March 5, 1935. W. B. TUNSTALL 1,993,231

VACUUM CLEANER

Filed July 24, 1930 2 Sheets-Sheet 1

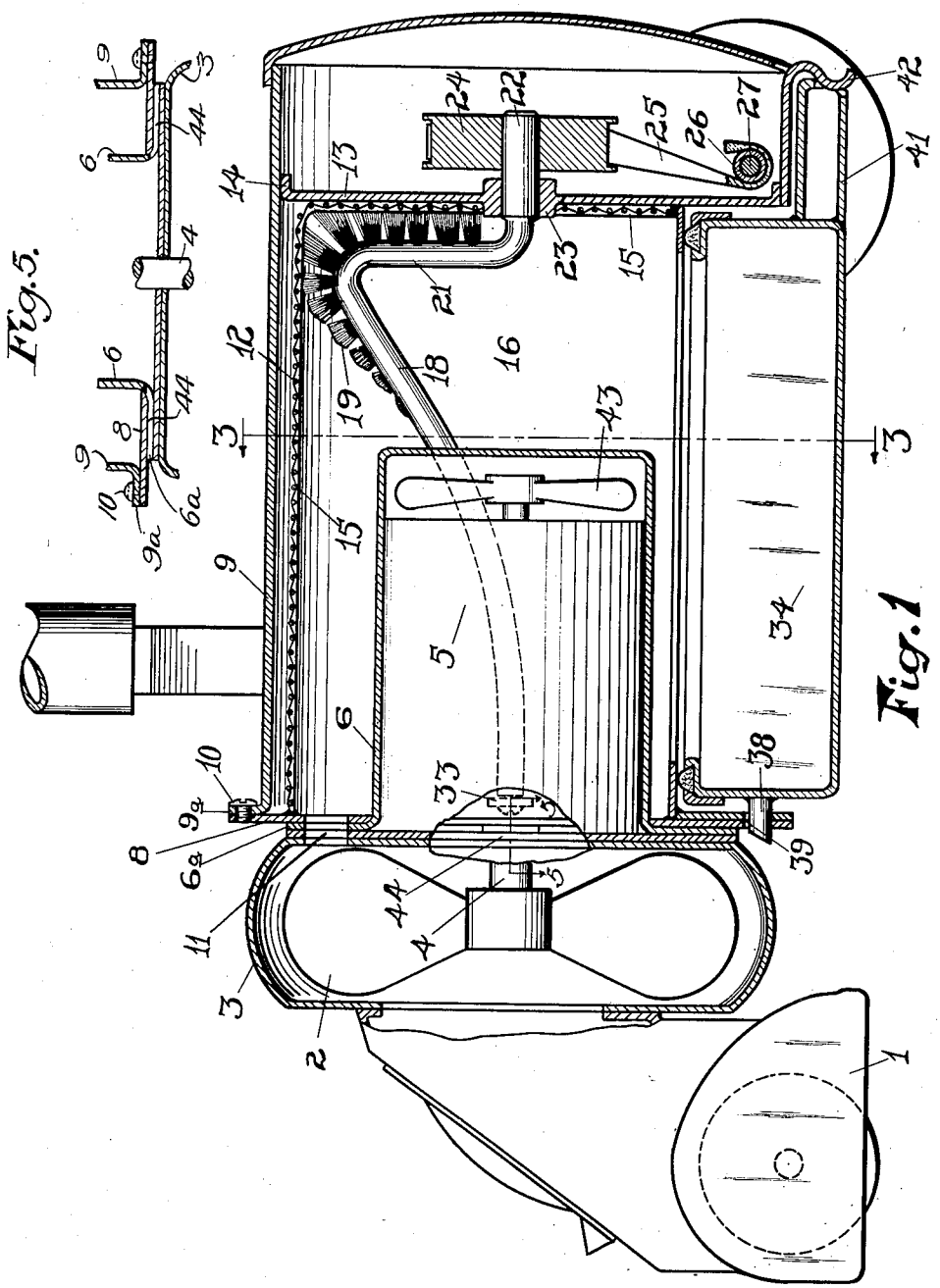


Fig. 1

Fig. 5.

