Dec. 19, 1950 J. J. BEVINGTON, JR., ET AL 2,534,808

SUCTION CLEANER

Filed Dec. 7, 1948 2 Sheets-Sheet 1

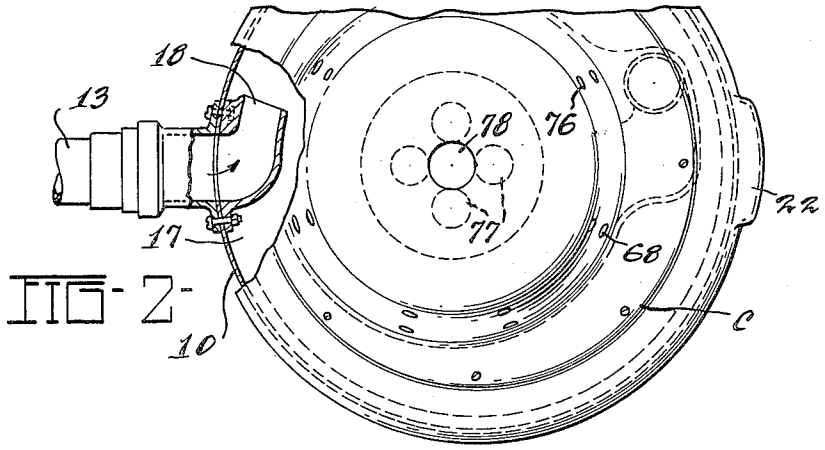


FIG. 2.

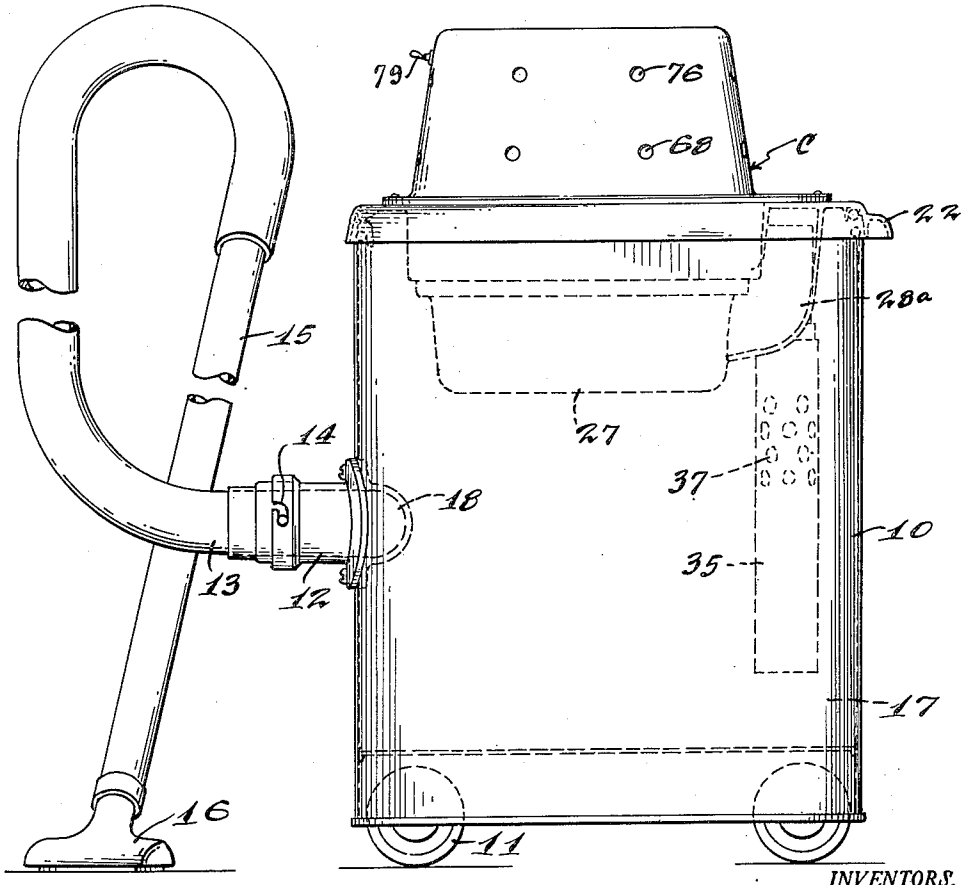


FIG. 1.

