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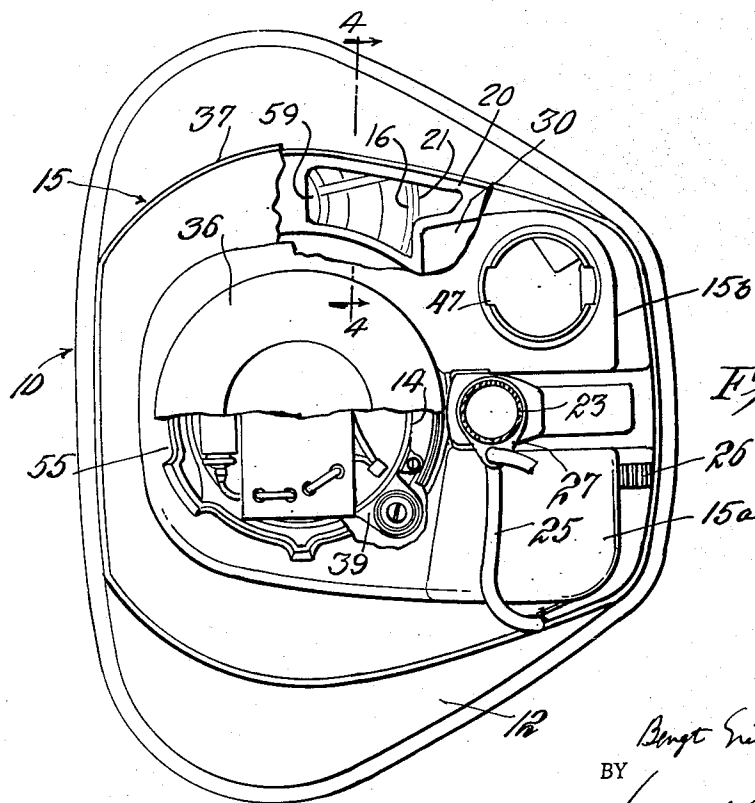
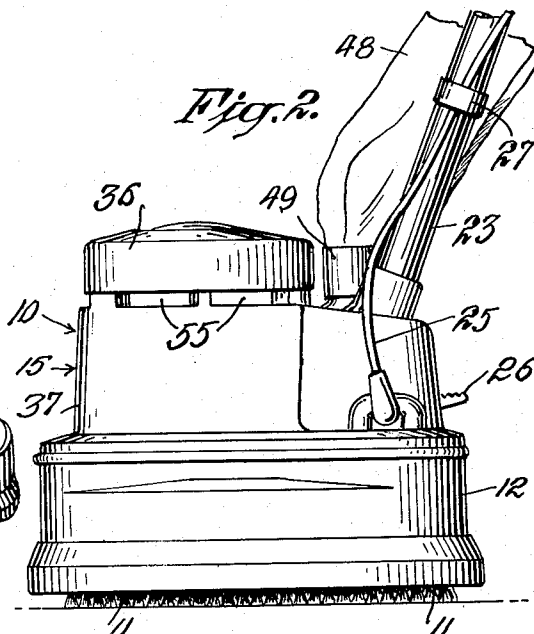
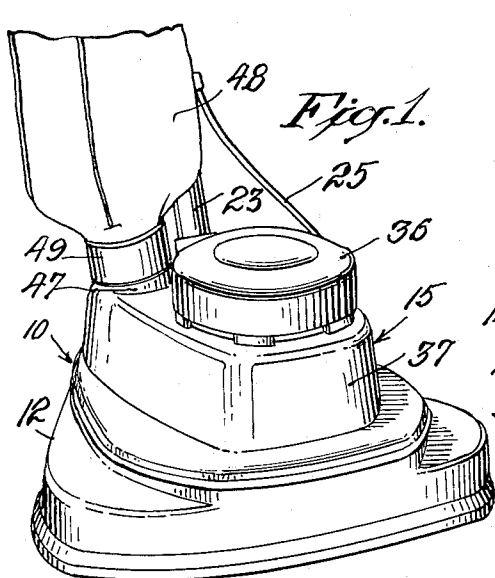
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2,953,807

