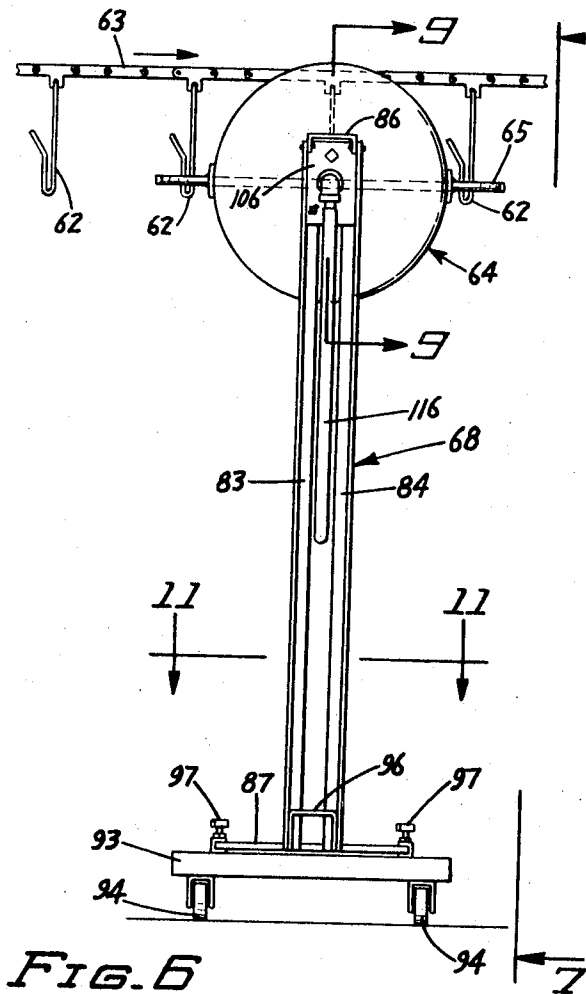
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[57] **ABSTRACT**

A cleaning apparatus having a pan-shaped housing enclosing a rotatable spinner assembly equipped with a plurality of rotatable laterally directed arms for carrying cleaning fluid under pressure to nozzles. Cleaning fluid under pressure is discharged in a circular pattern out the open side of the housing close to the surface to be cleaned. Brushes connected to the housing scrub the surface as the apparatus is moved over the surface. A pair of facing housings are adjustably mounted on a frame used to change the elevation of the housings. One of the frames is adjustably mounted on a support so that the space between the housings can be changed. A plurality of caster wheels and a handle may be connected to a housing so that the apparatus is movably supported above a surface.

50 Claims, 22 Drawing Figures





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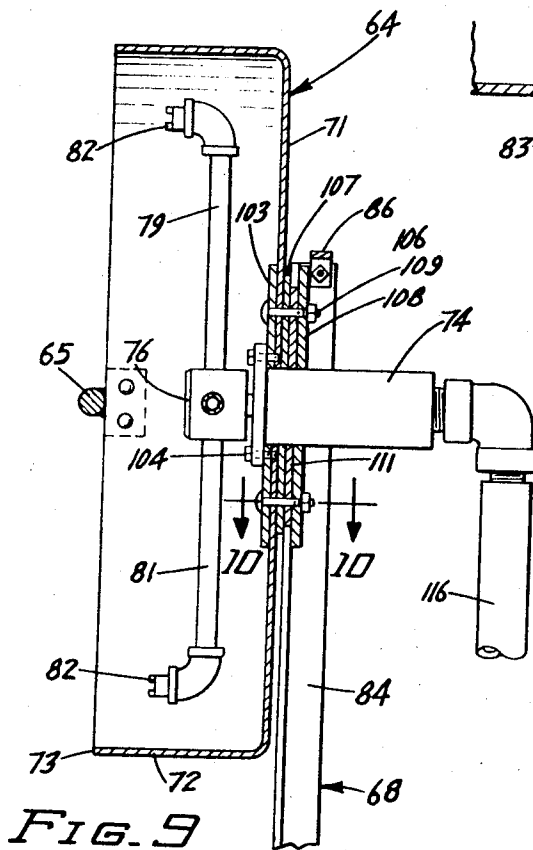


