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(54) **MOPPING MACHINE**

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(57) **ABSTRACT**

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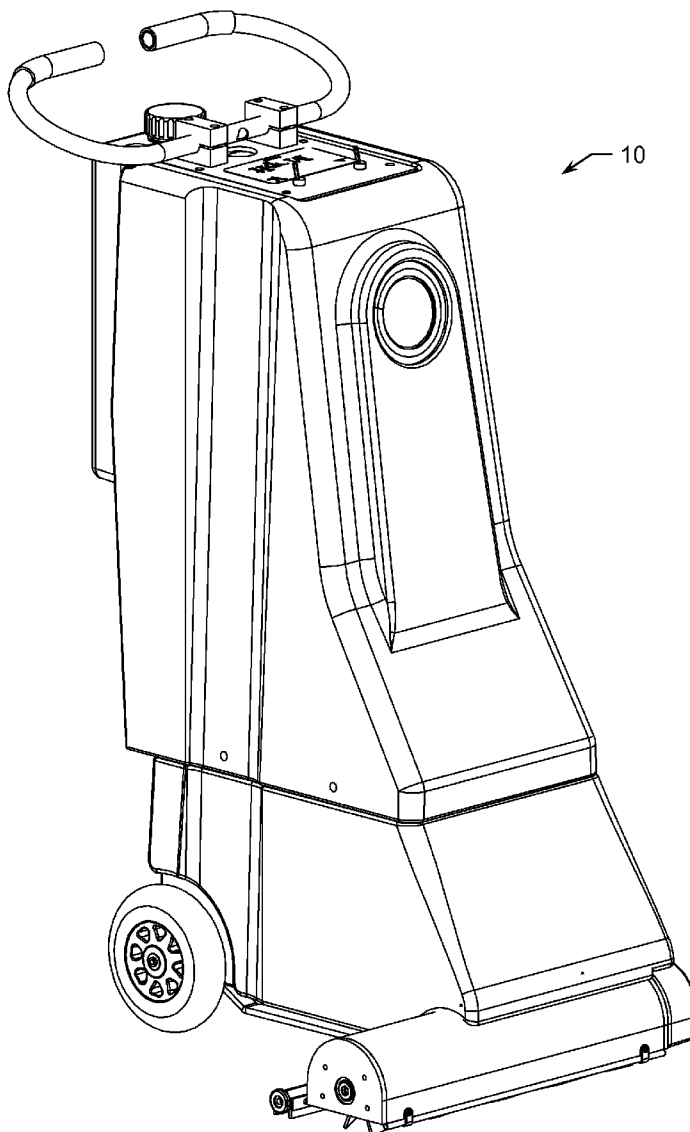
A powered mopping and cleaning machine is described. The machine includes a recovery tank, a filter assembly, a fresh water tank assembly, a vacuum assembly, a battery charger assembly, a control assembly, and a deck assembly. The machine is adapted to clean floors and more especially flat hard floors by means of providing a cleaning fluid to a rotating brush and by vacuuming resultant dirty fluid from the floor. The powered mopping and cleaning machine is adapted to replace the use of a conventional mop and mop bucket. Use of the powered mopping and cleaning machine is designed to result in decreased labor, increased efficiency, and decreased cleaning cost as compared to the use of a standard mop and mop bucket. The powered mopping and cleaning machine, although self-contained, will preferably fit into the same storage space that is otherwise allotted to store a conventional mop and mop bucket.

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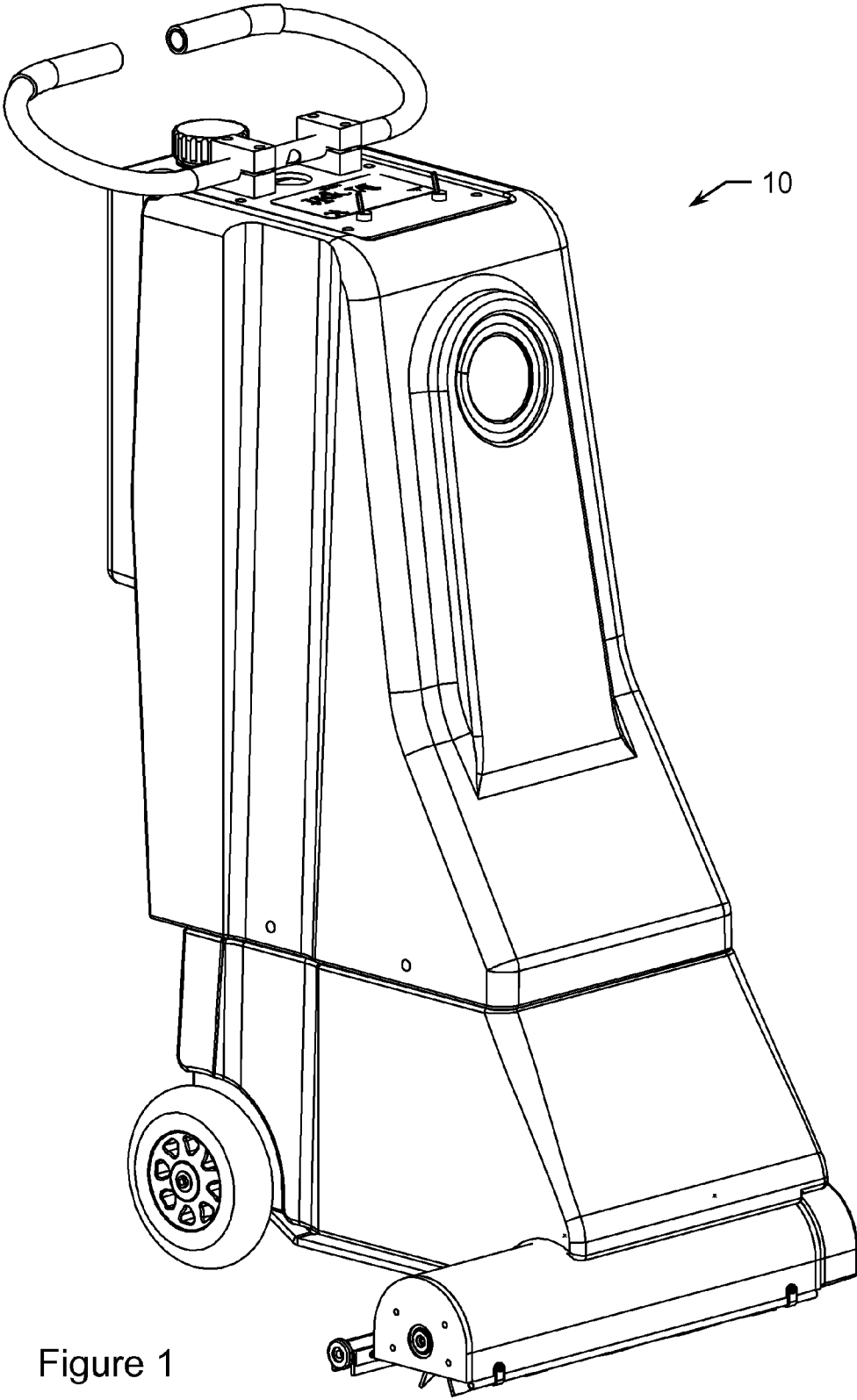


