Aug. 27, 1963 M. E. BELICKA ETAL 3,101,505

SURFACE TREATING MACHINE

Filed July 18, 1961 4 Sheets-Sheet 1

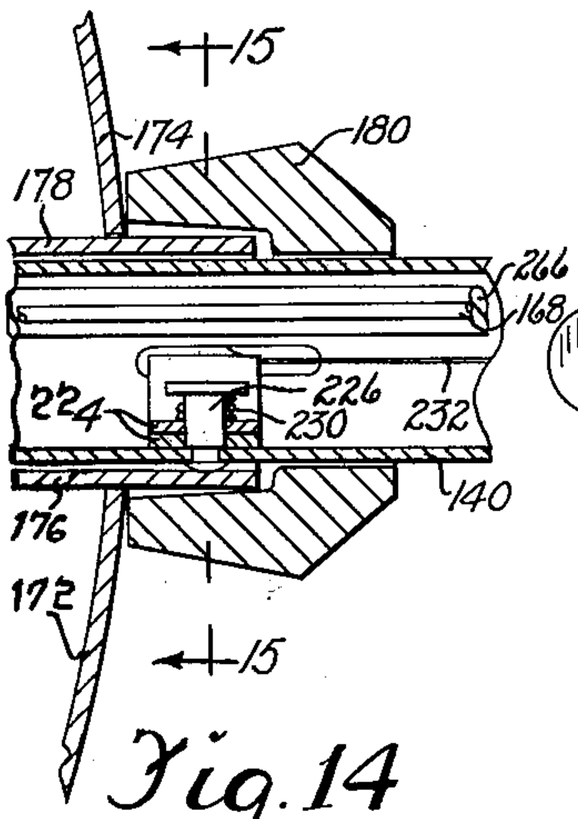


Fig. 14

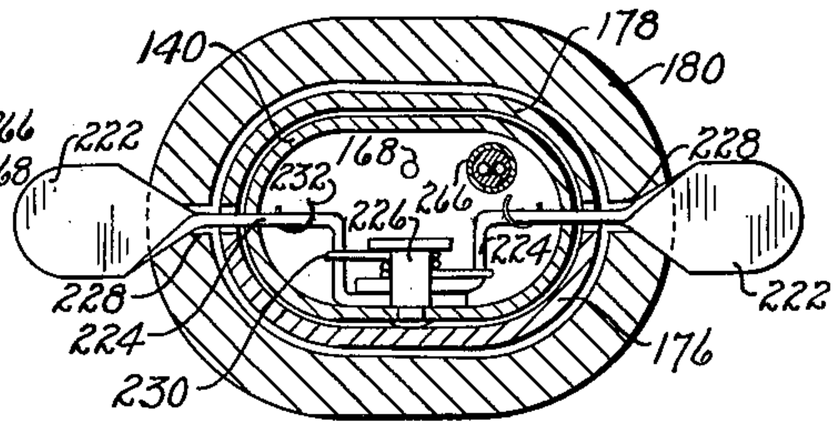


Fig. 15

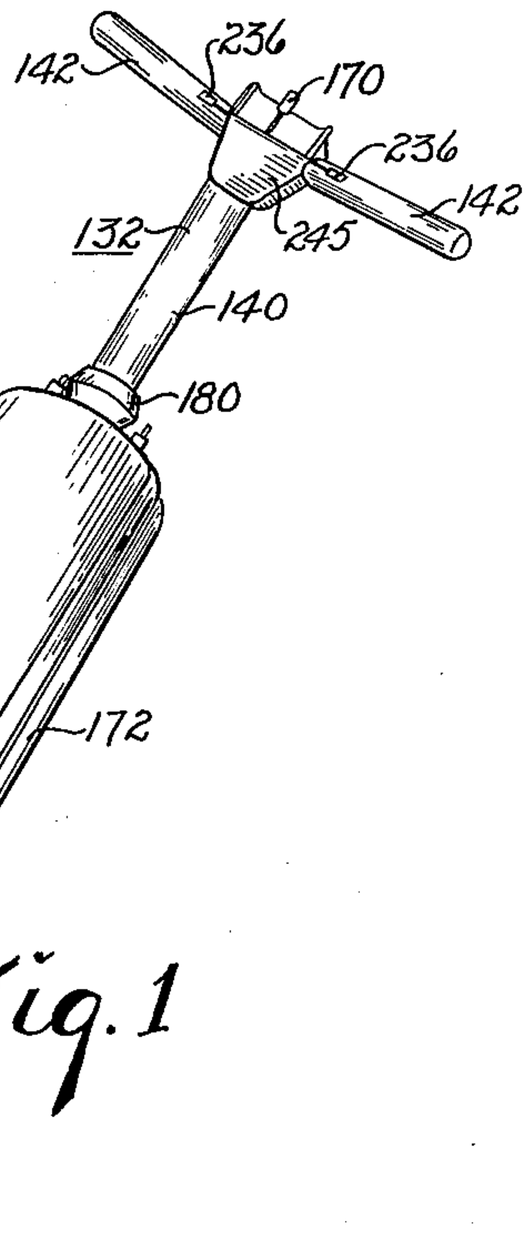


Fig. 1

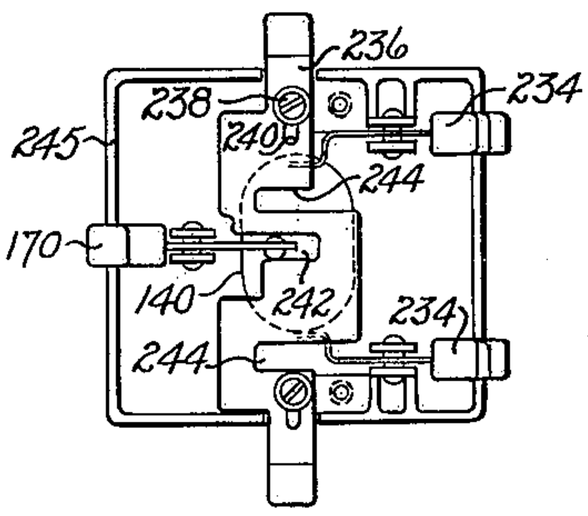
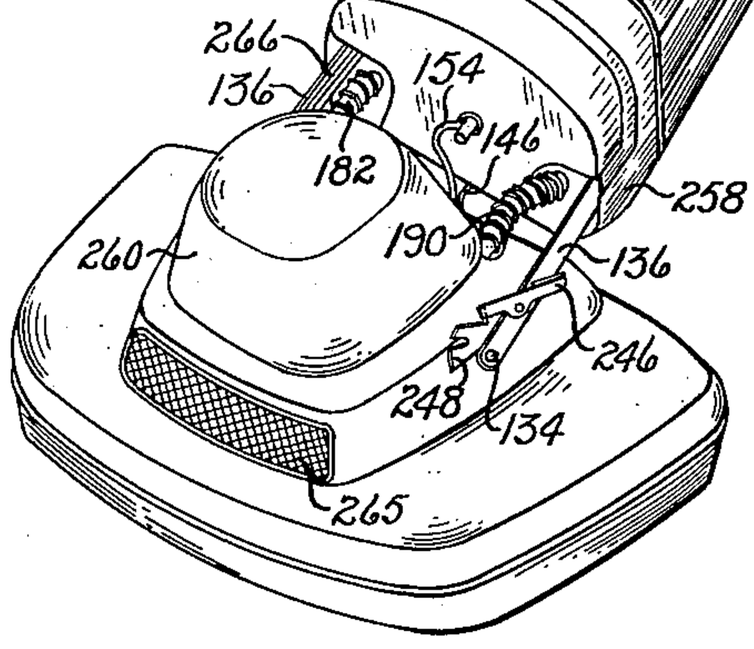