SURFACE TREATING APPARATUS

Filed March 25, 1957

3 Sheets-Sheet 1



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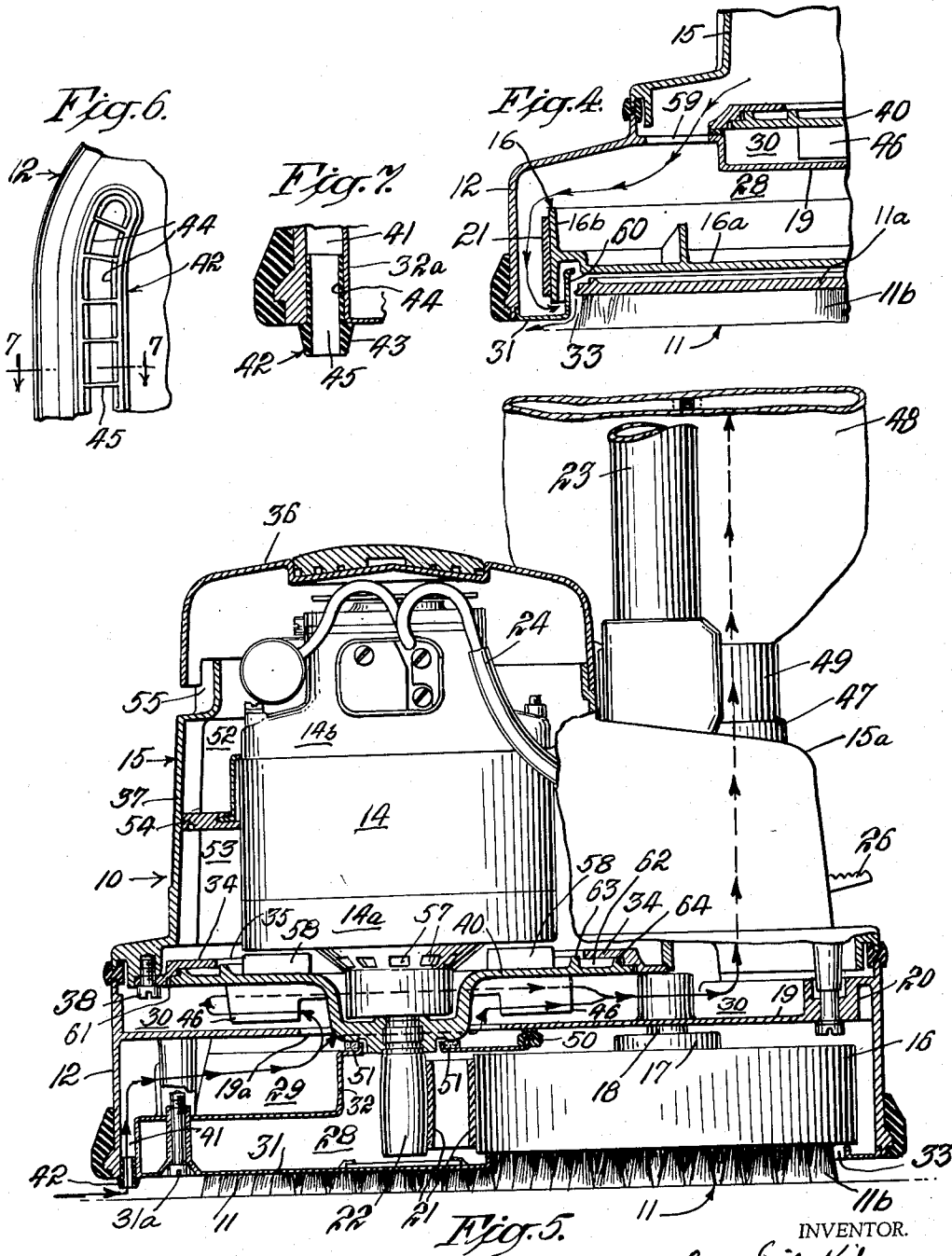
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SURFACE TREATING APPARATUS

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3 Sheets-Sheet 2



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SURFACE TREATING APPARATUS

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9 Claims. (Cl. 15—345)

My invention relates to a domestic appliance having a surface treating member adapted to be positioned on a surface and be moved thereover.

It is an object of my invention to provide improved surface treating apparatus having a rotatable surface treating member at the vicinity of which air is discharged toward the surface being treated.

Another object is to provide an improved domestic appliance having several paths of flow for air having different inlets and outlets.

A further object is to provide an improved domestic appliance of this kind in which the outlet of one of the paths of flow is arranged to discharge air toward the surface upon which the appliance is adapted to be positioned and over which it is movable, and the inlet of another path of flow is arranged to withdraw air from the immediate vicinity of the surface.

