Feb. 26, 1957 W. H. KITTO ET AL 2,782,452

FLOOR POLISHING AND SCRUBBING MACHINE

Filed Nov. 27, 1950 2 Sheets-Sheet 1

Fig. 1.

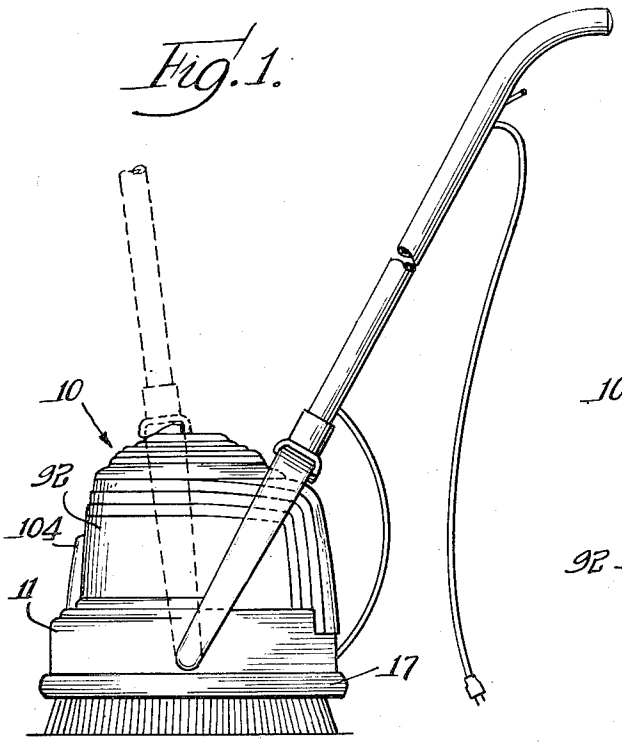
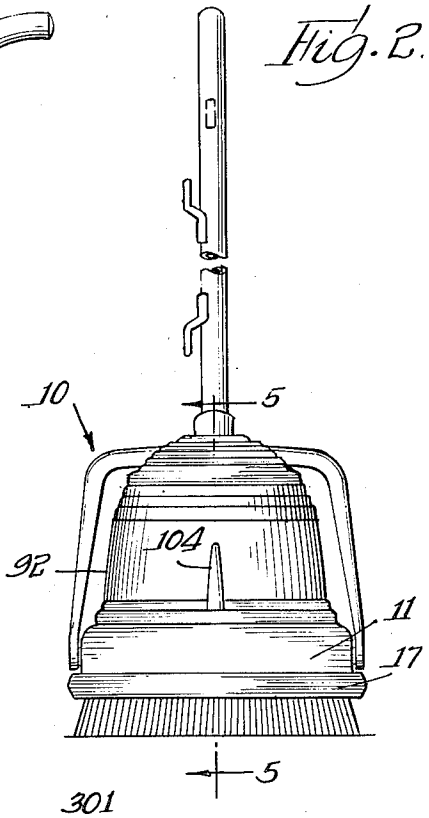


Fig. 2.



