Dec. 29, 1953 LA VERN A. PERCY 2,663,893

FLOOR TREATMENT IMPLEMENT WITH VACUUM CLEANING MECHANISM

Filed July 14, 1950

2 Sheets-Sheet 1

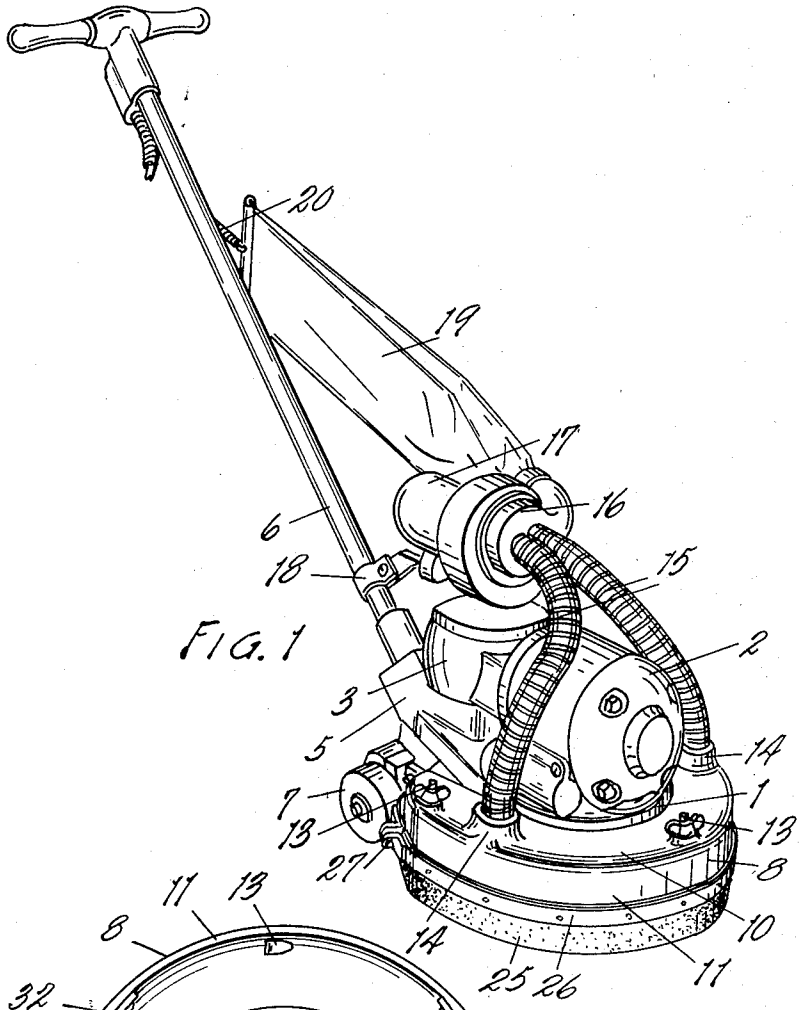


FIG. 1

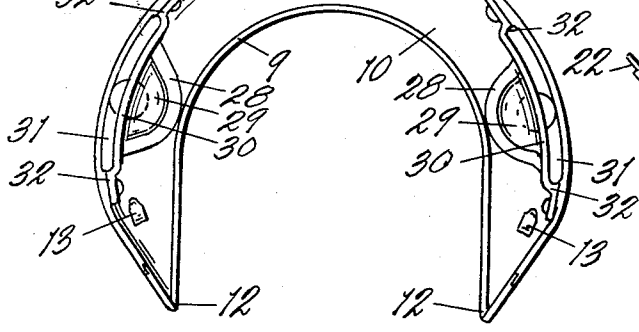


FIG. 5

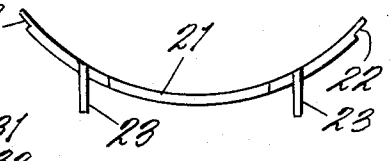


FIG. 6

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FLOOR TREATMENT IMPLEMENT WITH VACUUM CLEANING MECHANISM

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2 Sheets-Sheet 2

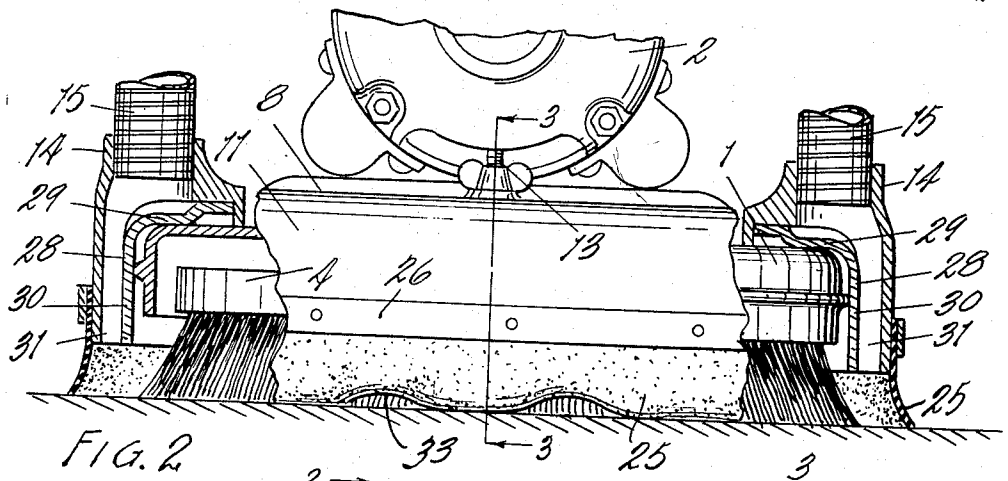


FIG. 2

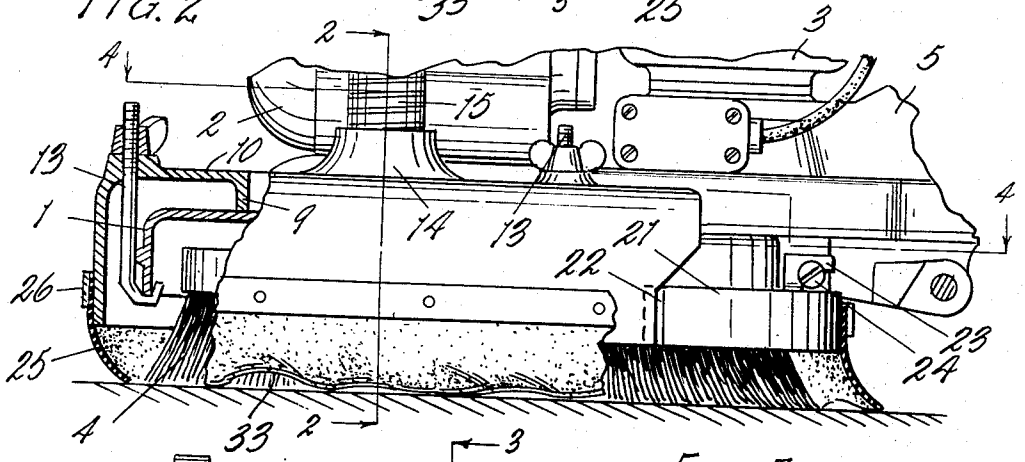


FIG. 3

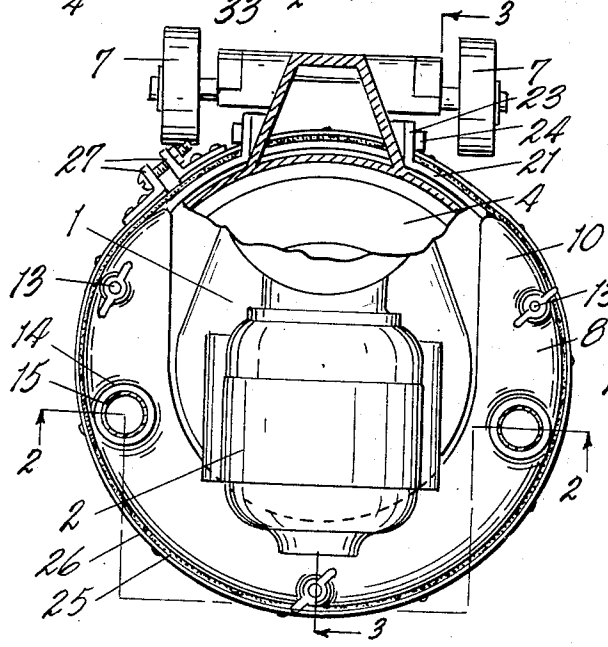


FIG. 4

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FLOOR TREATMENT IMPLEMENT WITH VACUUM CLEANING MECHANISM

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8 Claims. (Cl. 15—328)

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This invention relates to improvements in floor treating implement with vacuum cleaning mechanism.

The principal objects of this invention are:

First, to provide a floor polishing or treating implement of the flat rotary brush type with vacuum mechanism which will effectively pick up dirt and dust particles dislodged by the brush or otherwise encountered in moving the implement over the floor.

Second, to provide a vacuum attachment for floor treating implements which will permit the conversion of conventional rotary brush implements to combined polishing and vacuum implements.

Third, to provide a hood or baffle structure in combination with a vacuum attachment which will provide a high velocity vacuum passage adjacent to the periphery of a floor treating brush to effectively pick up dust, dirt and small objects without resorting to an excessively large vacuum motor.