FIG. 9

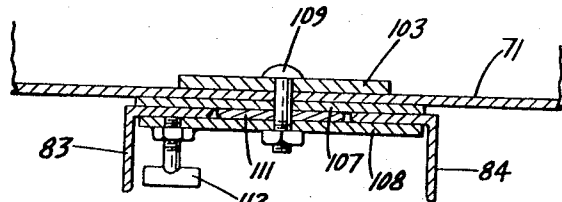


FIG. 10

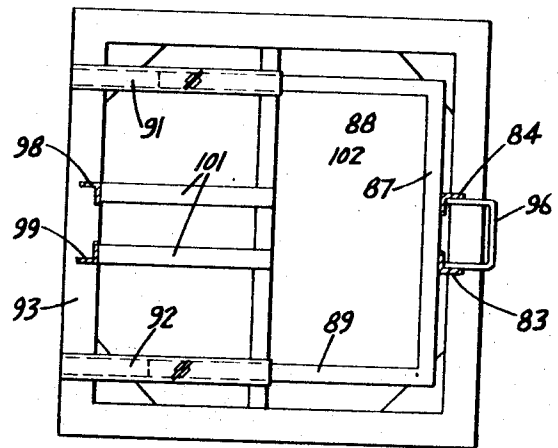


FIG. 11

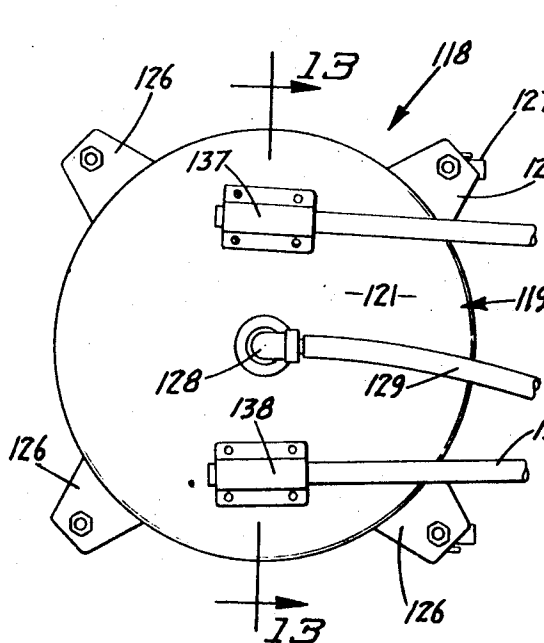


FIG. 12

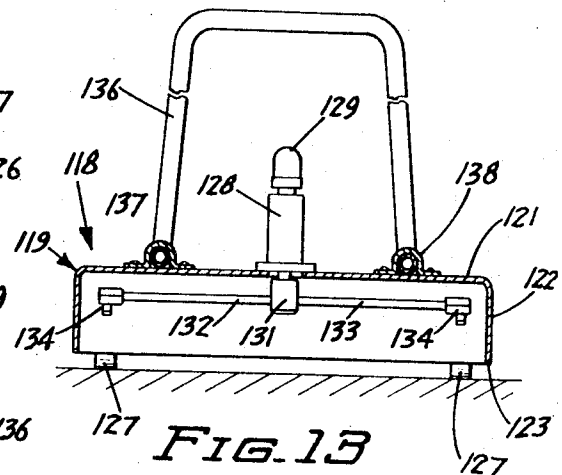


FIG. 13

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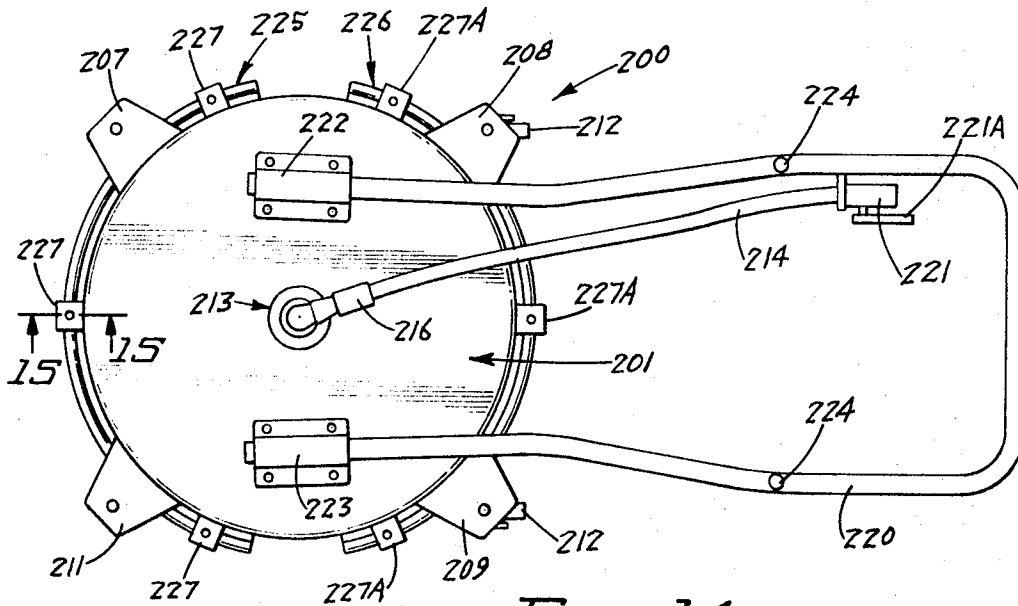


FIG. 14

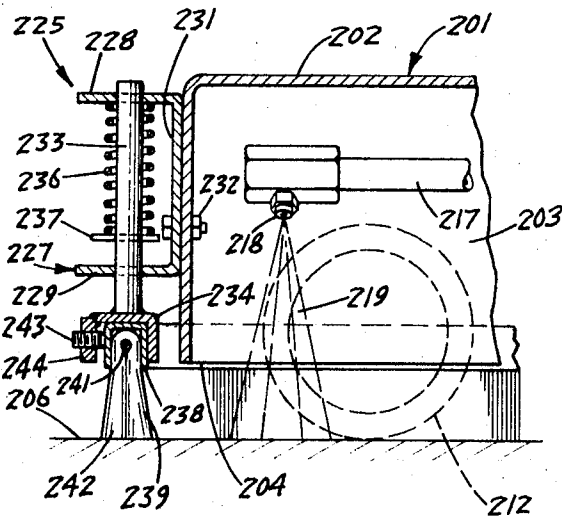


FIG. 15

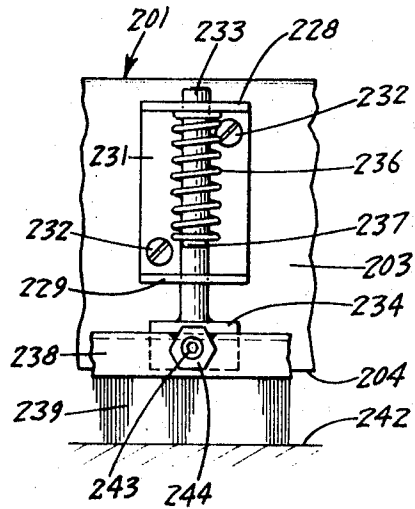


FIG. 16

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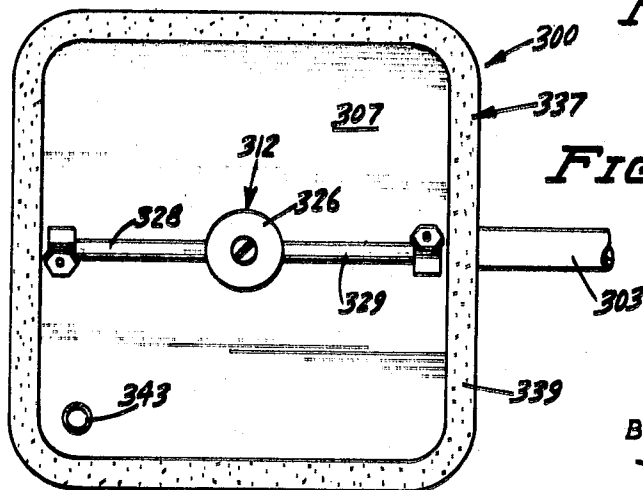
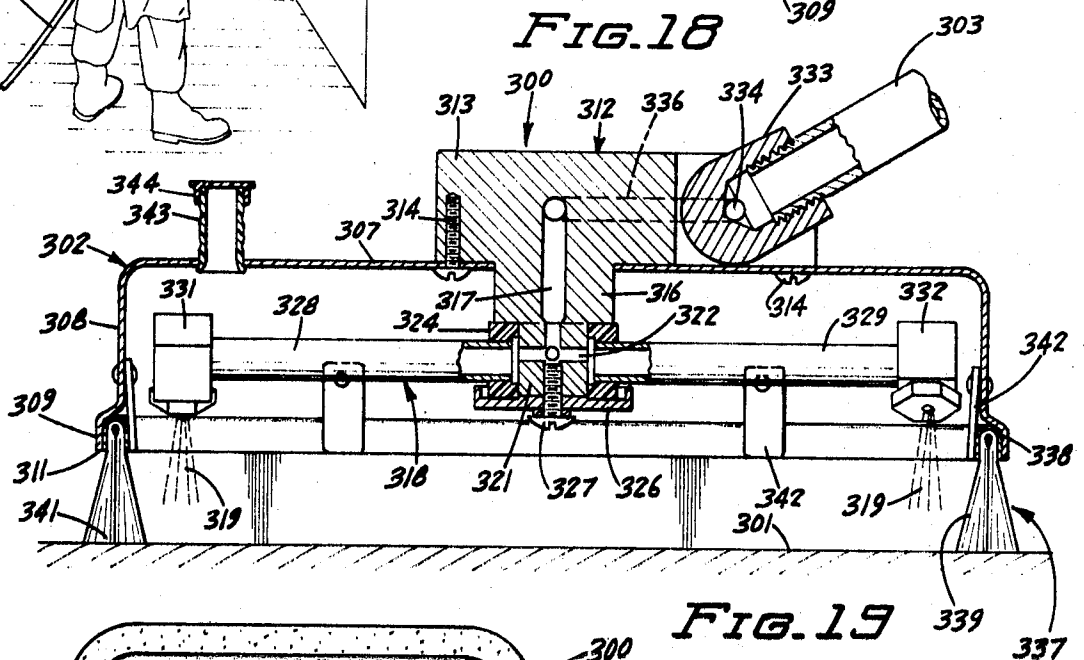
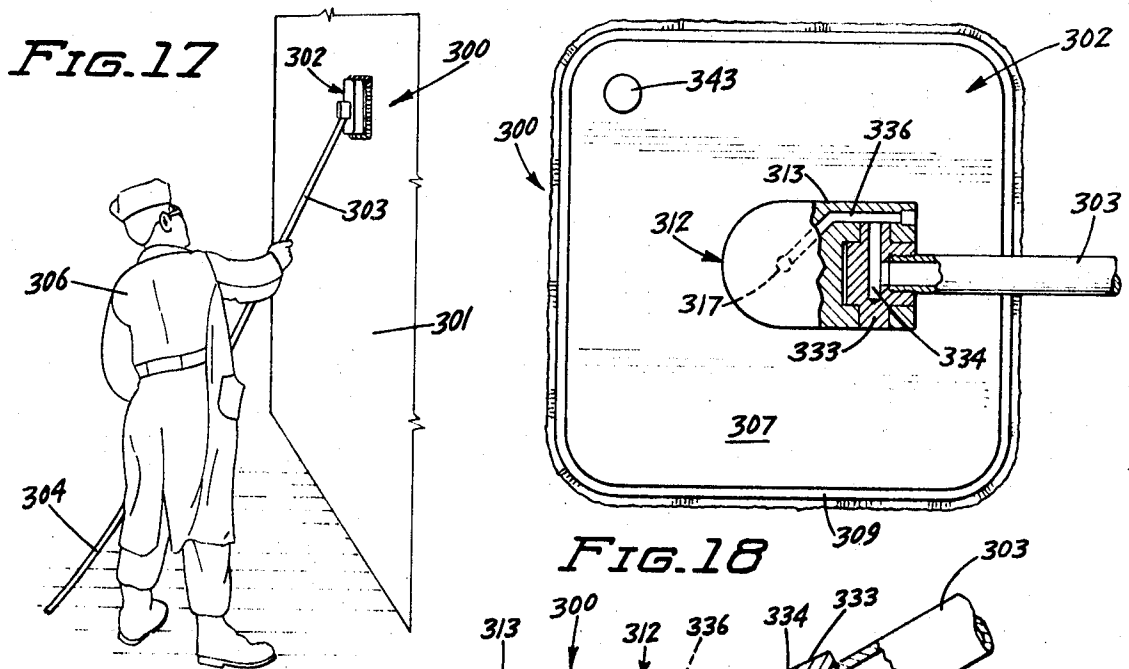