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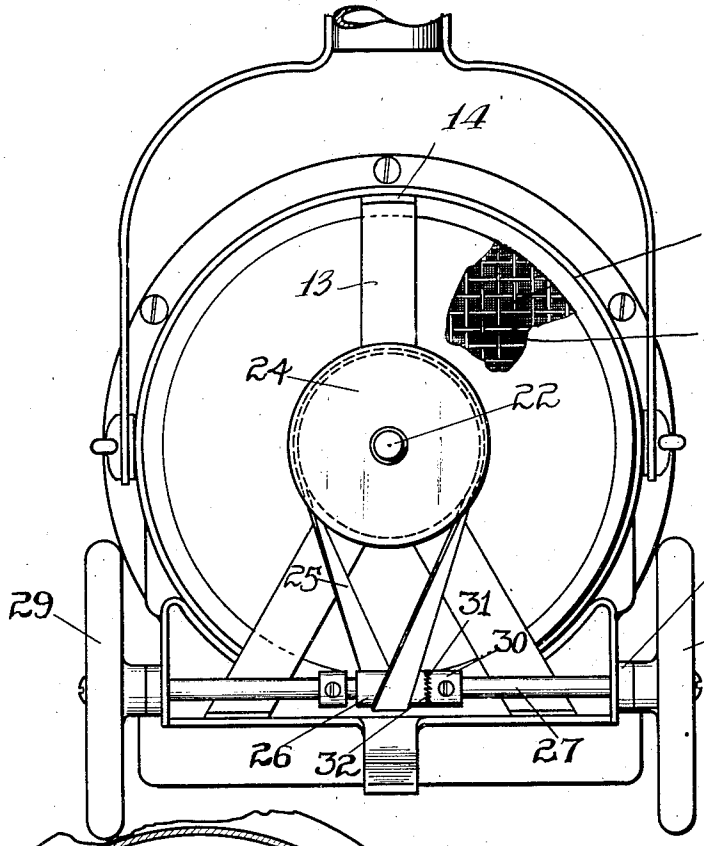


Fig. 2

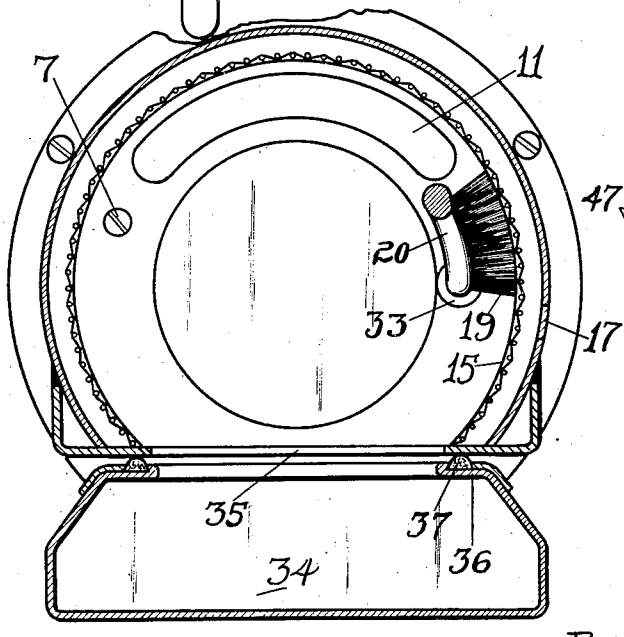


Fig. 3

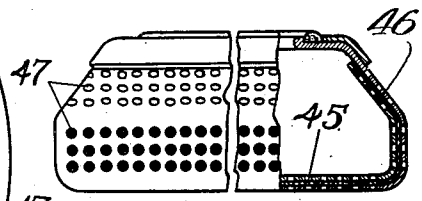


Fig. 4

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UNITED STATES PATENT OFFICE

1,993,231

VACUUM CLEANER

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Application July 24, 1930, Serial No. 470,279

5 Claims. (Cl. 183—60)

The present invention relates to vacuum cleaners and has for its object to provide a device of this class characterized by the provision of improved means for sifting the dust laden air drawn into the cleaner and for depositing the entrained particles of matter in a defined receptacle from which it may be readily removed.