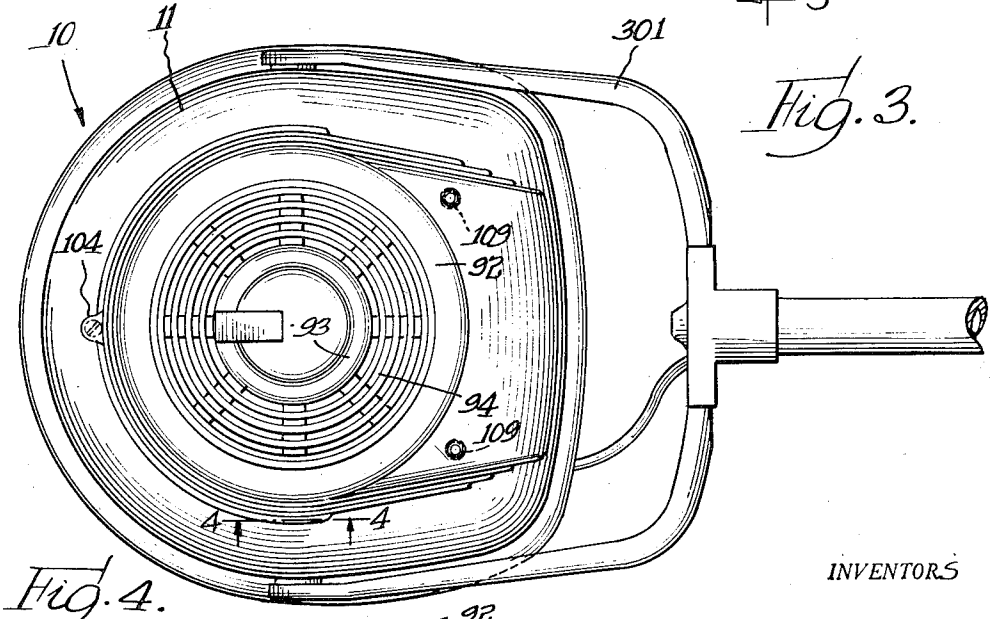
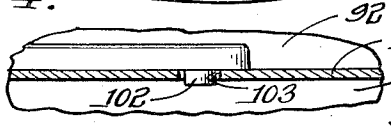


Fig. 3.

Fig. 4.



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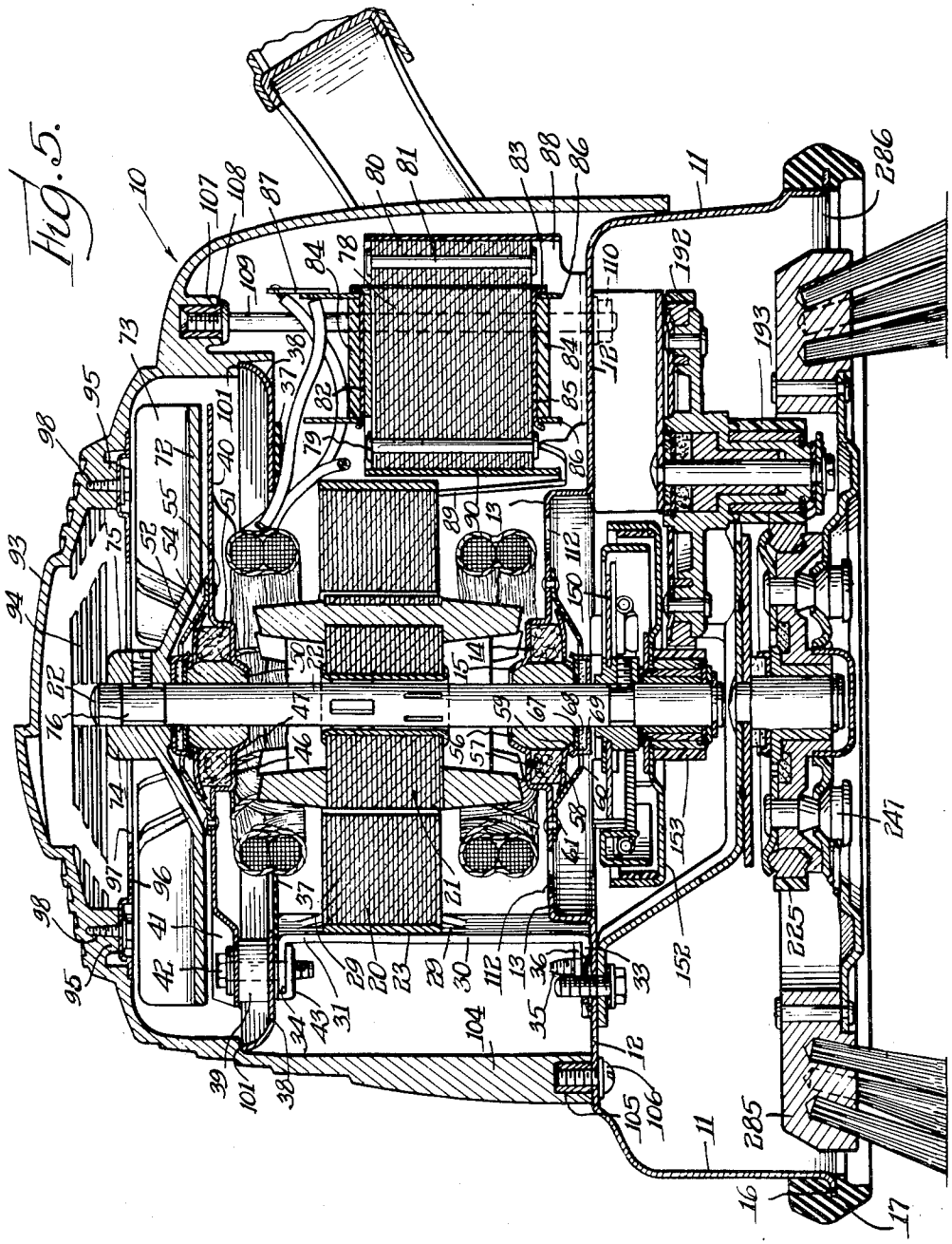
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Fig. 5.