A still further object is to provide an improved domestic appliance of this kind in which air is circulated in two paths of flow by a fan unit having a rotatable member provided with fan blades at opposite sides thereof, the rotatable member forming part of a wall separating the paths of flow of air.

Further objects and advantages of my invention will become apparent as the following description proceeds, and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention, reference may be had to the following description taken in connection with the accompanying drawing, in which:

Fig. 1 is a front perspective view, partly broken away, of surface treating apparatus embodying my invention;

Fig. 2 is a side elevation, partly broken away, of the apparatus shown in Fig. 1;

Fig. 3 is a top plan view, partly broken away, of the apparatus shown in Figs. 1 and 2;

Fig. 4 is a fragmentary vertical sectional view taken at line 4—4 of Fig. 3;

Fig. 5 is a side view, partly broken away and in section, of the apparatus shown in Figs. 1, 2 and 3;

Fig. 6 is a fragmentary bottom view of the apparatus shown in Figs. 1, 2, 3 and 5;

Fig. 7 is a fragmentary sectional view taken at line 7—7 of Fig. 6 to illustrate parts in Fig. 5 more clearly;

Fig. 8 is a fragmentary vertical sectional view to illustrate parts in Fig. 5 more clearly;

Fig. 9 is a top plan view of parts shown in Fig. 8; and

Fig. 10 is a bottom plan view, partly broken away, of the apparatus shown in Figs. 1, 2, 3 and 5.

Referring to the drawing, the invention is shown in connection with surface treating apparatus 10 having rotatable brushes 11 which project downwardly beneath a base or hood 12 and are arranged to be driven by an electric motor 14 housed in an upright casing 15 positioned over the base. The brushes 11 may be detachably connected in any suitable manner to pulleys 16 journaled by bearings 17 on pins 18 depending downwardly

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from and carried by a horizontal wall or partition 19 of a frame 20 disposed within the base 12. The rotatable pulleys 16, which are formed with cavities to receive the brushes 11, are driven by an endless belt 21 which may be formed of rubber or other suitable resilient material. The belt 21, which is under tension, passes over the rims of the pulleys 16 and a driving pulley 22 which is fixed to the lower end of the shaft of motor 14.

The surface treating apparatus is adapted to be manipulated by a handle (not shown) connected to the outer free end of an elongated rod 23, the lower end of which is pivotally connected in any suitable manner to the base 12 at the rear part thereof. The electrical circuit for the motor 14 includes electrical conductors 24 and 25 and a switch connected therebetween which is disposed in a small housing 15a separate from the casing 15 and closely adjacent thereto. The switch is adapted to be controlled by a foot-operated member 26 projecting externally of the housing 15a. The electrical conductor 25 extends upwardly from the casing 15 and is fixed to the elongated rod at 27.

The base 12 is divided into three chambers or spaces 28, 29 and 30. The bottom chamber 28, in which the pulleys 16 and pulley driving mechanism are located, is defined by the rear part of the horizontal partition or wall 19, an apertured bottom plate 31, and a shield or baffle member 32 which is of stepped form and extends between the horizontal wall 19 and bottom plate 31. As best shown in Figs. 5 and 10, the apertured bottom plate 31 is fixed to frame 20 by screws 31a and is formed with openings 33 through which the brushes 11 extend.

The chamber 29, which extends across the forward part of the base 12 in front of the motor shaft pulley 22, is formed by the shield or baffle 32 and the forward part of the horizontal wall or partition 19. The top or upper chamber 30 is defined in part by the horizontal wall 19 and a horizontal wall 34 having an opening 35 therein.

The upright casing 14 includes a removable cover 36, a vertically extending section 37, and an apertured bottom which is formed by the horizontal wall 34, the latter being secured at 38 to the vertically extending section 37. The bottom end cover 14a of the motor is provided with outwardly extending lugs 39, as seen in Fig. 3, which are secured to the bottom horizontal wall 34 of casing 15.

In accordance with my invention, a rotatable fan member 40, which is positioned at the opening 35 in the horizontal wall 34, is fixed to the motor shaft for drawing air into the chamber or space 29 from the underside of the base 12 through air inlet 41. The air inlet 41, which is defined by the skirt or side wall of the base 12 and the bottom vertically extending portion 32a of baffle or shield 32, extends across the forward part of the base between the regions 41a and 41b, as seen in Fig. 10.