FIG. 19

FIG. 20

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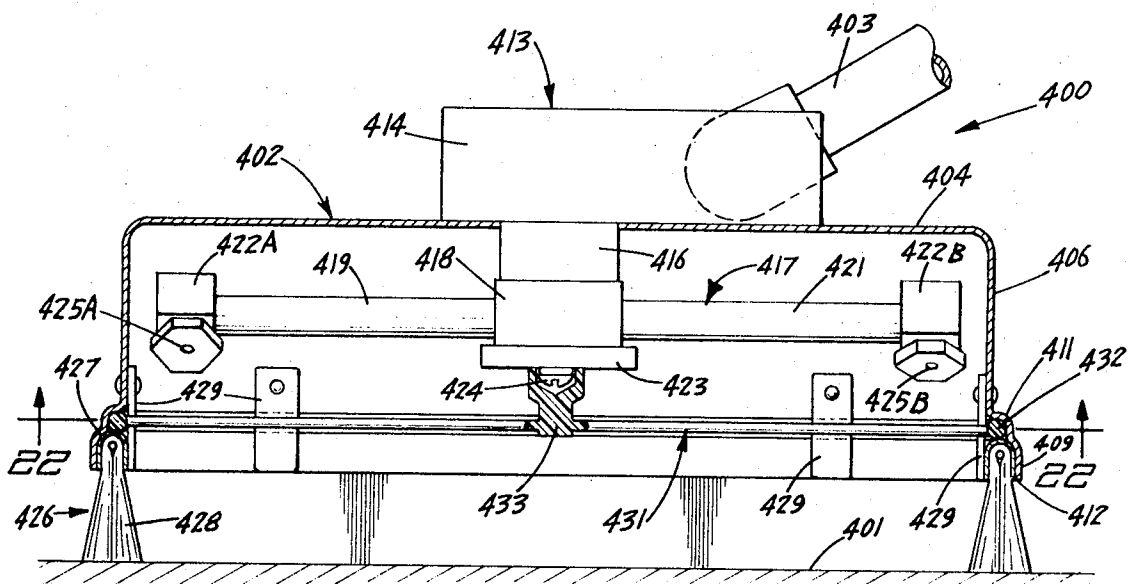


FIG. 21

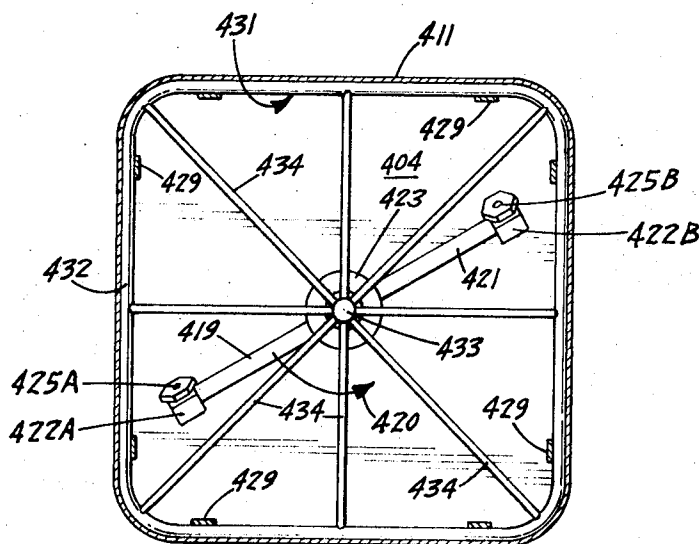


FIG. 22

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CLEANER ASSEMBLY

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of U.S. application Ser. No. 010,707 filed Feb. 12, 1970 now abandoned.

SUMMARY OF INVENTION

The invention is directed to a cleaning apparatus for discharging a generally circular pattern of cleaning fluid toward a surface or an object to be cleaned. The cleaning unit has a housing having a peripheral flange terminating in an edge surrounding an open side of the housing. A spinner assembly mounted on the housing is adapted to be connected to a source of cleaning fluid under pressure. The spinner assembly has a rotatable head located within the housing carrying at least a pair of laterally directed tubular arms. Nozzles secured to the ends of the arms direct cleaning fluid under pressure toward the open side of the housing. Brush units are mounted on the peripheral flange of the housing to operatively engage the object or surface to be cleaned.

In one form of the invention, the cleaning unit is mounted on an upright frame with an adjustable clamp structure usable to selectively change the elevation of the housing to align the open end of the housing with the objects or articles to be cleaned. The frame can be attached to an adjustable support, whereby the housing and frame may be laterally moved relative to the object to be cleaned. This frame and housing can be used in combination with a second cleaning unit mounted on a frame. The second cleaning unit has an open side facing the first cleaning unit, whereby generally circular patterns of cleaning fluid are directed toward opposite sides of the object to be cleaned. An adjustable clamp structure is used to adjustably mount the second housing at a selected elevation. Both of the frames can be mounted on a fixed support or a truck having a plurality of wheels so that the entire cleaning apparatus is portable.

In another form of the invention, a plurality of wheels and a handle are secured to the housing so that the housing can be moved over a surface, as a floor. The housing has a side wall carrying brush attachments for scrubbing the surface.

In another form of the invention, the housing is a generally square pan-shaped member connected to an elongated tubular handle. The cleaning fluid under pressure is delivered to a spinner assembly through the handle. A generally square shaped brush unit attached to the housing is operable to scrub the surface, as a wall or ceiling, to be cleaned.

An object of the invention is to provide a cleaning unit with a housing or shroud that is safe in operation and concentrates streams of cleaning fluids on surfaces or objects to be cleaned while at the same time it is thoroughly mixing and breaking down the cleaning fluid with the air to increase the washing penetration of the cleaning fluid. Another object of the invention is to provide a cleaning apparatus with adjustable cleaning units to accommodate different size articles to be cleaned and direct cleaning fluid under pressure to opposite sides of the articles. A further object of the invention is to provide a high pressure, low volume cleaning unit that uses a minimum amount of cleaning fluid and provides for a fast, thorough and efficient cleaning. Another object of the invention is to provide a cleaning

unit that dispenses a circular pattern of cleaning fluid toward a surface at a close distance concurrently with mechanical scrubbing of the surface.

In the drawings:

FIG. 1 is a side elevational view of a cleaning unit of the invention;

FIG. 2 is a bottom plan view of the cleaning unit of FIG. 1;

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

FIG. 4 is an enlarged sectional view taken along the line 4—4 of FIG. 2 showing the spinner assembly of the cleaning unit;

FIG. 5 is an enlarged sectional view taken along the line 5—5 of FIG. 3;

FIG. 6 is a side elevational view of a cleaning apparatus having a pair of cleaning units;

FIG. 7 is a front elevational view of the cleaning apparatus taken along the line 7—7 of FIG. 6;

FIG. 8 is an elevational view taken along the line 8—8 of FIG. 7;

FIG. 9 is an enlarged sectional view taken along the line 9—9 of FIG. 6;

FIG. 10 is an enlarged sectional view taken along the line 10—10 of FIG. 9;

FIG. 11 is an enlarged sectional view taken along the line 11—11 of FIG. 6;

FIG. 12 is a plan view of a floor cleaner having the cleaning unit of the invention;

FIG. 13 is a sectional view taken along the line 13—13 of FIG. 12;

FIG. 14 is a top plan view of a modified floor cleaner having the cleaning unit of the invention;

FIG. 15 is an enlarged sectional view taken along line 15—15 of FIG. 14;

FIG. 16 is a side elevational view of FIG. 15 showing the support for the brush attachment;

FIG. 17 is a perspective view showing a portable cleaner used on a wall;

FIG. 18 is a top plan view of the cleaner of FIG. 17;

FIG. 19 is an enlarged cross sectional view taken along line 19—19 of FIG. 18;

FIG. 20 is a bottom plan view of the cleaner of FIG. 18;

FIG. 21 is a sectional view similar to FIG. 19 of a modified portable cleaner; and

FIG. 22 is a sectional view on a reduced scale taken along line 22—22 of FIG. 21.