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FLOOR POLISHING AND SCRUBBING MACHINE

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Application November 27, 1950, Serial No. 197,724

5 Claims. (Cl. 15—385)

This invention relates to a floor polishing and scrubbing machine of the motor driven single rotary flat brush type and more particularly to the manner of cooling, ventilating and building up a positive air pressure in the machine.

The principal object of this invention is to provide an improved floor polishing and scrubbing machine having a motor, a rotary brush and driving means between the motor and the brush wherein the motor is effectively ventilated and cooled, wherein cooling air is readily circulated through and over the motor, wherein cooling air enters the top of the machine and discharges at the bottom to maintain at a minimum the amount of foreign matter entering the machine, and wherein a positive air pressure is maintained in the machine to prevent foreign matter resulting from the polishing and scrubbing operations from entering the machine.

An improved floor polishing and scrubbing machine utilizing the novel features of this invention is fully shown and described in a co-pending application, Serial No. 197,725, filed by Archie J. McMaster, William H. Kitto, and Kurt Burian, on November 27, 1950, and includes a base member which is preferably of an inverted cup shaped configuration. A substantially constant speed single phase induction motor is mounted on the upper side of the base member with the motor shaft extending downwardly through the base member. A phasing reactor is also mounted on the upper side of the base member. A cover is secured to the upper side of the base member and encloses the motor and phasing reactor. The lower end of the motor shaft operates a motor pinion meshing with a cluster gear carried by a bracket secured to the lower side of the base member. The cluster gear also meshes with an output gear carried by a bracket also secured to the lower side of the base member. Mounting means detachably secure a flat rotary brush to the output gear to be driven thereby. A centrifugal clutch is located between the motor shaft and the motor pinion. A handle having a bail is pivotally mounted on the side of the frame in transverse alignment with the brush axis for manipulating and controlling the machine.

All of the component parts of the machine are carried by the single base member so that they may all be accurately positioned with respect to each other with a minimum of effort, thereby greatly reducing manufacturing and assembly costs. Further, when the brush and cover are removed, the various parts are exposed for ready inspection, cleaning and repair, if necessary.

The top of the cover is provided with air inlet openings and the top of the base member is provided with air outlet openings. A fan is carried by the upper end of the motor shaft and circulates cooling air from the air inlet openings over and through the motor and out through the outlet openings. Baffles are provided for directing the cooling air to provide maximum cooling of the motor. The cooling air passing through the outlet openings enters the inverted cup shaped base member and then escapes around the periphery of the brush. This

cooling air builds up a positive air pressure in the base member and effectively prevents dirt and the like caused by the polishing and scrubbing operations from entering into the base member. In this way the centrifugal clutch, gearing and bearings contained within the base member are kept clean and free from foreign particles. Since the cooling air inlet is at the top of the machine and at a point farthest from the brush, intake of dirt and foreign particles with the cooling air is maintained at a minimum.

Further objects of this invention reside in the details of construction of the machine parts and the cooperative relationship between the machine parts for providing cooling, ventilating and building up of positive air pressures in the floor polishing and scrubbing machine.