Fig. 16



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SURFACE TREATING MACHINE

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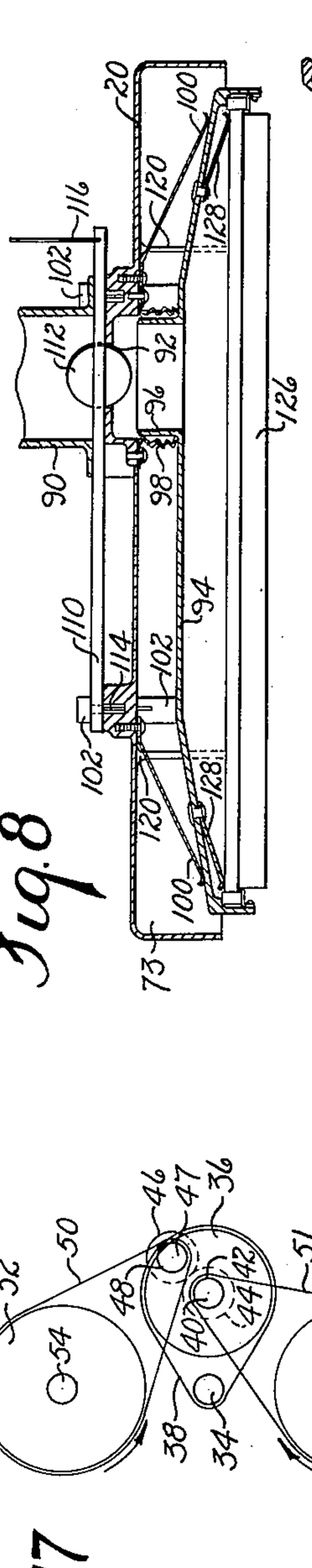

Fig. 8

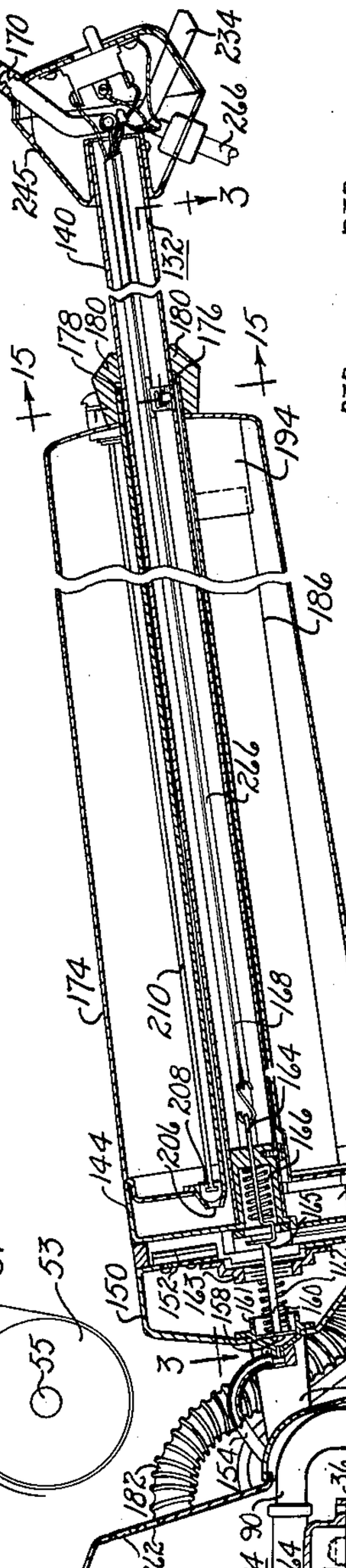

Fig. 2

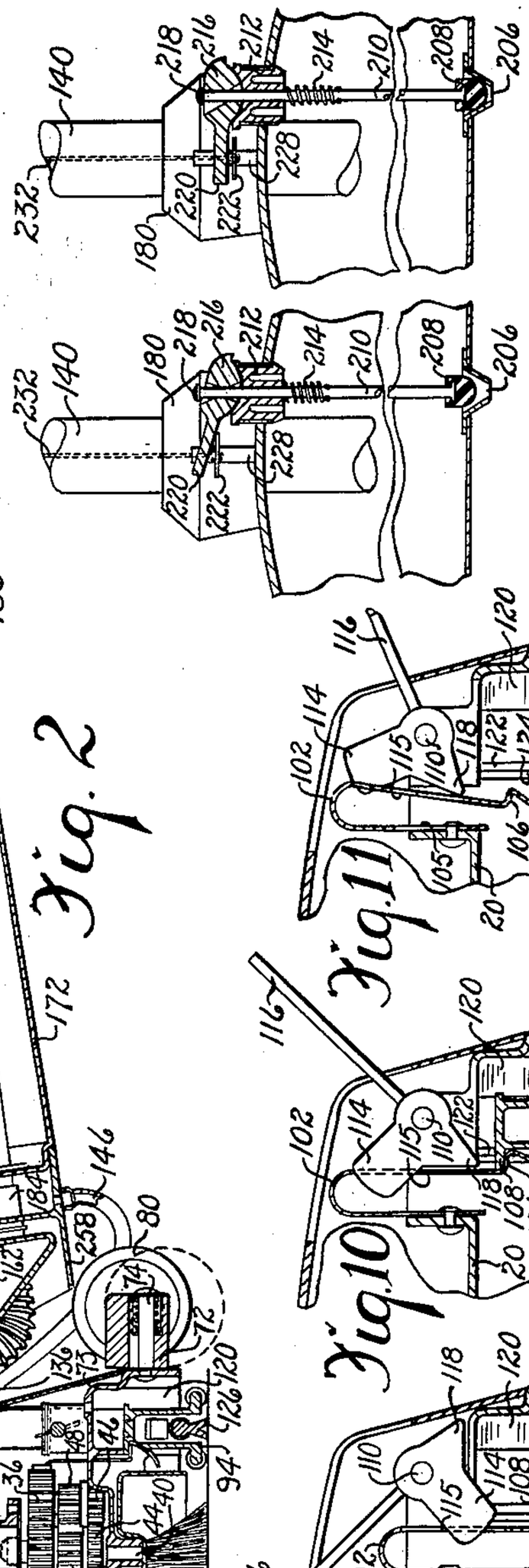

Fig. 12

Fig. 13

Fig. 11

Fig. 10

Fig. 9

Fig. 17

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SURFACE TREATING MACHINE

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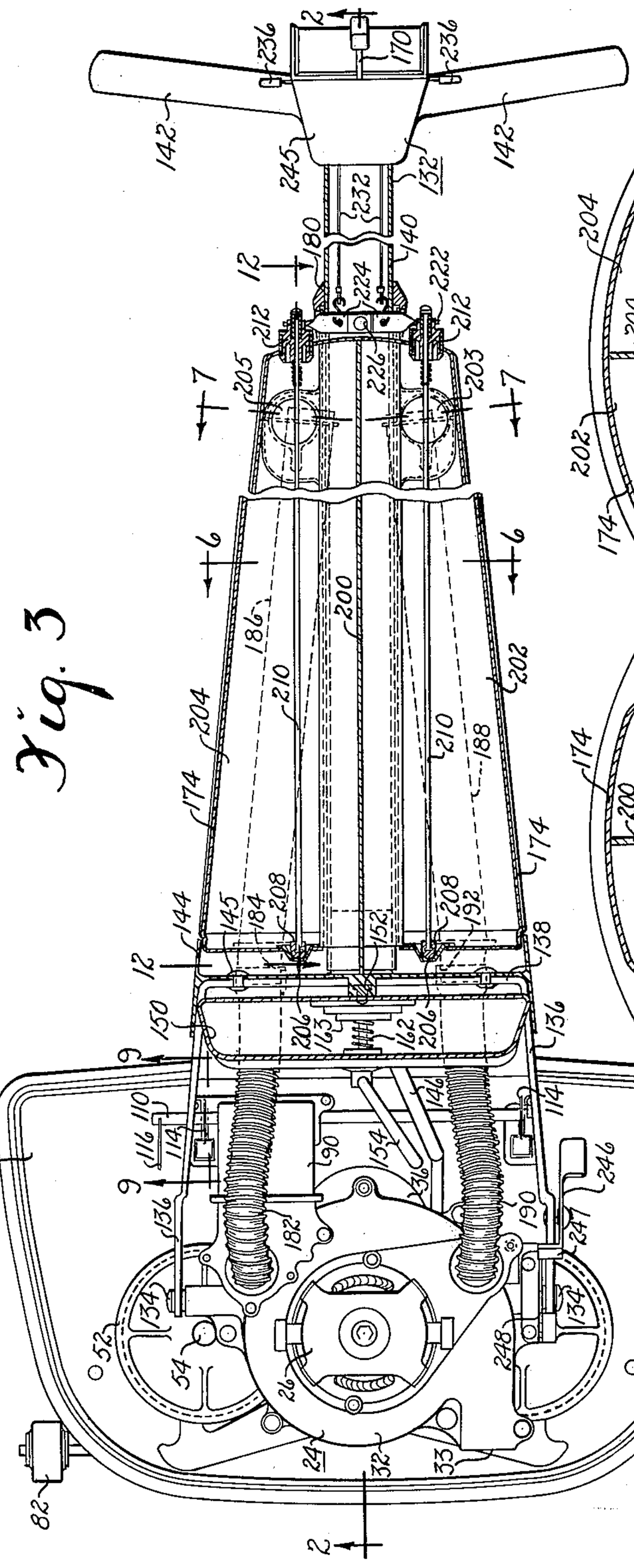

