Aug. 12, 1969 R. F. DYER 3,460,184
AUTOMATIC CONVERSION SYSTEM FOR A SCRUBBING AND LIQUID PICKUP APPLIANCE
Filed Nov. 15, 1966 4 Sheets-Sheet 1

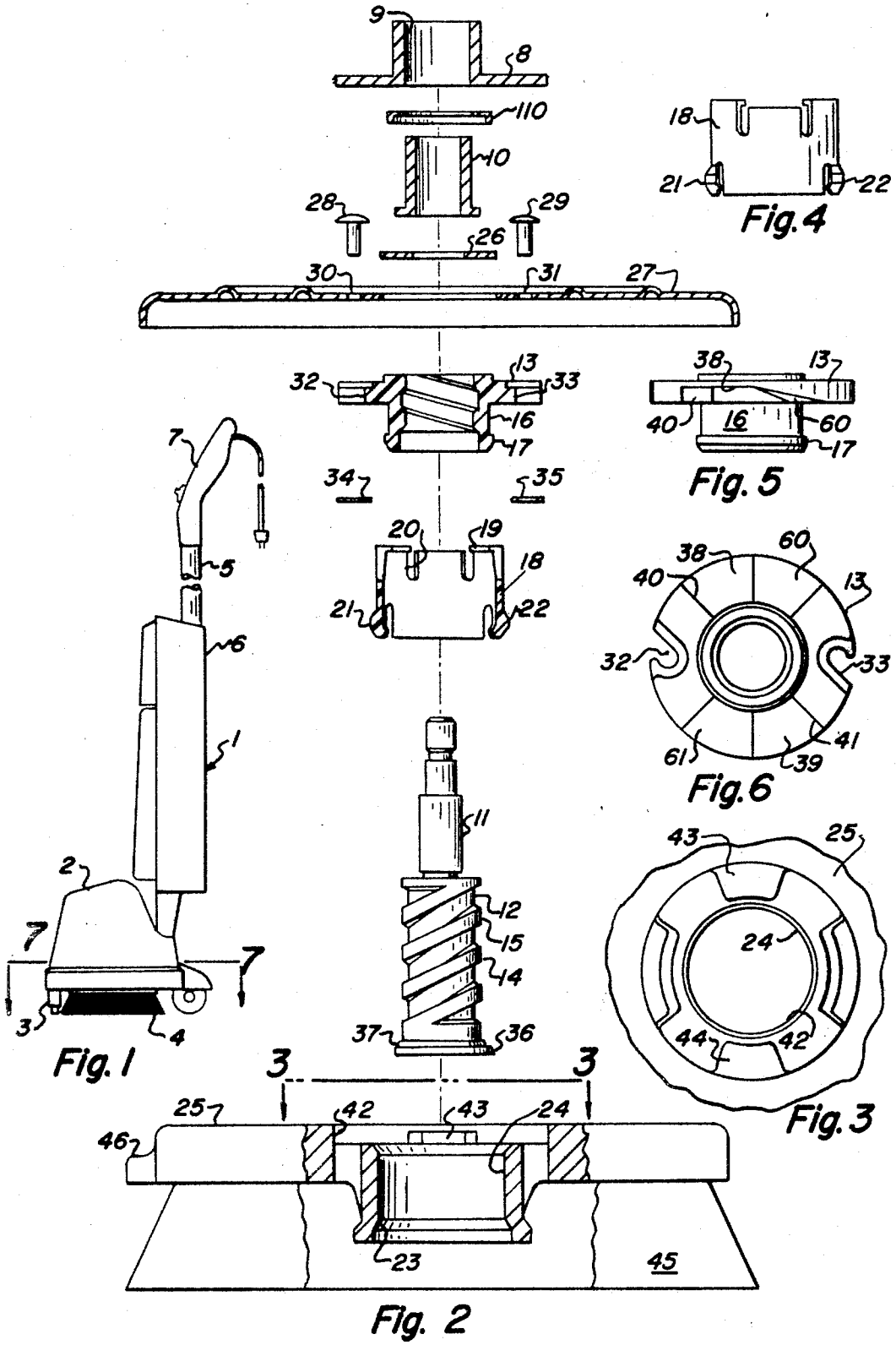

Fig. 2

Fig. 4

Fig. 5

Fig. 6

Fig. 3

Fig. 1

Aug. 12, 1969 R. F. DYER 3,460,184
AUTOMATIC CONVERSION SYSTEM FOR A SCRUBBING AND LIQUID PICKUP APPLIANCE
Filed Nov. 15, 1966 4 Sheets-Sheet 2

