Sept. 18, 1934. E. S. STINSMAN 1,973,915

FLOOR POLISHING MACHINE

Filed Sept. 9, 1930

Fig. 3

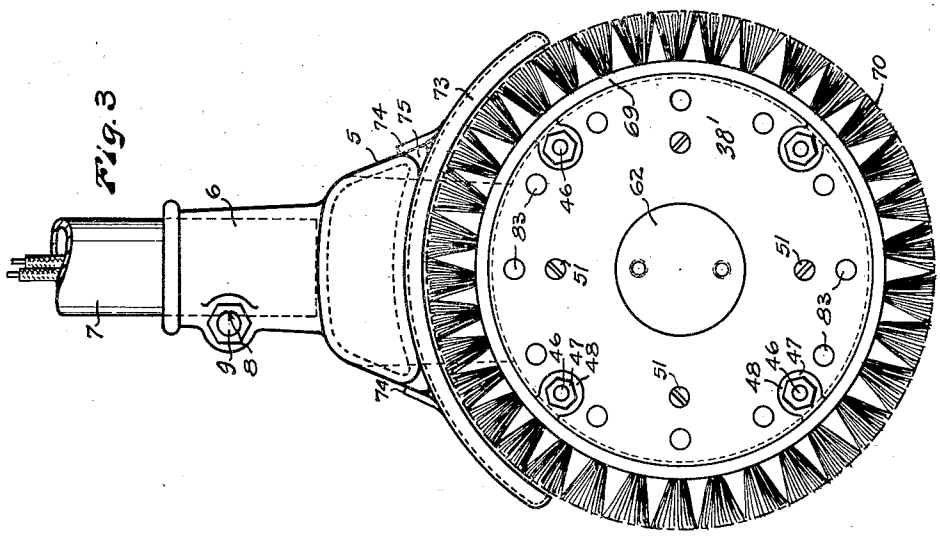


Fig. 2

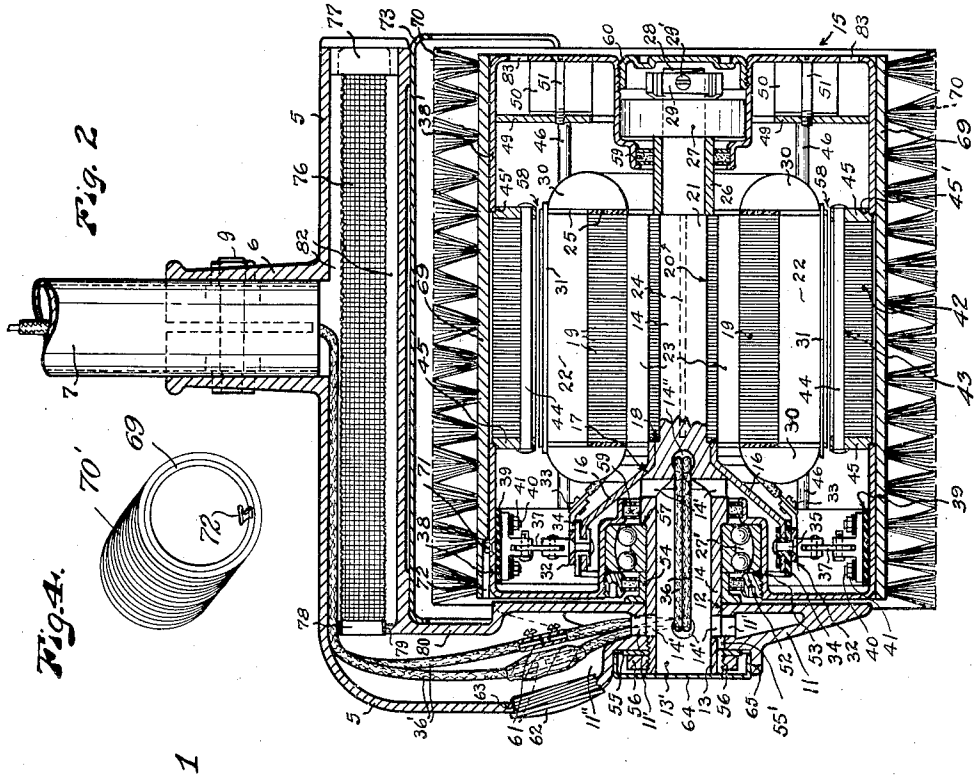
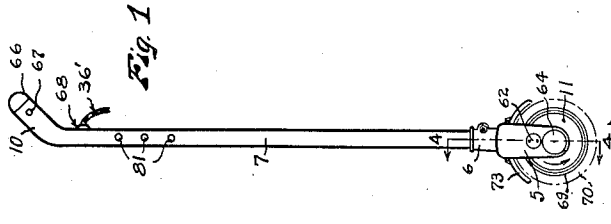


Fig. 4.