Fourth, to provide means for enclosing a flat rotary floor polishing brush so that a relatively small vacuum fan will effectively pick up dust and dirt within the enclosure.

Fifth, to provide a yieldable and deformable skirt for the vacuum attachment of a floor treating implement which will limit the opening to the vacuum attachment around the brush to maintain a high velocity suction flow while at the same time permitting dust and dirt around the periphery of the skirt to pass thereunder and be taken up by the vacuum.

Sixth, to provide a vacuum attachment which is easily attachable to existing floor treating brush implements and which is simple and economical to manufacture.

Other objects and advantages relating to details of my invention will be apparent from a consideration of the following description and claims. The drawings, of which there are two sheets, illustrate a preferred form of my attachment as mounted on a floor polishing or cleaning implement.

Fig. 1 is a perspective view of the implement and attachment in operative position.

Fig. 2 is a front elevational view of the implement partially broken away in transverse vertical cross section along the plane of the line 2—2 in Fig. 3.

Fig. 3 is a side elevational view of the implement partially broken away in vertical cross section along the plane of the line 3—3 in Fig. 2.

Fig. 4 is a plan view of the implement partially broken away in horizontal cross section along the plane of the line 4—4 in Fig. 3.

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Fig. 5 is a bottom plan view of the hood of the vacuum attachment.

Fig. 6 is a top plan view of the hood extension member which joins the rear ends of the hood.