Figure 1

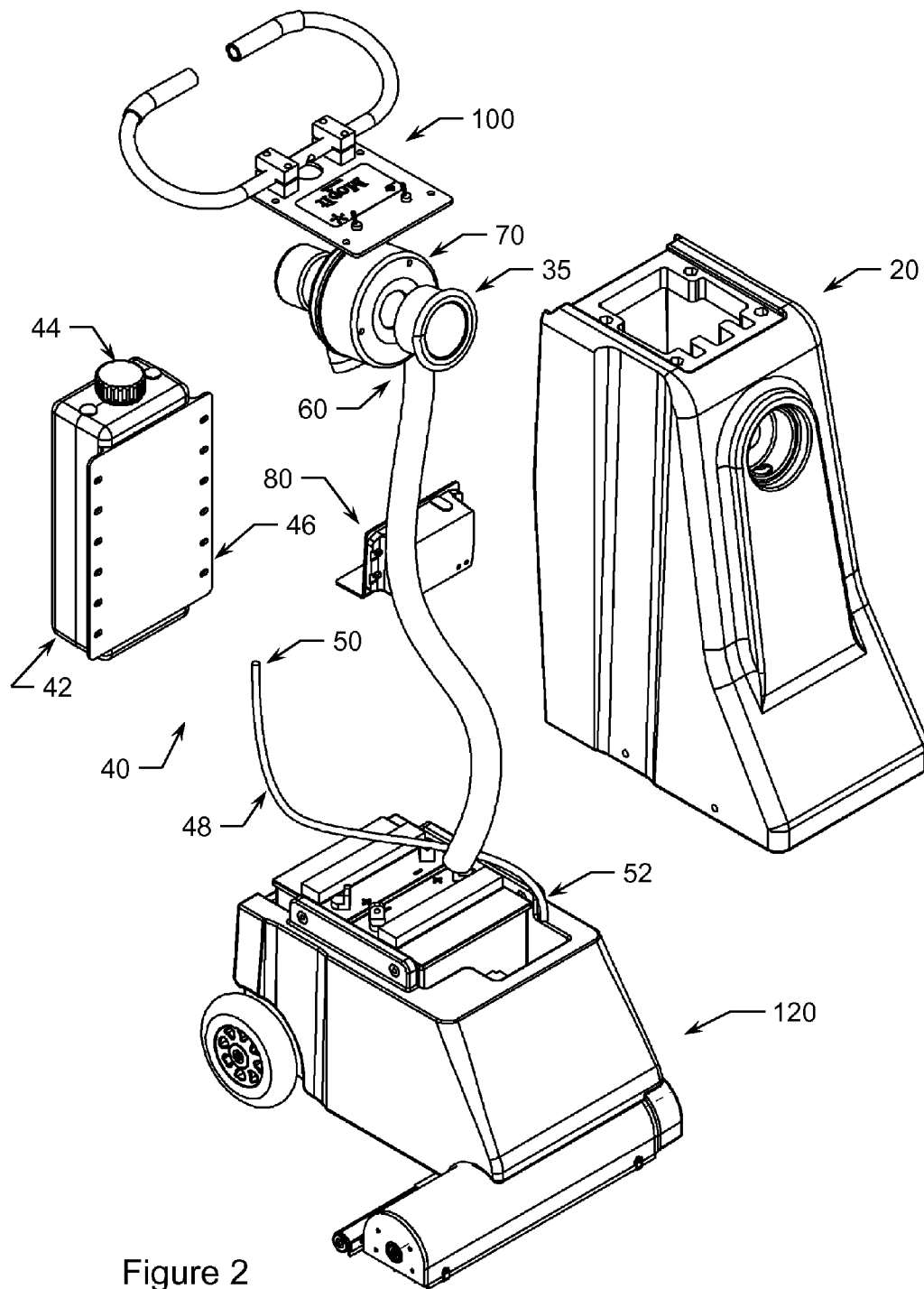


Figure 2

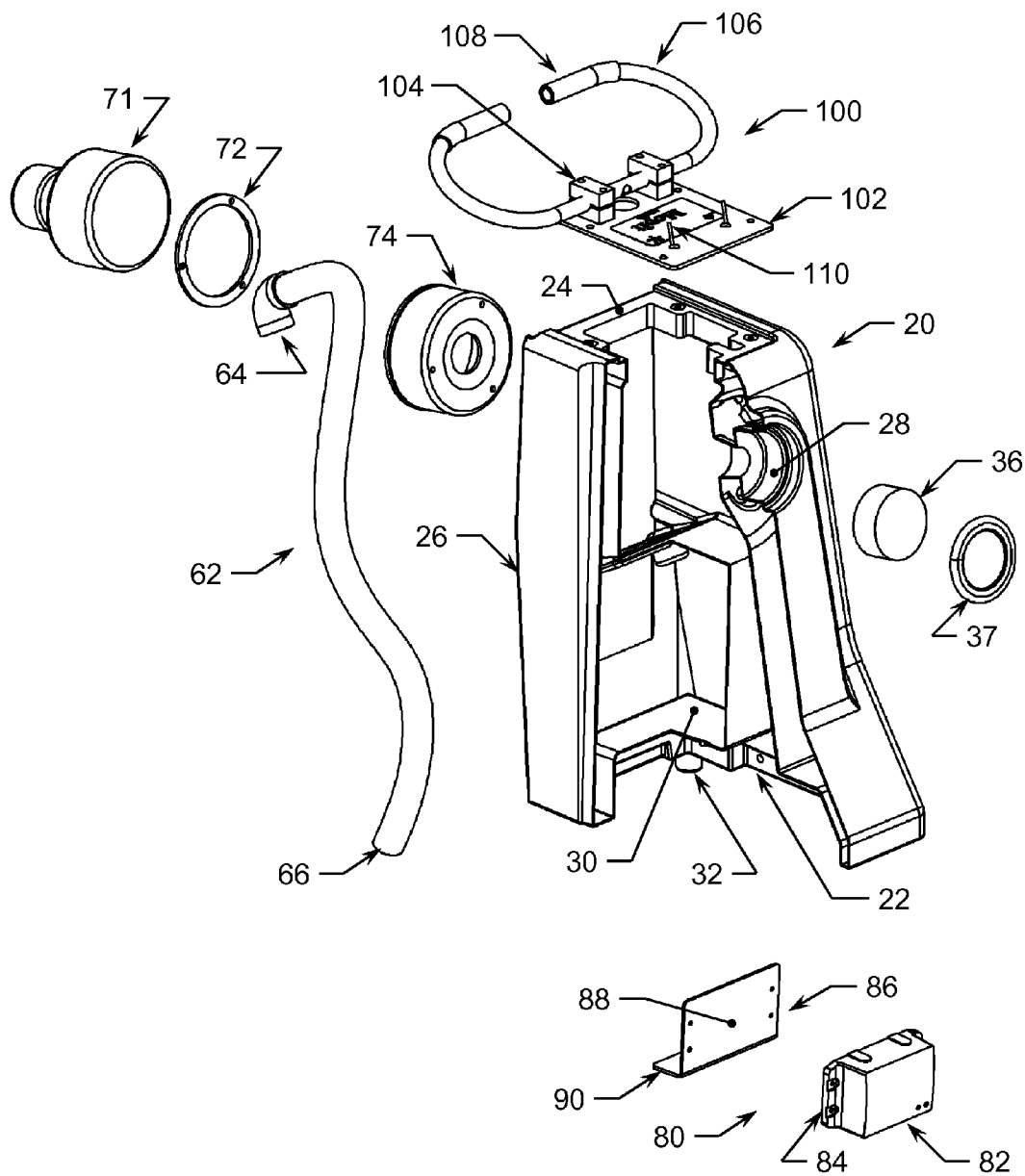


Figure 3

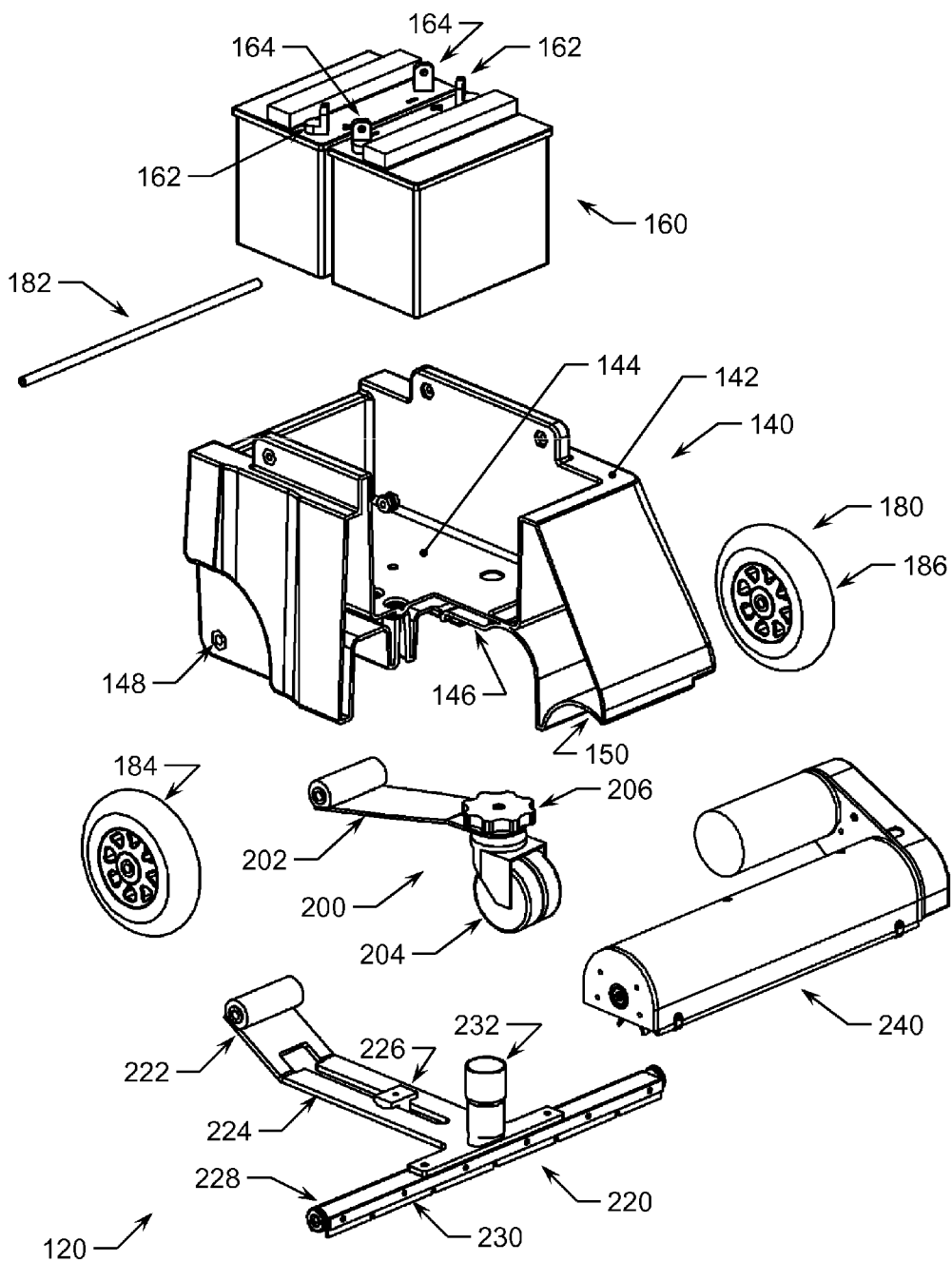


Figure 4

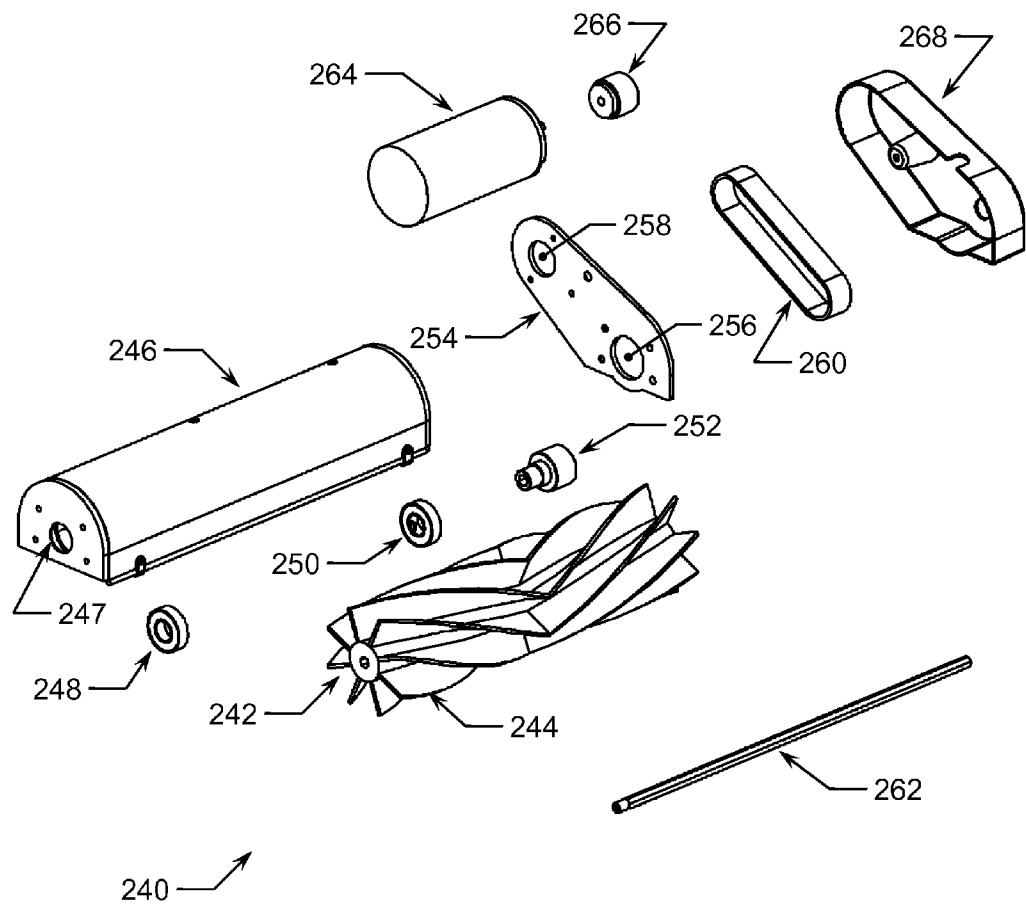


Figure 5

MOPPING MACHINE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] This invention relates to floor cleaning devices. More specifically, this invention relates to automatic powered floor mopping and cleaning devices.

[0003] 2. Description of Related Art

[0004] A variety of machines and devices have been developed to clean or mop floors. Typically, such machines are either large and cumbersome or they lack many automated features. Further those machines that are known to be automated require a higher degree of skill to operate (e.g. operated via remote control or complex programming) or lack the mopping efficiency of the present invention.

[0005] Different aspects of floor cleaning machines and components thereof have been disclosed in U.S. Pat. Nos. 3,107,387, 3,204,280, 3,600,735, 3,742,546, 3,795,933, 3,866,541, 3,879,789, 3,921,244, 3,931,659, 3,931,662, 3,942,215, 3,952,361, 3,972,088, 4,094,034, 4,096,084, 4,118,819, 4,122,576, 4,150,456, 4,196,492, 4,214,337, 4,217,671, 4,237,517, 4,295,243, 4,319,434, 4,322,920, 4,391,548, 4,393,534, 4,407,040, 4,506,405, 4,523,411, 4,577,364, 4,633,541, 4,654,918, 4,783,872, 4,910,824, 4,956,891, 5,054,245, 5,127,124, 5,253,384, 5,287,583, 5,289,605, 5,371,912, 5,402,559, 5,555,587, 5,797,157, 5,836,045, 6,023,813, 6,357,070, 6,418,585, 6,524,173, 6,550,094, 6,741,054, and 2004/0049878 each of which is hereby incorporated by reference in its entirety for the material disclosed therein. Further, U.S. patent application Ser. Nos. 09/865,766 and 11/342,042 are also incorporated by reference in their entirety.