Other objects and advantages of this invention will become apparent to those skilled in the art upon reference to the accompanying specification, claims and drawings, in which:

Fig. 1 is a side elevational view of the floor polishing and scrubbing machine of this invention;

Fig. 2 is a front elevational view looking from the left in Fig. 1;

Fig. 3 is an enlarged top plan view of the machine;

Fig. 4 is a partial sectional view taken along the line 4—4 of Fig. 3; and

Fig. 5 is an enlarged vertical sectional view taken through the machine along line 5—5 in Fig. 2.

Referring first to Figs. 1 to 3, and 5, the floor polishing and scrubbing machine of this invention is generally designated at 10 and includes an inverted cup-shaped base member formed from sheet steel having a side wall 11 and a top wall 12. The top wall 12 is recessed at 13 and is formed with a central bearing seat 14 having a spherical bearing supporting surface 15. The lower edge of the base member is flared outwardly at 16 for the purpose of receiving a furniture guard 17. The furniture guard may be made of rubber or other suitable material and extends outwardly and downwardly from the lower edge of the base member. The furniture guard prevents marring of furniture and marring of the floors when the machine is placed on the floor with the brush removed.

Mounted on the upper side of the base member is an electric motor, preferably of the split phase induction type. It includes a stator 20 and a rotor 21 carried by a shaft 22. The stator is carried by a stator support member which is illustrated in Fig. 5. The motor support member includes a clamping band 23 for clamping the motor stator. The stator support member also includes a plurality of downwardly extending legs 30 and upwardly extending legs 31. These legs may be integrally formed from sheet metal and may be connected to the sheet metal clamping band in any suitable manner. The legs 30 and 31 may also be lanced to provide lugs 29, also overlying the motor stator to prevent longitudinal shifting thereof.

The downwardly extending legs 30 are bent outwardly to provide attaching ears 33 having holes therein for the purpose of securing the motor stator support to the upper side of the base member. Likewise, the upper ends of the upwardly extending legs 31 are bent outwardly to form attaching ears 34 having holes for the purpose of mounting a bearing support plate. The motor stator support is secured to the upper wall 12 of the base member by means of screws 35 extending through the base member and attaching ears 33 and by means of nuts 36. The attaching ears 34 of the upwardly extending legs 31 carry an annular baffle plate 38, spacers 39, and a bearing support plate 40. The bearing support plate 40 is located above the baffle plate 38 and is cupped at 41 for receiving screws 42 extending through the bearing support plate 40, spacers 39, baffle plate 38 and attaching ears 34. The parts are held in assembled relation by nuts 43 cooperat-

ing with the screws 42. The baffle plate 38 and bearing support plate 40 are formed from sheet metal. The baffle plate 38 carries inwardly an annular baffle 37 which closely surrounds the windings of the electric motor. In this respect the baffle 37 is made of insulating material so as not to cause shorting of the motor windings. The bearing support plate is provided with a bearing seat 46 having a spherical seating surface 47.

The bearing support plate 40 supports a self-aligning bearing 50 preferably made of sintered porous bronze, the bearing having a spherical surface for engagement with the spherical seat 47 of the bearing plate. The porous bronze bearing 50 is surrounded with an absorbent washer 51 containing oil which feeds through the porous bearing for lubricating the running surfaces between the bearing and the motor shaft. A spring member 52 overlies the absorbent washer 51 and is provided with a spherical bearing seat 53 engaging a spherical surface on the other end of the bearing 50. A conical member 54 secured to the bearing plate 40 by rivets 55 places a spring tension on the spring member 52 for maintaining the bearing 50 in position on the bearing support plate 40.

The motor bearing construction carried by the base member is identical to that carried by the upper bearing support plate. It includes a self-centering sintered porous bronze bearing 56, an absorbent washer 57 containing oil, a spring member 58 provided with a spherical bearing seat 59, and a conical member 60 secured by rivets 61 to the base member tensioning the spring member 58.

To limit longitudinal movement of the rotor, the rotor shaft is provided with upper and lower thrust bearings. The upper thrust bearing includes a metal washer 63 running on the bearing 50. This metal washer is backed by a resilient washer 64 such as cork, the resilient washer 64 being tightly fitted to the motor shaft 22 and enclosed in a cup-shaped member 65 to maintain a friction fit between the resilient washer and the motor shaft. The lower thrust bearing is the same as the upper. It includes a metal washer 67 running against the motor bearing 56, a resilient washer 68 and a cup-shaped member 69.