Fig. 6

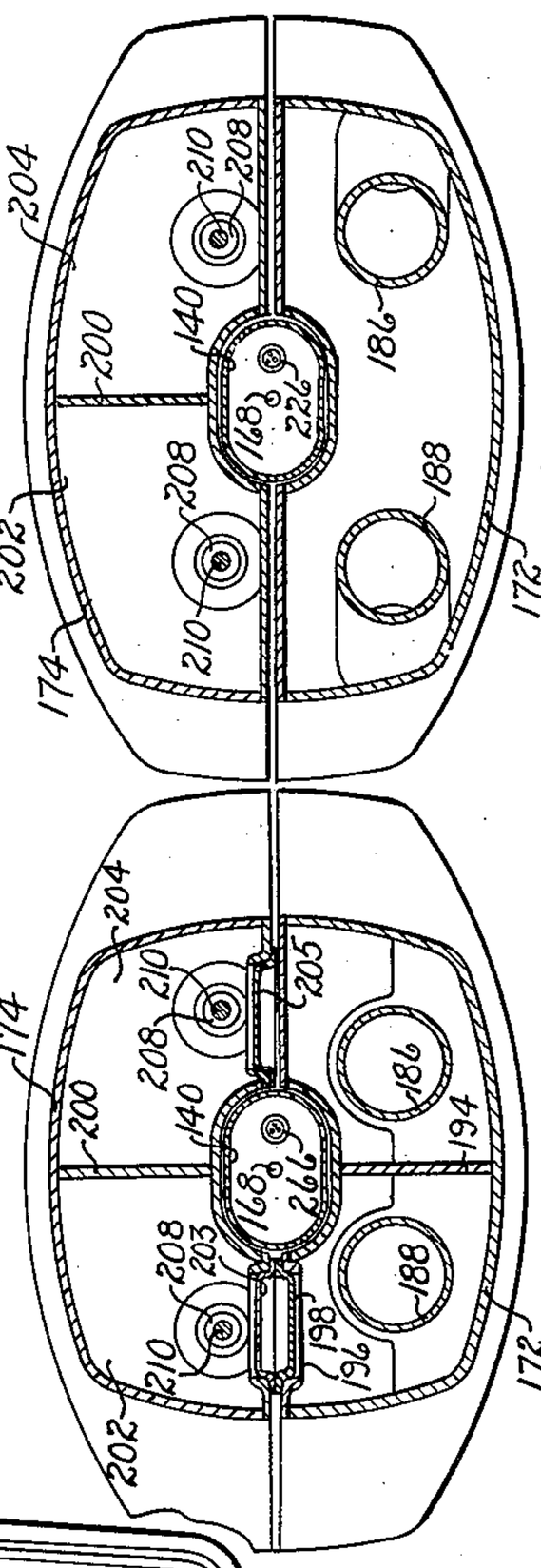

Fig. 7

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SURFACE TREATING MACHINE

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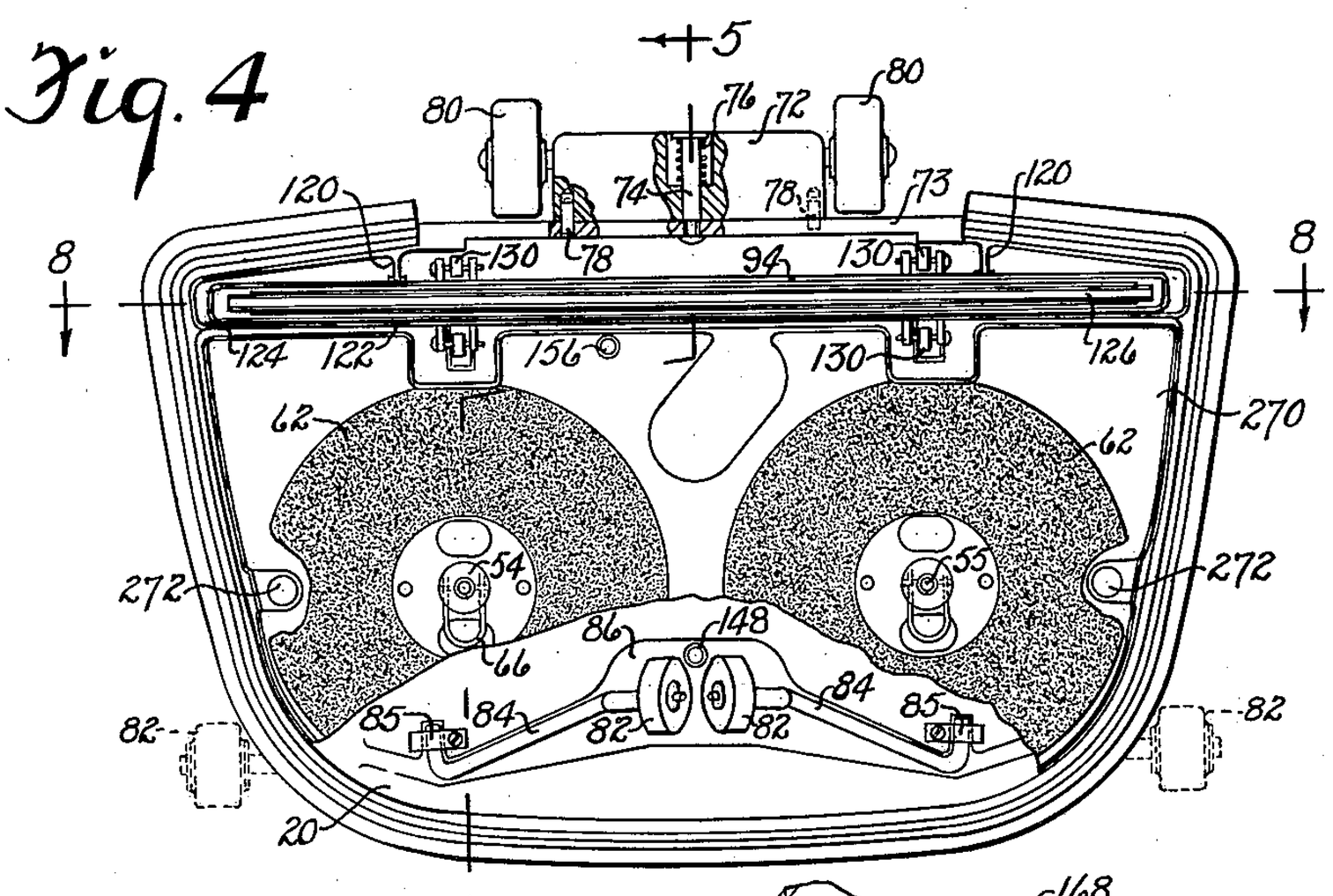
Fig. 4