In order to promote the suction effect produced at the inlet 41 for drawing air into the space 29, the inlet is provided with an insert 42 which includes a portion 43 projecting downwardly below the bottom plate 31 and another upwardly extending portion having spaced apart sides 44. A number of spaced apart partitions 45 may be provided which bridge the gap between the sides and extend vertically from the top to the bottom of the insert 42. The insert 42 desirably is formed of soft resilient material, such as foamed plastic or rubber, which is frictionally held in place at the inlet 41 and easily positioned on and removed from the base 12.

Air drawn through the inlet 41 into the space 29 passes through an opening 19a in the horizontal wall 19 into the space 30. Such movement of air is effected by a number of blades 46 provided at the underside of the rotatable fan member 40. Air is discharged from the

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space 30 through an outlet 47 formed in a rearwardly extending part 15b of the casing 15 which is at the opposite side of the elongated rod 23 from the housing 15a, as best shown in Fig. 3. The movement of air from the inlet 41 to the outlet 47 is indicated by the arrows in Fig. 5, it being understood that the arrows at the vicinity of the housing 15a are intended to show the upward movement of air through the rear part 15b of casing 15 which actually is behind the housing.

Dust and dirt entrained in the air are separated from the air when the latter passes through a filter bag 48 which is connected at its lower end at 49 to the outlet 47 and is carried at its upper end in any well-known manner at the upper end of the elongated rod 23. In order to provide a substantially air-tight seal between the spaces 28 and 29, the rear edge of the shield 32 is effectively sealed at 50 to the underside of the horizontal wall 19 and suitable packing is provided between the opening in shield 32 and the hub portion of the rotatable fan member 40, as indicated at 51 in Fig. 5.

Within the casing 15 about the motor 14 is provided a space of annular form which is divided into upper and lower chambers 52 and 53 by a partition 54, as shown in Fig. 5. The upper part of casing 15 is formed with a number of inlet openings 55 for admitting air into the upper chamber 52, the inlet openings being directed upwardly under the extreme lower edge portion of the cover 36 which serves as a splash guard to prevent moisture from entering the interior of the casing 15. Air entering the upper chamber 52 is employed for cooling the motor 14, such cooling air passing into the interior of the motor through openings in an upper end cover 14b and emerging therefrom through similar openings 57 in the lower end cover 14a of the motor into the bottom part of the lower chamber 53.

Movement of cooling air through the motor 14 into the lower chamber 53 in the manner just described is effected by a number of blades 58 provided at the top surface of the rotatable fan member 40. As shown in Figs. 3 and 4, air is discharged from the lower chamber 53 of casing 15 into the bottom space 28 of the base 12 through an opening 59 formed in the bottom part of the casing 15. The movement of air discharged from lower chamber 53 of casing 15 through the opening 59 is indicated by the arrows in Fig. 4. As shown, the bottom plate 31 at the vicinity of the openings 33 therein is provided with flanges 60 which are in overlapping relation with the rims of the pulleys 16 and disposed between the inner faces of the rims and the outer peripheries of the brushes 11. Hence, the flanges 60 form a circuitous path of flow for air which is discharged from the space 28 about the brushes 11. In this manner, air drawn into the casing 15 through the inlet openings 55 is not only employed to effect cooling of the motor 14 but is also advantageously used to force foreign matter, such as dust and dirt, from the immediate vicinities of the brushes 11 or other surface treating members that may be employed with or in place of the brushes. When the surface treating apparatus 10 is being manipulated over a surface being treated, foreign matter forced from the immediate vicinities of the brushes by air discharged about the peripheries thereof can be effectively drawn from the surface by the suction effect produced at inlet 41 which, as explained above, extends across the forward part of the base 12. The pulleys 16 include hub portions (not shown) which are fixed to bearings 17, one of which is illustrated in Fig. 5. Each pulley 16 is provided with an imperforate web 16a to the outer periphery of which is secured the flange or rim 16b, as best shown in Fig. 4. With this construction each pulley 16 forms an inverted open cup within which a brush back 11a is disposed, the downwardly extending flange 16b being spaced radially from the periphery of the brush 11 to provide a gap therebetween.