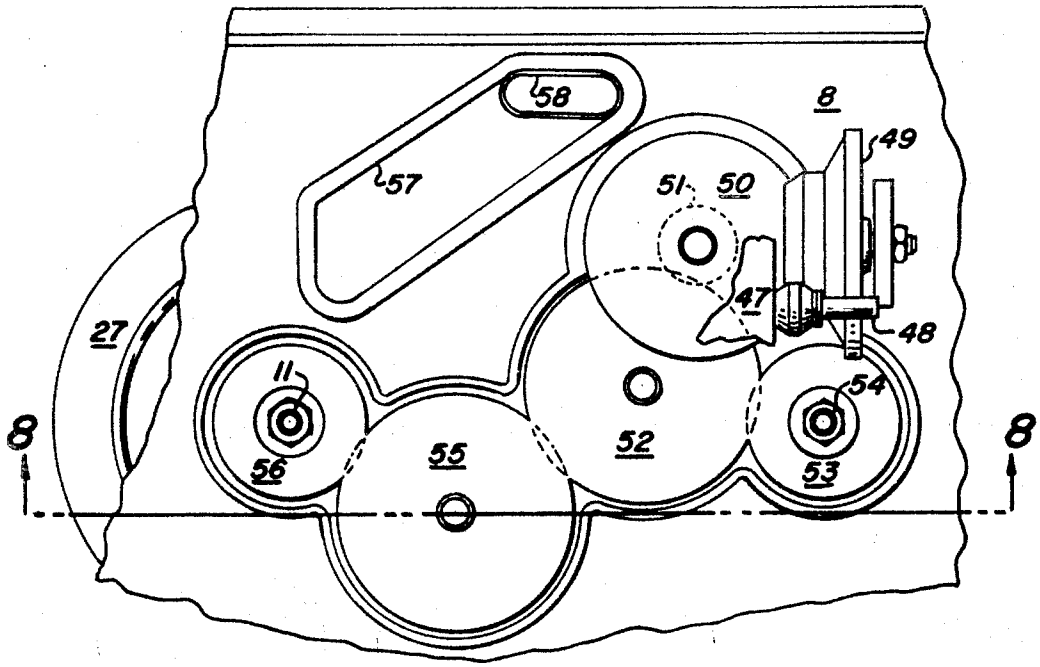

Fig. 7

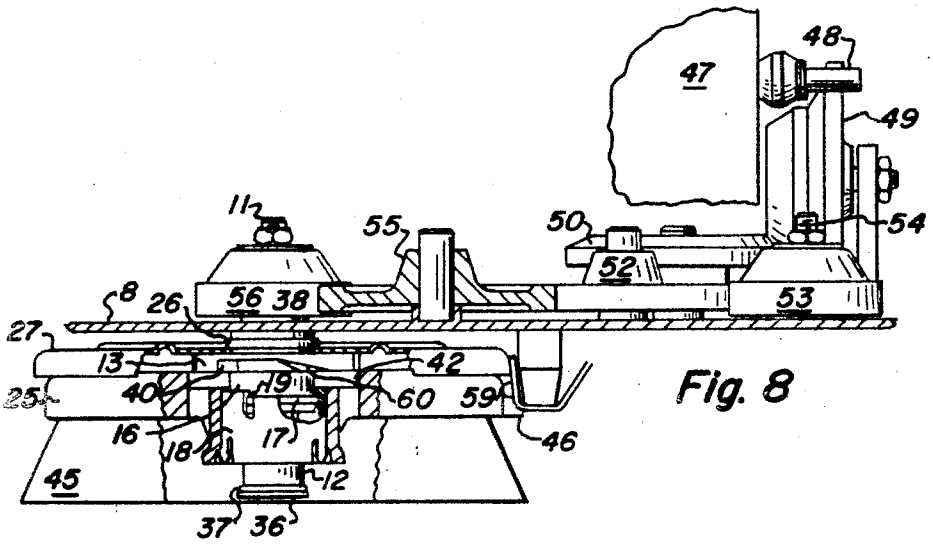

Fig. 8

Aug. 12, 1969 R. F. DYER 3,460,184
AUTOMATIC CONVERSION SYSTEM FOR A SCRUBBING AND LIQUID PICKUP APPLIANCE
Filed Nov. 15, 1966 4 Sheets-Sheet 3