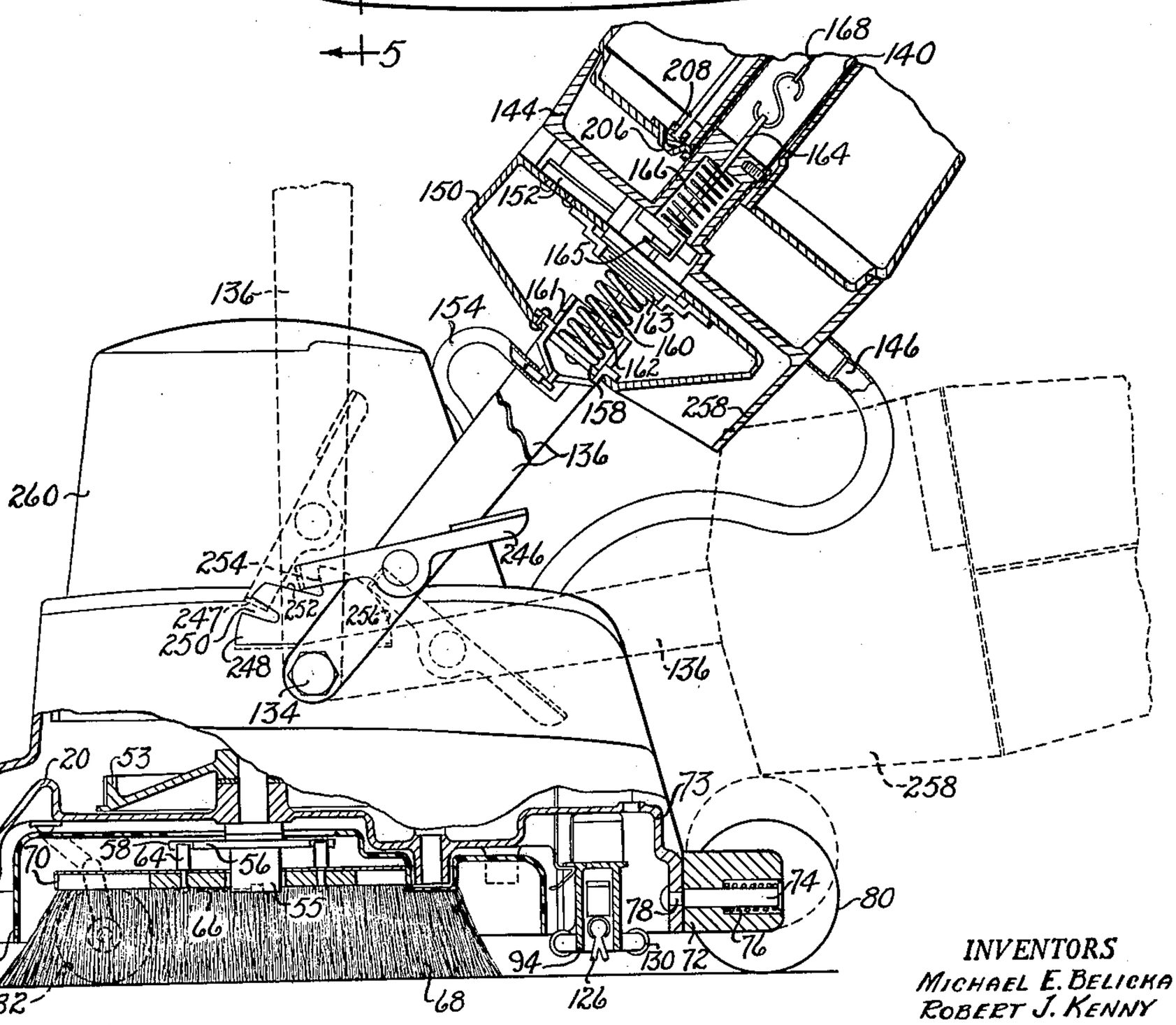


Fig. 5

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United States Patent Office

3,101,505
Patented Aug. 27, 1963

3,101,505
SURFACE TREATING MACHINE

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Filed July 18, 1961, Ser. No. 124,993
16 Claims. (Cl. 15—320)

Our invention relates to a surface treating machine and more particularly to a relatively small machine of this type suitable for use in a home by the housewife.

One of the objects of our invention is to provide a machine having one or more rotary scrubbing elements for contacting a floor, together with means under the control of the operator for feeding a detergent liquid to the floor in the neighborhood of the scrubbing means in combination with a wet pick-up arrangement whereby the detergent and dissolved dirt may be removed from the floor, leaving the latter practically dry.

A further object of our invention is to provide means also under the control of the operator for supplying rinse water or the like to the floor in the neighborhood of the scrubbing means in order that any remaining traces of detergent may be diluted thereby, the water pick-up means then serving to remove the rinse water from the floor.

A further object of our invention is to provide removable reservoirs for holding the liquid detergent and the rinse water and a removable container for accumulating the liquid which is picked up, the latter preferably having a capacity equal to at least that of the combined capacities of the two reservoirs. It is desirable that the container and reservoirs be easily removable from the rest of the apparatus in order that they may be independently carried to a sink or the like for convenience in filling and emptying.

An additional object of our invention is to provide a liquid wax reservoir, also easily removable from the rest of the apparatus for the same reasons as above mentioned, together with means under the control of the operator for applying liquid wax to the surface in order that the device may also serve as a floor polisher.

A still further object of our invention is to provide automatically connectable and disconnectable means between valves located in the respective removable reservoirs and control handles permanently mounted on the handle of the device so that the reservoirs may be readily removed and replaced without the operator having to independently connect and disconnect the valves and the control handles.

A still further object of our invention is to provide retractable wheeled means for supporting the device on a rug or other soft surface covering in order that it may be used for scrubbing the rug.

Further objects and advantages of our invention will be apparent from the following description considered in connection with the accompanying drawings which form part of the specification and of which;

FIG. 1 is a perspective view of a preferred embodiment of our invention;

FIG. 2 is a cross-sectional view of the device shown in FIG. 1 and is taken on the line **2—2** of FIG. 3;

FIG. 3 is a view partially in cross-section and with a hood member removed, the cross-sectional portion being taken on the line **3—3** of FIG. 2;

FIG. 4 is a bottom view, partially broken away, of the device shown in the preceding figures;

FIG. 5 is a view partially in cross-section taken on the line **5—5** of FIG. 4;

FIG. 6 is a cross-sectional view taken on the line **6—6** of FIG. 3;

FIG. 7 is a cross-sectional view taken on the line **7—7** of FIG. 3;

FIG. 8 is a cross-sectional view taken on the line **8—8** of FIG. 4;

FIG. 9 is a cross-sectional view taken on the line **9—9** of FIG. 3;

FIG. 10 is a cross-sectional view similar to FIG. 9, but with certain parts in different positions;

FIG. 11 is a cross-sectional view similar to FIGS. 9 and 10, but with certain parts in still different positions;

FIG. 12 is a cross-sectional view on an enlarged scale taken on the line **12—12** of FIG. 3;

FIG. 13 is a view similar to FIG. 12, but with certain parts in different positions;

FIG. 14 is a view on an enlarged scale of a portion of the device as seen in FIG. 2;

FIG. 15 is a cross-sectional view taken on the lines **15—15** of FIGS. 2 and 14;

FIG. 16 is a view of the upper end of the control handle with the cover removed; and

FIG. 17 is a diagrammatical view of the gear and belt drive best shown otherwise in FIG. 2.

Referring to the drawings reference character **20** designates a base member, preferably a die casting, which supports a plurality of posts **22** on the upper ends of which is mounted a motor-fan unit **24** comprising an electric motor **26** having a shaft **28** carrying a centrifugal fan **30** within a fan housing **32**, the latter having a convolute discharge **33**. The lower end of shaft **28** extends below the fan housing and carries a toothed pulley **34** which drives a larger toothed wheel **36** by means of a toothed timing belt **38**. Pulley **36** is mounted on a shaft **40** journaled in the base **20**. Shaft **40** also carries a toothed pulley **42** and a pinion gear **44**, the latter meshing with a pinion **46** mounted on a shaft **47** which is also journaled in the base **20** and which carries a toothed pulley **48**. As is shown more particularly in FIG. 17, toothed pulley **48** by means of a timing belt **50** drives a larger toothed pulley **52** mounted on a shaft **54**, and pulley **42** by means of a similar belt **51** drives a large toothed pulley **53** mounted on a shaft **55**. Due to the gears **44** and **46**, the shafts **54** and **55** will rotate in the opposite directions. As is seen in FIGS. 2 and 5, shafts **54** and **55** are journaled in base **20**, the lower ends of the shafts extending beneath the base where each is provided with a plate **56** having slots or apertures **58** therein. A brush disc **60** carrying bristles **62** extending downwardly therefrom and a plurality of pins **64** extending upwardly, may be mounted on the lower end of each shaft **54** and **55**, the pins being received within the recesses **58**. The lower end of each shaft is provided with a pivoted snap ring **66**, shown in FIGS. 4 and 5 which may be pivoted to a position extending at right angles to the shaft to retain the brush thereon, or may be pivoted to a position parallel to the shaft to permit removal of the brush.

It will be noted that the brush shown in FIG. 2 is somewhat different from that shown in FIG. 5. In FIG. 2, brush **62** is provided with a back **60** of sufficient thickness so that when the snap ring **66** extends at right angles to the shaft, the upper surface of the back is in contact with the plate **56**. In other words, there is no vertical movement of the brush with respect to the shaft **54** and the bristles of the brush **62** are sufficiently stiff to support the weight of the entire machine. In FIG. 5, on the other hand, there is a brush **68** having bristles somewhat longer and more flexible than those of brush **62** and having a back **70** which is somewhat thinner than the back **60** so that there may be vertical movement between the brush and the shaft **55**. The back **70** is provided with pins **64** which engage the recesses **58** in plate **56** in all vertical positions of the brush so that the brush will turn with the shaft.