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SUCTION CLEANER

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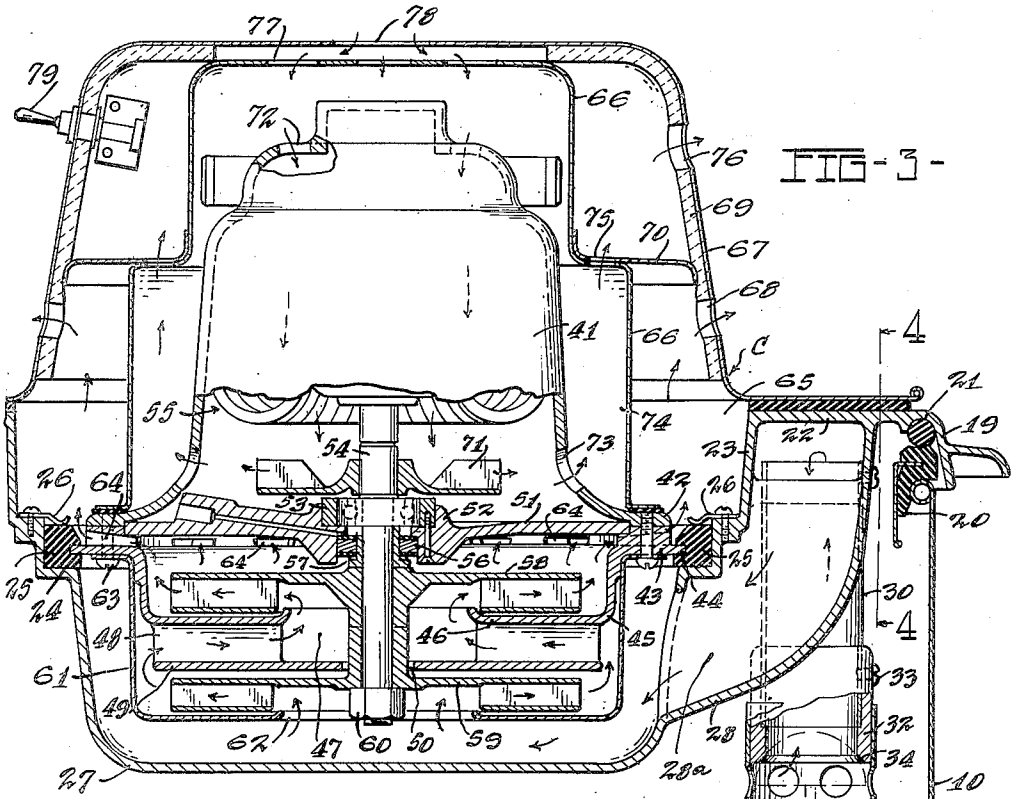


FIG-3-

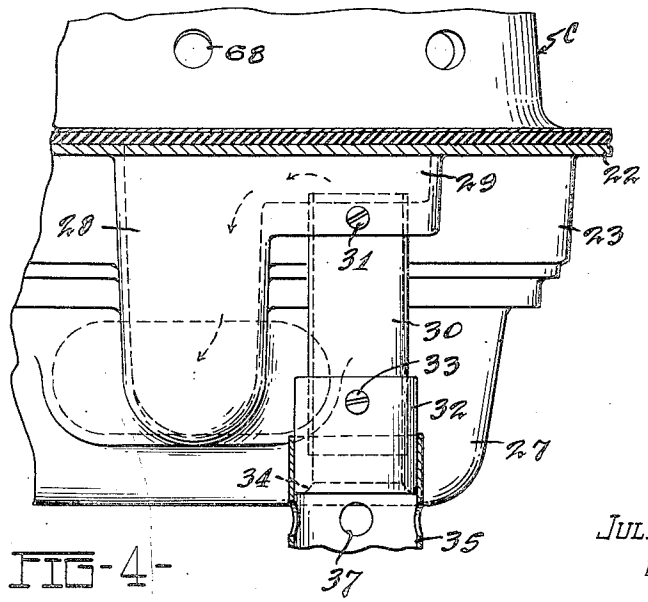


FIG-4-

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UNITED STATES PATENT OFFICE

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SUCTION CLEANER

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Application December 7, 1948, Serial No. 63,994

3 Claims. (Cl. 183—37)

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This invention relates to suction cleaners but particularly to cleaners of this type adapted especially, although not exclusively, for hand use, and which are capable of handling relatively dry air or moisture laden air.