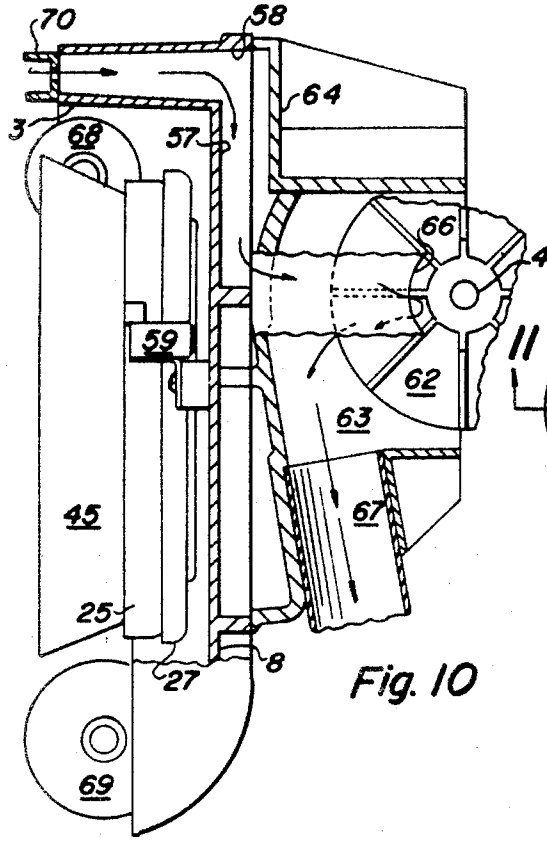

Fig. 10

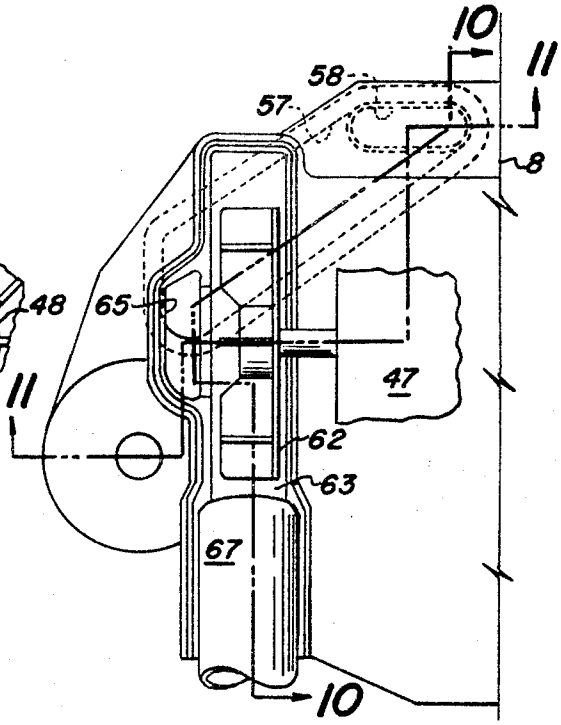

Fig. 9

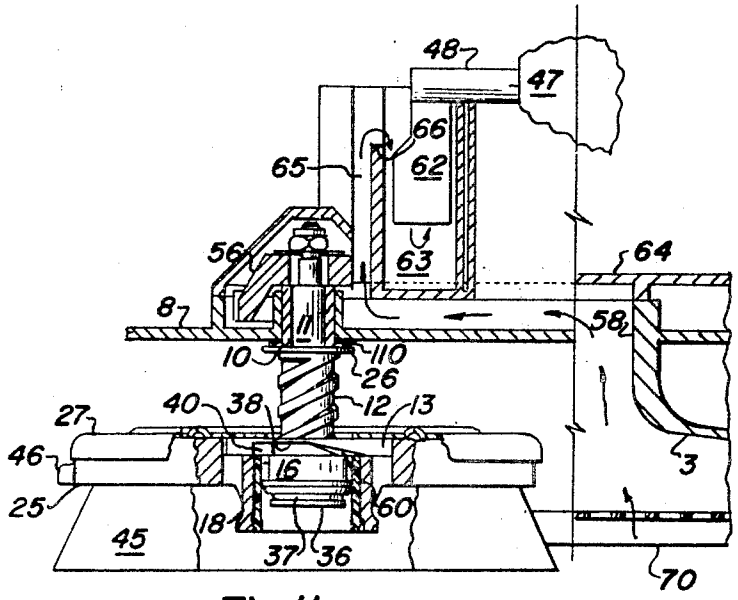

Fig. 11

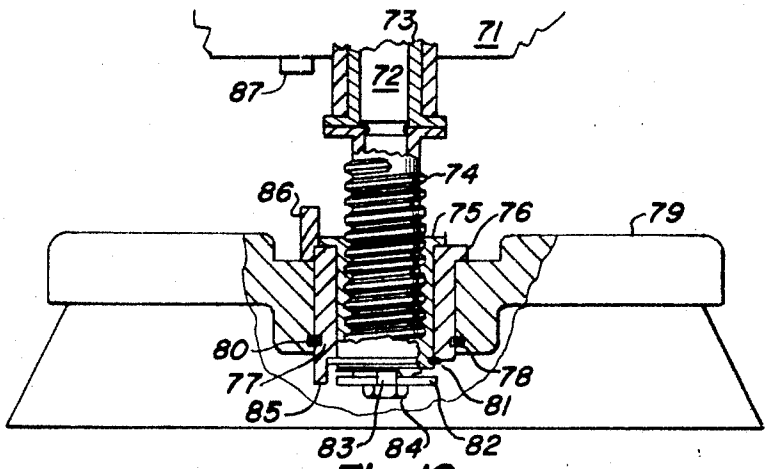
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Fig. 12

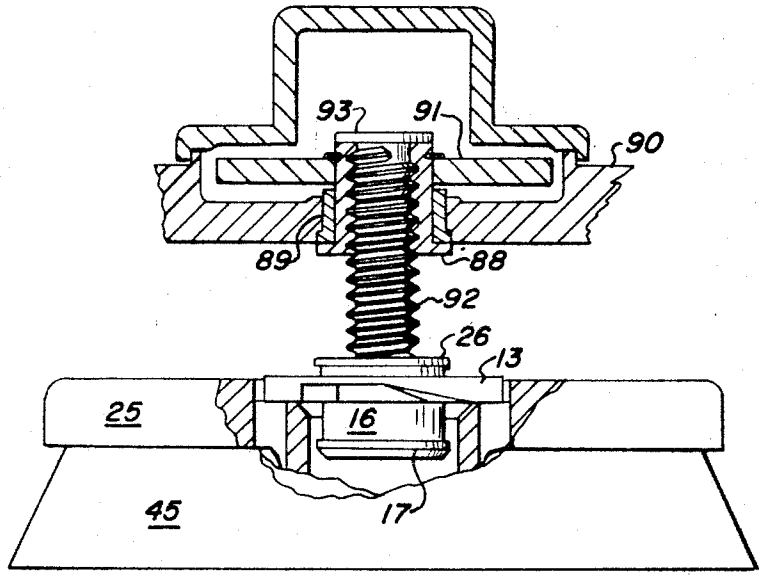
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Fig. 13

United States Patent Office 3,460,184
Patented Aug. 12, 1969

3,460,184

AUTOMATIC CONVERSION SYSTEM FOR A SCRUBBING AND LIQUID PICKUP APPLIANCE

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Filed Nov. 15, 1966, Ser. No. 594,624
Int. Cl. A47l 5/30, 7/02
U.S. Cl. 15—320 26 Claims

ABSTRACT OF THE DISCLOSURE

A floor scrubbing and drying appliance includes automatic conversion means for changing the device from a scrubbing condition to a liquid pickup condition by reversing the direction of rotation of a driving motor. A scrubbing brush is threaded on a vertical axis shaft driven by the motor so that the brush will move up or down the shaft depending upon the direction in which the shaft is being rotated by a driving motor. Movement of the brush up and down the shaft automatically places a liquid pickup nozzle either in a raised and inactive position or in liquid pickup contact with the surface.

The present invention relates to an automatic conversion system for a scrubbing and liquid pickup appliance. In an appliance for power scrubbing of floors it is desirable to also pick up the liquid used in scrubbing. Prior devices have provided either power scrubbing or liquid pickup in advantageous manners. However, prior devices have not advantageously combined the features of scrubbing and pickup as one feature was usually sacrificed in favor of the other. In prior devices it has been necessary to use manual shifting of levers or changing of brushes to convert from a scrubbing to a liquid pickup condition. Other prior devices having liquid pickup have only power pickup and require manual manipulation for scrubbing. Additional devices having power scrubbing require rather extensive manual modification to change from a scrubbing to a liquid pickup condition. Other prior devices have attempted to convert from scrub to pickup simply by reversing the direction of rotation of a horizontal axis brush. This leaves the brush in continuous contact with the surface being scrubbed and the floor is not dried well due to residual liquid in the brush.