My vacuum attachment is disclosed as applied to an existing floor polishing or treating implement which consists of a generally circular base 1 having an electric motor 2 mounted on the top thereof. The motor is connected through a gear box 3 and suitable gear or chain drives to a flat circular floor treating brush 4 mounted beneath the base 1. The rear side of the base has an extension 5 formed thereon for the attachment of an operating handle 6 and transporting wheels 7 to the implement. The implement is designed to be supported entirely by the brush when in operating position, and the brush is rotated at high speed to clean or polish a floor after suitable soaps or waxes have been deposited on the floor.

Previous attempts have been made to combine the action of a vacuum with this type of floor treating implement but have been largely unsuccessful due to the fact that excessively large vacuum fans and motors were required to pick up and carry away dirt and dust from around the brush. My attachment consists first of a hood 8, generally U-shaped in horizontal outline and having a downwardly opening U-shaped cross section. The inner flange 9 of the hood is adapted to extend around the motor and seat upon the top of the base 1. The web 10 of the hood is of such a width as to project substantially beyond the periphery of the base 1, and the outer flange 11 of the hood projects downwardly below the bottom of the base 1 but in vertically spaced relation to the floor when the implement is supported on the brush. At the rear end of the U-shaped hood the outer flange 11 curves inwardly and merges with the inner flange 9 as at 12 (see Fig. 5) thus forming a vacuum chamber which is generally U-shaped in horizontal outline and L-shaped in cross section as will appear from Figs. 2 and 3. The hood is removably secured to the base 1 by means of the bolts 13 having hooked ends engageable under the rim of the base 1.