Referring to the drawings, there is shown in FIGS. 1 and 2 the cleaning unit, indicated generally at 20, connected to a source 21 of cleaning fluid under relatively high pressure (600–1,000 psi) with a line 22, as a long, flexible hose. The cleaning unit 20 is used to apply the cleaning fluid under pressure to a surface 23, as a floor, wall, conveyor belt, machinery and like objects to be cleaned. The fluid pressure source 21 can be a portable cleaning apparatus, as shown in U.S. Pat. No. 3,433,417, or a permanent system having a central pumping station and cleaning distribution lines with a number of stations adapted to be connected to the cleaning unit. The cleaning fluid can be an acid liquid solution, an alkaline liquid solution or water. The cleaning fluid can be a heated vapor, as steam, gas under pressure or mixed air and liquid.

Cleaning unit 20 has a circular pan-shaped shroud or housing 24 carrying a spinner assembly 26. The housing 24 has a flat, disc-like top wall 27 joined to a cir-

cumferential flange or side wall 28. Housing 24 can be a one-piece, pan-shaped member made from a rigid material, as metal, sheet metal, plastic, plastic reinforced with glass fibers and like construction materials. The flange 28 terminates in a circular bottom edge 29. The flange 28 has a substantially uniform width so that the bottom edge 29 lies substantially in the same transverse plane. As shown in FIG. 1, the bottom edge 29 is spaced a short distance above the surface 23 so that the housing can be moved relative to the surface without interfering with the cleaning action of the unit.

The spinner assembly 26 has a main cylindrical body 31 threaded on a support 32. Fasteners 33, as bolts, attach the support 32 to the center of the top wall 27. The spinner assembly 26 has a rotatable head 34 projected through a hole in the top wall and located within chamber 25 of the housing 24. Mounted on opposite portions of the head 34 are a pair of outwardly directed tubular arms 36 and 37. Downwardly directed nozzles 38 and 39 are secured to the ends of the arms. The arms 36 and 37 are tubular or pipe members adapted to carry cleaning fluid under pressure to the nozzles. Nozzles 38 and 39 have discharge ends 41 and 42 containing orifices or holes to direct the cleaning fluid under pressure through the open side of the housing to the surface to be cleaned. As shown in FIGS. 2 and 5, the nozzles 38 and 39 are located at an angle relative to the plane of the bottom edge of the housing 24 so that the reaction forces on the nozzles, due to the discharge of fluid under pressure from the nozzles, will turn the arms 36 and 37 in the direction of the arrow 43, shown in FIG. 2, and thereby provide a rotary cleaning motion or circular pattern to the cleaning fluid. The angle of each nozzle can be changed to alter the speed of rotation of the arms. The ends 41 and 42 of the nozzles are located inwardly from the bottom edge 29. In other words, each entire nozzle is located in chamber 25. Preferably, this distance is one or more inches from the plane of the bottom edge 29 to the ends 41 and 42 of the nozzles 38 and 39. The nozzles 38 and 39, being located inwardly from the bottom edge 29 of the housing, confine and concentrate the spray of cleaning fluid and moves this spray of cleaning fluid in a circular motion about the housing. Both the air and cleaning liquids are thoroughly mixed in chamber 25. The cleaning fluid breaks down into small particles which result in greater washing penetration with less cleaning fluid. The inside sheltered location of the moving nozzles is also a safety feature, in that the side wall protects the nozzles from any obstructions. An additional safety feature is that the flange 28 prevents the feet of the operator from engaging the spinning arms and nozzles.

Referring to FIG. 4, there is shown the spinner assembly 26 mounted on the top wall 27 of the housing. Spinner assembly body 31 has an inwardly directed central rib 43 dividing the main body into a first chamber 44 and a second chamber 46. The support 32 has an upwardly directed sleeve or tubular boss 47 threaded to the main body 31. Located within sleeve 47 is a thrust bearing 48. An elongated sleeve bearing 49, as a plastic sleeve, is located in the sleeve 47 adjacent an O-ring 41. Extended longitudinally through the bearing 49, O-ring 41 and thrust bearing 48 is a tubular shaft 52 having a central passage 53. The shaft 52 projects through the rib 43 and support 32 and is attached to the head 34. Suitable passages in the head 34 con-

nect the passageway 53 with the passageways in the arms 36 and 37. A snap ring 54 on the shaft 52 adjacent the rib 43 holds the shaft in assembled relation with the thrust bearing 48. The outer end of the main body 31 has an inlet plug 56 which is threaded into the chamber 46 to force an O-ring 57 into engagement with the top of the body. Located between the plug 56 and the rib 43 is a seal means 58, as a plurality of packing rings, which surround the outer end of the shaft 52. The inlet of the shaft 52 projects slightly into the passage 59 of the inlet plug 56. The fluid line 21, through a suitable coupler, is attached to the inlet plug 56 so that fluid under pressure is directed through the inlet plug passage 59 into the shaft passage 53 and into the head 34 for distribution to the arms 36 and 37. This fluid is discharged through the nozzles 38 and 39 secured to the ends of the arms 36 and 37.

In use, the shaft 52 is rotatably carried on the support 32 with the sleeve bearing 49. The axial thrust of shaft 52 is taken up by the thrust bearing 48 which rests against the end of support sleeve 47. The seal means 58, in conjunction with the bearings, provide for a combined bearing and seal for shaft 52. Bearings 48 and 49 take both the axial and lateral thrust on the shaft 52 due to the pressure on the cleaning fluid and the rotation of the shaft.

Referring to FIGS. 6 and 7 of the drawings, there is shown a cleaning apparatus, indicated generally at 61, for continuously cleaning members 62, as shackle hooks or other holding objects, supported from a moving conveyor 63. The apparatus 61 has a pair of facing cleaning units 64 and 66 located on opposite sides of members 62. The oppositely directed cleaning fluid being discharged on members 62 keeps the members in line and out of engagement with the movable parts of the cleaning apparatus. Guide structures 65 are provided between the cleaning units to orientate and keep the objects to be cleaned in proper alignment. Guide structures 65 are rods secured to units 64 and 66 or may be separate structures for maintaining the position of members 62 as they pass between the units. The ends of the rods are curved outwardly to guide members 62 between units 64 and 66.

Cleaning units 64 and 66 are adjustably mounted on a pair of generally upright frames or stands 68 so that the cleaning apparatus can accommodate members to be cleaned which are located at varying heights. As shown in FIGS. 6 and 7, the cleaning units 64 and 66 are positioned on top of the frames 68.

The cleaning units 64 and 66 are identical in structure. The following description is limited to cleaning unit 64. The parts of cleaning unit 66 which correspond to parts of cleaning unit 64 are identified with the same reference numeral having the suffix A. Cleaning unit 64 has a shroud or housing 69 having a disc-like top wall 71 integral with the cylindrical flange 72 terminating in an edge 73 located generally in a transverse plane. The housing is a large pan-shaped member having a chamber 65 and open side which serves to confine and concentrate the cleaning fluid for discharge onto the member 62 which moves adjacent the edge 73.