[0006] U.S. Pat. No. 3,600,735 describes a drive connection for a floor polisher, which permits ready removal from an attachment of brush units to the vertical shaft driven by the motor.

[0007] U.S. Pat. No. 3,742,546 describes a surface treating apparatus having rotatable treating members movable over a surface, a container for liquid wax, which is positioned in a compartment, and has an outlet at its bottom normally closed by a valve having a vertically movable stem.

[0008] U.S. Pat. No. 3,795,933 discloses a multi-purpose cleaning implement includes a base member supporting a sponge mop type work head and an auxiliary implement such as a brush, squeegee, scraper, spreader or similar implement.

[0009] U.S. Pat. No. 3,921,244 discloses a floor buffer for operator directed polishing of a floor.

[0010] U.S. Pat. No. 3,931,659 discloses a floor treating machine supported at the floor or surface to be treated by means of a work disk arranged beneath a substantially ring-shaped stop member, the work disk being detachably coupled with a drive motor.

[0011] U.S. Pat. No. 3,952,361 discloses a floor treating machine having laterally spaced drive wheels driven by separate electric traction motors under electronic control so as to be driven by a separate train of pulses, comprising means for recording the trains of pulses to the traction motors and means for replaying the record to reproduce the trains of pulses whereby the machine will repeat the operation.

[0012] U.S. Pat. No. 3,972,088 discloses an electric floor scrubber and buffer having its scrubber or buffer pad attached to the underside of an oscillating plate.

[0013] U.S. Pat. No. 4,094,034 discloses a floor treating machine of the rotary brush type in which, in operation, the

weight of the machine is, to at least a significant extent, supported by the rotary brush or brushes, in which a brush mounting member is flexibly suspended between resilient elements for limited universal movement.

[0014] U.S. Pat. No. 4,096,084 discloses a method for cleaning surfaces such as floors and pavements that includes incorporating a polyelectrolyte in the cleaning solution and a surface-scrubbing machine for carrying out the process.

[0015] U.S. Pat. No. 4,118,819 discloses a floor treating machine of the single rotary brush type having a handle and a motor both laterally offset from the axis of rotation of the brush in a direction to impart a tilting couple opposed to that arising from operator forces counteracting the reaction couple on the handle.

[0016] U.S. Pat. No. 4,122,576 discloses a manually operated floor polishing machine comprising a polishing pad or brush rotatable at a speed above 660 rpm, pressing against the floor with a force of less than about 25 lbs., and positioned so that one segment of the pad presses harder against the floor than the other, such as by mounting the pad's driving plate or disc to that its plane of rotation is at an angle less than about 10 degree to the plane of the floor.

[0017] U.S. Pat. No. 4,150,456 discloses a floor scrubber with a propane powered internal combustion engine which is mounted on a wheeled dolly and which is attached by its rotary output shaft to a circular cage provided with a plurality of rotary brushes on the underside thereof.

[0018] U.S. Pat. Nos. 4,214,337 and 4,237,571 disclose compact floor polishers including a base supporting an electric motor having a vertically oriented output shaft and driving a circular brush.

[0019] U.S. Pat. No. 4,217,671 discloses a multipurpose cleaning device which can be used as a bath and tile scrubbing device as well as being adapted for use in conjunction with floors, walls, ceilings and the like.

[0020] U.S. Pat. No. 4,295,243 discloses an apparatus for cleaning, waxing, polishing and otherwise treating the surface of a floor, where the apparatus includes a carriage or frame with a handle for guiding and maneuvering, several containers for dispensing several selected types of fluids or solutions to the floor where a reciprocating scrubber, such as steel wool or a buffing pad operates with a solution to effectively clean, strip, wax or polish the floor surface. In addition, there is a vacuum means, which removes and carries away any excess liquid, solution or dirty cleaning fluids from the floor surface.

[0021] U.S. Pat. No. 4,319,434 describes a surface processing machine that includes at least one motor-driven spider arm assembly, each of the arms of the spider having rotatably mounted as the ends thereof a surface processing tools such as a brush, buffing pad, grinding stone or the like and wherein the surface processing tools are mounted on an axis which is substantially parallel to the axis.

[0022] U.S. Pat. No. 4,322,920 discloses an attachment for use on a rotary floor-conditioning machine comprising a master block, which is integrally molded of a urethane elastomer including a centrally located hub with a circular flange member extending radially from the base thereof.

[0023] U.S. Pat. No. 4,391,548 describes a coupling device adapted for use with floor maintenance machines of the type such as floor brushing, buffing, polishing, scrubbing or the like which enables automatic coupling of the maintenance element without direct manual implementation thereof.

[0024] U.S. Pat. No. 4,393,534 discloses an apparatus for mechanically varying the speed of a disk, such as a floor treating pad, mounted for rotation about the axis of elongation of a shaft powered by a fixed speed motor.

[0025] U.S. Pat. No. 4,407,040 describes a pad drive assembly that detachably grips and rotatably drives a selected maintenance pad by a floor maintenance pad by a floor maintenance machine.

[0026] U.S. Pat. No. 4,506,405 discloses a floor-treating machine adapted to operate as a floor scrubber and a floor polisher or buffer includes a main housing or support frame structure from which extends a brush housing assembly.

[0027] U.S. Pat. No. 4,523,411 describes a rotatable element and a surface-treating device.

[0028] U.S. Pat. No. 4,577,364 discloses a floor-cleaning machine including a support frame with a handle attached to the upper end of the support frame for guiding the machine along the floor and a wheel assembly attached to the lower end. A plurality of disc-shaped floor cleaning pads disposed and held adjacent one another such that a floor pad cylinder having a horizontally disposed and held adjacent one another such that a floor pad cylinder having a horizontally-disposed longitudinal axis is formed are attached to the lower end of the frame.

[0029] U.S. Pat. No. 4,633,541 discloses a floor-treating machine adapted to operate as a floor scrubber and a floor polisher or buffer, which includes a main housing or support frame structure from which extends a brush housing assembly.

[0030] U.S. Pat. No. 4,654,918 describes a buffer deck assembly for floor scrubbing, cleaning and polishing machine that includes a displaceable buffer deck housing mounted to the machine through a substantially U-shaped mounting frame having a pair of sleeves that each slid ably receive a cantilever support arm.

[0031] U.S. Pat. No. 4,783,872 discloses a high-speed floor-treating machine is provided comprising a frame, a control and guiding handle extending rearward of the frame and an electric motor for rotating a floor-contacting pad is secured.

[0032] U.S. Pat. No. 4,910,824 discloses a floor polisher, which causes a pad to rotate at a high speed to polish a floor. The floor polisher has a vertically moving mechanism adapted to move the pad in the vertical direction with respect to the floor, a ground pressure adjusting mechanism adapted to maintain a ground pressure of the pad at a set pressure by controlling the vertically moving mechanism and a floor protecting mechanism adapted to actuate the vertically moving mechanism to lift the pad immediately when the travel of the floor polisher is stopped.

[0033] U.S. Pat. No. 5,054,245 describes a combination of cleaning pads, cleaning pad mounting members and a base member for a rotary cleaning machine.

[0034] U.S. Pat. No. 5,127,124 describes an apparatus for adjusting the height above the floor of a plate to which is attached a pad in a rotary floor machine to accommodate pads having a range of thicknesses.