As is shown in FIGS. 2, 4 and 5, a wheel supporting member 72 is pivotally mounted on a rear skirt 73 of base casting 20 on a pin 74 which carries a spring 76 urging the member 72 against the skirt. The latter is provided with a pair of pins 78 which engage recesses formed in the member 72 for preventing pivoting of the latter about the pin 74 when the member 72 is in the position shown in the figures. However, the member 72 may be moved axially outwardly along the pin 74 by compressing the spring 76 until the member has been withdrawn from engagement with the pins 78, whereupon the member 72 may be pivoted through 180° about the pin 74. Wheels 80 are mounted at the opposite ends of the member 72 and, as will be seen from FIGS. 2 and 5, the bore in member 72 which receives the pin 74 is off-center vertically, with the result that the vertical location of the wheels 80 with respect to the base member 20 is altered by rotating the member 72 about the pin 74. Thus, in FIG. 2 the wheels are shown in solid lines in their upper position where they are spaced above the floor when the device is supported on the bristles 62. In FIG. 5, on the other hand, the wheels 80 are shown in their lower position where they contact the floor so as to support a portion of the weight of the device, thus permitting the brush 68 to float on the shaft 55.

Two other supporting wheels 82 are rotatably mounted on arms 84 which are pivotally secured at 85 to the base member 20, as is best shown in FIG. 4. In the position shown in FIG. 2 as well as that shown in full lines in FIG. 4, the wheels 82 are received in a recess 86 formed in the base member and thus are spaced well above the floor. However, the arms 84 may be pivoted to the position shown in FIG. 5, and in broken lines in FIG. 4, to bring the wheels 82 into vertical alignment with the rear wheels 80, the wheels 80 and 82 together serving to support the entire weight of the device, thus leaving the brushes 68 free to float on their driving shafts as previously mentioned, so that the bristles thereof contact the supporting surface but lightly.

A conduit 90 is mounted on the upper surface of base member 20 and the lower end of the conduit communicates with an opening 92 formed in the rear portion of the base member, as shown in FIG. 8. Disposed underneath this portion of the base member is a nozzle 94 formed with a short outlet conduit 96 which is arranged to communicate with the opening 92, a flexible tube or bellows 98 being secured to the base member and bearing against the top of the nozzle to prevent leakage. A pair of leaf springs 100 urges the nozzle 94 downwardly, while a pair of resilient members 102 located near opposite ends of the nozzle restrain such downward movement. As is shown particularly in FIGS. 9 through 11, each member 102 is U-shaped with one leg secured to the base member 20 by means of a rivet or the like 104 which extends through a slot 105 in the leg so that the member 102 may be moved vertically with respect to the base member, the other leg of each member 102 being formed with an offset portion 106 adapted to engage underneath a projection 108 on the nozzle 94.

A shaft 110 is rotatably mounted so as to extend at right angles through the lower end of conduit 90 and is provided with a butterfly valve 112 so located as to control the flow through opening 92. Shaft 110 also carries a pair of arms 114 which engage slots 115 formed in the right-hand leg of each U-shaped member 102. One end of shaft 110 extends to the exterior of the device where it is provided with an actuating arm 116 by means of which the shaft may be rotated through an angle of slightly more than 90°. With the parts in the position shown in FIG. 9, the nozzle 94 is in its lowermost position, to which position it is urged by the springs 100. In this position the butterfly valve 112 lies in a plane parallel to the axis of opening 92, which is the open position of the valve. If the handle 116 and shaft 110 are rotated through approximately 90° in a clockwise direction to the position shown in FIG. 10, the arms 114 lift the U-shaped members 102 which in turn lift the nozzle 94 to an inoperative position above the floor, while at the same time the butterfly valve 112 is turned to a plane normal to the axis of opening 92, thus closing the opening. Each arm 114 is provided with a projection 118 which, if the shaft 110 is turned further in a clockwise direction to the position shown in FIG. 11, bears against a solid portion of the corresponding U-shaped member 102 below the slot 115 therein so as to deflect the right-hand legs of members 102 sufficiently to disengage offset portions 106 from projection 108 on the nozzle 94, thus permitting ejection of the nozzle 94 from the device due to the urging of the springs 100. Shaft 110 will not remain in this extreme position, but as soon as the operator releases handle 116, the resiliency of members 102 will rotate the shaft 110 counterclockwise to the position shown in FIG. 10, and hence the valve 112 will be closed and the offset portions 106 in proper position to engage the projection 108 on the nozzle when it is desired to again connect the latter.

Nozzle 94 is guided and constrained to only vertical movement with respect to the base 20 by a pair of ribs 120 extending inwardly from the rear skirt 73 of the base member, and by a pair of ribs 122 extending rearwardly from a partition 124 which extends downwardly from the top portion of the base member. Swingably mounted within the nozzle 94 is a squeegee 126 which is resiliently held in position within the nozzle by means of a pair of leaf springs 128. The nozzle is also preferably provided with pairs of small rollers 130 adjacent either end thereof which are adapted to roll on the floor and which may cause the nozzle to move upwards slightly against the force of spring 100, especially if the floor is uneven, thus preventing the nozzle from scratching high points of the floor.

A handle member designated generally by reference character 132 is pivotally secured to the fan housing 32 at points 134. The lower portion of the handle comprises a fork having a pair of legs 136 joined by a horizontal portion 138. A rigid tubular member 140 of oval cross-section is connected at its lower end to a tray or manifold 144 and at its upper end carries handle grips 142.

The manifold 144 is secured above horizontal member 138 of the handle fork by means of rivets or the like 145. The interior of the manifold is connected by means of a flexible tube 146 to an opening 148 through the base member 20 at a point between the brushes 62. A liquid wax container 150 is removably secured below the portion 138 of the fork by any suitable means, such as the channel members 152 shown in FIGS. 2 and 5 which engage grooves formed in portion 138 so that the reservoir 150 may be removed from the handle by sliding it upwardly, as viewed in FIG. 2. The reservoir 150 is connected by means of a flexible tube 154 with an opening 156 in the base member 20, which opening is shown in FIG. 4 as being located just ahead of the nozzle 94.

Flow from the reservoir 150 into the tube 154 is effected by means of a piston 158 mounted on a stem 160 which is urged downwardly in a cylinder 161 by means of a spring 162. Stem 160 extends through a filler cap 163 of reservoir 150, the outer end of the stem being provided with a head which may be engaged by the forked lower end 165 of an actuating rod 164 which is urged downwardly by means of a spring 166. When the reservoir 150 is removed by sliding it upwardly, as viewed in FIG. 2, the stem 160 is moved therewith out of the forked portion 165 of rod 164, and when the reservoir is replaced the stem 160 slides into the forked portion without any conscious effort on the part of the operator. The upper end of rod 164 is connected by means of a rod or wire 168 with a lever 170 pivotally mounted at the upper end of the handle. Consequently, when the lever 170 is pivoted in a counterclockwise direction, as viewed in FIG. 2, it places the rod or wire under tension which causes the rod 164 to move upwardly, thus lifting the stem 160 and piston 158 to permit flow of wax into the cylinder 161, and subse-

quent release of the lever permits spring **162** to force the piston **158** downwardly, thus pumping wax through tube **154**. Liquid wax may be introduced into the reservoir **150** when the latter is removed from the handle through the opening normally closed by cap **163**.

Removably mounted on the handle **132** is a pair of containers **172** and **174**. As is shown particularly in FIGS. 2, 3 and 5, the lower ends of these containers are received snugly within manifold **144** and, as shown in FIGS. 6 and 7 these containers closely embrace the tubular member **140**. At the upper ends the containers are provided with extending walls **176** and **178**, respectively, which may be engaged by a locking ring **180** which is slidably mounted on tubular member **140**. Thus with the parts in the position shown in FIGS. 2 and 14 the containers **172** and **174** are securely mounted on the handle by virtue of the fact that their lower ends are received within the manifold **144** while the wall extensions **176** and **178** are held by the clamping ring **180**. In order to remove the containers, the ring may be slid upwardly on the tubular member **140** so as to disengage the extensions **176** and **178**.

Container **172** is for receiving waste water which is picked up from the floor by the nozzle **94**. As previously described, this nozzle is connected to the conduit **90** on the upper side of the base member **20**. As is shown particularly in FIG. 3, a flexible conduit **182** extends from conduit **90** to a socket **184** which extends through the bottom of manifold **144**. Container **172** is provided with conduits **186** and **188** each of which extends a short distance below the bottom of the container and upwardly through the interior of the container to near the upper end thereof.