The bottom closure plate 31 includes a horizontally

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disposed section which is at a level below the flanges 16b of the pulleys 16 and brush backs 11a, as best seen in Fig. 4, and are formed with openings 33 which are of larger size than the brush backs 11a and through which the brush bristles 11b project downwardly. The upwardly extending flanges 60 of the closure plate 31, at the vicinities of the openings 33 therein, extend vertically upwardly a sufficient distance to effect reversal of the direction of air flow within the inverted open cups formed by the pulleys 16. As best seen in Fig. 4, such reversal of the direction of air flow is effected in each inverted open cup at a region which is at the vicinity of the flange 16b and at the periphery of the rotatable member or pulley 16.

In view of the foregoing description, it will now be understood that the rotatable fan member 40 forms a dividing wall between the space 30 and the lower chamber 53 of the casing 15, the blades 46 at the underside of the member 40 being disposed in the space 30, and the blades 58 at the top surface of the member 40 being disposed in the chamber 53. As illustrated in Fig. 5, a small gap 61 is provided between the outer peripheral portion of the rotatable fan member 40 and the horizontal wall 34 to provide the necessary clearance therebetween. Also, the horizontal wall 34 includes a section at the immediate vicinity of the opening 35 which overlies the outer peripheral edge portion of the rotatable fan member 40.

In addition to the blades or vanes 46 and 58 referred to above, the rotatable fan member 40 is also provided with a third series of blades or vanes 62 which extend radially at the top surface of the member between a pair of ring-shaped ridges 63 and 64 at the outer periphery of the member, as best shown in Figs. 5, 8 and 9. During rotation of the fan member 40 the blades 62 cooperate with the blades 58 for the primary purpose of developing a pressure at the top face of the fan member, at the immediate vicinity of the gap 61, which at least balances the pressure produced at the underside of the fan member by the blades 46, so that flow of air through the gap 61 from the bottom side to the top side of the fan member is prevented. Stated another way, the blades 62, over which a portion of the horizontal wall 34 is disposed, cooperate with the blades 58 to maintain a sufficiently high pressure above the rotatable fan member 40 to prevent upward flow of air through the gap 61, so that dust and dirt entrained in air flowing in space 30 cannot mix with motor cooling air emerging from openings 57 in the lower end cover 14a. The rotatable fan member 40 is imperforate and essentially axially immovable along its axis of rotation between the packing indicated at 51 and the portion of the horizontal wall 34 overlying the vanes 62 at the peripheral edge portion of the rotatable member 40. Since the bottom blades 46 extend radially outward a greater distance than the top blades 58, the air pressure developed by the blades 46 in the chamber 30 is greater than that developed by the blades 58 in the chamber 53, there will be a tendency for dust-laden air to pass through the gap 61 at the periphery of the rotatable member 40 from the space or chamber 30 to the space or chamber 53. However, by providing the additional vanes 62, which are distributed about the blades 58 at the periphery of the rotatable member 40, the air pressure in the chamber 53 at the immediate vicinity of the gap 61 is at least as great as that developed by the bottom blades 46 alone in the space 30, so that flow of dust-laden air through the gap 61 from space 30 to chamber 53 will be prevented.

Since the vanes 62 at their inner and outer ends are bridged by ridges 63 and 64 of annular form, these vanes are essentially ineffective to promote circulation of air through the chamber 53 and are operable primarily to develop an air pressure in chamber 53 adequate to prevent flow of dust-laden air therein through the gap 61.

It will now be understood that the blades 46 and 58 on fan member 40 effect movement of two streams of air, one stream of air being drawn from the surface being treated at the suction inlet 41 and the other stream of air being discharged through the openings 33 in bottom plate 31 toward the surface. When it is desired to use the appliance 10 only as a floor polisher or the like, the connector 49 at the inlet of the filter bag 48 may be removed from the outlet 47, as indicated in Fig. 3, and a suitable cover may be detachably connected to the outlet 47 in any suitable manner. The brushes 11 may be replaced with other types of tools to perform a variety of surface treating operations, or felt pads or pieces of sandpaper may be detachably fixed to the undersides of the brushes in any suitable manner to perform other surface treating operations such as buffing or sanding, for example.

Accordingly, while I have shown my invention in connection with surface treating apparatus which may be referred to as a combined floor polisher and vacuum cleaner, I do not desire my invention to be limited to the particular arrangement set forth, and I intend in the claims to cover all modifications which do not depart from the spirit and scope of my invention.