[0035] U.S. Pat. No. 5,253,384 discloses an electric buffing machine and a method for buffing waxed floors. The buffing machine comprises a molded plastic housing, a foldable handle and a DC drive motor directly driving a buffing pad holder.

[0036] U.S. Pat. No. 5,287,583 discloses a floor treatment machine having a frame, a handle mounted to the frame,

wheels mounted to the frame, and a rotatable floor treatment pad mounted to the frame for treating a floor surface.

[0037] U.S. Pat. No. 5,289,605 discloses a cleaning apparatus in the form of a scrubber that is a motor driven by a direct current (DC) motor driving a rotatable scrubber unit which includes a scrubber disc with the motor and scrubber disc forming a power head supported from a detachable and adjustable length pole which enables surfaces that are normally out of reach to be easily scrubbed.

[0038] U.S. Pat. No. 5,371,912 discloses an electric floor and baseboard-cleaning machine which includes a motor assembly attached to a medium frame in which the movement thereof is adjustable for either straight line or circular motion.

[0039] U.S. Pat. No. 5,402,559 discloses a floor scrubber is provided which consists of a rectangular head assembly.

[0040] U.S. Pat. No. 5,555,587 discloses a floor mopping machine for automatic mopping of floors having a movable housing and a rotatable mopping member including a plurality of spongy mop pieces.

[0041] U.S. Pat. No. 5,797,157 describes a floor buffer having the power source and drive means mounted at one end of an elongate handle, and a buffer head mounted at the other end, such that the center of gravity of the machine is roughly at the midpoint of the elongate handle.

[0042] U.S. Pat. No. 6,023,813 describes an automatic floor scrubber and buffer that provides for simultaneous scrubbing and buffing of floors through the use of a plurality of pads operating at different speeds to optimize the scrubbing and buffing operation of the device.

[0043] U.S. Pat. No. 6,357,070 discloses a riding cleaning machine that can simultaneously perform sweeping, scrubbing, and burnishing.

[0044] U.S. Pat. No. 6,418,585 discloses a mopping device that may be adapted for manual or electromechanical operation.

[0045] U.S. Pat. No. 6,524,173 discloses an apparatus for cleaning a surface having a handle joined to a cleaning head operable to dispense liquid onto a surface to be cleaned.

[0046] U.S. Pat. No. 6,550,094 discloses a self-contained electrically powered wringer.

[0047] U.S. Pat. No. 6,741,05 discloses a robotic floor mopping assembly.

[0048] U.S. Pat. No. 2004/0049878 discloses a floor cleaner having a sweeper, a scrubber, and a burnisher.

SUMMARY OF THE INVENTION

[0049] It is desirable to provide an automatic mopping machine that mops, cleans, sweeps, vacuums, and dries a floor surface preferably in one pass. It is further desirable to provide such a mopping machine that is of a compact size, of low weight, easy to use, and easy to store. It is also desirable to provide a mopping and cleaning machine that can be readily maneuvered in tight spaces. For instance in one embodiment, the machine may be driven in a "U-turn" in a space as tight as three feet (e.g. a turning radius of eighteen inches). In yet other embodiments, the machine may be driven in a "U-turn" in a space as tight as two feet.

[0050] Accordingly, it is an object of this invention to provide a self-contained automatic mopping and cleaning machine that is compact and is preferably no larger than a standard mop and mop bucket combination, and is preferably lower in height than a standard mop stored in a standard mop bucket.

[0051] Another object of this invention is to provide an automatic mopping machine that reduces the labor otherwise required when conventionally mopping a floor such as moistening a mop, sliding a mop, and wringing a mop, thus resulting in a reduced commercial floor cleaning cost.

[0052] Further it is an object of this invention to provide a mopping and cleaning machine that provides for improved cleaning and that imparts a greater luster to a cleaned floor that can be obtained from a convention mop and bucket or other prior art cleaning machines. The improved cleaning and increased luster is in part obtained by the high speed rotation of the preferably soft bristled brush of the cleaning machine which in at least one embodiment, rotates at a rate of 1400 revolutions per minute, but may rotate substantially faster or slower such as 1200 or 1600 revolutions per minute.

[0053] Further it is an object of this invention to provide a mopping and cleaning machine that provides for improved cleaning by avoiding the reuse of water or water and a cleaning solution. Such improved cleaning is in contrast to the use of a conventional mop and buck or prior art cleaning machine which recycle the cleaning fluid or in other words such prior art machines reuse dirty water in attempting to clean a floor.

[0054] Further it is an object of this invention to provide a mopping and cleaning machine that is very simple to operate due to very simple controls.

[0055] Further it is an object of this invention to provide a mopping and cleaning machine that incorporates a self-adjusting squeegee that provides for on-going proper squeegee deflection.

[0056] Further it is an object of this invention to provide a mopping and cleaning machine that includes a dirty water level viewing window which provides a means to determine when the machine dirty water should be emptied so as to prevent excess water and debris from entering the vacuum motor or other areas of the machine.

[0057] Further it is an object of this invention to provide a mopping and cleaning machine that provides for an adjustable caster assembly so as to provide proper brush loading against a floor resulting in proper cleaning without undue drag being place on the machine motor.

[0058] Further it is an object of this invention to provide a mopping and cleaning machine that provides for selective squeegee lifting resulting in selectively greater brush rotation dwell times prior to selectively vacuuming the resultant dirty water and drying the floor.

[0059] Further it is an object of this invention to provide a mopping and cleaning machine that provides for handle height adjustment resulting in improved operator convenience and improved compactness in storage and shipping of the machine.

[0060] Further it is an object of this invention to provide a mopping and cleaning machine that includes an on-board battery charger and preferably "gel cell" type batteries that may be selectively charged while storing the machine or while operating the machine resulting in even greater portability of the machine.

[0061] Further it is an object of this invention to provide a mopping and cleaning machine that incorporates a self-centering drive-belt, the removal and replacement of which requires no tools resulting in improved maintainability of the machine.

[0062] Further it is an object of this invention to provide a mopping and cleaning machine that incorporates a quick-change easily installable self-adjusting squeegee that is

readily replaceable preferably in no more than two minutes, resulting in improved maintainability of the machine.

[0063] Further it is an object of this invention to provide a mopping and cleaning machine that incorporates a quick-change and easily cleanable vacuum hose, resulting in improved maintainability of the machine.

[0064] Additional objects, advantages, and other novel features of this invention will be set forth in part in the description that follows and in part will become apparent to those skilled in the art upon examination of the following or may be learned with the practice of the invention. The objects and advantages of this invention may be realized and attained by means of the instrumentalities and combinations particularly pointed out in the appended claims. Still other objects of the present invention will be readily apparent to those skilled in the art from the following description wherein there is shown and described the preferred embodiment of this invention. As it will be realized, this invention is capable of other different embodiments, and its several details, and specific configurations, are capable of modification in various aspects without departing from the invention. Accordingly, the drawings and descriptions should be regarded as illustrative in nature and not as restrictive.

DESCRIPTION OF DRAWINGS

[0065] In order that the advantages of the invention will be readily understood, a more particular description of the invention briefly described above will be rendered by reference to specific embodiments that are illustrated in the appended drawings. Understanding that these drawings depict only typical embodiments of the invention and are not therefore to be considered to be limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings, in which: trimetric

[0066] FIG. 1 is a trimetric view of the preferred embodiment of the invention.

[0067] FIG. 2 is a partially exploded isometric view of the preferred embodiment of the invention.

[0068] FIG. 3 is a further exploded isometric view of select subassemblies and components of the preferred embodiment of the invention. Recovery tank 20 is shown with the near side quarter of the tank removed. Due to the relatively thin wall sections, for drawing clarity, no cross-hatching is shown.