In accordance with the present invention a power scrubbing and liquid pickup appliance is provided wherein a mere reversal in direction of rotation of the motor converts the device from a scrubbing to a liquid pickup condition. The device of the present invention utilizes vertical axis brushes which are highly efficient for scrubbing hard surface floors or for shampooing carpets. The device is automatically convertible from scrubbing to liquid pickup simply by reversing the motor on the device. The device of the present invention has rotatable brush mounting shafts which have screw threads formed thereon for cooperation with corresponding screw threads formed on brush carriers. The direction of rotation of the brush mounting shafts is reversible and the brush carriers are selectively moved up or down the shafts simply by reversing the direction of rotation of the shafts. The brush carriers thus carry the brushes to upper or lower positions. The device includes a suction nozzle which is in

liquid pickup contact with a floor when the brushes are in their upper position. Reversing the rotary direction of the shafts moves the brushes and carriers downwardly and the force of the brushes against a floor lift, the entire device to lift the nozzle out of liquid pickup contact with a floor. The device includes a releasable drive connection between the brushes and brush carriers so that the brushes are not driven in their upper position. The screw threads are specially formed so that the brush carriers will not jam in the upper or lower position. A special inertia mass is provided on the brush carriers to insure that the carriers move up and down the shafts and do not rotate with the shafts during shifting movements.

Therefore, it is an object of this invention to provide a power scrubbing and liquid pickup device having means to automatically convert from scrub to pickup simply by reversing the direction of rotation of the motor to move the scrubbing brushes up or down which in turn raises or lowers the nozzle.

It is another object of this invention to raise and lower scrubbing brushes on a floor cleaning appliance by forming screw threads on the brush mounting shafts and on brush carriers for automatically screwing the carriers up or down the shafts by reversing the direction of rotation of the shafts.

It is another object of this invention to provide a releasable driving connection between brushes and brush carriers so that the driving connection is automatically connected in an upper position of the brushes and automatically disconnected in a lower position of the brushes.

It is an additional object of this invention to provide special screw threads on the brush shafts and brush carriers so that the carriers will not jam in an upper or lower position, and to provide retainers and stops for holding the brushes and carriers in an upper position and for stopping rotation of the brushes.

It is another object of this invention to provide an inertia mass on brush carrier means to prevent rotation of the carrier with the shaft when the carrier is moving between lower and upper positions.

It is a further object of this invention to provide shock absorbing means on the bottom of brush shafts to absorb the kinetic energy of a brush and carrier moving down the shaft.

Other objects and advantages of the present invention will be apparent as the description proceeds when taken in connection with the accompanying drawing wherein:

FIGURE 1 is a side elevational view of a floor scrubbing and liquid pickup device having the features of the present invention embodied therein.

FIGURE 2 is an exploded view showing the brush mounting shaft, brush carrier and brush of the present invention with portions in section for clarity.

FIGURE 3 is a partial top view of the brush in FIG. 2 taken in the direction of arrows 3—3.

FIGURE 4 is a side elevational view of the brush attaching member of FIG. 2.

FIGURE 5 is a side elevational view of the brush carrier member of FIG. 2.

FIGURE 6 is a bottom view of the brush carrier member of FIG. 5.

FIGURE 7 is a top sectional view of the main support taken on line 3—3 of FIG. 1 and showing the brush drive with portions removed for clarity.

FIGURE 8 is a sectional view taken on line 8—8 of FIG. 7 showing the brush carrier, brush shaft and brush

of FIG. 2 in assembled condition and in raised position.

FIGURE 9 is a partial sectional view taken in the direction of arrows 7—7 of FIG. 1 but at a higher position to show the suction fan arrangement.

FIGURE 10 is a partial sectional view taken on line 10—10 of FIG. 9.

FIGURE 11 is a partial sectional view taken on line 11—11 of FIG. 9, and showing the brush carrier, brush shaft and brush of FIG. 2 in assembled condition and in lower position.

FIGURE 12 is a partial sectional view showing a modified brush raising and lowering mechanism.

FIGURE 13 is a partial sectional view showing another modified brush raising and lowering mechanism.

Referring now to FIG. 1 there is shown a floor scrubbing and liquid pickup device 1 including a main body portion 2 housing an electric motor driving a suction fan connected to liquid pickup squeegee nozzle 3 and also driving rotatable shafts mounting a brush as at 4. A handle 5 is pivotally connected to body portion 2 and mounted on handle 5 is a liquid tank mounting and air-water separator housing assembly 6 which is more fully described in a copending application of Louis E. Segesman, Ser. No. 594,551, filed Nov. 15, 1966. Handgrip portion 7 of handle 5 houses a motor reversing switch in a manner disclosed in a copending application of Donald R. Bowers, Ser. No. 594,580, filed Nov. 15, 1966.