A flexible conduit **190** is connected at one end to the inlet to the fan housing **32** and at the other end to a socket **192** extending through the bottom of manifold **144**. The sockets **184** and **192** are so positioned with respect to the projecting ends of conduits **186** and **188** that the latter are received within the former in substantially fluid tight manner when the container **172** is secured to the handle. Thus, operation of the fan **30** draws air from the container **172** through the pipe **188** and flexible conduit **190**, thus causing air to be drawn into the container through the nozzle **94**, pipe **90**, flexible conduit **182** and conduit **186** and if the device is being moved over a wet floor, water accumulated by the squeegee **126** is carried along with this air into the container **172**. A partition **194** is positioned within the container **172** between the upper open ends of conduits **186** and **188** in order to prevent liquid discharge from the upper end of conduit **186** being carried directly into conduit **188**. As is shown in FIG. 2, partition **194** extends downwardly only a short distance. Container **172** is in effect a liquid separator for separating water from the air entering through conduit **186** so that only air passes out through conduit **188**. The inner wall of container **172** is provided with an opening **196** normally closely by a cap **198** which may be removed to empty the contents of the container when the latter has been removed from the handle.

Container **174** is divided throughout its entire length by a partition **200** to provide separate reservoirs **202** and **204**. One of these may be used for storing a liquid detergent solution and the other for storing clear rinse water. Near their respective upper ends the reservoirs **202** and **204** are provided with filler openings which are normally closed by caps **203** and **205**, respectively. The combined capacities of reservoirs **202** and **204** should not exceed that of waste water container **172**.

Each reservoir is provided with a discharge opening **206** in the lower wall thereof which communicates with the manifold **144**. Each opening **206** is normally closed by a valve member **208** mounted on a valve rod **210** which extends through a bushing **212** mounted in the top wall of each reservoir, as is shown more in detail in FIGS. 12 and 13. A spring **214** urges each valve **208** towards closed position.

The outer end of each bushing **212** is formed as an arcuate surface which is engaged by a similar surface on

a valve lifting lever **216** through which the valve rod **210** extends, the rod being provided with a head **218** which bears against the upper surface of lever **216**.

The arms **220** of the levers **216** extend over the projecting ends **222** of two levers **224**, the opposite ends of which are pivoted about a pin **226** within tubular member **140**, as is shown more in detail in FIGS. 14 and 15. Each lever **224** extends outwardly through a slot formed in the tubular member, as well as through a slot **228** formed in locking ring **180**. A spring **230** encircles pin **226** and has its opposite ends engaging the levers **224** so as to urge the outer ends of each in a downward direction. An actuating chain or cord **232** is secured to an intermediate point of each lever **224** and extends upwardly within tubular member **140**. The upper ends of chains **232** are connected to actuating levers **234** pivotally mounted at the upper end of the handle, the arrangement being such that depression of the outer end of a lever **234** will pivot the corresponding lever **222** in an upward direction, as shown in FIG. 13, so as to raise the corresponding valve rod **210** to thereby permit flow through the opening **206** into the manifold **144**, from whence it flows through the conduit **146** to the floor. Manipulation of one of the levers **234** thus results in supplying detergent solution to the floor, while manipulation of the other lever supplies clear rinse water.

Due to the fact that there is no actual connection between the arms **220** of the valve lifting levers **216** which are mounted on the container **174**, and the ends **222** of levers **224** which are mounted on the handle, these members do not interfere with removal of the container from the handle. Moreover, when the container is replaced on the handle the arms **220** are properly positioned over the ends **222** without any conscious effort on the part of the operator.

Inasmuch as it is never desirable to supply liquid wax at the same time that detergent solution or rinse water is supplied to the floor, an interlocking bar **236** is provided, as shown in FIG. 16. This bar is slidably mounted on the upper end of the handle by means of bolts **238** passing through the slots **240**. The bar is provided with a central notch **242** and two outer notches **244**. In the position shown in FIG. 16 the notch **242** is in line with the lever **170** which, as previously described, operates the piston **158** in the wax reservoir **150** and hence the lever **170** is free to be pivoted so as to lift the piston. However, the levers **234** are both out of alignment with the notches **244** and hence both of these levers are locked against actuation. If the bar **236** is slid upwardly, as viewed in FIG. 16, notch **242** will be moved out of alignment with lever **170** while notches **244** will be moved into alignment with levers **234**. Consequently, the former is locked against actuation so that the wax piston **158** cannot be actuated, but either of the valves **208** can be opened so as to dispense either detergent solution or rinse water. While normally both valves **208** would not be open at the same time, no serious results would be incurred if they were and hence it is not considered necessary to absolutely prevent their simultaneous operation.

A hood or cover **245** is secured to the upper end of the handle so as to conceal the mechanism carried thereby, the ends of the control levers and the locking bar extending through suitable slots therein.

As is shown in FIG. 5, mechanism is provided for retaining the handle in different positions with respect to the base member **20** and the parts mounted thereon. As there shown a treadle **246** having a flanged end **247** is pivotally mounted on one of the forks **136**, while a plate **248** is fixed to the fan housing **32**. Plate **248** has an upper edge formed with a deep slot **250**, and a substantially straight surface **252** terminating in a substantially radial face **254** extending between the straight surface **252** and an arcuate surface **256**.

With the parts in the positions shown in full lines in FIG. 5, the handle may be pivoted through an angle of

approximately 45° from the vertical, the end 247 of the treadle 246 riding on the straight surface 252. The handle cannot be pivoted beyond about 45° as movement in this direction is arrested by the end 247 contacting the radial surface 254. If the handle is pivoted to a little past the vertical, the end 247 of the treadle will drop into the notch 250 and the handle will be locked in this substantially vertical position. In order to release it, the treadle 246 is pivoted in a clockwise direction, conveniently by the operator's foot, sufficiently to move the end 247 out of the slot 250. Likewise, if it is desired to lower the handle below the 45° angle, this may be done by pivoting the treadle 246 sufficiently to lift the end 247 above the outer end of the radial surface 254, where it will ride on the arcuate surface 256. With the treadle in this position the handle may be lowered until a skirt 258 on the manifold 144 strikes the rear wheels 80.

A protective and decorative hood 260 is mounted on the base member 20 so as to enclose the motor 26 and other parts carried on the upper surface of the base member. This hood is formed with openings 262 (FIG. 2) through which cooling air may be drawn by the fan 30 which air passes through the motor and through openings 264 in the motor housing directly to the inlet of the fan. Air discharged from the convolute 33 of the fan passes through an opening 265 in the hood member 260. Electric current for operating the motor is supplied by the cable 266 which extends upwardly through the tubular member 140 of the handle and out through a suitable opening in the cover 245.

If desired, a removable splash guard 270 may be provided for protecting the lower surface of base member 20 from becoming soiled by the detergent solution or liquid wax spun off from the rotating brushes. This guard is provided with apertures for the shafts 54 and 55 as well as apertures in line with the liquid discharge openings 148 and 156. The guard is preferably made of light weight sheet metal or plastic and is removably secured to the base 20 by means of snap fasteners 272. In order to remove the splash guard for cleaning, it is necessary to first remove the brushes 62 or 68 from the shafts 54 and 55. Also, the guard must be removed when the forward wheels 82 are to be raised or lowered.

The above-identified described device operates as follows:

Assuming it is desired to use the machine for washing a floor, containers 172 and 174 are removed from the handle 132. This is conveniently accomplished by placing the handle in the 45° position, where the projecting end 247 of the treadle 246 engages the radial surface 254. The locking ring 180 is then slid upwardly along the tubular member 140 by one hand, the other hand holding the lower container 172, until the ring is disengaged from the extensions 176 and 178 of the containers. This releases the lower container 172 so that it may be removed immediately, and if there is any waste water in it from a previous operation, this should be emptied by removing the cap 198 and pouring the water into a sink or other suitable place for disposal. In the meantime, the upper container 174 will remain on the tube 140, but may be readily removed therefrom by lifting it upwardly. The caps 203 and 205 are then removed and a suitable liquid detergent solution placed in one of the reservoirs and clear rinse water in the other. The caps 198, 203 and 205 having been replaced, the container 174 is then placed on the tube 140 with its lower end received within the manifold 144, and thereafter the lower container 172 is placed underneath the handle with its lower end received within the manifold, whereupon downward movement of the locking ring 180 secures both of the containers in place.

The supporting wheels 80 are placed in their upper position and the wheels 82 are placed in their retracted position so that the weight of the device is borne by the circular brushes 62 which are provided with bristles of sufficient stiffness to support this weight. The electric motor 26 is then started and it drives the fan 30 directly and the brushes 62 through the belts and gearing illustrated in FIG. 17.