[0069] FIG. 4 is an additional further exploded isometric view of select subassemblies and components of the preferred embodiment of the invention. Deck 140 is shown with the near side quarter of the deck removed. Due to the relatively thin wall sections, for drawing clarity, no cross-hatching is shown.

[0070] FIG. 5 is an exploded isometric view of brush assembly 240 of the preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0071] The invention is a machine for cleaning and mopping floors. The invention in its preferred embodiment is a rollable mopping machine having wheels and being equipped with an electric motor driven rotatable cleaning brush, a vacuum powered squeegee, on-board batteries to power the machine, a fresh water/cleaning chemical tank, and a recovery tank. In order to facilitate the understanding of the present invention in reviewing the drawings accompanying the speci-

fication, a feature list is provided below. It is noted that like features are like numbered throughout all of the figures.

FEATURE TABLE	
#	Feature
10	Mopping machine
20	Recovery tank
22	Tank lower mounting surface
24	Tank upper mounting surface
26	Tank back mounting surface
28	Tank filter mounting recess
30	Tank holding chamber
32	Tank drain hole
35	Filter assembly
36	Filter
37	Filter cover
40	Fresh water tank assembly
42	Fresh water tank
44	Fresh water tank lid
46	Fresh water tank mounting plate
48	Fresh water tube
50	Fresh water tube first end
52	Fresh water tube second end
60	Vacuum assembly
62	Vacuum hose
64	Vacuum hose first end
66	Vacuum hose second end
70	Vacuum motor assembly
72	Vacuum motor
74	Vacuum motor gasket
76	Vacuum motor boot
80	Battery charger assembly
82	Battery charger
84	Battery charger mounting flange
86	Battery charger mounting bracket
88	Bracket charger mounting flange
90	Bracket tank mounting flange
100	Control assembly
102	Control assembly mounting plate
104	Handle bar mounting bracket
106	Handle bar
108	Handle bar hand grip
110	Control switch
120	Deck assembly
140	Deck
142	Deck mounting platform
144	Deck battery holding compartment
146	Deck lower mounting surface
148	Deck rear axle retention hole
150	Deck brush assembly mounting recess
160	Battery
162	Battery positive connection terminal
164	Battery negative connection terminal
180	Rear axle assembly
182	Rear axle
184	Rear axle assembly first wheel
186	Rear axle assembly second wheel
200	Front caster assembly
202	Caster assembly mounting arm
204	Caster
206	Caster assembly adjustment knob
220	Squeegee assembly
222	Squeegee assembly mounting arm
224	Squeegee assembly mounting bracket
226	Squeegee assembly adjustment clamp
228	Squeegee assembly support shaft
230	Squeegee blade
232	Squeegee assembly vacuum connection fitting
240	Brush assembly
242	Brush
244	Brush bristle
246	Brush housing
247	Brush housing opening

-continued

FEATURE TABLE	
#	Feature
248	Brush assembly first bushing
250	Brush assembly second bushing
252	Brush pulley
254	Brush assembly end plate
256	End plate brush pulley opening
258	End plate motor pulley opening
260	Brush assembly drive belt
262	Brush axle
264	Brush assembly motor
266	Motor pulley
268	Drive belt shroud

[0072] Referring now to the drawings, the invention is a powered mopping and cleaning machine **10** for use in mopping and cleaning tile, linoleum, hardwood and like floors, comprising a recovery tank **20**, a filter assembly **35**, a fresh water tank assembly **40**, a vacuum assembly **60**, a battery charger assembly **80**, a control assembly **100**, and a deck assembly **120**. Recovery tank **20** defines a generally cubic shaped elongated preferably rotationally molded plastic tank capable of storing liquids having a lower mounting surface **22**, an upper mounting surface **24**, a back mounting surface **26**, a filter mounting recess **28**, a holding chamber **30**, and a drain hole **32**. Recovery tank **20** may further include a substantially transparent portion that functions as a window allowing the user to determine the machine dirty water level in Recovery tank **20**.

[0073] Filter assembly **35** defines a filter assembly comprising a filter **36** and a filter cover **37**. Filter **36** defines a generally cylindrically shaped foam filter. Filter cover **37** defines a preferably plastic injection molded generally hollow open ended cylindrically shaped cover. Filter cover **37** is adapted to snappingly engage to filter mounting recess **28**. Filter assembly **35** is assembled such that filter **36** is contained within filter cover **37**.

[0074] Fresh water tank assembly **40** defines a tank assembly comprising a fresh water tank **42**, a fresh water tank mounting plate **46**, and a fresh water tube **48**. Fresh water tank **42** defines a generally cubic shaped elongated rotationally molded plastic tank capable of storing liquids having a fresh water tank lid **44** removeably connected to fresh water tank **42**. Fresh water tube **48** defines a substantially elongated hollow tube capable of carrying liquids and controllably providing such liquids to a brush assembly, having a first end **50** and a second end **52**. Fresh water tank assembly **40** is assembled such that fresh water tank mounting plate **46** is mounted to a side of fresh water tank **42** and fresh water tube first end **50** is mounted to fresh water tank **42**.

[0075] Vacuum assembly **60** defines a vacuum assembly comprising a vacuum hose **62** and a vacuum motor assembly **70**. Vacuum hose **62** defines a generally flexible elongated corrugated hose capable of carrying liquids having a first end **64** and a second end **66**. Vacuum motor assembly **70** defines a vacuum motor assembly comprising a vacuum motor **72**, a vacuum motor gasket **74**, and a vacuum motor boot **76**. Vacuum motor assembly **70** is assembled such that vacuum motor boot **76** is coveringly mounted to vacuum motor **72** with vacuum motor gasket **74** sealing sandwiched therebe-

tween. Vacuum assembly 60 is assembled such that Vacuum hose 62 is vacuum suction portingly connected to vacuum motor assembly 70.

[0076] Battery charger assembly 80 defines a battery charger comprising a battery charger 82 and a battery charger mounting bracket 86. Battery charger 82 defines a conventional battery charger capable of charging batteries and having a mounting flange 84. Battery charger mounting bracket 86 defines a generally "L" shaped preferably formed sheet metal mounting bracket capable of supporting a battery charger and having a charger mounting flange 88 and a tank mounting flange 90. Battery charger assembly 80 is assembled such that mounting flange 84 is fastened to mounting flange 88.

[0077] Control assembly 100 defines a mopping machine controllable assembly comprising a generally rectangular shaped mounting plate 102, handle bar mounting brackets 104, a tubular shaped handle bar 106, preferably high friction rubber or plastic or the like handle bar hand grips 108, and control switches 110. Control assembly 100 is assembled such that at least one handle bar mounting bracket 104 is fastened to mounting plate 102, handle bar 106 is clamped to at least one handle bar mounting bracket 104, handle bar grips 108 are press fittingly connected mounted to ends of handle bar 106, and at least one control switch 110 is operably mounted to mounting plate 102. Control assembly 100 is adapted such that height of handle bar 106 is adjustable resulting in improved operator convenience and improved compactness in storage and shipping of the machine

[0078] Deck assembly 120 defines a deck assembly comprising a deck 140, at least one battery 160, a rear axle assembly 180, a front caster assembly 200, a squeegee assembly 220, and a brush assembly 240. Deck 140 defines a generally hollow cubic shaped preferably rotationally molded plastic deck capable of storing batteries and providing a structural support having a mounting platform 142, a battery holding compartment 144, a lower mounting surface 146, a rear axle retention hole 148, and a brush assembly mounting recess 150. At least one battery 160 defines a conventional electrical power storage battery capable of powering a mopping machine having a positive connection terminal 162 and a negative connection terminal 164. Battery 160 is preferably a "gel cell" type battery and may be selectively charged while storing machine 10 or while operating machine 10 resulting in even greater portability of machine 10. Further, when more than one battery 160 is used in machine 10, batteries 160 are preferably fastened together to provide for increased convenience in service battery 160 or machine 10.