FIGURE 2 shows the parts of the brush raising and lowering structure of the present invention. Main support 8 of body portion 2 has a hole 9 therein for receiving sleeve bearing 10 in which shaft 11 is rotatably mounted. A gasket 110 of elastomeric material such as rubber is positioned between support 8 and a flange on bearing 10 to effect a water seal. Shaft 11 includes a lower portion 12 having screw threads formed thereon for threadedly receiving carrier member 13 having cooperating screw threads formed interiorly thereof. Threaded portion 12 includes a double thread having thread 14 and thread 15 which are spaced 180 degrees apart. Corresponding double threads are formed in carrier member 13 for cooperating threaded engagement with threads 14 and 15. Carrier 13 includes a cylindrical shank portion 16 having an outwardly projecting flange 17 on the bottom thereof. A brush attaching portion 18 of carrier 13 is cylindrical and has inwardly extending flange means as at 19 which is received rotatably and slidably around shank 16. The inner diameter of flange 19 is smaller than the outer diameter of flange 17. Slots as at 20 in the upper portion of member 18 allow upper portions to bend outwardly so that flange means 19 can be received on shank 16 over flange 17. Brush attaching portion 18 includes resilient fingers 21 and 22 which are bendable radially inward and have outwardly extending projections thereon for locking under a shoulder 23 formed at the bottom of a circular hole 24 in the rigid back portion of circular brush 25. A washer 26 is a tight fit on the upper portion of shaft 11 and is adhesively secured to the flat top of bottom portion 12 for rotation with shaft 11. A substantially flat circular plate 27 is secured to carrier 13 as by rivets 28 and 29 extending through holes 30 and 31 in plate 27 and through recesses 32 and 33 in a flat upper portion of carrier 13. Eyelets 34 and 35 are positioned around the lower portions of rivets 28 and 29 before the rivets are flattened. Lower portion 12 of shaft 11 has an outwardly extending flange 36 on the bottom thereof and an elastomeric washer 37 such as rubber is positioned around lower portion 12 above flange 36 to serve as a shock absorber. Carrier 13 has a pair of oppositely disposed recesses 38 and 39 in the underside of its flat top portion. Each recess 38 and 39 has a vertical face 40 and 41 defining driving lugs. The rear face of brush 25 has a circular recess 42 therein surrounding opening 24 and a pair of oppositely disposed projections 43 and 44 project upwardly to define driving lugs which are received in recesses 38 and 39. Vertical side faces on projections 43 and 44 cooperate with faces 40 and 41 of recesses 38 and 39. Brush 25 has bristles 45 projecting downwardly from the front face thereof and a radially extending projection 46 extends from the periphery of brush 25. Further details of the brush connection and drive are disclosed in a copending application of Brandt F. Ziegler, Ser. No. 594,623, filed Nov. 15, 1966. The bottom edge of shank 16 on carrier 13 has a diameter smaller than the diameter of flange 36 on the bottom of shaft 11 so that the bottom edge of shank 16 strikes shock absorber 37 when carrier 13 moves downwardly on threaded portion 12 of shaft 11. When carrier 13 moves up on threaded portion 12 its top strikes washer 26 to limit its vertical movement. When shaft 11 rotates clockwise, from right to left in FIG. 2, carrier 13 is caused to thread upwardly on threaded portion 12 until it strikes washer 26 and is then rotatably driven with shaft 11. When shaft 11 is rotated counterclockwise, from left to right in FIG. 2, carrier 13 is caused to thread down threaded portion 12 until it strikes shock absorber 37 above flange 36 and is then rotatably driven with shaft 11. Shock absorber 37 absorbs the kinetic energy in carrier 13, inertia plate 27 and brush 25 as they move down threaded portion 12 from an upper to a lower position. This has been found highly advantageous to prevent bouncing or hunting of carrier 13 on flange 36. Shock absorber 37 also provides some slack in the drive to take up variations in brush load as it is being driven in contact with a floor.

Thread portion 12 is molded on shaft 11 and is of synthetic plastic material such as rigid polyvinyl acetate. The threads could also be metal and integral with shaft 11 but synthetic plastic material provides better corrosion resistance. Threaded portion 12 has a length from its upper edge to the upper surface of flange 36 of around 1.60 inches. Shock absorber 37 has a thickness of around 0.06 inch so that the length of threaded portion 12 on which carrier 13 can move up and down is around 1.54 inches. Carrier 13 has a lengtth from its upper surface to the bottom edge of shank 16 of around 0.675 inch. Thus, the extent of movement of carrier 13 from its extreme upper position in which it abuts washer 26 to its extreme lower position where it abuts shock absorber 37 is around 0.865 inch. Shank 16 has a length of around 0.200 inch between the underside of the flat upper portion on carrier 13 and the top surface of flange 17. Flange 19 on attaching portion 18 has a thickness of around 0.05 inch so that attaching portion 18 can move a distance of around 0.150 inch vertically on shank 16. Thus, when carrier 13 moves from its extreme lower position to its extreme upper position it lifts brush 25 around 0.715 inch. The threads in carrier 13 start at points spaced upwardly from the bottom edge of shank 16 a distance greater than the distance between the top of shock absorber 37 and the starting point of the threads on portion 12. This insures engagement between shock absorber 37 and the bottom edge of shank 16. It will be understood by those skilled in the art that the dimensions given are only for purposes of example and could be modified.

Threaded portion 12 of shaft 11 has a root diameter of around 0.560 inch and a peak thread diameter of around 0.680 inch. In designing the pitch of threads 14 and 15 it is desirable to have a large enough pitch so that carrier 13 will not tighten in its extreme upper or lower position to such an extent that it cannot be freed merely by reversing the direction of rotation of shaft 11. To accomplish this it is desirable to form threads 14 and 15 with a pitch such that carrier 13, inertia plate 27 and brush 25 will cause carrier 13 to rotate down threads 14 and 15 by the force of their weight alone. For the specific example described this pitch is around 0.460 or roughly two threads per inch. By experimentation it has been found that a pitch of around 0.666 or roughly one and one half threads per inch is most desirable. This pitch is for a combined weight of inertia plate 27 and brush 25 of around 306 grams or 10.8 ounces. Carrier 13 and attaching por-

tion 18 are of synthetic plastic material such as rigid polyvinyl acetate and are of negligible weight. It will be understood that these dimension can be varied depending on material used for the threads and the friction therebetween, and/or the diameter of threaded portion 12.

When brush 25 is in its lower position and the direction of rotation of shaft 11 is reversed to raise carrier 13 it is possible that carrier 13 will simply rotate with shaft 11 due to frictional engagement between the threads as brush 25 and attaching portion 18 are freely rotatable on shank 16 and provide little resistance to rotation of carrier 13. To prevent this rotation of carrier 13 on shaft 11 when moving between lower and upper positions an inertia mass is provided in the form of plate 27 having a weight of around 106 grams or 3.74 ounces. This provides carrier 13 with sufficient mass to resist rotation with shaft 11 simply due to frictional engagement between the threads so that carrier 13 will move upwardly on threaded portion 12. When carrier 13 is rotating in its upper position plate 27 also provides sufficient mass to insure relative rotation between carrier 13 and shaft 11 when the direction of rotation of shaft 11 is reversed to lower carrier 13. With the long pitch for each thread 14 and 15 it is possible that carrier 13 would be unstable or would wobble so the double thread is advantageous to prevent wobbling and adequately support carrier 13.