An object is to produce a cleaner of the above type which is capable efficiently of drawing into a collecting chamber dirt laden air or liquids and in the latter case, is adapted to render ineffective the suction producing means when a predetermined volume of liquid has been drawn into the collecting chamber.

Another object is to produce a suction cleaner capable of cleaning wet surfaces such as floors, the liquid being delivered to a collecting chamber and the suction producing source being automatically rendered ineffective after a predetermined quantity of the liquid has been delivered to such chamber.

A further object is to produce a suction cleaner powered by an electric motor which is so shielded or isolated from the suction producing fan assembly as to militate against moisture or dirt particles in the air stream coming in contact with the motor and thereby causing injury or damage thereto.

A still further object is to produce a new and improved valve for a suction cleaner assembly which when a predetermined amount of liquid has been delivered to the collecting chamber, automatically shuts off the air stream and after the collecting chamber is emptied of its contents, automatically moves to an operative position permitting resumption of the air stream.

A still further object is to produce a suction cleaner having the new and improved features of construction, arrangement and operation hereinafter described.

The illustrated embodiment of the invention is shown by way of illustration but not of limitation in the accompanying drawings, in which

Figure 1 is a side elevation of the suction cleaner;

Figure 2 is a fragmentary top plan view of the suction cleaner, a portion being broken away to show the means by which the air stream delivered to the collecting chamber is deflected;

Figure 3 is an enlarged vertical sectional elevation of the suction producing assembly and the valve assembly which depends into the collecting chamber; and

Figure 4 is a sectional elevation substantially on the line 4—4 of Figure 3.

The illustrated embodiment of the invention comprises an upright tubular casing 10 which is

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suitably mounted on caster wheels 11 to enable it readily to be moved from place to place.

Projecting outwardly from an intermediate portion of the casing 10 is a tube 12 to which a flexible hose 13 is detachably connected by a suitable bayonet joint 14. Connected to the outer end of the hose is a tubular wand 15 which carries a floor tool 16 at its outer end, the latter being moved by the operator over the floor or other surface to be cleaned. As will hereinafter appear, a negative pressure is generated within the casing 10 by a suction producing unit and a stream of air is caused to suck or draw dirt particles from the surface to be cleaned and discharge the same into a collecting chamber 17 on the inside of the casing 10. It will also be understood that when the cleaner is used for cleaning of floors of buildings or the like, the water having a suitable detergent is first spread over the surface and in that event, the water or other liquid containing the dirt and foreign particles is drawn up through the floor tool, wand and flexible hose and discharged into the collecting chamber 17. As shown on Figure 2, a deflecting tube 18 communicates with the outside tube 12 and deflects the air stream laterally to facilitate the discharge of dirt particles, liquid or the like from the air stream into the collecting chamber 17.

Fitting on the top or open mouth of the casing 10 is a cover C which carries the suction producing unit. As shown, the cover has a downturned peripheral flange 19 which overlaps the side walls of the casing and interposed is a molded rubber gasket 20 which extends about the mouth of the casing 10, the cover carrying a rubber sealing ring 21 which rests upon the rubber gasket 20. This arrangement not only provides an effective fluid-tight seal but also provides a sound deadening cushion.

Integral with the flange 19 is a hand hold 22 to enable the tilting or lifting of the cover to afford access to the collection chamber 17. Integral with the cover flange 19 is a lateral ledge or wall 22 from the inner edge of which is an integral depending annular wall 23 and formed in the wall 23 is an inwardly extending shoulder 24 to receive a rubber-like annular ring 25 which is held from upward movement by a series of metal clips 26. From the ledge 24 extends a cup-shaped bottom wall 27. At one side of the cup-shaped bottom wall 27 extends a tubular duct portion 28 which extends upwardly from the cup body portion 27 and terminates in a lateral extension 29 integrally joined to the duct portion 28 and to the lateral wall portion 22.