[0079] Rear axle assembly 180 defines a rear axle assembly capable of bearing and carrying the weight of a mopping machine comprising a substantially elongated cylindrically shaped preferable steel axle 182, a first wheel 184, and a second wheel 186. Rear axle assembly 180 is assembled such that with axle 182 rotatably inserted through axle retention hole 148, first wheel 184 is connected to a first end of axle 182 and second wheel 186 is connected to a second end of axle 182.

[0080] Front caster assembly 200 defines a caster assembly capable of directionally swiveling and bearing and carrying the weight of a mopping machine comprising a somewhat flexible preferably steel mounting arm 202, a rotatable and swivelable caster 204, and a rotatable caster adjustment knob 206. Front caster assembly 200 is assembled such that caster 204 is swivelably mounted to mounting arm 202 and adjust-

ment knob 206 is rotatably adjustingly connected to mounting arm 202 and such that when front caster assembly 200 is mounted to deck 140, rotation of adjustment knob 206 causes a corresponding height adjustment of front caster assembly 200 relative to deck 140.

[0081] Squeegee assembly 220 defines a squeegee assembly capable of squeegeeing or scraping and collecting water and like liquids comprising a somewhat flexible preferably steel mounting arm 222, a preferably steel mounting bracket 224, an adjustment clamp 226, a preferably hollow tubular support shaft 228, a preferably rubber squeegee blade 230, and a preferably molded plastic vacuum connection fitting 232. Squeegee assembly 220 is assembled such that mounting arm 222 is slidingly adjustably connected to mounting bracket 224 by adjustment clamp 226, vacuum connection fitting 232 is vacuum portingly connected to mounting bracket 224, support shaft 228 is mounted to mounting bracket 224, and squeegee blade 230 is mounted to support shaft 228. It is noted that squeegee assembly 220 is a quick-change easily installable self-adjusting squeegee that is readily replaceable within two minutes. Squeegee blade 230, a wearable item, is readily replaced by loosening a single wing-nut, removing a first instance of squeegee blade 230, installing a second instance of squeegee blade 230, and tightening the single wing-nut.

[0082] Brush assembly 240 defines a brush assembly capable of rotating a brush to clean a floor comprising a brush 242, a brush housing 246, a first bushing 248, a second bushing 250, a brush pulley 252, a brush end plate 254, a preferably self-centering rubber or the like drive belt 260, a substantially elongated cylindrically shaped preferable steel brush axle 262, a motor 264, and a belt shroud 268. Brush 242 defines a conventional rotatable brush having a plurality of bristles 244. Brush 242 may alternatively define a dense foam rotatable brush or another brush of suitable material. Brush housing 246 defines a generally hollow semi-cylindrically shaped housing having a plurality of openings 247 to accommodate brush 242. Brush end plate 254 defines a substantially flat plate having a brush pulley opening 256 and a motor pulley opening 258. Motor 264 defines a conventional electrical drive motor having a pulley 266. Brush assembly 240 is assembled such that axle 262 is pressed into brush 242, bushing 248 is pressed onto a first end of brush axle 262, bushing 250 and brush pulley 252 are pressed onto a second end of brush axle 262, brush axle 262 is rotatably mounted in housing 246 with first bushing 248, second bushing 250, and brush pulley 252 positioned in housing openings 247, end plate 254 is mounted to housing 246 with pulley 252 protruding through pulley opening 256, motor 264 is mounted to end plate 254 with pulley 266 protruding through pulley opening 258, drive belt 260 is placed in rotational drive relationship to brush pulley 252 and motor pulley 266, and shroud 268 is mounted in drive belt 260 covering relationship to end plate 254 and such that a rotation of motor 264 causes rotation of motor pulley 266 which causes rotation of belt 260 which causes rotation of pulley 252 which causes rotation of brush 242 which causes a floor to be cleaned. It is noted that belt 260 is adapted to be removed and replaced without the use of tools.

[0083] Deck assembly 120 is assembled such that at least one battery 160 is mounted within battery holding compartment 144 of deck 140, rear axle assembly 180 is rotatably connected to deck 140 with axle 182 being rotatably positioned within rear axle retention hole 148 and wheels 184 and

186 being positioned on sides of deck 140, front caster assembly 200 is swivelably and adjustably mounted to lower mounting surface 146, squeegee assembly 220 is connected to lower mounting surface 146, and brush assembly 240 is mounted to brush assembly mounting recess 150.

[0084] Powered mopping and cleaning machine 10 is assembled such that recovery tank 20 is mounted to deck assembly 120 by connecting lower mounting surface 22 to mounting platform 142, filter assembly 35 is connected to filter mounting recess 28, fresh water tank assembly 40 is mounted to recovery tank 20 by connecting mounting plate 46 to back mounting surface 26 and with fresh water tube second end 52 in fresh water delivery connection to brush assembly 240, vacuum assembly 60 is assembled to recovery tank 20 with vacuum motor assembly 70 mounted substantially within recovery tank 20 and with vacuum hose end 66 in vacuum connection with squeegee assembly 220, battery charger assembly 80 is mounted to recovery tank 20 by connecting mounting flange 90 to back mounting surface 26, and control assembly 100 is mounted to recovery tank 20 by connecting mounting plate 102 to upper mounting surface 24. Further, powered mopping and cleaning machine 10 is assembled such that battery charger 80 is electrically connected to battery 160, and such that battery 160 is electrically connected to at least one control switch 110, vacuum motor 72, and brush assembly motor 264 such that electrical power from battery 160 is selectively distributed to at least one control switch 110, vacuum motor 72, and brush assembly motor 264, to cause selective rotation of motors 72 and 264 and in turn to power vacuum assembly 60 and brush assembly 240 respectively. Powered mopping and cleaning machine 10 may also include a solenoid (not shown) fluid transmissibly connected between fresh water tube second end 52 and brush assembly 240 and electrically connected to battery 160 and at least one control switch 110 such that fresh water or like cleaning fluid is selectively sent to brush assembly 240. It is noted that at least a portion of vacuum hose 62 is mounted substantially external to recovery tank 20 such that removal of at least one end of vacuum hose 62 is readily removable to facilitate cleaning of vacuum hose 62. It is further noted that vacuum hose 62 may be cleaned by running water from a conventional garden hose into vacuum hose 62 to flush debris from vacuum hose 62.

[0085] In practice, with powered mopping and cleaning machine 10 assembled and resting on a floor, electrical power is transmitted from battery 160 to motors 72 and 264 to create vacuum suction to be delivered to squeegee assembly 220 and to cause rotation of brush assembly 240. It is noted that brush 242 may be rotated at significantly high speeds, for instance brush 242 may rotate at a speed of 1400 revolutions per minute. Further, fresh water or a cleaning fluid or a combination of water and a cleaning fluid is provided to brush assembly 240. While grasping hand grips 108 of handle bar 106, powered mopping and cleaning machine 10 is then maneuvered across the floor at a selected rate, and the floor is mopped, cleaned, vacuumed, and squeegeed dry in preferably a single pass. When greater mopping action is required for a section of floor, squeegee assembly 220 is independently raised and brush 242 is allowed to rotate on the floor section for a select dwell period. It is noted that in contrast to a conventional mop and bucket or prior art machines, powered mopping and cleaning machine 10 does not reuse dirty water in cleaning a floor. It is noted that depending on the adjustment of front caster assembly 200, the rotation of brush 242

may cause or assist in the self-propelling of powered mopping and cleaning machine 10 and facilitates proper squeegee loading and deflection. It shall be noted that mopping or cleaning a floor using powered mopping and cleaning machine 10 in the method described, reduces the amount of labor otherwise required when using a convention mop and mop bucket and such use of powered mopping and cleaning machine 10 allows a user to clean a substantially larger area of floor space in a given period of time that the user could otherwise clean using a standard mop and mop bucket. It shall also be noted that disclosed powered mopping and cleaning machine 10 is adapted to fit into and be stored in the same storage area that is used to store a conventional mop and mop bucket. Thus powered mopping and cleaning machine 10 preferably has a foot print of 18 inches by 22 inches and a height of 42 inches. However, powered mopping and cleaning machine 10 may be altered such as by altering the fresh water tank capacity, the recovery tank capacity, the battery quantity and size, to result in a powered mopping and cleaning machine of a different size. Thus for instance, powered mopping and cleaning machine by have any one of the following footprint and height combinations: a foot print of 26 inches by 30 inches and a height of 54 inches, a foot print of 26 inches by 26 inches and a height of 42 inches, and a foot print of 14 inches by 18 inches and a height of 39 inches. Further, powered mopping and cleaning machine 10 may also define a volumetric space envelopes that is a combination of the noted dimensions.