FIGURE 7 shows main support 8 having a motor 47 mounted thereon in a manner well known in the floor polisher art. Motor 47 has a power takeoff shaft 48 having a helical gear formed thereon to drive horizontally mounted gear 49 which in turn drives idler gear 50. Idler gear 50 has a reduction gear 51 on the underside thereof driving idler 52 which drives brush shaft gear 53 driving shaft 54. Idler 52 also drives idler 55 which in turn drives gear 56 on brush shaft 11. The direction of rotation of motor 47 and motor shaft 48 is reversible to effect reversal of the direction of rotation of brush shafts 11 and 54 to move the brushes up and down. Support 8 has a channel 57 formed therein and an opening 58 through the front thereof leading to nozzle 3 of FIG. 1.

FIGURE 8 shows brush 25 in its upper position. In this view shaft 11 is rotating clockwise, or from right to left, and carrier 13 and plate 27 have screwed up threaded portion 12 to abut washer 26 where they rotate with shaft 11. In this condition there is no relative rotation between shaft 11 and carrier 13 so that it is the same as if they were standing still. Thus, carrier 13 could rotate down shaft 11 by the force of the weight of plate 27 and brush 25. To prevent this a retaining member 59 is secured to support 8. Retaining member 59 comprises a substantially U-shaped piece of polyvinyl acetate having bendable leg portions. Plate 27 has its periphery contacting retaining member 59 to bend one of its legs and provide a friction drag on plate 27 which prevents carrier 13 from rotating downward on shaft 11. Retaining member 59 also forms a stop against which radial projection 46 on brush 25 abuts to prevent rotation of brush 25 in its upper position. This prevents residual liquid from being thrown out of bristles 45 in the upper position of brush 25. In the upper position shown flange 19 on attaching portion 18 is hanging on flange 17 of shank 16 and the flat upper portion of carrier 13 is out of recess 42 in the rear face of brush 25 so there is no driving engagement between lugs 43 and 44 and recesses 38 and 39. Recesses 38 and 39 have a sloping sidewall 60 and 61 for disengaging the driving connection between carrier 13 and brush 25 as soon as carrier 13 starts to move upwardly on shaft 11.

When the direction of rotation of shaft 11 in FIG. 8 is reversed to counterclockwise, from left to right, plate 27 provides carrier 13 with sufficient mass to continue rotating clockwise so that threaded portion 12 and carrier 13 are rotating in opposite directions and this causes carrier 13 to screw down shaft 11 to the position of FIG. 11. Carrier 13 moves down until the bottom edge of shank 16 strikes shock absorber 37. Shock absorber 37 absorbs the impact of the downwardly moving parts to prevent bouncing and also tends to wedge or lock carrier 13 in its lower position. Carrier 13 then rotates counterclockwises with shaft 11. Bristles 45 bearing against a surface to be scrubbed raise attaching portion 18 upwardly on shank 16 and causes the flattened upper portion of carrier 13 to enter recess 42 in the rear face of brush 25. Driving lugs 43 and 44 on brush 25 are then received in recesses 38 and 39 on carrier 13 and driving faces 40 and 41 of the recesses drivingly engage corresponding driving faces on lugs 43 and 44. Brush 25 is then rotatably driven by carrier 13.

FIGURES 9–11 show the opposite end of horizontally mounted motor 47 having a suction fan 62 mounted on motor shaft 48 in suction fan chamber 63. The casing for motor 47 has a bottom portion as at 64 in FIG. 10 sealed against the top of channel 57 in the top of support 8 and over opening 58 leading to nozzle 3. The casing has a vertical conduit portion 65 connected with channel 57 and having a top opening 66 leading to the eye of centrifugal suction fan 62. An outlet passage 67 leads from the rear of fan chamber 63. Further details of the suction fan arrangement are described in a copending application of Jack E. McKinney, Ser. No. 594,442, filed Nov. 15, 1966. Support 8 has spaced apart front wheels rotatably attached thereto and only one of which is shown at 68 in FIG. 10. Support 8 also has spaced rear wheels rotatably attached thereto and only one of which is shown at 69 in FIG. 10. Nozzle 3 has squeegee lip 70 thereon for picking up liquid from a floor. When brush 25 is in raised position as shown in FIG. 10, and as described with reference to FIG. 8, wheels 68 and 69 support the device with squeegee lip 70 in liquid pickup contact with a floor. Fan 62 then causes air and liquid to flow through squeegee 70, nozzle 3, opening 58, along the passage formed by channel 47 and the bottom 64 of the motor casing, up conduit 65 into fan chamber 63 and out outlet 67. Reversal of the direction of rotation of motor 47 and brush shaft 11 causes the brush 25 to begin moving downward with carrier 13. Before the bottom edge of shank 16 on carrier 13 abuts shock absorber 37, brush bristles 45 contact the floor to move attaching portion 18 up and cause engagement between lugs 43 and 44 on brush 25 and recesses 38 and 39 on carrier 13. The resistance of bristles 45 against the floor and the engagement between lugs 43 and 44 and recesses 38 and 39 prevent rotation of carrier 13 with shaft 11 and carrier 13 continues to screw down threaded portion 12. As carrier 13 continues to screw down the reaction of the brush 25 against the floor causes the entire device to be raised off wheels 68 and 69, and lifts squeegee 70 out of liquid pickup contact with the floor. The device is then supported entirely on bristles 45 and squeegee 70 is above the plane of the bristle ends as shown in FIG. 11. Thus, the device is automatically convertible from a scrubbing condition to a liquid pickup condition simply by reversing the motor. Reversing the motor in the position of FIG. 11 automatically returns the parts to the position of FIGS. 8 and 10. Stopping rotation of brush 25 in its upper position relieves a load on motor 47 so that it has more power for fan 62 in the liquid pickup condition of the device. The device may have only one brush if desired but it is understood that the device shown would have two brushes with only one being shown and described in detail because the other one has the same construction.