The spinner assembly 74 is mounted on the central portion of the top wall 71. The spinner assembly 74 is identical with the spinner assembly 26 shown in detail in FIG. 4. Spinner assembly 74 has a rotatable head 76 located within the chamber 65 of housing 64. Two pairs of equally spaced arms 77, 78 and 79, 81 are secured

to the head 76. The first pair of arms 77 and 78 are longer than the second pair of arms 79 and 81. For example, the first pair of arms may be three inches longer than the second pair of arms. Mounted on the end of each arm is a nozzle 82 having a discharge opening positioned to discharge cleaning fluid outwardly from the housing. The nozzles 82 function to provide overlapping circular patterns of cleaning fluids. As the head 76 rotates, the arms carry the cleaning fluid patterns in a circular direction. This motion breaks down the cleaning fluid particles and mixes them with air, with the result that there is greater washing penetration with less use of cleaning fluid. The nozzles 82 can be angularly adjusted on the arms so that the reaction forces on the nozzles cause the nozzles and arms to rotate in chamber 65.

As shown in FIG. 9, the nozzles 82 are located a considerable distance inwardly from the transverse plane of the edge 73 of the housing. This inside location of the nozzle confines and concentrates the discharge cleaning fluid and provides for greater mixing of air and cleaning fluid which is directed to the article or member 62 to be cleaned.

As shown in FIGS. 6 and 11, the frame 68 has a first pair of upright angle members 83 and 84 joined together at their upper ends with a cross member 86. A horizontal U-shaped yoke 87 is secured to the lower ends of the angle members 83 and 84. The yoke 87 has horizontally directed parallel legs 88 and 89. The legs telescope into tubular members 91 and 92 so that the angle members 83 and 84 can be laterally adjusted to change the horizontal position of the cleaning unit 64 relative to the member 62. The tubular members 91 and 92 are substantially parallel to each other and in alignment with the legs 88 and 89. Located below the tubular members is a generally square frame 93 of a truck or portable support. The tubular members 91 and 92 are secured directly to the frame 93 and a cross frame member 102. Caster wheels 94 are pivotally mounted on each corner of the frame 93, whereby the entire cleaning apparatus 61 may be moved to selected cleaning locations. The caster wheels 94 may be provided with suitable brakes (not shown) to fix the cleaning apparatus at a desired location. A handle 96 is secured to the bottom portions of the angle members 83 and 86 to facilitate the movement of the legs 88 and 89 into and out of the tubular members 91 and 92. Set screws 97, threaded into the top portions of the tubular members 91 and 92, are used to lock the legs 88 and 89 at selected positions with the tubular members 91 and 92.

The frame 68 has a second pair of upright angle members 98 and 99 secured directly to the truck frame 93. Diagonal braces 101 extend upwardly from cross frame member 102 to the angle members 98 and 99 to stabilize the upright angle members. Tubular members 91 and 92 are also secured or welded to the cross frame member 102.

Referring to FIGS. 9 and 10, the housing 64 is attached to a circular plate 103 with a slide assembly, indicated generally at 106, which slides up and down along the angle members 83 and 84. A plurality of fasteners 104 attach the support 32 of the spinner assembly 74 to the plate 103. The slide assembly 106 has an inside slide plate 107 and an outside slide plate 108 located on opposite sides of the inwardly directed flanges of the angle members 83 and 84. Upper and lower nut

and bolt assemblies 109 attach the slide plates 107 and 108 to both the plate 103 and the housing 64. A spacer member 111 is located between the slide plates 107 and 108 in the space between the angle members 83 and 84 to prevent rotation of the cleaning unit 64 on the frame 68. As shown in FIG. 10, a lock bolt 112, having a wing head, is threadably mounted on the plate 108. The bolt 112 can be turned to a tight, locked position to clamp the slide assembly to the angle member 83. The elevation of the cleaning unit 64 may be changed by loosening the lock bolt 112 and moving the slide assembly 106 relative to the angle members 83 and 84.

Returning to FIG. 7, the cleaning unit 66 is adjustably mounted on the upright angle members 88 and 89 with a slide assembly which is identical with the slide assembly 106. In this manner, both cleaning units 64 and 66 may be vertically adjusted relative to each other and horizontally aligned with each other.

An on-off valve 113, mounted on a T-coupling 114, is used to regulate the flow of cleaning fluid to both the cleaning units 64 and 66. The T-coupling 114 is mounted on the end of the spinner assembly 74A. An elongated, flexible hose 116 connects the T-coupling 114 to the inlet plug of the spinner assembly 74. A source of cleaning fluid, indicated at arrow 117, is directed to the valve 113. This source may be from a portable pumping and mixing machine or a permanent installation at the cleaning location.

In use, referring to FIGS. 6 and 7, the cleaning units 64 and 66 are initially elevated to a face-to-face relation on opposite sides of the members 62. The conveyor 63 continuously moves the members 62 to be cleaned between the cleaning units 64 and 66. The slide assemblies 106 and 106A, together with their associated lock bolts 112, function to hold the cleaning units 64 and 66 at their elevated positions.

The lateral space between the facing cleaning units 64 and 66 may be adjusted by moving the movable portion of the frame 68 in a lateral or horizontal direction. The movable frame comprises the upright angle members 83 and 84, together with the U-shaped support yoke 87. The lock bolts 97 are released so that the legs 88 and 89 may be telescoped into or out of the tubular members 91 and 92. The lock bolts 97 are used to lock the legs 88 and 89 in the tubular members 91 and 92. Both cleaning units 64 and 66 can thus be vertically and horizontally adjusted relative to each other.

Referring to FIGS. 12 and 13, there is shown a modified cleaning apparatus, indicated generally at 118. Apparatus 118 has a shroud or housing 119 comprising a one-piece, inverted, pan-shaped member having a generally flat top wall 121 and a downwardly directed circumferential flange or side wall 122. The flange terminates in an edge 123 located in a generally horizontal plane above a surface 124 to be cleaned. The surface 124 may be a floor, conveyor belt or like areas to be cleaned. As shown in FIG. 12, four equally circumferentially spaced brackets 126 are secured to the side wall 122 of the housing. The caster wheels 127 are rotatably mounted on the brackets 126 to support the housing 119 a short distance above the surface 124. As shown in FIG. 13, the caster wheels 127 space the bottom edge 123 of the housing a uniform and short distance above the surface 124. This distance may vary by having the caster wheels 127 vertically adjustable.

Secured to the center of the top wall 121 is an upright spinner assembly 128. Spinner assembly 128 is identical to the spinner assembly 26, as shown in FIG. 4. A hose 129 for directing cleaning fluid under pressure is connected to the inlet plug on the top of the spinner assembly 128. Located within the housing 119 is a rotatable head 131. A pair of outwardly directed arms or tubular members 132 and 133, as pipes, are secured to the head 131. Nozzles 134 are attached to the outer ends of the arms 132 and 133 for directing cleaning fluid under pressure downwardly toward the surface 124. The nozzles 134 can be angularly located with respect to an upright axis so that the cleaning fluid is discharged at an acute angle with respect to the surface 124. This will cause the arms, as well as the head 131, to rotate or spin about the upright axis of the spinner assembly 128. The nozzles 134 are located above the horizontal plane of the bottom edge 123 of the housing. This confines and concentrates the discharge of cleaning fluid to the open end of the housing and provides for an intimate mixing and breakdown of the cleaning fluid with the air within the housing. The result is that there is greater washing penetration with a minimum use of cleaning fluid.

Attached to the top and extended upwardly and away from the housing 119 is an inverted U-shaped handle 136 used for propelling and guiding the housing on the surface 124. The lower ends of the handle 136 are attached to the top of the housing 119 on opposite sides of the spinner 128 with clamps or connectors 137 and 138. The handle 136 may be provided with short legs to accommodate the excess hose 129 used to direct cleaning fluid under pressure to the spinner assembly 128. A hose reel, to store the hose, can be mounted on top of the housing 119. A control valve 137 is mounted on handle 136 to control the flow of cleaning fluid to the spinner assembly 128. The hose 129 can be connected to a portable source of cleaning fluid under relatively high pressure, as shown in U.S. Pat. No. 3,433,417, or a permanently installed cleaning installation.