Fig. 1



INVENTOR
EDGAR STANLEY STINSMAN.
BY
Fred C. Matheny
ATTORNEY

Patented Sept. 18, 1934 1,973,915

UNITED STATES PATENT OFFICE

1,973,915

FLOOR POLISHING MACHINE

Edgar Stanley Stinsman, Wenatchee, Wash., assignor of one-half to Harry M. Madden, Seattle, Wash.

Application September 9, 1930, Serial No. 480,646

5 Claims. (Cl. 15—49)

My invention relates to improvements in electrically driven floor polishers, the same being particularly adapted to expedite and simplify the polishing of waxed floors and other waxed surfaces.

Portable electric polishers of various kinds have been devised prior to my invention to polish more or less of the total waxed surfaces of floors and the like, but heretofore separate high speed motor units of standard design have been used to drive cylindrical rotating polishing brushes through the intermediacy of belts, gears, chains or other speed reducing devices in order to operate the polishing member at the comparatively low surface speed required to burnish the surface without unduly disturbing the film of wax previously applied.

Furthermore it has been necessary to supplement the work of the machines by hand polishing around the edges of the floor near the base board where the rotating brushes could not reach because of the frame and other projections at the ends of the machines, and because of the curvature of the face of the brushes themselves when used in the other operating position.

Both of these objectionable features are eliminated in my invention which enables me also to use an improved method of mechanically polishing waxed surfaces whereby a bright smooth and hard finish is assured as hereinafter described.

The chief object of my invention is to provide improved portable means for mechanically polishing waxed surfaces in general and particularly waxed floors and such portions thereof as may be next to the base board and under heavy obstructions, such as book cases, cupboards and other heavy pieces of furniture.

Another object is to provide an improved device of the kind described whereby the motor element is concentric with removable polishing elements and drives the same direct without the intermediacy of speed reducing mechanism.

A final object is to provide a simple, compact for ventilating the motor element of the device.

An final object is to provide a simple, compact device of the kind described that is easy to manipulate, reliable in its operation and cheap to manufacture.

With the above and related objects in view, the invention consists of certain parts, combination of parts and methods hereinafter described, illustrated in the accompanying drawing and embraced in the appended claims.

In the drawing:

Figure 1 is a side elevation of the complete machine.

Figure 2 is a longitudinal mid-section of the operating mechanism to a larger scale on broken line 4—4.

Figure 3 is an end elevation of the operating mechanism to the same scale as in Fig. 2.

Figure 4 is a view in perspective of the polishing ring pad to a smaller scale.

Like reference numerals are used to indicate like parts throughout the drawing wherein a frame casting 5, preferably of an aluminum alloy, is provided with a split socket 6 wherein a tubular metal handle 7 of suitable length is removably secured against rotational or axial displacement by means of a notch 8 in the handle and a snug fitting clamp bolt 9. The upper end of the tubular handle may be enlarged and bent through a suitable angle to form a handle grip 10 for the convenient operation of the machine.

The downwardly projecting portion of frame 5 terminates in a hollow, conical end piece 11 having an axial cylindrical aperture 12 adapted to receive the threaded projecting end 13 of stationary spindle 14 of motor unit 15. This end piece also forms a guard adapted to cover the adjacent end of the rotating member hereinafter described, and is adapted to prevent clothing and the like from being caught and wound about said spindle. The larger end of spindle 14 is hollow as at 13' and has radial connecting apertures 14' and 14'' which are used as hereinafter described.

This spindle is the nucleus around which the motor is assembled. First a conical, pressed steel, starting switch support 16 is mounted upon the spindle so it bears against shoulder 17 and projects slightly past shoulder 18. Stamped sheet steel laminations 19 each having a central circular aperture 20 adapted to fit over portion 21 of the spindle are assembled thereon with their partly closed slots 22 and ventilating duct apertures 23 in assured alignment by reason of key 24 in the spindle and registering key way notches, not shown, in the laminations. End discs of insulating material 25 having slot and ventilating duct apertures registering with those of the laminations are assembled therewith in the order shown. Shoulder 18, sleeve 26 and the inner race of self aligning ball bearing 27 in combination with the threaded end 28 of spindle 14 and nut 29 provided with a set screw 29' serve to clamp the laminations securely in position to form the stator core of the motor. Sleeve 26 is preferably a press fit on the spindle.