On opposite sides of the hood 8, the web 10 is provided with upstanding bosses 14 which define suction ports opening into the suction chamber and to which the flexible vacuum tubes 15 are connected. The vacuum tubes 15 extend to the inlet of a vacuum fan 16, the fan being joined as a unit with an electric motor 17. A bracket clamp

18 serves to secure the motor and fan to the handle 6 of the implement. A familiar type of dust bag 19 is associated with the vacuum fan and connected to the upper end of the handle by a spring 20.

In order to close the opening at the rear end of the hood around the back of the base 1, I provide a curved extension plate 21 having notched forward ends 22 which fit between the base and the rear end of the hood 8. Ears 23 on the extension plate are arranged to be secured to flat surfaces on the rear of the base by means of screws 24. In order to enclose the space completely around the hood and extension plate downwardly to the floor, I provide a skirt 25 of flexible rubber which is wrapped completely around the bottom of the hood and the extension plate and held in place by a retaining band 26. The band 26 is drawn tight by the screw clamp 27 (see Figs. 1 and 4).

Mounted on the underside of the hood below each of the bosses 14 and the suction ports therein is a nozzle plate 28 which serves to limit the size of the vacuum passages from the tubes 15 to adjacent the brush 4. As is most clearly shown in Figs. 2 and 5, the nozzle plates 28 consist of upper horizontal portions 29 which underlie the bosses 14 and project from their radially inner edges outwardly toward the outer flange 11 of the hood. Downturned arcuate flange 30 on the nozzle plates coact with the outer flange 11 to form segmental arcuate nozzle passages 31 which are relatively narrow and of limited length so that the vacuum capacity of the fan 16 is sufficient to maintain relatively high velocity through the nozzle passages 31. The horizontally opposite ends of the arcuate flanges 30 are turned radially outwardly and secured to the flange 11, thus closing the ends of the arcuate nozzle passages at 32.

I find that the foregoing construction is extremely effective in picking up wax particles or dust dislodged by the rotating brush 4 and, further, in picking up dirt and small objects on the floor which are encountered as the implement is moved over the floor. It will be noted that the hood 8 and skirt 25 provide a closed vacuum chamber completely around the brush 4. The flexible character of the skirt 25 causes it to wrinkle or buckle as the implement is passed over the floor, thus creating relatively small inlet openings 33 at various positions around the skirt. The small area of these openings coupled with the capacity of the fan 16 to create a vacuum result in relatively high velocity of the air passing through the openings 33 and effective pickup of small objects as large as cigarette butts from the floor around the implement. All dirt or dust within the hood 8 is subject to the vacuum of the fan 16 and will tend to be drawn up through the tubes 15. The nozzle plates 28 are extremely important to the effectiveness of my attachment in that the area between the brush 4 and the skirt 25 is relatively large, and the velocity of air therethrough would normally be relatively low. However, the nozzle plates 28 form relatively constricted nozzles at each side of the brush so that there is an area of high suction velocity at each side of the brush. All dust and dirt within the skirt will sooner or later be brushed by one of the nozzle plates 28 and thus be subjected to the high velocity air passing therethrough. The dirt will accordingly be picked up and carried into the dust bag 19 without resorting to abnormally large and uneconomical size in the vacuum fan and motor.