Referring to FIGS. 14 and 15, there is shown a floor cleaner or cleaning apparatus indicated generally at 200, operable to concurrently wash and scrub a surface 206, as a floor. Cleaner 200 has a shroud or housing 201 comprising a one-piece inverted generally pan-shaped member open to the surface 206. Housing 201 has a generally flat top wall 202 and a downwardly directed circumferential flange or side wall 203. The flange 203 terminates in a bottom circular edge 204 located in a generally horizontal plane above the surface 206 to be cleaned.

A plurality of outwardly directed brackets 207, 208, 209 and 211 secured to the side wall 203 provide supports for caster wheels 212. Wheels 212 hold housing 201 a fixed distance above the floor 206. This distance can be altered by having the caster wheels 212 vertically adjustable. Also, the caster wheels can be yieldable or biased to permit limited relative movement between the housing and the caster wheels.

Secured to the center of the top wall 202 is a spinner assembly 213. Cleaning fluid under pressure is supplied to the spinner assembly 213 through an elongated flexible line or hose 214. Coupling 216 is used to connect the end of the hose 214 to the inlet portion of the spinner assembly 213. The hose 214 is connected to a suitable on-off valve 221 to control the flow of cleaning

fluid to the spinner assembly 213. Valve 221 has a manually operated lever 221A which permits the operator to regulate the flow of cleaning fluid to the spinner assembly. A hose or line (not shown) is connected to the valve 221 to couple the source of fluid under pressure to the cleaner 200.

Spinner assembly 213 has a rotor portion located within the housing 201 carrying a plurality of outwardly directed arms or tubular members 217. A nozzle 218 attached to the outer end of each arm 217 directs cleaning fluid 219 in a downward direction toward the surface 206. The nozzle discharge orifice can be angularly positioned on the arm with respect to an upright axis so that the cleaning fluid is discharged at an acute angle with respect to the surface 206. This will cause the arm 217 as well as the movable rotor of the spinner assembly to rotate or spin about the upright axis of the spinner assembly. The nozzles are located above the horizontal plane of the bottom edge 204 of the housing. This confines and concentrates the discharge of cleaning fluid to the open end of the housing and provides for an intimate washing contact and limited breakdown of the cleaning fluid with the air within the housing. With the nozzles located close to the surface 206, there is effective fluid penetration with a minimum use of cleaning fluid. The result is a savings in water, detergent and time.

The details of the spinner assembly 213 are the same as the spinner assembly 26 shown in FIG. 4. Alternatively, the spinner assembly 213 can be constructed according to the spinner assembly 312 shown in FIG. 19.

Mounted on the top and extended upwardly away from housing 201 is an inverted U-shaped handle 220 used to move the housing over the floor. Handle 220 has lower ends positioned adjacent opposite portions of the housing top wall 202. Connectors or clamps 222 and 223 located over the ends of the handle are secured to the top wall with fasteners, as bolts and the like. The mid-portion of handle 220 has a pair of outwardly directed legs 224 used as supports to accommodate and store the hose (not shown) used to direct fluid under pressure to the valve 221. The control valve 221 mounted on handle 220 is adapted to be connected to a hose leading to a source of cleaning fluid under pressure, as a portable pressure cleaning system shown in U.S. Pat. No. 3,433,417 or a permanently installed cleaning system.

A pair of brush attachments, indicated generally at 225 and 226, mounted on the housing 201 are adapted to scrub and engage the surface 206 in the area below the bottom edge 204 of the housing. The brush attachments 225 and 226 are identical in construction and have arcuate configurations slightly less than half the circumference of the side wall 203. The following description is limited to brush attachment 225. The corresponding parts of brush attachment are identified with the same reference numerals having the suffix A.

Brush attachment 225 has three circumferentially spaced supports or mounting structures 227. As shown in FIG. 15, the mounting structure 227 has an upper outwardly directed flange 228 and a lower outwardly directed flange 229 joined together with a generally upright back or base 231. A pair of nut and bolt assemblies 232 secure the base to the outside of the side wall 203. Flanges 228 and 229 have vertically aligned holes accommodating an upright rod 233. A holder 234 is secured to the lower end of rod 233. The rod 233 is bi-

ased in a downward direction by a spring 236 which engages a pin 237 extended through the rod 233. The spring is positioned about the rod 233 and has a lower end resting on pin 237 and an upper end in engagement with flange 228. Holder 234 is a generally U-shaped member for accommodating a downwardly open channel 238. Brush bristles or fibers 239 are located around a core or wire member 241 located in channel 238. The side walls of the channel are directed toward each other to clamp the bristles in the channel. The lower ends 242 of the bristles diverge in a slight downward direction and engage the surface 206. Channel 238 is releasably held in the holder 234 with a set screw 243 turned into a nut 244 forming a side wall of the holder 234. Set screws 243 of all the mounting structures can be removed so that the brush channel and bristles can be removed for cleaning or replacement.

The brush units can be mounted on the side wall 203 in a manner similar to the mounting of brush unit 337, shown in FIG. 19, on side wall 308. The caster wheels 212 can be provided with yieldable mounts or springs to permit the housing to move toward the surface 206.

In use, the biasing action of the springs 236 forces the entire lower ends 242 of the bristles 239 into scrubbing surface engagement with the surface 206. As the housing 201 is moved over the surface, the spinner assembly 213 produces a high pressure cleaning action as the fluid discharged from the nozzles 218 strikes the surface at a circular acute angle in a confined area. Brushes 225 and 226 perform a scrubbing action as the cleaner is moved over the surface. The two brush attachments 225 and 226 scrub the surface prior to its cleaning by the rotating cleaning fluid and after the action of the cleaning fluid.

Referring to FIG. 17, there is shown a modified portable cleaner indicated generally at 300 cleaning a wall 301. The cleaner 300 is usable to clean ceilings, floors and other surfaces including trucks, buses, automobiles, signs, buildings and the like. Cleaner 300 has a cleaning head or housing 302 attached to a tubular handle 303. A supply line or hose 304 is connected to the end of the handle for supplying cleaning fluid under pressure to the housing. The operator 306, through use of the handle 303, moves the cleaner housing over the surface 301 to be cleaned.

As shown in FIGS. 18 and 19, the cleaning housing has a generally square top wall 307 adjoined to a peripheral or side wall 308 to form a generally pan-shaped member. The corners of the cleaning housing are rounded to enable the cleaner to be used in corners. The outer portion of the side wall 308 has an outwardly stepped lip 309 terminating in a continuous bottom edge 311.

Mounted in the center portion of top wall 307 is a spinner assembly indicated generally at 312. Cleaning fluid under pressure is supplied to the spinner assembly through the elongated handle 303. This cleaning fluid is dispensed in a continuous circular pattern from a relatively close and fixed distance toward the surface 301. Spinner assembly 312 has a low body 313 secured to the top of wall 307 with a plurality of bolts 314. The upper part of body 313 is relatively flat, giving the cleaner a low profile so that it can be used in relatively small and narrow places. Body 313 has a neck or projection 316 which extends down through a center hole in top wall 307 into the housing chamber. The neck 316 has a central passageway 317 for carrying fluid

under pressure to a rotor indicated generally at 318. The rotor 318 moves in a circular path to discharge high pressure cleaning liquid 319 onto the surface 301. The neck 316 has a reduced diameter head 321 with radial bores 322 communicating with the passageway 317. Rotatably mounted on the head is a cylindrical collar sleeve 324. A cap 326 is secured to the bottom of head 321 with a bolt 327. The sleeve 324 has an inside cylindrical surface located in a close sliding fit with the outside cylindrical surface of the head 321. In addition, the sleeve has radial surfaces in sliding contact with adjacent radial surfaces of the neck 316 and the cap 326. These surfaces provide a seal between the sleeve 324 and the head 321. The center portion of the inside of cap 326 is slightly raised to prevent locking or binding of sleeve 324. Sleeve 324 preferably is made of a plastic material, as Nylon, which has self-lubricating characteristics with respect to the material of the head 321 and the cap 326. The inner ends of tubular radial arms 328 328 and 329 are secured to the sleeve 324. Nozzle units 331 and 332 are attached to the outer ends of arms 328 and 329 respectively. Each nozzle unit has a discharge orifice for directing the high pressure cleaning fluid 319 toward the surface 301. Each nozzle unit can be angularly located with respect to the axis of rotation of the rotor 318 so that the cleaning fluid is discharged at an angle with respect to the surface 301. This will cause the rotor to spin or rotate on head 321 as the fluid is discharged.