In the bottom wall of the extension 29 is an annular opening into which extends a vertical tube 30, a screw 31 securing the tube 30 to the extension 29. The lower end of the tube 30 extends into a tubular fitting 32, a screw 33 retaining the tube 30 and fitting 32 in assembled relation. At the lower end of the fitting 33 is a downwardly facing valve seat 34, the purpose for which will be hereinafter described. Suitably secured to the outside of the fitting 32 and depending therefrom is a thin-walled tube 35, the lower end of which terminates a short distance above the bottom of the collecting chamber 17 as shown in Figure 1. Suitably fixed to the inside of the tube 35 at the lower end thereof is a stop ring 36. In the region of the fitting 32 and extending a substantial distance therebelow is a series of perforations or air ports 37, sufficient number and area of ports 37 being provided to enable a relatively free flow of air upwardly through the fitting 32 and tube 30 from the inside of the collecting chamber 17.

As will hereinafter more fully be explained, a multi-fan arrangement creates a negative pressure to create a stream of air from the floor tool 16 through the wand 15, flexible tube 13 and into the collecting chamber 17 and thence through the air ports 37 in the depending tube 35 and thence upwardly through the fitting 32, tube 30, into the extension 29 and thence downwardly through the passage 28a in the duct portion 28 and into the cup-shaped or bowl portion 27. When the cleaner is used for dry-cleaning, that is, to draw into the collecting chamber 17 dust-laden air, the dust settles to the bottom of the collecting chamber from the stream of air. However, this machine is adapted for use in wet cleaning, for example, where floors have been mopped with water or other liquid containing a detergent which frequently creates foam or suds. The negative pressure then causes the liquid to be drawn into the collecting chamber 17 and the suds or foam gathers on the top of the liquid.

It is desired to render the suction-producing unit ineffective after a predetermined level of liquid within the collecting chamber has been reached, and that preferably should take place before the level of the suds or foam on top of the liquid reaches the lowermost airports 37. For this purpose, a hemispherical valve 38, the diameter of which is slightly less than the inside diameter of the tube 35, is arranged within the tube with the dome-shaped portion facing upwardly. Suitably secured to the valve 38 and depending axially therefrom is a stem 39, the lower end of which is connected to a vertically elongate float 40 which may be of any suitable material capable of floating on the surface of the liquid and thus moving upwardly or downwardly in accordance with the level of the liquid within the chamber 17. Manifestly, when the valve 38 is lifted by the float 40 to a position that it bears against the valve seat 34, the stream of air through the collecting chamber 17 will be cut off and in this manner, it will be manifest to the operator that the liquid should be emptied from the collecting chamber.

The importance of spacing the sponge rubber valve 38 from the float is to enable the valve to cut off the flow of air through the collecting chamber before the suds or foam on the top of the liquid enters the lowermost air ports 37. For this purpose, the spacing of the valve 38 from the float is predetermined in accordance with the depth of the foam ordinarily occurring in this connection. It will be manifest that the valve device above described positively militates against liquid as well as the foam or suds being carried upwardly through the tube 30 and into the bowl or cup 27.

The suction producing unit is in the main supported by the annular rubber-like ring 25, thereby substantially obviating vibrational noises. A substantially bell-shaped electric motor housing 41 has an annular flange 42 at the lower end which rests upon a flange 43 which has an annular outwardly extending rim 44 which is embedded or fits into a notch in the rubber ring 25. The flange member 43 has an integral downwardly extending annular wall 45 which terminates in an inwardly extending wall 46 provided with a central aperture 47. Depending from the under side of the wall 46 is an annular series of vertical partition walls 48, the lower ends of which are integral with a horizontal wall 49 which has a central aperture 50 considerably smaller than the opening 47. An imperforate partition wall 51 fits the desired peripheral edge snugly in a recess formed between the flange portions 42 and 43, and a boss 52 is provided centrally of the partition wall 51. A ball-bearing unit 53 is carried by the boss 52 to support the armature shaft 54 of an electric motor 55 disposed within the bell housing 41. A packing 56 is also carried by the boss 52 below the bearing unit 53 and bears against the outer surface of a bushing 57.

Below the partition wall 51 is a fan blade unit 58 which is disposed above the horizontal wall portion 46 and a fan blade unit 59 which is disposed directly beneath the bottom wall portion 49. Each of the fan blades has a hub which are in abutting relation and are held securely against the bearing 57 by a nut 60 threaded on the lower end of the armature shaft 54. Enclosing the above described wall portions is a cup-shaped sheet metal shroud 61 having a central aperture 62 and a flanged upper end which is secured in place by a series of screws 63 which also secure the flange portions 42 and 43. The arrows on Figure 3 show the path of travel of the air stream which, it will be observed, is circuitous or tortuous, the air passing through the upper portion of the depending wall 45 through a series of slots 64 and into a space 65 which is formed by a cylindrical shell 66 and a dome-shaped cover 67, there being a series of outlet ports or vents 68 in the cover 67. The cover 67 is lined with suitable sound insulating material 69. The space or chamber 65 has a top wall formed by a flanged shell 70 which militates against the vented air passing upwardly and into the motor.