I find that an efficient and effective ratio between the cross sectional areas of the tubes 15 and the nozzle passages 31 to be 1 to 1.84. The nozzle passages 31 may be considered as throats opening into the annular space around the brush. This may be varied considerably, and if the area of the throats is kept between four times and slightly less than one times the area of the tubes, the resulting structure will be effective to pick up most objects encountered in cleaning floors. Cutting the area of the throats much below the area of the tubes unnecessarily chokes the fan, assuming a properly designed fan and tube. Extending the area of the throats much over four times the area of the tubes reduces the velocity of air at the throats to a point where the suction will be ineffective to pick up any but the lightest dust.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A vacuum attachment for a floor treating implement having a flat circular brush rotatively mounted on the bottom of a circular base comprising, a hood U-shaped in horizontal outline and downwardly opening U-shaped in vertical cross section with depending flanges on its radially inner and outer edges, said hood being adapted to fit around the front and sides of said base with the inner flange of the hood resting on said base and the outer flange of said hood projecting therebelow, hooked bolts for releasably clamping said hood to said base, an extension plate connectable between the rear ends of the outer flanges of said hood to extend around the rear of said brush and below said base, a skirt of flexible sheeting clamped around the outside of said hood and said extension plate and extending downwardly below the bottom of said brush to engage the floor therearound in a ruffled fashion, a vacuum motor and fan adapted to be mounted on said implement and having a dust receiving bag, a pair of suction tubes extending from the inlet of said fan to the top of said hood on opposite sides thereof and opening therethrough to the space between said hood and said base, and a pair of throat elements secured to the underside of said hood adjacent to said tubes and coacting with the outer side flanges of said hood to form a segmental arcuate vacuum throat at each side of said hood and projecting downwardly to the bottom thereof within said skirt.

2. A vacuum attachment for a floor treating implement having a flat circular brush rotatively mounted on the bottom of a base comprising, a hood U-shaped in horizontal outline and downwardly opening U-shaped in vertical cross section with depending flanges on its radially inner and outer edges, said hood being adapted to fit around the front and sides of said base with the inner flange of the hood supported on said base and the outer flange of said hood surrounding the front and sides of said base, hooks for clamping said hood to said base, an extension plate connectable between the rear ends of said hood to extend around the rear of said brush, a skirt of flexible sheeting clamped around the outside of said hood and said extension plate and extending downwardly below the bottom of said brush to engage the floor therearound in a ruffled fashion, a vacuum motor and fan adapted to be mounted on said implement and having a dust receiving bag, a pair of suction tubes extending from the inlet of said fan to the top of said hood

on opposite sides thereof and opening therethrough to the space between said hood and said base, and a pair of throat elements secured to the underside of said hood adjacent to said tubes and coacting with the outer side flanges of said hood to form a segmental arcuate vacuum throat at each side of said hood and projecting downwardly to the bottom thereof within said skirt and to below the level of said base and opening downwardly at its lower end.

3. A vacuum attachment for a floor treating implement having a flat circular brush rotatively mounted on the bottom of a base comprising, a hood U-shaped in horizontal outline and downwardly opening U-shaped in vertical cross section with depending flanges on its radially inner and outer edges, said hood being adapted to fit around the front and sides of said base with the inner flange of the hood supported on said base and the outer flange of said hood surrounding the front and sides of said base, means for clamping said hood to said base, an extension plate connectable between the rear ends of said hood to extend around the rear of said brush, a skirt of flexible sheeting clamped around said hood and said extension plate and extending downwardly to the bottom of said brush to engage the floor therearound, a vacuum motor and fan adapted to be mounted on said implement and having a dust receiving bag, a pair of suction tubes extending from the inlet of said fan to the side branches of said hood and opening therethrough to the space between said hood and said base, and a pair of walls on the underside of said hood adjacent to said tubes and coacting with the outer side flanges of said hood to form a segmental arcuate vacuum throat at each side of said hood, each throat opening to its adjacent tube and projecting downwardly within said skirt and to below the level of said base and opening downwardly at its lower end.

4. A vacuum attachment for a floor treating machine having a flat circular power driven brush rotatively mounted on the bottom of a base and a handle secured to the rear of said base comprising, a horizontally U-shaped hood arranged to fit around the front and sides of said base and project radially therebeyond, the radially inner edge of said hood being closed upon the top of said base, a flexible skirt secured around said hood and base and projecting therebelow to engage the floor around said brush and spaced radially outwardly therefrom, a vacuum motor and fan adapted to be mounted on said machine, a dust collecting bag operatively associated with said fan, and a pair of vacuum tubes opening from the inlet of said fan through oppositely disposed portions of said hood into the annular space between said brush and said skirt, means forming suction throats within said hood communicating with the ends of said tubes within said hood, said throat forming means having downwardly facing openings formed therein and positioned in and being narrower than the annular space between said skirt and said brush and extending arcuately along the underside of said hood, said throats extending downwardly to below the level of said base.