What is claimed is:

1. In a floor polisher of the class described having a base provided with a downwardly depending side wall, an electric motor housed in the upper part of said base with its shaft depending vertically downward therefrom, at least one member mounted for rotation about a vertical axis at the underside of said base and about which said side wall is disposed, a brush including a back and bristles fixed thereto, means for mounting said back on said rotatable member with the bristles projecting downwardly therefrom, means including said motor shaft for driving said rotatable member and brush mounted thereon, structure providing an air passage having an inlet and outlet at the top and bottom parts, respectively, of said base, means for circulating air in the passage including a rotatable element fixed to the motor shaft, said structure providing the passage being constructed and formed to circulate air past said motor to effect cooling thereof and subsequently discharge such air at the vicinity of said brush, said rotatable member having a hub at its axis of rotation and a flange at its periphery and an imperforate web therebetween which forms an inverted open cup within which said brush back is disposed, said flange being spaced radially from the periphery of said brush to provide a gap therebetween, a bottom closure plate fixed to said base, said closure having a horizontally disposed section which is at a level below said flange and said brush back and is formed with an opening which is of larger size than said brush back and through which said brush bristles project downwardly, said closure plate at the opening therein having an upwardly extending flange, and the part of said structure providing the outlet end of the passage comprising the downwardly extending flange of said rotatable member and the upwardly extending flange of said closure plate which extends into the gap between the periphery of said brush and said flange at the periphery of said rotatable member a vertical extent sufficient to effect reversal of the direction of air flow within the inverted open cup at a region which is at the vicinity of said downwardly extending flange and at the periphery of said rotatable member.

2. In a combined floor polisher and suction cleaner of the class described having a base provided with a downwardly depending side wall, an electric motor housed in the upper part of said base with its shaft depending vertically downward therefrom, a plurality of floor polishing brushes mounted for rotation about spaced vertical axes at the underside of said base and about which said side wall is disposed, said brushes including backs and bristles projecting downwardly therefrom, means includ-

ing said motor shaft for driving said brushes, means including a handle connected to said base which, during normal operation, extends rearwardly therefrom for moving said brushes on a floor, structure providing first and second air passages in said base each having an inlet and outlet which is independent of the inlet and outlet of the other passage, the first passage at the inlet thereof forming a suction nozzle extending across the front of said base and the outlet thereof being removed therefrom, the part of said structure providing the suction nozzle including said downwardly extending side wall and another vertically disposed wall within said base which extends alongside said side wall and is spaced therefrom, means connected to the outlet of said first passage for collecting dirt entrained in air discharged from such passage, the inlet and outlet of the second passage being disposed at the top and bottom parts, respectively, of said base, the part of said structure providing the second passage being constructed and formed to circulate air past said motor to effect cooling thereof, said structure including horizontal wall means separating the first and second passages intermediate the inlets and outlets thereof, said wall means including a rotatable member which is fixed to said motor shaft and provided with blade means at opposing faces thereof for circulating air in said passages, said wall means having a gap at the periphery of said rotatable member, and said wall means being constructed and formed so that the rotatable member thereof will develop an air pressure at the second passage side thereof, at the vicinity of the gap, which is at least as great as that developed at the opposite first passage side thereof to prevent flow of dirt-laden air through the gap to the second passage side of said rotatable member from the first passage side thereof.

3. In a combined floor polisher and suction cleaner of the class described having a base provided with a downwardly depending side wall, an electric motor housed in the upper part of said base with its shaft depending vertically downward therefrom, a plurality of floor polishing brushes mounted for rotation about spaced vertical axes at the underside of said base and about which said side wall is disposed, said brushes including backs and bristles projecting downwardly therefrom, means including said motor shaft for driving said brushes, means including a handle connected to said base which, during normal operation, extends rearwardly therefrom for moving said brushes on a floor, structure providing first and second air passages in said base each having an inlet and outlet which is independent of the inlet and outlet of the other passage, the first passage at the inlet thereof forming a suction nozzle extending across the front of said base and the outlet thereof being removed therefrom, the part of said structure providing the suction nozzle including said downwardly extending side wall and another vertically disposed wall within said base which extends alongside said side wall and is spaced therefrom, means connected to the outlet of said first passage for collecting dirt entrained in air discharged from such passage, the inlet and outlet of the second passage being disposed at the top and bottom parts, respectively, of said base, the part of said structure providing the second passage being constructed and formed to circulate air past said motor to effect cooling thereof and subsequently discharge such air at the vicinities of said brushes, said structure including horizontal wall means separating the first and second passages intermediate the inlets and outlets thereof, said wall means including a rotatable member which is fixed to said motor shaft and provided with blade means at opposing faces thereof for circulating air in said passages, said wall means having a gap at the periphery of said rotatable member, and additional means for primarily developing an air pressure at the second passage side of said rotatable member, at the immediate vicinity of the gap, which is at least as great as that developed at the opposite first passage side thereof to

prevent flow of dirt-laden air through the gap to the second passage side of said rotatable member from the first passage side thereof.