FIGURE 12 shows a modified form of brush raising and lowering mechanism wherein support 71 rotatably mounts shaft 72 in sleeve bearing 73. Shaft 72 is drivingly connected to a reversible electric motor on support 71. Threaded portion 74 of shaft 72 threadedly receives bushing 75 having cooperating screw threads formed therein. Bushing 75 is cylindrical and rotatably receives brush carrier 76. The outside surface of carrier 76 is polygonal and has a circumferential groove 77 formed therein and holding spring wire 78. When brush 79 is pushed on car-

rier 76 spring wire 78 is compressed in groove 77 and then snaps out into a circumferential groove 80 in brush 79 to hold brush 79 on carrier 76. Brush 79 has a polygonal hole to receive carrier 76. Carrier 76 is held on bushing 75 by a C-shaped washer 81 received in a circumferential groove in the bottom portion of bushing 75. A washer 82 having a radially extending lug 83 thereon is held on the bottom of shaft 72 for rotation therewith by nut 84. When shaft 72 is rotated counterclockwise bushing 75 threads down shaft 72 to a lower position. A driving lug 85 on the bottom end of carrier 76 is then driven by lug 83 to rotate carrier 76 which in turn rotates 79 through the mating polygonal surfaces. When shaft 72 is rotated clockwise bushing 75 threads up shaft 72 disengaging the drive between lugs 83 and 85. When bushing 75 reaches its upper position stop 86 on carrier 76 hits abutment 87 on support 71 to stop rotation of brush 79. The frictional drag between bushing 75 and carrier 76 is sufficient for brush 79 to act as an inertia weight for bushing 75 when moving between lower and upper positions.

FIGURE 13 shows another embodiment of a brush raising and lowering mechanism wherein a bushing 88 is rotatably mounted in bearing 89 in support 90. Bushing 88 is rotatably driven by gear 91 fixed thereto and drivingly connected to a reversible electric motor. A threaded shaft 92 is threadedly received in bushing 88. When bushing 88 is rotated clockwise shaft 92 threads downwardly therein until flanged upper portion 93 hits the top of bushing 88 and shaft 92 is then rotatably driven. When bushing 88 is rotated counterclockwise shaft 92 threads upwardly thereon until washer 26 hits the bottom of bushing 88. The other parts at the bottom of the shaft may be the same as those described with reference to FIGS. 2–11. These alternative embodiments are merely shown for illustration and do not have the ease of manufacturing and operation of the preferred embodiment although they are satisfactory in operation.

It is possible to use threads having a smaller pitch if the parts are accurately made and jamming will not be a difficult problem even though the weight of the brush and carrier would not carry them down the shaft. The preferred pitch of the preferred embodiment does have distinct advantages as described.

Those skilled in the art will be readily aware of the advantages of the present device which automatically converts from a scrubbing to a liquid condition simply by reversing the direction of rotation of the motor. It is to be understood that the disclosed embodiments are only illustrative and are not to be taken in a limiting sense. The present invention includes all equivalent variations and obvious modifications of the disclosed embodiments and is limited only by the scope of the claims.

I claim:

1. In a scrubbing and wet pickup device,
(a) a body portion,
(b) a reversible electric motor mounted on said device, said motor being selectively rotatable in first and second opposite directions,
(c) suction nozzle means depending from said body portion,
(d) suction fan means drivingly connected with said motor,
(e) conduit means connecting said suction fan with said nozzle,
(f) scrubbing means drivingly connected with said motor by force transmitting means,
(g) said force transmitting means having automatic conversion means for automatically moving said entire scrubbing means downwardly to a lower position in scrubbing contact with a surface to be scrubbed in said first direction of rotation of said motor and for automatically moving said entire scubbing means upwardly to an upper position out of contact with a surface to be scrubbed in said second direction of rotation of said motor,
(h) said nozzle being lifted out of liquid pickup contact with a surface to be scrubbed by said scrubbing means moving to said lower position and being lowered into liquid pickup contact with a surface to be scrubbed by said scrubbing means moving to said upper position,
(i) whereby said device is automatically selectively convertible from a scrubbing condition to a liquid pickup condition by reversing the direction of rotation of said motor.

2. The device of claim 1 and further including a releasable drive connection in said force transmitting means between said motor and said scrubbing means, said releasable drive connection being automatically released in said upper position of said scrubbing means and being automatically connected in said lower position of said scrubbing means.

3. The device of claim 2 and further including stop means for stopping movement of said scrubbing means in said upper position thereof.

4. The device of claim 1 wherein said force transmitting means includes shaft means rotatably mounted on said body portion and said scrubbing means is attached to said shaft means by carrier means, said conversion means comprising cooperating screw threads formed on said shaft and said carrier means whereby rotation of said motor in said first direction rotates said shaft in one direction to screw said carrier means down said shaft and rotation of said motor in said second direction rotates said shaft in another direction to screw said carrier means up said shaft.

5. The device of claim 4 and including a releasable driving connection between said scrubbing means and said carrier means, said releasable driving connection being automatically released in said upper position of said scrubbing means and being automatically connected in said lower position of said scrubbing means.

6. The device of claim 4 wherein said cooperating screw threads on said shaft means and carrier means are formed with a pitch such that said scrubbing means and carrier means will rotate down said shaft means by the force of their own weight whereby said cooperating screw threads will not jam said carrier means in its extreme upper or lower positions.

7. The device of claim 6 wherein said cooperating screw threads on said shaft means and carrier means comprise a double thread on each of said shaft means and said carrier means, said double thread on each of said shaft means and carrier means comprising a pair of threads spaced one hundred eighty degrees apart and each of said pair of threads having the same pitch.

8. The device of claim 6 wherein said shaft means has flange means extending outwardly from its bottom portion, and shock absorber means positioned on the top surface of said flange means whereby the kinetic energy in said scrubbing means and carrier means when moving from said upper position to said lower position is absorbed by said shock absorber means.

9. The device of claim 6 and including retaining means on said body portion for retaining said carrier means and scrubbing means in said upper position of said scrubbing means whereby said carrier means and scrubbing means cannot rotate down said shaft from said upper position by the force of their own weight.

10. The device of claim 9 and including a releasable driving connection between said scrubbing means and said carrier means, said releasable driving connection being automatically released in said upper position of said scrubbing means and being automatically connected to said lower position of said scrubbing means.