The upper end of the motor shaft carries a fan 72 having fan blades 73. The fan hub 74 receives the motor shaft 22 and is adjustably secured in place thereon by a set screw 75 engaging a recessed portion 76 of the shaft. The fan hub 74 acts as a thrust stop for the upper thrust bearing and limits the downward movement of the rotor and its shaft.

A phasing reactor in the form of a choke is also carried by the upper side of the base member 12. It includes two sets of laminations, E laminations 78 and I laminations 80. The E laminations are secured togeter by rivets 79 and the I laminations by rivets 81. The E and I laminations are separated by a fiber plate 83 to form a fixed gap therebetween and to provide a more nearly constant current characteristic for line voltage variations. The center leg of the E laminations carries a coil 84 wound on a suitable coil form 85, 86 formed of insulating material. The coil form carries connecting terminals 87. The coil form is securely held in place on the center leg of the E laminations by a wooden wedge 82. The laminations are encased in a sheet metal housing 88 suitably secured to the upper side of the base member 12. The forward edges of the housing 88 are provided with cam surfaces 89 which receive a wedge member 90.

The machine is provided with a cover 92 for enclosing the motor and the phasing reactor. The cover is molded from a suitable plastic as by injection or compression molding. The cover is generally cup-shaped in configuration and has a side wall and a top wall 93. The top wall 93 is provided with a plurality of concentrically arranged air inlet openings 94 through which cooling air is drawn by the fan 72 for cooling and ventilation purposes. The bottom side of the top wall 93 of the cover is provided with bosses 95 for attaching an annular baffle plate 96 having a central opening 97, the opening 97 forming the eye for the fan 72. The baffle plate 96 is secured in place by screws 98. The cover 92 is also internally provided with an annular shoulder 101 which is adapted to engage the baffle plate 38 carried by the stator support member. As shown more particularly in Fig. 4, the lower edge of the cover 92 is provided with a pair of projections 102 to be received in holes 103 in the upper wall 12 of the base member. These projections cooperate with the holes to aid in centering the cover 92 with respect to the base member 12. The forward side of the cover 92 is provided with a boss 104 having a screw threaded sleeve 105 for receiving a screw 106 to secure the cover to the base member. The cover is also provided with a pair of internal bosses 107 carrying screw-threaded sleeves 108 for receiving studs 109. The studs 109 extend downwardly through holes in the upper wall of the base member and carry nuts 110 also for securing the cover to the base member. In this way the cover may be detachably and securely fastened to the base member for enclosing the motor and phasing reactor.

For cooling and ventilation purposes the recessed portion 13 of the upper wall of the base member is provided with a plurality of holes 112 to form outlet air passages. When the machine is in operation, air is drawn through the inlet openings 94 by the fan 72, the air being directed to the center of the fan by the baffle plate 96. The air delivered by the fan passes around the outside of the upper bearing support plate 40 and then inwardly along the baffle plate 38. The air thus delivered is forced over the windings of the motor, down through and around the motor, and over the phasing reactor. The air then exits through the outlet openings 112 into the inverted cup-shaped base member. It is noted that the holes 112 are located near the windings of the motor so that the air passing through the openings also passes over these windings. In this way maximum cooling and ventilating efficiency for the motor and phasing reactor are obtained. Since the air inlet openings 94 are located in the top of the cover farthest away from the floor polishing operation, the amount of dirt and foreign material drawn into the cover is maintained at a minimum. The baffle plate 96 also hides the fan 72 from view through the openings 94 in the top of the cover. In addition it should be noted that the arrangement of the baffle plate and air outlet apertures also directs the cooling air over the upper and lower motor bearings for cooling these parts.