5. In combination with a floor treating machine having a flat circular power driven brush rotatively mounted on the underside of a base and a handle connected to the rear of said base for guiding said machine, a hood removably secured around the front and sides of said base and having a depending outer flange projecting

downwardly in radially spaced relationship with said base, removable means closing the rear end of said hood around the rear of said base, a flexible skirt secured around the bottom of said hood and said means in radially spaced relation to said brush and projecting into wrinkling contact with the floor when said brush is operatively engaged with the floor, a vacuum fan and motor therefor mounted on said machine, a pair of vacuum tubes opening from the inlet of said fan through said hood to opposite sides of the space between said hood and said base, and walls on the underside of said hood adjacent to said tubes and coacting with the outer flange of said hood to form downwardly opening narrow arcuate vacuum throats between said tubes and the space within said skirt, said throats extending downwardly below the level of said base.

6. In combination with a floor treating machine having a flat circular power driven brush rotatively mounted on the underside of a base and a handle connected to the rear of said base for guiding said machine, a hood removably secured around the front and sides of said base and having a depending outer flange projecting downwardly in radially spaced relationship with said base, a flexible skirt secured around the bottom of said hood and the back of said base in radially spaced relation to said brush and projecting into wrinkling contact with the floor when said brush is operatively engaged with the floor, a vacuum motor and fan mounted on said machine, a vacuum tube opening from the inlet of said fan to the space between said hood and said base, and means on the underside of said hood adjacent to said tube forming a downwardly opening narrow arcuate vacuum throat between said tube and the space within said skirt, said throat projecting downwardly to the bottom of said flange and to below the level of said base.

7. A vacuum attachment for a floor treating machine having a power driven flat circular brush rotatively mounted on the bottom of a base and a handle secured to the rear of said base comprising, a horizontally U-shaped hood arranged to fit around the front and sides of said base and project therebelow, the radially inner edge of said U-shaped hood being sealingly engageable with the top of said base, a flexible skirt adapted to be secured around the bottom of said hood and the rear of said base to project therebelow and engage the floor around said brush radially outward therefrom, an extension plate adapted to connect the rear ends of said hood behind said base and support the rear portion of said skirt to complete an annular space around said brush, a vacuum motor and fan adapted to be mounted on said handle, a dust collecting bag operatively associated with said fan, and a pair of vacuum tubes opening from the inlet of said fan through oppositely disposed portions at the sides of said hood, means forming suction throats within said hood communicating with the ends of the tubes, said throat forming means extending arcuately along the underside of the periphery of said hood and projecting downwardly to below the level of said base and having downwardly facing openings positioned in the space between said brush and said skirt, the cross sectional area of said openings being between one and four times the area of said tubes.

8. A vacuum attachment for a floor treating machine having a power driven flat circular brush rotatively mounted on the bottom of a base

and a handle secured to the rear of said base comprising, a horizontally U-shaped hood arranged to fit around the front and sides of said base and project radially outwardly therefrom, the radially inner edge of said U-shaped hood being closed upon the top of said base, a flexible skirt adapted to be secured around the rear of said base and said hood to project therebelow to engage the floor around said brush in radially outwardly spaced relation, a vacuum motor and fan adapted to be mounted on said handle, a dust collecting bag operatively associated with said fan, a pair of vacuum tubes opening from the inlet of said fan through oppositely disposed portions at the sides of said hood, and means on the underside of said hood forming suction throats communicating with said tubes, said throats extending arcuately and downwardly within the annular space between said brush and said skirt to downwardly opening lower ends positioned

below the level of said base, the cross sectional area of said open ends being slightly larger than the area of said tubes.

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