After insulating the slots, insulated copper magnet wire is wound therein in the usual manner to form what is known in the art as a split phase winding which fills the slots and occupies approximately the space 30 at the ends of the stator core. The number of slots and the arrangement of the winding are such that the proper number of magnetic flux poles will result to give a rotating magnetic field such that the polishing element will have a surface speed of from 1650 to 2000 feet per minute. In the machine illustrated herewith, having an outer diameter of 6⅝ inches and operating at a surface speed of about 1980 feet per minute, six poles are used with 60 cycle, single phase, alternating current. The tops of the slots are closed in the usual way after winding by means of fibre insulating strips 31.

The stationary part of the centrifugally operated starting switch consists of two nearly semi-circular bronze segments 32 having terminal lugs and screws 33 which are mounted on starting switch support 16 over a strip of suitable insulating material 34 and secured thereto by means of insulated rivets 35, thus electrically insulating the segments from the support and from each other. These switch segments are connected in series with the starting winding and insulated flexible stator leads 36 which pass through aperture 14'' into space 13' of the spindle. The terminal ends of the running winding are connected directly to the two stator leads, thus forming the usual parallel arrangements of the two windings so long as segments 32 are connected by the usual contact members 37 which are electrically connected and mounted within the cylindrical flange portion of pressed steel end piece 38, on a strip of insulating material 39, and secured thereto by means of insulated screws 40 and nuts 41.

The rotating element or rotor of the motor consists of a plurality of annular sheet steel laminations 42 having partly closed slots 43 carrying bare copper wire bars 44 that are riveted over and soldered to copper end rings 45 to form the usual squirrel cage type of rotor winding. The number of bars is preferably made equal to 1.25 times the number of stator slots, plus or minus one, in order to secure good starting characteristics.

With the squirrel cage rotor in position over the stator as shown and the ball bearings 27 and 27' removed from the spindle, the rotor assembly is built up by fitting the flange edges of rotor end pieces 38 and 38' into notches 45' in the periphery of the rotor end rings and clamping the end pieces firmly in position by means of bolts 46 which pass through equally spaced holes, not shown, in the rotor assembly and nuts 47 in recesses 48 of the end pieces. Flanged end piece 38' carries the centrifugal fan assembly consisting of an annular ring 49 to which a plurality of radial impellers 50 are fixedly attached, preferably by spot welding. Screws 51 serve to removably secure the fan assembly in position.

The self aligning ball bearings 27 and 27', properly packed with grease, may next be placed in position with their inner races on the spindle and outer races within the accurately ground cylindrical recesses provided therefor in their respective end pieces. Nut 29 is used to secure the inner race of bearing 27 to the spindle as previously described, and a threaded ring 52, adapted to fit with threads in the recess of end bell 38, and a leather ring of triangular cross section 53 are used to secure the outer race of bearing 27' to the end bell. A flanged sleeve 54 is next fitted over end 13 of spindle 14 and, with flexible stator leads 36 projecting axially from space 13', end 13 of the spindle is fitted into aperture 12 of the frame and removably secured therein by means of lock washer 55 and nut 56, thus forcing sleeve 54 against the inner race of bearing 27' which is thus firmly gripped between the sleeve and shoulder 57 of the spindle. The registration of frame and spindle apertures 11' and 14' respectively is assured by means of a suitable alignment pin 55' positioned in grooves in the spindle and frame.

It will be noted that the fastening arrangements for the inner and outer races of bearing 27' provide means whereby the rotor and stator elements are definitely positioned axially of the spindle; yet provision is made for the unequal axial expansion and contraction of these elements by providing adequate end clearances for bearing 27 in the bearing recess of end piece 38'. The ball bearings are considerably over size for the requirements of the machine, hence assure a constant air gap 58 between rotor and stator cores for a long period of time. The bearings are sealed against the entrance of dust particles by means of felt rings 59 secured to the rotor elements, and a taper-threaded closure cap 60 as clearly shown in Fig. 2 of the drawing.