11. The device of claim 10 and further including stop means on said body portion for stopping movement of said scrubbing means in said upper position thereof.

12. The device of claim 1 wherein said force transmitting means includes shaft means mounted on said body portion rotatably for rotation thereon and movably

for limited up and down movement relative to said body portion axially of said shaft means, said scrubbing means being mounted on said shaft means, said conversion means comprising cooperating thrust means on said shaft means and in said force transmitting means for rotatably driving said shaft means and for moving said shaft means upwardly in said first direction of rotation of said motor and downwardly in said second direction of rotation of said motor.

13. The device of claim **12** and further including a releasable drive connection between said shaft means and said scrubbing means, said releasable drive connection being automatically released in said upper position of said scrubbing means and being automatically connected in said lower position of said scrubbing means.

14. The device of claim **12** wherein said cooperating thrust means comprises cooperating screw threads on said shaft means and on a shaft driving element in said force transmitting means, said cooperating screw threads being formed with a pitch such that said shaft and scrubbing means will move downwardly to said lower position of said scrubbing means by the force of their own weight.

15. The device of claim **1** wherein said force transmitting means includes shaft means defining a first element rotatably mounted on said body portion and said scrubbing means is attached to said shaft by carrier means defining a second element, said carrier means being rotatable relative to said scrubbing means, said conversion means comprising cooperating screw threads formed on said shaft and said carrier means for screwing said carrier means up said shaft to lift said scrubbing means to said upper position when said shaft is rotated in one direction by said motor rotating in said first direction and for screwing said carrier means down said shaft to lower said scrubbing means to said lower position when said shaft is rotated in another direction by said motor rotating in said second direction, said carrier means being rotatably driven by said shaft means in said upper and lower positions of said scrubbing means, and cooperative driving lug means on said scrubbing means and on one of said first and second elements for driving said scrubbing means in said lower position thereof, said driving lug means being disengaged in said upper position of said scrubbing means.

16. The device of claim **15** and further including drag means providing a resistance to said carrier means against rotating with said shaft means between said upper and lower positions of said scrubbing means whereby said carrier means moves up and down said shaft means on said cooperating screw threads when directions of rotation of said shaft means are reversed.

17. The device of claim **16** wherein said drag means comprises an inertia mass on said carrier means, said inertia mass providing sufficient mass to said carrier means to prevent rotation thereof with said shaft due to engagement between said cooperating screw threads when said carrier means moves up and down on said shaft.

18. The device of claim **17** wherein said inertia mass comprises a substantially flat circular plate on the upper portion of said carrier means, said plate extending outward beyond the periphery of said back portion of said scrubbing means, friction means on said body portion, said plate having its periphery dragging against said friction means in said upper position of said scrubbing means.

19. The device of claim **17** wherein said cooperating drive lug means comprises downwardly facing lug means on said carrier means and upwardly facing lug means on said scrubbing means, said scrubbing means having a rigid circular back portion, stop means on said body portion, projection means extending radially outward from said back portion, said projection means engaging said stop means in said upper position of said scrubbing means to prevent rotation of said scrubbing means with said carrier means.

20. The device of claim **19** wherein said cooperating screw threads comprise double threads on each of said shaft means and carrier means, each single thread of said double threads on each of said shaft and carrier means having a pitch such that said carrier means, inertia mass and scrubbing means will rotate down said shaft by the force of their own weight when the periphery of said plate is not dragging against said friction means.

21. The device of claim **20** wherein said shaft means has an outwardly extending flange on its bottom portion, elastomeric shock absorbing means above said flange around said shaft means, said shock absorbing means contacting said carrier means in said lower position of said scrubbing means, said shaft absorbing means absorbing the kinetic energy in said carrier means and scrubbing means when said scrubbing means moves from said upper to said lower position.

22. In a polishing, scrubbing and suction pickup device:

(a) a body portion,

(b) suction nozzle means depending from said body portion,

(c) suction means connected with said nozzle means through conduit means,

(d) polishing and scrubbing means movably mounted on said body portion,

(e) reversible power means drivingly connected with said polishing and scrubbing means through force transmitting means, said power means being selectively drivable in first and second opposite directions,

(f) said force transmitting means including automatic conversion means for automatically moving said entire polishing and scrubbing means downwardly to a lower position in contact with a surface to be treated in said first direction of drive of said power means and for automatically moving said entire scrubbing means upwardly to an upper position out of contact with a surface to be treated in said second direction of drive of said power means,

(g) said nozzle being lifted out of suction pickup contact with a surface to be treated when said polishing and scrubbing means moves to said lower position and being lowered into suction pickup contact with a surface to be treated when said polishing and scrubbing means moves to said upper position,

(h) whereby said device is automatically and selectively convertible from a surface treating condition to a suction pickup condition by reversing the direction of drive of said power means.

23. The device of claim **22** and further including a releasable drive connection in said force transmitting means between said power means and said polishing and scrubbing means, said releasable drive connection being automatically released in said upper position of said scrubbing means and being automatically connected in said lower position of said scrubbing means.

24. The device of claim **23** and further including stop means for stopping movement of said scrubbing means in said upper position thereof.

25. In a surface treating device:

(a) a body portion,

(b) polishing and scrubbing means movably mounted on said body portion,

(c) reversible power means drivingly connected with said polishing and scrubbing means through force transmitting means, said power means being selectively drivable in first and second opposite directions,

(d) said force transmitting means including automatic conversion means for automatically moving said polishing and scrubbing means downwardly to a lower position in contact with a surface to be treated in said first direction of drive of said power means and for automatically moving said scrubbing means upwardly to an upper position out of contact with a

surface to be treated in said second direction of drive of said power means, and

(e) a releasable drive connection in said force transmitting means between said power means and said polishing and scrubbing means, said releasable drive connection being automatically released in said upper position of said polishing and scrubbing means and being automatically connected in said lower position of said polishing and scrubbing means.

26. The device of claim **25** and further including stop means for stopping movement of said scrubbing means in said upper position thereof.

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