The lower end of the motor shaft 22 carries within the base member 11 a centrifugal clutch and a motor pinion assembly which is fully illustrated and described in the above mentioned co-pending application, Serial No. 197,725, and includes a clutch drive plate 150, a clutch cup 152, and a motor pinion 153. It should be noted that the cooperative surfaces of the clutch are in general axial alignment with the annular series of air outlet openings 112 so that the cooling air also is directed for efficiently cooling the clutch. The motor pinion meshes with a relatively large gear 192 of a cluster gear assembly including a small gear 193. The gear 193 meshes with an output gear 225, which output gear detachably carries a suitable brush 285. The details of the gearing and brush are also fully disclosed in the above mentioned co-pending application. It should be noted that the output gear and brush assembly is preferably constructed so as to prevent the passage of air, dust, or the like therethrough, and the periphery of the brush fits closely within the base 11. With this construction, the output gear and brush effectively close the bottom end of the base 11, except for an annular restricting outlet 286 about the periphery of the brush. The clean air which builds up a positive pressure within the base 11 is forced out through the outlet opening 286 under pressure, whereby dirt, dust, and any other foreign material is restrained from entering the base and causing injury to the gearing, clutch, and motor.

From the above description, it is seen that the present invention has provided a novel floor working apparatus,

wherein cooling air is drawn to the housing and directed in a manner to provide maximum cooling for the motor. Furthermore, it is seen that the present invention is constructed so as to protect the moving parts of the gearing, clutch, and motor from injury by confining and directing the cooling air in a manner to restrain entry of foreign material into the base and housing.

While for purposes of illustration one form of this invention has been disclosed, other forms thereof may become apparent to those skilled in the art upon reference to this disclosure and, therefore, this invention is to be limited only by the scope of the appended claims.

We claim as our invention:

1. In a floor polishing and scrubbing machine, housing means having an open bottom end, floor working means rotatably supported within said housing means and extending below said bottom end for floor working purposes, said floor working means substantially closing said open bottom end of the housing means, an electric motor mounted within said housing means above said floor working means for driving said floor working means, a fan disposed within said housing means and adjacent an air inlet opening near the top of said housing means and driven by said motor for drawing cooling air through said air inlet opening, baffle means in an upper part of the housing means and beneath said fan and closely surrounding an upper portion of the motor for directing the cooling air from the inlet opening to the upper portion of the motor, means providing a restricted air passageway adjacent a lower portion of the motor so that the cooling air flows closely past said lower portion of the motor, said cooling air flowing through said restricted passageway and building up a positive air pressure above said floor working means and then flowing out of the housing means around said floor working means to restrain entry of foreign material into said housing means, and clutch means operatively connecting said motor and said floor working means, said clutch means being disposed in general alignment with said restricted air passageway so that cooling air is directed over said clutch means for cooling purposes.

2. A floor polishing and scrubbing machine, as defined in claim 1, wherein said fan is a centrifugal fan, and wherein means is provided for directing air from said inlet opening toward the center of the centrifugal fan to promote efficient operation.

3. A floor polishing and scrubbing machine, as defined in claim 1, wherein said upper portion of the electric motor includes stator windings and said baffle means includes a portion of electrical insulating material closely surrounding and engaging said windings.

4. A floor polishing and scrubbing machine as defined in claim 1 which includes upper and lower bearing means for rotatably supporting the rotor of said motor, said upper bearing means being disposed beneath and in operative engagement with said fan and adjacent said baffle means, which fan is mounted directly on a vertically disposed motor rotor shaft and serves by engaging the upper bearing means to prevent downward movement of the motor rotor, and said lower bearing being disposed near said restricted air passageway so that the cooling air is also directed around the bearings for cooling purposes.

5. In a floor polishing and scrubbing machine, housing means having an open bottom end, floor working means rotatably supported within said housing means and extending below said bottom end for floor working purposes, said floor working means substantially closing said open bottom end of the housing means, an electric motor mounted within said housing means above and operatively connected with said floor working means, a fan disposed within said housing means and driven by said motor for drawing cooling air through an inlet opening in an upper portion of said housing means, means in said housing means for directing cooling air from the inlet opening to an upper portion of the motor, means providing a restricted air passageway adjacent a lower portion of the motor, and clutch means operatively connecting said motor and said floor working means, said clutch means being disposed in general alignment with said restricted air passageway so that the cooling air is directed over the clutch means for cooling purposes.

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