The body 313 carries an angularly movable block 333 having a threaded opening for accommodating the end of handle 303. The block 333 has a transverse passageway 334 which leads to a passageway 336 in the body 313. Passageway 336 is in communication with passageway 317.

A generally square brush assembly 337 is positioned adjacent the inside of the lip 309 on the side wall 308. Brush assembly 337 has a channel shaped back or rib 338 clamped about the brush bristles or fibers 339. The lower or outer ends of fibers 339 diverge outwardly and are generally flat. Downwardly directed clips or fingers 342 secured to the side wall 308 engage the inner portions of the back 338 to hold the brush assembly 337 against lip 309. The bristles 339 of the brush assembly 337 are of a substantially uniform length and thereby hold the housing 302 at a generally uniform and close distance from the surface 301. In addition, the brush assembly, being continuous, confines the high pressure cleaning fluid to the immediate space or surface to be cleaned.

When the cleaner 300 is used in an overhead position to clean a surface, as a ceiling, the cleaning liquid is drained from the housing 302 through a drain nipple 343 adapted to be connected to an elongated flexible tube (not shown). Nipple 343 projects through a hole in a portion of the top wall 307 and is retained therein by expanding the end portion of the nipple. When nipple 343 is not in use, it is closed with a cap 344.

Referring to FIGS. 21 and 22, there is shown a modification of the portable cleaner indicated generally at 400 for cleaning a surface 401, as a wall, ceiling or the surface of an object. The cleaner 400 has a generally square cleaning head or housing 402 secured to an elongated handle 403. The handle 403 is a tubular member which also serves as a means for delivering cleaning fluid under pressure to the cleaning housing. The cleaning housing 402 has a generally flat top wall

404 and a side wall or flange 406 defining a generally pan-shaped member. The side wall 406 has an outwardly and downwardly directed lip 409. An outwardly directed stepped portion 411 joins the lip 409 to the lower portion of the side wall 406. The side wall 406 has a continuous bottom edge 412 that surrounds the open end of the housing 402.

Mounted on the housing is a spinner assembly 413 connected to the handle 403. The spinner assembly 413 has a body 414 having a neck 416 projected into the housing. A rotor 417 is mounted on the neck 416 for distributing cleaning fluid in a circular pattern to the surface 401. The spinner assembly 413 is identical in construction with the spinner assembly 312 shown in detail in FIG. 19. Rotor 417 has a sleeve 418 rotatably mounted on neck 416. A plurality of outwardly directed arms 419 and 421 secured to sleeve 418 carry nozzles 422A and 422B. Nozzles 422A and 422B are operable to direct cleaning fluid under high pressure through the open end of the housing 404 onto the surface 401. A cap 423 is secured with a bolt 424 to the lower end of neck 416 to hold sleeve 418 in assembled rotating relationship with neck 416. Nozzles 422A and 422B each have fluid discharge openings or orifices 425A and 425B for directing cleaning fluids, as liquids under high pressure, toward the surface to be cleaned. The orifices 425A and 425B have longitudinal axes that are at an angle or inclination with respect to the surface to be cleaned. The axis of orifice 425A extends in the rearward inclined direction and is at a greater angle than orifice 425B. Thus, the circumferential reaction forces on the nozzle 422A will rotate the rotor 417 in the direction of arrow 420. The axis of orifice 425B is inclined in the forward direction so that the cleaning fluid discharged therefrom will hit the surface to be cleaned at a forward inclined angle. This will increase the cleaning effectiveness of the fluid, as it will peel off and dig into the foreign material on the surface to be cleaned. For example, the axis of orifice 425A could be inclined 20° relative to the surface to be cleaned and the axis of orifice 425B could be inclined 10° relative to the surface to be cleaned.

Located adjacent lip 409 is a generally rectangular brush assembly 426 adapted to scrub surface 401. Brush assembly 426 has a generally channel-shaped back 427 carrying brush bristles or fibers 428. The ends of the bristles are in scrubbing engagement with surface 401. A plurality of spaced clips 429 secured to the inside of side wall 406 project downwardly adjacent the back 427 to retain the brush assembly 426 on the lip 409.

The open end of housing 404 is traversed with an open grille or guard indicated generally at 431. As shown in FIG. 22, the guard 431 has a generally rectangular peripheral edge member 432 that fits in the stepped portion 411 of the housing 404. The retaining clips 429 hold the member 432 in the inside of the stepped portion 411 above the brush assembly 426. The guard 431 has a center member or portion 433 which extends inwardly and engages the cap 423. A network or array of members 434, as rods or wires, radially extend from the center member 433 and are secured to the peripheral member 432. Members 434 are generally narrow elongated members and do not appreciably interfere with the dispensing of the cleaning fluid under high pressure onto the surface 401. They provide a guard or shield to prevent projected portions of sur-

face 401 from engaging the rotating rotor arms or nozzles. Additional circular, rectangular and radial members can be added to the grille to provide more members which will obstruct and interfere with the insertion of objects into the housing.

The invention has been shown and described with respect to preferred embodiments of the cleaning apparatus utilizing one or more cleaning units. Changes, modifications, substitutions, as well as the size of the housings, spinner assemblies, brush units and other parts of the cleaners may be made by those skilled in the art without departing from the spirit of the invention.

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

1. A cleaning apparatus for discharging a generally circular pattern of cleaning fluid toward a surface comprising: a housing having a top wall and a peripheral side wall terminating in an edge surrounding an open side of the housing; a spinner assembly mounted on a central portion of the top wall and adapted to be connected to a source of cleaning fluid under pressure, said spinner assembly having a rotatable rotor located within said housing; tubular arm means mounted on the rotor for rotation therewith within said housing; said spinner assembly having a body with a cylindrical portion, said rotor having a sleeve rotatably mounted on the cylindrical portion; means to hold the sleeve on the cylindrical portion, said arm means being secured to said sleeve, said sleeve having passageways to direct cleaning fluid under pressure to said arm means; nozzle means secured to portions of the arm means, said nozzle means located inwardly from the plane of the edge of the housing, each nozzle means having at least one discharge orifice directed toward the open side of the housing whereby on application of cleaning fluid under pressure to the spinner assembly the nozzle means move in a circular direction directing a pattern of cleaning fluid out through the open side of the housing; and brush means mounted on said wall engageable with said surface to be cleaned.

2. The cleaning apparatus of claim 1 including: means to removably mount the brush means on the side wall of the housing.

3. The cleaning apparatus of claim 1 wherein: said brush means comprise a plurality of arcuate brush units, and mounting means for connecting the brush units to the side wall.

4. The cleaning apparatus of claim 1 including: wheel means attached to the housing to support the housing on the surface with the bottom edge of the housing spaced from the surface.

5. The cleaning apparatus of claim 1 including: mount means movably attaching the brush means to the side wall of the housing, said mount means having generally upwardly movable members attached to the brush means and biasing means for yieldably urging the brush means in a downward direction into engagement with the surface.

6. The cleaning apparatus of claim 5 wherein: the mount means comprises a support means secured to the side wall of the housing, a generally upright rod member movably mounted in said support means and spring means for biasing the rod in a downward direction and means to connect the brush means to the lower end of the rod.

7. The cleaning apparatus of claim 1 including: mount means for attaching the brush means to the side wall of the housing, said mount means having means to releasably attach the brush unit to the side wall whereby the brush unit can be removed from the housing.

8. The cleaning apparatus of claim 1 including: handle means connected to opposite portions of the housing, and flexible hose means connected to the handle means and the spinner assembly for carrying cleaning fluid under pressure from the handle means to the spinner assembly.

9. The cleaning apparatus of claim 1 including: handle means connected to the housing.

10. The cleaning apparatus of claim 9 wherein: the handle means is an elongated tube adapted to carry cleaning fluid under pressure to the spinner assembly.