[0086] The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

1. A self-contained powered mopping and cleaning machine for use in replacing a conventional mop and mop bucket without said machine occupying a three-dimensional greater than that which would otherwise be occupied by said replaced conventional mop and mop bucket, and for use in mopping, cleaning, vacuuming, squeegeeing, and drying a portion of a floor in a single pass without reusing cleaning fluid such that used cleaning fluid is not placed onto a cleaned floor by said machine, said machine having a cleaning fluid tank, a dirty fluid recovery tank, a vacuum device, a electrical battery, a machine function control apparatus, a machine steering apparatus, and a floor cleaning head, wherein said machine fits within a three dimensional spatial envelope of no more than 26 inches by 30 inches by 54 inches.

2. The machine of claim 1 wherein said machine fits within a three dimensional spatial envelope of no more than 18 inches by 22 inches by 42 inches.

3. The machine of claim 1 wherein said machine fits within a three dimensional spatial envelope of no more than 14 inches by 18 inches by 39 inches.

4. The machine of claim 1 wherein said steering apparatus defines a handle bar.

5. The machine of claim 1 wherein said machine includes a battery charger capable of recharging said electrical battery.

6. The machine of claim 1 wherein said machine includes at least one caster assembly and wherein said caster assembly is height adjustable.

7. The machine of claim 1 wherein said floor cleaning head includes a horizontally positioned motorized rotating brush.

8. The machine of claim 7 wherein said vacuum device includes a squeegee pick-up head and wherein said squeegee pick-up head is mounted in near proximity to said brush and wherein said squeegee pick-up head is adapted to vacuum dirty fluid and debris.

9. A self-contained powered mopping and cleaning machine for use in replacing a conventional mop and mop bucket without said machine occupying a three-dimensional greater than that which would otherwise be occupied by said replaced conventional mop and mop bucket, and for use in mopping, cleaning, vacuuming, squeegeeing, and drying a portion of a floor in a single pass without reusing cleaning fluid such that used cleaning fluid is not placed onto a cleaned floor by said machine, said machine having an automated brush head to brush a floor, a squeegee and vacuum device to squeegee and vacuum a floor, and a manual steering device to effect the steering of said machine, wherein said machine fits within a three dimensional spatial envelope of no more than 26 inches by 30 inches by 54 inches.

10. The machine of claim 9 wherein said machine fits within a three dimensional spatial envelope of no more than 18 inches by 22 inches by 42 inches.

11. The machine of claim 9 wherein said machine fits within a three dimensional spatial envelope of no more than 14 inches by 18 inches by 39 inches.

12. The machine of claim 9 wherein said steering apparatus defines a handle bar.

13. The machine of claim 9 wherein said machine includes a battery and a battery charger capable of recharging said electrical battery.

14. The machine of claim 9 wherein said machine includes at least one caster assembly and wherein said caster assembly is height adjustable.

15. The machine of claim 9 wherein said automated brush head defines a horizontally positioned motorized rotating brush.

16. A self-contained powered mopping and cleaning machine for use in replacing a conventional mop and mop bucket without said machine occupying a three-dimensional greater than that which would otherwise be occupied by said replaced conventional mop and mop bucket, and for use in mopping, cleaning, vacuuming, squeegeeing, and drying a portion of a floor in a single pass without reusing cleaning fluid such that used cleaning fluid is not placed onto a cleaned floor by said machine, said machine having a cleaning fluid tank, a dirty fluid recovery tank, a vacuum device, a electrical battery, a machine function control apparatus, a handle bar to manually effect the steering of said machine, and a floor cleaning head, wherein said machine fits within a three dimensional spatial envelope of no more than 26 inches by 30 inches by 54 inches.

17. The machine of claim 16 wherein said machine fits within a three dimensional spatial envelope of no more than 18 inches by 22 inches by 42 inches.

18. The machine of claim 16 wherein said machine fits within a three dimensional spatial envelope of no more than 14 inches by 18 inches by 39 inches.

19. The machine of claim 16 wherein said machine includes a battery charger capable of recharging said electrical battery.

20. The machine of claim 16 wherein said machine includes at least one caster assembly and wherein said caster assembly is height adjustable.

21. The machine of claim 16 wherein said floor cleaning head includes a horizontally positioned motorized rotating brush.

22. The machine of claim 21 wherein said vacuum device includes a squeegee pick-up head and wherein said squeegee pick-up head is mounted in near proximity to said brush and wherein said squeegee pick-up head is adapted to vacuum dirty fluid and debris.

23. A nonautonomous self-contained powered floor cleaning machine for use in replacing a conventional mop and mop bucket without said machine occupying a three-dimensional greater than that which would otherwise be occupied by said replaced conventional mop and mop bucket, and for use in mopping, cleaning, vacuuming, squeegeeing, and drying a portion of a floor in a single pass without reusing cleaning fluid such that used cleaning fluid is not placed onto a cleaned floor by said machine, said machine having a substantially high speed brush, wherein said high speed brush rotates at a rate of at least 1200 revolutions per minute, and wherein said machine defines at least one of a machine that does not reuse cleaning fluid and a machine that fits within a three dimensional spatial envelope of no more than 26 inches by 30 inches by 54 inches.

24. The machine of claim 23 wherein said brush rotates at a rate of 1200 revolutions per minute to 1600 revolutions per minute, and wherein said machine does not reuse cleaning fluid such that used cleaning fluid is not placed onto a floor by said machine, and wherein said machine fits within a three dimensional spatial envelope of no more than 26 inches by 30 inches by 54 inches.

25. The machine of claim 24 wherein said machine is highly maneuverable such that said machine has a minimum U-turn radius of no more than eighteen inches, and wherein said machine includes a recovery tank for dirty water wherein said tank includes a window such that a fluid level in said tank may be ascertained by a machine user, and wherein said machine includes a height adjustable caster assembly that facilitates the proper amount of loading on said brush, and wherein said machine includes a height adjustable handle bar, and wherein said machine includes a battery bundle defining a plurality of batteries fastened together such that said batteries may be lifted out of said machine as a single bundle, and wherein said machine includes a drive belt that is selectively replaceable without the use of tools.

26. A method of cleaning a floor comprising the steps of: providing a cleaning machine, and moving said cleaning machine across a portion of said floor in a single pass such that said floor portion is mopped, cleaned, vacuumed, and squeegeed substantially dry in said single pass.

27. The process of claim 26 wherein said cleaning machine further defines a cleaning machine having a substantially high speed brush, and wherein said machine does not reuse cleaning fluid such that used cleaning fluid is not placed onto said floor by said machine, and wherein said machine fits within a three dimensional spatial envelope of no more than 26 inches by 30 inches by 54 inches.