Also carried by the armature shaft 54 and disposed above the partition wall 51 is a fan 71 which is designed to draw air through openings 72 in the top of the casing 41 for ventilating and cooling the motor, such air passing from the motor through ports 73 and into a chamber 64 from which it passes through apertures 75 extending through the shells 66 and 73 and to the outside through ports 76. Air from the outside passes to the motor casing inlet ports 72 through ports 77 in the shell 66 and a main inlet port 78 in the outer casing shell 67.

From the above description it will be manifest that the fan blades 58 and 59 serve to draw air into the collecting chamber 17 as above described and discharge the same through the ports 64 to

the chamber 65 and to the outside through the port 68. None of this air is permitted to come in contact with the electric motor 55. On the other hand, the electric motor 55 is kept cool by a separate fan 71, the air for which is handled entirely separately.

A manual switch 79 is suitably provided in the cover shell 67 and is electrically connected in any suitable manner to the motor 55 as will be readily understood.

It is to be understood that numerous changes in details of construction, arrangement and operation may be effected without departing from the spirit of the invention especially as defined in the appended claims.

What we claim is:

1. A suction cleaner comprising an upright receptacle, an inlet in the side walls of said receptacle through which either wet or dry dirt may pass into the receptacle, a cover tightly fitting the top of said receptacle and providing a closure therefor, said cover having side perforations, a suction producing unit carried by said cover, said suction unit comprising a housing, an electric motor within said housing, a partition wall carried by said housing, a motor shaft extending through said partition wall and bearing therein, suction producing fan means on said shaft disposed on the opposite side of said partition wall, a laterally extending flange connected to said housing, fasteners connecting said housing to said flange, annular wall means forming a part of said cover, a rubber ring carried by said annular wall means and receiving the edge portion of said lateral flange, thereby resiliently to support said suction unit, means forming a part of said cover providing a passage from said receptacle to said suction unit, a shell interposed between said housing and cover, and means providing ports and passages to vent air from said suction producing fan means to the space between the shell and cover and thence to the outside through the cover perforations.

2. A suction cleaner comprising an upright receptacle, an inlet in the side walls of said receptacle through which either wet or dry dirt may pass into the receptacle, a cover tightly fitting the top of said receptacle and providing a closure therefor, said cover having side perforations, a suction producing unit carried by said cover, said suction unit comprising a housing, an electric motor within said housing, a partition wall carried by said housing, a motor shaft extending through said partition wall and bearing therein, suction producing fan means on said shaft disposed on the opposite side of said partition wall, a laterally extending flange connected to said housing, fasteners connecting said housing to said flange, annular wall means forming a part of said cover, a rubber ring carried by said annular wall means and receiving the edge portion of said lateral flange, thereby resiliently to support said suction unit, means forming a part of said cover providing a passage from said receptacle to said suction unit, a shell interposed between said housing and cover, and means providing ports and passages to vent air from said suction producing fan means to the space between the shell and cover and thence to the outside through the cover perforations, said air venting means including lateral slots in said flange enabling air from said suction producing fan means to pass therethrough to the space between the shell and cover.

3. A suction cleaner comprising an upright receptacle, an inlet in the side walls of said receptacle through which either wet or dry dirt may pass into the receptacle, a cover tightly fitting the top of said receptacle and providing a closure therefor, said cover having a lateral exhaust vent, a suction producing unit carried by said cover, said suction unit comprising a housing, an electric motor within said housing, a partition wall closing the lower end of said housing, a motor shaft extending through said partition wall and bearing therein, suction producing fan means on said shaft disposed on the opposite side of said partition wall, a laterally extending annular flange connected to said housing, fasteners connecting said housing to said flange, annular wall means forming a part of said cover, a rubber ring interposed between said annular wall means and the edge portion of said lateral flange, thereby resiliently to support said suction unit, means associated with said cover providing a passage from said receptacle to said suction unit, a shell interposed between said housing and cover, and means providing ports and passages to vent air from said suction producing fan means to the space between the shell and cover and thence to the outside through the lateral exhaust vent.

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