11. The cleaning apparatus of claim 1 including: handle means pivotally mounted on a portion of the spinner assembly.

12. The cleaning apparatus of claim 11 wherein: the handle means is an elongated tube adapted to carry cleaning fluid under pressure to the spinner assembly.

13. The cleaning apparatus of claim 1 including: an open guard means extended across the open side of the housing.

14. The cleaning apparatus of claim 1 wherein: the housing has a generally square shape.

15. The cleaning apparatus of claim 1 wherein: the side wall has an outwardly stepped lip providing an inside peripheral space for a portion of the brush means, and means to hold said portion of the brush means in said space.

16. The cleaning apparatus of claim 15 including: open guard means extended across the open side of the housing, said guard means having a portion located adjacent said brush means, said means to hold the brush means also holds the guard means to the side wall.

17. The cleaning apparatus of claim 1 including: drain means attached to said top wall to allow cleaning fluid to drain from said housing when it is used in an inverted position.

18. The cleaning apparatus of claim 1 wherein: the nozzle means has one nozzle having a discharge orifice inclined in a forward direction and another nozzle having a discharge orifice inclined in a rearward direction relative to the direction of rotation of the rotor.

19. A cleaning apparatus for discharging a generally circular pattern of cleaning fluid toward a surface comprising: a housing having a top wall and a peripheral side wall terminating in an edge surrounding an open side of the housing; a spinner assembly mounted on a central portion of the top wall and adapted to be connected to a source of cleaning fluid under pressure, handle means connected to the cleaning apparatus, said handle means comprising an elongated tube adapted to carry cleaning fluid under pressure to the spinner assembly, said spinner assembly having a rotatable rotor located within said housing; tubular arm means mounted on the rotor for rotation therewith within said housing; nozzle means secured to portions of the arm means, said nozzle means located inwardly from the plane of the edge of the housing, each nozzle means having at least one discharge orifice directed toward the open side of the housing whereby on application of cleaning fluid under pressure to the spinner assembly the nozzle means move in a circular direction

directing a pattern of cleaning fluid out through the open side of the housing; and brush means mounted on said side wall engageable with said surface to be cleaned.

20. The cleaning apparatus of claim 19 including: means to removably mount the brush means on the side wall of the housing.

21. The cleaning apparatus of claim 19 wherein: said brush means comprise a plurality of arcuate brush units, and mounting means for connecting the brush units to the side wall.

22. The cleaning apparatus of claim 19 including: wheel means attached to the housing to support the housing on the surface with the bottom edge of the housing spaced from the surface.

23. The cleaning apparatus of claim 19 including: mount means movably attaching the brush means to the side wall of the housing, said mount means having generally upwardly movable members attached to the brush means and biasing means for yieldably urging the brush means in a downward direction into engagement with the surface.

24. The cleaning apparatus of claim 23 wherein: the mount means comprise a support means secured to the side wall of the housing, a generally upright rod member movably mounted in said support means and spring means for biasing the rod in a downward direction and means to connect the brush means to the lower end of the rod.

25. The cleaning apparatus of claim 19 including: mount means for attaching the brush means to the side wall of the housing, said mount means having means to releasably attach the brush unit to the side wall whereby the brush unit can be removed from the housing.

26. The cleaning apparatus of claim 19 including: an open guard means extended across the open side of the housing.

27. The cleaning apparatus of claim 19 wherein: the housing has a generally square shape.

28. The cleaning apparatus of claim 19 wherein: the side wall has an outwardly stepped lip providing an inside peripheral space for a portion of the brush means, and means to hold said portion of the brush means in said space.

29. The cleaning apparatus of claim 28 including: open guard means extended across the open side of the housing, said guard means having a portion located adjacent said brush means, said means to hold the brush means also holds the guard means to the side wall.

30. The cleaning apparatus of claim 19 wherein: said spinner assembly has a body having a cylindrical portion, said rotor having a sleeve rotatably mounted on the cylindrical portion, means to hold the sleeve on the cylindrical portion, said arm means being secured to said sleeve, said sleeve having passageways to direct cleaning fluid under pressure to said arm means.

31. The cleaning apparatus of claim 19 including: drain means attached to said top wall to allow cleaning fluid to drain from said housing when it is used in an inverted position.

32. The cleaning apparatus of claim 19 wherein: the nozzle means has one nozzle having a discharge orifice inclined in a forward direction and another nozzle having a discharge orifice inclined in a rearward direction relative to the direction of rotation of the rotor.

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33. A cleaning apparatus for discharging a generally circular pattern of cleaning fluid toward a surface comprising: a housing having a top wall and an outer peripheral side wall terminating in an edge surrounding an open side of the housing; a spinner assembly 5
 10 mounted on a central portion of the top wall adapted to be connected to a source of cleaning fluid under pressure, said spinner assembly having a body secured to the top wall, a member rotatably mounted on the body, means to hold the member in rotatable assembled relation with the body, tubular arm means 15
 20 mounted on the member for rotation therewith within said housing, said body and member having passageways to direct cleaning fluid under pressure to said arm means, nozzle means secured to portions of the arm means, said nozzle means located inwardly from the plane of the edge of the housing, each nozzle means having at least one discharge orifice directed toward the open side of the housing whereby on application of cleaning fluid under pressure to the spinner assembly 25
 30 the nozzle means moves in a circular direction directing a pattern of cleaning fluid out through the open side of the housing; and brush means mounted on said side wall adapted to engage the surface to be cleaned.

34. The cleaning apparatus of claim 33 including: 25
 means to removably mount the brush means on the side wall of the housing.

35. The cleaning apparatus of claim 33 wherein: said brush means comprise a plurality of arcuate brush units, and mounting means for connecting the brush 30
 units to the side wall.

36. The cleaning apparatus of claim 33 including: wheel means attached to the housing to support the housing on the surface with the bottom edge of the housing spaced from the surface.

37. The cleaning apparatus of claim 33 including: mount means movably attaching the brush means to the side wall of the housing, said mount means having generally upwardly movable members attached to the brush means and biasing means for yieldably urging the 40
 brush means in a downward direction into engagement with the surface.

38. The cleaning apparatus of claim 37 wherein: the mount means comprises a support means secured to the side wall of the housing, a generally upright rod 45
 member movably mounted in said support means and spring means for biasing the rod in a downward direction and means to connect the brush means to the lower end of the rod.

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39. The cleaning apparatus of claim 33 including: mount means for attaching the brush means to the side wall of the housing, said mount means having means to releasably attach the brush unit to the side wall whereby the brush unit can be removed from the housing.

40. The cleaning apparatus of claim 33 including: handle means connected to opposite portions of the housing, and flexible hose means connected to the handle means and the spinner assembly for carrying cleaning fluid under pressure from the handle means to the spinner assembly.

41. Cleaning apparatus of claim 33 including: handle means connected to the housing.

42. The cleaning apparatus of claim 41 wherein: the handle means is an elongated tube adapted to carry cleaning fluid under pressure to the spinner assembly.

43. The cleaning apparatus of claim 33 including: handle means pivotally mounted on a portion of the spinner assembly.

44. The cleaning apparatus of claim 43 wherein: the handle means is an elongated tube adapted to carry cleaning fluid under pressure to the spinner assembly.

45. The cleaning apparatus of claim 33 including: an open guard means extended across the open side of the housing.

46. The cleaning apparatus of claim 33 wherein: the housing has a generally square shape.

47. The cleaning apparatus of claim 33 wherein: the side wall has an outwardly stepped lip providing an inside peripheral space for a portion of the brush means, and means to hold said portion of the brush means in said space.

48. The cleaning apparatus of claim 47 including: open guard means extended across the open side of the housing, said guard means having a portion located adjacent said brush means, said means to hold the brush means also holds the guard means to the side wall.

49. The cleaning apparatus of claim 33 including: drain means attached to said top wall to allow cleaning fluid to drain from said housing when it is used in an inverted position.

50. The cleaning apparatus of claim 33 wherein: the nozzle means has one nozzle having a discharge orifice inclined in a forward direction and another nozzle having a discharge orifice inclined in a rearward direction relative to the direction of rotation of the rotor.

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