If the floor is quite dirty, the lever 116 is placed in the position shown in FIG. 10, thereby lifting the nozzle 94 from the floor and closing the valve 112 in the suction line. The proper lever 234 is manipulated so as to open the corresponding valve 208 in the tank which contains liquid detergent, thus permitting the detergent to flow into the manifold 144 from where it is conveyed through the flexible tube 146 to the opening 148 in the base plate between the brushes 62. As the detergent flows onto the floor it is distributed by the brushes which scrub the floor as the device is moved back and forth thereover. After sufficient scrubbing in this manner has taken place to loosen and dissolve the dirt, the lever 116 is shifted to the position shown in FIG. 9, where the nozzle 94 is in contact with the floor and the valve 112 is open. If the device is now moved back and forth over the area which has been previously scrubbed, the squeegee 126 accumulates the dirt-bearing detergent solution at the nozzle mouth where it is picked up by the air stream and carried through the conduits 90, 182 and 186 to the upper part of container 172. As previously described, the liquid is separated from the air stream in this container, the air continuing through the conduits 188 and 190 to the inlet to the fan from where it is discharged to the atmosphere through convolute 33 of the fan housing and opening 265 in the hood 260.

In order to remove all traces of the dirty detergent solution the above operation may be repeated by manipulating the other handle 234 so as to open the valve 208 in the reservoir containing rinse water. This permits rinse water to run into the manifold 144 where it is conveyed through the conduit 146 and the opening 148 to the floor. It there dilutes any remaining detergent solution as the brushes 62 rotate in contact with the floor and may thereafter be picked up by the nozzle 94, in the manner previously described.

If the floor is but lightly soiled it may be possible to clean it satisfactorily by having the nozzle 94 on the floor at the same time that detergent solution is applied, the device being moved continuously forwardly across the floor, rather than being moved back and forth. In this mode of operation, inasmuch as the detergent is applied near the front of the brush, the latter scrub the floor with it as the device is moved forwardly and the detergent is picked up by the nozzle 94 located behind the brushes.

The device may also be used as a polisher to apply a coating of wax to a floor, either immediately after the floor has been washed or at any other time. To be used in this manner the wax reservoir 150 is removed from the handle by sliding it upwardly, as previously described. The filler cap 163 may then be removed and liquid wax poured into the reservoir whereupon the cap is replaced and the reservoir again secured to the handle. The lever 116 is placed in the position shown in FIG. 10 so as to raise the nozzle 94 from the floor. The wheels 80 and 82 are in their raised positions as previously described.

The motor 26 is then started and liquid wax may be applied to the floor by manipulating the handle 170 which lifts the piston 162 to permit wax to flow into the cylinder 161 from where it is forced by the piston under the action of opening 162 into the flexible tube 164 to the opening 156 in the base 20. This wax is distributed by the brushes 162 as the device is moved back and forth over the floor and is applied in a thin layer to the surface of the floor in well known manner.

If it is desired to use the device for scrubbing carpets, one or both of the reservoirs in container 172 is filled with a suitable liquid rug shampoo. The lever 116 is placed in the position shown in FIG. 10 so as to raise the nozzle 94 above the surface of the carpet and the wheels 80 and 82 are placed in their lower positions, as shown in FIG.

5. Also, the brushes **62** are removed from the shafts **54** and **55** and are replaced by brushes **68** which, as previously mentioned have relatively long flexible bristles and the construction of the backs **70** of these brushes is such that they may float vertically on the shafts **54** and **55**.

The motor **26** is now started so as to rotate the brushes **68** and liquid shampoo is applied to the rug by manipulating the proper handle **234**. As the machine is moved back and forth on wheels **80** and **82** over the rug, the bristles of brushes **68** lightly contact the rug and distribute the shampoo solution and scrub the surface of the rug with it, thus loosening and dissolving dirt. After a suitable area of the rug has been scrubbed in this manner no more shampoo is applied, but the machine is moved back and forth over this area in order that the rotating brushes may pick up the dirt which has been previously loosened. After each use, the brushes should be removed and rinsed, for instance under a water tap, to remove the accumulated dirt therefrom.

It will thus be seen that the machine in accordance with our invention is suitable for scrubbing, rinsing and drying hard surfaces and also for waxing such surfaces. In addition the same machine may be used for scrubbing rugs and carpets without removing the latter from the floor.

While we have shown one more or less specific embodiment of our invention this has been done for purpose of illustration only and is not to be considered as limiting the scope of our invention, which is to be determined from the appended claims.

What we claim is:

1. In a floor care machine, a frame, an electric motor supported on said frame, rotary surface treating means below said frame and driven by said motor, a manipulating handle pivotally connected to said frame, a cleaning liquid tank removably mounted on said handle, means for conveying liquid from said tank to the floor adjacent to said rotary means, a liquid pick-up suction nozzle depending from said frame, a fan driven by said motor, conduit means for connecting the inlet of said fan to said nozzle, a waste liquid tank interposed in said conduit means and removably mounted on said handle, and means in the last-mentioned tank for separating liquid from the air passing therethrough.

2. In a floor care machine, a frame, an electric motor supported on said frame, rotary surface treating means below said frame and driven by said motor, a manipulating handle pivotally connected to said frame, a cleaning liquid tank removably mounted on said handle, a rinse water tank removably mounted on said handle, means for selectively conveying liquid from the respective tanks to the floor adjacent to said rotary means, a liquid pick-up suction nozzle depending from said frame, a fan driven by said motor, conduit means for connecting the inlet of said fan to said nozzle, a waste liquid tank interposed in said conduit means and removably mounted on said handle, and means in the last-mentioned tank for separating liquid from the air passing therethrough.

3. In a floor care machine, a frame, an electric motor supported on said frame, rotary surface treating means below said frame and driven by said motor, a manipulating handle pivotally connected to said frame, a cleaning liquid tank removably mounted on said handle, means for conveying liquid from said tank to the floor adjacent to said rotary means, a liquid pick-up suction nozzle depending from said frame, a squeegee associated with said nozzle and positioned to contact said floor, a fan driven by said motor, conduit means for connecting the inlet of said fan to said nozzle, a waste liquid tank interposed in said conduit means and removably mounted on said handle, and means in the last-mentioned tank for separating liquid from the air passing therethrough.

4. In a floor care machine, a frame, an electric motor supported on said frame, rotary surface treating means below said frame and driven by said motor, a manipulating handle pivotally connected to said frame, a cleaning liquid tank removably mounted on said handle, means for conveying liquid from said tank to the floor adjacent to said rotary means, a liquid pick-up suction nozzle depending from and vertically movable with respect to said frame to vary the spacing of the nozzle above the floor, a fan driven by said motor, conduit means for connecting the inlet of said fan to said nozzle, a waste liquid tank interposed in said conduit means and removably mounted on said handle, and means in the last-mentioned tank for separating liquid from the air passing therethrough.

5. In a floor care machine, a frame, an electric motor supported on said frame, a rotary surface treating means below said frame and driven by said motor, a manipulating handle pivotally connected to said frame, a cleaning liquid tank removably mounted on said handle, means for conveying liquid from said tank to the floor adjacent to said rotary means, a liquid pick-up suction nozzle depending from and vertically movable with respect to said frame to vary the spacing of the nozzle above the floor, a fan driven by said motor, conduit means for connecting the inlet of said fan to said nozzle, a waste liquid tank interposed in said conduit means and removably mounted on said handle, and means in the last-mentioned tank for separating liquid from the air passing therethrough.

6. In a floor care machine, a frame, an electric motor supported on said frame, rotary surface treating means below said frame and driven by said motor, a manipulating handle pivotally connected to said frame, a cleaning liquid tank removably mounted on said handle, means for conveying liquid from said tank to the floor adjacent to said rotary means, a liquid pick-up suction nozzle depending from and vertically movable with respect to said frame to vary the spacing of the nozzle above the floor, roller means carried by said nozzle for contacting the floor to maintain a minimum spacing between the nozzle and the floor, a fan driven by said motor, conduit means for connecting the inlet of said fan to said nozzle, a waste liquid tank interposed in said conduit means and removably mounted on said handle, and means in the last-mentioned tank for separating liquid from the air passing therethrough.

7. In a floor care machine, a frame, an electric motor supported on said frame, rotary surface treating means below said frame and driven by said motor, a manipulating handle pivotally connected to said frame, a cleaning liquid tank removably mounted on said handle, means for conveying liquid from said tank to the floor adjacent to said rotary means, a liquid pick-up suction nozzle depending from and vertically movable with respect to said frame to vary the spacing of the nozzle above the floor, roller means carried by said nozzle for contacting the floor to maintain a minimum spacing between the nozzle and the floor, a squeegee associated with said nozzle to move vertically therewith and positioned to contact said floor when said roller means are on the floor, a fan driven by said motor, conduit means for connecting the inlet of said fan to said nozzle, a waste liquid tank interposed in said conduit means and removably mounted on said handle, and means in the last-mentioned tank for separating liquid from the air passing therethrough.