4. In a combined motor-driven floor polisher and suction cleaner, the combination of structure providing first and second paths of flow for motor-cooling air and dust-laden air, respectively, said structure including means defining an enclosure divided by wall means to provide first and second spaces forming parts of said first and second paths of air flow, respectively, said wall means including an imperforate rotatable member provided with first and second blade means at opposing faces thereof for circulating air in said first and second paths of air flow, respectively, said wall means having a gap at the periphery of said rotatable member, means for mounting said rotatable member for rotation about an axis along which said rotatable member is substantially axially immovable, the air pressure developed in said second space by said second blade means being greater than that developed in said first space by said first blade means in said first space so that dust-laden air will tend to pass through the gap at the periphery of said rotatable member from said second space to said first space, and additional means independent of said first blade means operable primarily to develop in said first space at the immediate vicinity of the gap an air pressure which is at least as great as that developed by said second blade means alone in said second space at the opposite side of said rotatable member to prevent flow of dust-laden air through the gap to said first space from said second space, said last-mentioned additional means being substantially ineffective to promote circulation of air in said first path of air flow.

5. Apparatus as set forth in claim 4 in which said additional means for primarily developing the air pressure in said first space at the immediate vicinity of said gap includes structure adjacent the periphery of said rotatable member on the side thereof facing said first space.

6. Apparatus as set forth in claim 5 in which said structure on said rotatable member comprises vanes which are distributed about said first blade means at the side thereof facing said first space.

7. Apparatus as set forth in claim 6 in which said additional means for primarily developing the air pressure in said first space at the immediate vicinity of said gap includes a portion of said wall means which overlaps the side of said rotatable member at the region of said vanes.

8. Apparatus as set forth in claim 4 including a base provided with a downwardly depending side wall, an electric motor housed in the upper part of said base with its shaft depending vertically downward therefrom, a plurality of floor polishing brushes mounted for rotation about spaced vertical axes at the underside of said base and about which said side wall is disposed, said brushes including backs and bristles projecting downwardly therefrom, means including said motor shaft for driving said brushes, means including a handle connected to said base which, during normal operation, extends rearwardly

therefrom for moving said brushes on a floor, said base being provided with an air passage having an inlet and an outlet removed therefrom, said passage forming said second path of flow for dust-laden air and having a suction nozzle at its inlet which extends across the front of said base, said suction nozzle including said downwardly extending side wall and another vertically disposed wall within said base which extends alongside said side wall and is spaced therefrom, means including said motor for rotating said rotatable member to circulate motor-cooling air and dust-laden air in said first path of air flow and passage, respectively, and means connected to the outlet of said passage for collecting dirt entrained in air discharged from such passage.

9. Apparatus as set forth in claim 4 including a base provided with a downwardly depending side wall, an electric motor housed in the upper part of said base with its shaft depending vertically downward therefrom, a plurality of floor polishing brushes mounted for rotation about spaced vertical axes at the underside of said base and about which said side wall is disposed, said brushes including backs and bristles projecting downwardly therefrom, means including said motor shaft for driving said brushes, means including a handle connected to said base which, during normal operation, extends rearwardly therefrom for moving said brushes on a floor, said base being provided with a pair of air passages each having an inlet and an outlet removed therefrom which is independent of the inlet and outlet of the other passage, one of said passages forming said second path of flow for dust-laden air and having a suction nozzle at its inlet which extends across the front of said base, said suction nozzle including said downwardly extending side wall and another vertically disposed wall within said base which extends alongside said side wall and is spaced therefrom, means connected to the outlet of said one passage for collecting dirt entrained in air discharged from such passage, the other of said passages forming said first path of flow for motor-cooling air being constructed and formed to circulate air past said motor to effect cooling thereof, and means including said motor for rotating said rotatable member to circulate air in said passages from the inlets to the outlets thereof.

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