The flexible stator leads 36 next may be passed through registering apertures 11' and 14' and cored space 11'' for joining to insulated flexible conductors 36' by means of connectors 61, after which the connectors are taped and plug 62 screwed into position to close the threaded convenience opening 63 in frame 5. A pressed metal cap 64 fitting tightly into recess 65 closes the exposed end of the spindle and its fastenings. A snap switch 66 of standard design adapted to be removably secured in the end of handle grip 10 by means of screws 67 is connected to one of the insulated conductors 36' which pass from tubular handle 7 through an insulating bushing 68 to a suitable terminal plug connection, not shown, and to one of the wires connected to the motor windings.

After assembly with the rotor core, the peripheral surfaces of end pieces 38 and 38' are accurately ground to a suitable taper with the smaller diameter at the fan end of the rotor. Metal ring 69, in which the brush bristles 70 are mounted in the usual way, is taper bored to fit over the tapered rotor end bells and is secured in position against axial and rotational displacement by means of a pin 71 in end piece 38 and an L shaped slot 72 in the ring. In addition to the brush ring, each machine is preferably supplied with a polishing pad ring, shown in Fig. 4, adapted for use interchangeably with the brush ring as hereinafter described. This pad ring consists of a metal ring identical with ring 69 on which is secured suitable polishing pad material 70' such as wool felt that occupies approximately the space as brush bristles 70.

A sheet metal guard 73, having fastening ears 74 adapted to fit over the lower edges 75 of frame 5, protects the operator from flying particles projected from the rotating brush or pad while the machine is in use. Edges 75 are preferably tapered toward the open end of the frame to facilitate the installation and removal of the guard which can be done without interference with the brush or pad rings, which likewise can be installed and removed without interfering with the guard.

The upper portion of the frame of the machine preferably is fitted with a dust straining unit consisting of a fine mesh, wire screen envelope 76 to one end of which a head 77 is fixedly attached by soldering, and in like manner a plain sleeve 78 is attached to its opposite end. When in position, as shown in the drawing, sleeve 78 fits in aperture 79 of wall 80, and head 77 closes the end opening of the frame.

To operate the machine the terminal plug at the end of conductors 36' is inserted in a convenient receptacle connected to the source of electrical supply. With the left hand grasping handle grip 10 switch 66 is turned to the "on" position, thus completing the circuit to the two stator windings of the motor. When the rotating element reaches the speed for which the starting winding switch is set, the centrifugal force causes contact members 37 to overcome the tension of the closing springs, not shown, and open the switch thus breaking the flow of current to the starting winding. The machine then operates as a single phase, squirrel cage, induction motor with the interior member of the motor stationary, and with the exterior member rotating about the interior member on ball bearings 27 and 27' preferably in the direction indicated by the arrow in Fig. 1 of the drawing.

The centrifugal fan impellers 50 serve to induce a flow of cooling air through a plurality of inlet apertures 81 into tubular metal handle 7, then down the same to space 82 exterior of the dust strainer, thence through screen 76 to the interior of the envelope, through the open end sleeve 78, through apertures 11', 14', 13' and 14'' to the interior cavity within end piece 38, thence through stator ventilating ducts 23 to the intake of the fan. After passing through the fan, the air is finally discharged from the machine through a plurality of apertures 83 in end piece 38'. With this system of cooling the interior of the motor, whereby the air therefor is obtained from a region removed from the immediate vicinity of the rotating brush or pad, I am able to keep the interior of the motor clean and prevent the accumulation of dust and wax particles that tend to collect in floor polisher motors and often cause serious damage to the mechanism.

By turning switch 66 to the "off" position the flow of current to the running winding is interrupted and the rotating element comes to rest, thus allowing the tension of the starting switch springs to actuate contact members 37 to again close the circuit through the starting winding.

With the motor in operation the machine is worked back and forth, by means of the handle grip 10, over the surface to be polished until every part possible has been covered systematically and satisfactorily by the machine. It will be noted that the absence of obstructions at one end of the machine together with the natural axial direction spread of the bristles of the ring brush or the felt of the ring pad mounted on the rotating element make it possible to polish the portions of a floor next to the base board and around the legs of heavy pieces of furniture that heretofore could not be reached with a rotating machine, and of necessity had to be polished by hand.