8. In a floor care machine, a frame, an electric motor supported on said frame, rotary surface treating means below said frame and driven by said motor, a manipulating handle pivotally connected to said frame, a cleaning liquid tank removably mounted on said handle, means for conveying liquid from said tank to the floor adjacent to said rotary means, a liquid pick-up suction nozzle depending from and vertically movable with respect to said frame to vary the spacing of said nozzle above the floor, a fan driven by said motor, conduit means for connecting

the inlet of said fan to said nozzle, a waste liquid tank interposed in said conduit means and removably mounted on said handle, means in the last-mentioned tank for separating liquid from the air passing therethrough, a valve in said conduit means, and single control means for lifting said nozzle and closing said valve.

9. In a floor care machine, a frame, an electric motor supported on said frame, rotary surface treating means removably supported below said frame and driven by said motor, a manipulating handle pivotally connected to said frame, a cleaning liquid tank removably mounted on said handle, means for conveying liquid from said tank to the floor adjacent to said rotary means, a liquid pick-up suction nozzle depending from and vertically movable with respect to said frame, manually operable means for moving said nozzle vertically between a position closely adjacent to the floor and a position raised thereabove, a fan driven by said motor, conduit means for connecting the inlet of said fan to said nozzle, a waste liquid tank interposed in said conduit means and removably mounted on said handle, means in the last-mentioned tank for separating liquid from the air passing therethrough, a liquid wax reservoir removably mounted on said handle, and means for conveying wax from said reservoir to the floor adjacent to said rotary means.

10. In a floor care machine, a frame, an electric motor supported on said frame, rotary surface treating means removably mounted below said frame for supporting the latter on a floor, means for driving said rotary means by said motor, a manipulating handle pivotally connected to said frame, a cleaning liquid tank removably mounted on said handle, means for conveying liquid from said tank to the floor adjacent to said rotary means, a liquid pick-up suction nozzle depending from and vertically movable with respect to said frame, manually operable means for moving said nozzle vertically between a position closely adjacent to the floor and a position raised thereabove, a fan driven by said motor, conduit means for connecting the inlet of said fan to said nozzle, a waste liquid tank interposed in said conduit means and removably mounted on said handle, means in the last-mentioned tank for separating liquid from the air passing therethrough, and wheeled means mounted on said frame and movable with respect thereto between a retracted position in which said frame is supported on said rotary means and lowered position in which said frame is supported by said wheeled means.

11. In a floor care machine, a frame, an electric motor supported on said frame, rotary surface treating means below said frame and driven by said motor, a manipulating handle pivotally connected to said frame, a manifold secured to said handle adjacent to the lower pivoted end of the latter, a cleaning liquid tank having a lower end receivable in said manifold for positioning the lower end of the tank with respect to said handle, means for removably securing the upper end of said tank to said handle, a conduit for conveying liquid from said manifold to the floor adjacent to said rotary means, valve means for controlling flow from said tank into said manifold, a liquid pick-up suction nozzle depending from said frame, a fan driven by said motor, conduit means for connecting the inlet of said fan to said nozzle, a waste liquid tank interposed in said conduit means, means in the last-mentioned tank for separating liquid from the air passing therethrough, the lower end of said last-mentioned tank being receivable in said manifold for positioning the last-mentioned lower end with respect to said handle, and means for removably securing the upper end of said last-mentioned tank to said handle.

12. In a floor care machine, a frame, an electric motor supported on said frame, rotary surface treating means below said frame and driven by said motor, a manipulating handle pivotally connected to said frame, a manifold secured to said handle adjacent to the lower pivoted end of the latter, a tank having a lower end receivable in said manifold for positioning the lower end of the tank with respect to said handle, partition means in said tank dividing it into a cleaning liquid reservoir and a rinse water reservoir, means for removably securing the upper end of said tank to said handle, a conduit for conveying liquid from said manifold to the floor adjacent to said rotary means, valve means in the lower end of each reservoir for controlling flow from the respective reservoir into said manifold, a liquid pick-up suction nozzle depending from said frame, a fan driven by said motor, conduit means for connecting the inlet of said fan to said nozzle, a waste liquid tank interposed in said conduit means, means in the last-mentioned tank for separating liquid from the air passing therethrough, the lower end of said last-mentioned tank being receivable in said manifold for positioning the last-mentioned lower end with respect to said handle, and means for removably securing the upper end of said last-mentioned tank to said handle.

13. In a floor care machine, a frame, an electric motor supported on said frame, rotary surface treating means below said frame and driven by said motor, a manipulating handle pivotally connected to said frame, a cleaning liquid tank mounted on said handle, conduit means for conveying liquid from said tank to the floor adjacent to said rotary means, a manually operable valve for controlling flow from said tank, a liquid wax reservoir mounted on said handle, conduit means for conveying wax from said reservoir to the floor adjacent to said rotary means, a manually operable valve for controlling flow from said reservoir, and interlocking means for preventing simultaneous opening of said valves.

14. In a floor care machine, a frame, an electric motor supported on said frame, rotary surface treating means below said frame and driven by said motor, a manipulating handle pivotally connected to said frame, a manifold secured to said handle adjacent to the lower pivoted end of the latter, a cleaning liquid tank having a lower end receivable in said manifold for positioning the lower end of the tank with respect to said handle, means for removably securing the upper end of said tank to said handle, a conduit for conveying liquid from said manifold to the floor adjacent to said rotary means, valve means in said tank for controlling flow from the latter into said manifold, valve actuating means movably mounted on said handle, mechanism for transmitting motion from said actuating means to said valve means, said mechanism including separable coupling means automatically coupled when said tank is secured to said handle, a liquid pick-up suction nozzle depending from said frame, a fan driven by said motor, conduit means for connecting the inlet of said fan to said nozzle, a waste liquid tank interposed in said conduit means, means in the last-mentioned tank for separating liquid from the air passing therethrough, the lower end of said last-mentioned tank being receivable in said manifold for positioning the last-mentioned end with respect to said handle, and means for removably securing the upper end of said last-mentioned tank to said handle.

15. In a floor care machine, a frame, an electric motor supported on said frame, rotary surface treating means below said frame and driven by said motor, a manipulating handle pivotally connected to said frame, a manifold secured to said handle adjacent to the lower pivoted end of the latter, a cleaning liquid tank having a lower end receivable in said manifold for positioning the lower end of the ank with respect to said handle, a conduit for conveying liquid from said manifold to the floor adjacent to said rotary means, valve means for controlling flow from said tank into said manifold, a liquid pick-up suction nozzle depending from said frame, a fan driven by said motor, conduit means for connecting the inlet of said fan to said nozzle, a waste liquid tank interposed in said conduit means, means in the last-mentioned tank for separating liquid from the air passing therethrough, the lower end of said last-mentioned tank being receivable in said manifold for positioning the last-mentioned end with respect to said handle, and a single means mov-

able with respect to said handle for securing the upper ends of said tanks to said handle.

16. In a floor care machine, a frame, an electric motor supported on said frame, rotary surface treating means below said frame and driven by said motor, a manipulating handle pivotally connected to said frame, a cleaning liquid tank removably mounted on said handle, means for conveying liquid from said tank to the floor adjacent to said rotary means, a liquid pick-up suction nozzle depending from said frame, a fan driven by said motor, conduit means for connecting the inlet of said fan to said nozzle, a waste liquid tank interposed in said conduit means and removably mounted on said handle, means in the last-mentioned tank for separating liquid from the air passing therethrough, and manually selectively operable means for locking said pivoted handle in a substantially vertical position with respect to said frame, for limiting pivotal movement of said handle to approximately a 45° arc from the vertical, or for releasing said handle for pivotal movement to a substantially horizontal position.

References Cited in the file of this patent

UNITED STATES PATENTS

1,240,799	Gray	Sept. 18, 1917
1,687,283	Deutscher	Oct. 9, 1928
2,149,453	Longshore et al.	Mar. 7, 1939
2,622,254	Mendelson	Dec. 23, 1952
2,953,807	Nilsson	Sept. 27, 1960
2,986,764	Krammes	June 6, 1961
3,013,288	Lappin	Dec. 19, 1961
3,028,615	Helm	Apr. 10, 1962
3,040,362	Krammes	June 26, 1962
3,060,484	Krammes	Oct. 30, 1962