The direct drive feature of the invention, whereby all belts, gears and the like are eliminated and a relatively slow speed motor unit is employed, assures positive and quiet operation. Obviously the guard and air strainer may be removed and cleaned readily, thus adding greatly to the sanitary features of the device, which together with the absence of objectionable noise in its operation enhance its operating advantages in hospitals and sick rooms where septic conditions and mechanical noises are particularly objectionable. Another advantage resides in the fact that the relatively slow-speed motor unit adds considerably to the weight of the machine which is found to contribute greatly to the ease and effectiveness of the polishing operation.

By means of the machine of my invention I find that I am able to secure superior results as compared with the polish produced by other power operated devices. Furthermore I have devised an improved process for use with my machine whereby a hard, lasting and brilliant finish is assured for waxed surfaces that is superior to that obtained in any other way commensurate with the time and effort expended.

The process in full is as follows:

A coat of wax of substantially uniform thickness is applied to the surface to be polished, such as a floor, in the usual way and allowed to dry sufficiently to set the wax. The machine of my invention with the brush ring attached is next used to rough polish the waxed surface, after which the brush ring of the machine is removed, the pad ring is installed and the machine thus equipped, is again used to final polish or buff the surface.

The process may be repeated, if desired, but I find that when my process is employed, a single coat of wax is sufficient if the floor is in good condition. An important feature of the process is the additional drying time between the rough and final polishing operations that is enforced in making the change from the brush ring to the pad ring, thus assuring a harder, more lasting, and more brilliantly finished surface than would otherwise be obtained.

As will be evident, the mechanism may be modified in various details of construction without departing from the spirit of the invention herein shown and described, and embraced within the scope of the appended claims; For instance, in addition to the use of the machine for polishing purposes, it may be used conveniently to surface finish a floor by substituting a ring on which is mounted an abrasive means, such as a sandpaper pad, for the polishing rings as hereinbefore described.

What I claim and desire to protect by Letters Patent is:

1. In a machine adapted to polish waxed surfaces, the combination of a stationary spindle, a wound stator element fixedly mounted on said spindle, an annular squirrel-cage rotor element rotatively mounted on said spindle exterior of said stator element, an annular polishing brush removably mounted on the periphery of said rotor element, a frame fixedly mounting one end of said spindle and providing a handle leg substantially parallel with the axis of said spindle, and an inwardly flanged segmental brush guard removably secured to the brush side of said handle leg.

2. In a polishing machine, the combination of a stationary spindle, a wound stator element fixedly mounted on said spindle, an annular squirrel-cage rotor element, cylindrically flanged end pieces of larger diameter than said rotor element removably secured to the ends thereof and rotatively mounted on said spindle whereby said rotor and said end pieces combine to form a rotating member exterior of said stator element, and an

annular brush member removably mounted on the peripheral portions of said end pieces.

3. In a polishing machine, the combination of a stationary spindle, a wound stator element fixedly mounted on said spindle, an annular squirrel-cage rotor element, cylindrically flanged end pieces of larger diameter than said rotor element removably secured to the ends thereof and rotatively mounted on said spindle to form a rotating member exterior of said stator element, an annular brush member removably mounted on the peripheral portions of said end pieces, and, fixedly secured to one end of said spindle, a frame providing a guard adapted to cover the adjacent end of said rotating member, whereby clothing and the like is prevented from being caught and wound about said spindle.

4. In a polishing machine, the combination of a stationary spindle, a wound stator element fixedly mounted on said spindle, an annular squirrel-cage rotor element, flanged end pieces fixedly secured to the ends of said annular rotor element and rotatively mounted on said spindle to form a rotating member exterior of said stator element, an annular brush removably mounted on the periphery of said rotating member, a frame fixedly mounting one end of said spindle said frame providing a guard adapted to cover the adjacent end of said rotating element and providing also a handle leg substantially normal to said guard leg, and an inwardly flanged segmental brush guard removably secured to the brush side of said handle leg.

5. In a polishing machine, the combination of a stationary spindle, a wound stator element fixedly mounted on said spindle, an annular squirrel-cage rotor element, a pair of end pieces each embodying a peripheral cylindrical flange of larger diameter than said rotor element and an interior cylindrical flange forming an axial aperture adapted to receive bearing means for rotatively mounting said end pieces on said spindle, means removably securing the flange edges of said end pieces to said rotor element to form a rotating member exterior of said stator element, and an annular brush member removably mounted on the peripheral portions of said end pieces.

E. STANLEY STINSMAN.