It is well known that vacuum cleaners, as heretofore constructed, are adapted to remove dirt from the air by the sifting action obtained in passing it through a fabric, usually in the form of a cloth bag, but such prior devices possess certain objectionable features due to the necessity of cleaning the dirt holding bag after continued use. Furthermore, continued use of the dirt holding bag without frequent cleaning serves to reduce the efficiency of the cleaner, as a whole, due to the fact that as the air sifting action continues, the fabric of the bag becomes more and more clogged with the accumulating dust and other particles, so that the blower works under a constantly increasing load. Therefore, in order to maintain a vacuum cleaner of this type in proper operating condition, it is necessary to frequently remove the dirt bag for cleaning which is necessarily an unpleasant task, particularly when the dust and dirt has accumulated in a thick mat on the surface of the fabric.

With the above mentioned objectionable features of prior vacuum cleaners in mind, the present invention provides an improved device in which the fabric through which the dust laden air is sifted is swept clean while the cleaner is in operation, this sweeping action serving to deposit all of the dirt and dust in a receptacle separate from the fabric. In addition, the dirt receptacle is capable of being readily removed so that it may be quickly emptied, without any of the unpleasant features accompanying the cleaning of a fabric bag. As a result, the cleaner always operates at high efficiency and it is never necessary for the user to clean the fabric through which the dust laden air is sifted. The above and other advantageous features of the invention will hereinafter more fully appear with reference to the accompanying drawings in which—

Fig. 1 is a view partially in section and partially in side elevation of a vacuum cleaner embodying the invention.

Fig. 2 is a view in end elevation of the cleaner shown in Fig. 1, looking at the right hand end, with the cover removed.

Fig. 3 is a vertical sectional view along the line 3—3 of Fig. 1, looking in the direction of the arrows.

Fig. 4 is a fragmentary view showing a modification of the dust tray shown in Fig. 3.

Fig. 5 is a horizontal fragmentary section substantially along the line 5—5 of Fig. 1 looking in the direction of the arrows.

Like reference characters refer to like parts throughout the drawings.

Referring first to Figs. 1 and 2, the cleaner consists of a suction nozzle 1 of a conventional type into which air is adapted to be sucked by means of a blower 2 rotatable within a suitable casing 3. The blower 2 is mounted on the shaft 4 of an electric motor 5 inclosed within a ventilated dirt-proof casing 6 providing a flange 6a secured to the blower casing 3 by screws 7, see Fig. 3. The screws 7 also serve to support an annular plate 8 surrounding the motor casing 6 and this plate 8 supports a cylindrical housing 9 by means of screws 10 passing through a flange 9a of the housing 9. Dust laden air sucked into the nozzle 1 by the operation of the blower 2 is exhausted through an arcuate passage 11, extending through the upper portion of motor casing flange 6a and plate 8, into a cylindrical air cleaning cage 12. The cage 12 is spaced from the inner wall of the housing 9, with one end attached to the end plate 8, outside of the exhaust passage 11, while its other end is supported symmetrically within the housing 9 by a bracket 13 having feet 14 secured to the inner wall of the housing 9. The cage 12 is preferably composed of open work, semi-rigid material, such as wire screening, which serves to support an inner layer of fabric 15 of such density that air will readily blow therethrough while at the same time depositing dust, or any other entrained matter, on the inside of the fabric 15. Thus, the fabric 15 and its inclosing wire cage 12 define a cylindrical chamber 16 open at one end to the exhaust of the blower 2 through the passage 11 and providing walls through which the air may readily pass with a cleaning action.

In the absence of the provision of any other means, it is obvious that the delivery of a blast of dust laden air into the chamber 16 by the blower 2 will result in sifting the air through the fabric 15 and wire cage 12, the cleansed air being free to pass out of the housing 9 through an opening 17, see Fig. 3, leaving the particles of dust and other matter deposited on the inside of the fabric 15. But as previously pointed out, the present invention contemplates the provision of means for cleaning the sifting fabric 15 while the cleaner is in use, and one preferred embodiment of such a fabric cleaning means resides in

the provision of a wiper 18 extending the length of the chamber 16 with bristles 19 carried thereby just engaging the inner surface of the fabric 15. As best shown in Figs. 1 and 3, the wiper 18 consists of a rod 20 curved spirally around the motor casing 6 and connected by a radial arm 21 to a shaft 22 which is journaled in a central boss 23 provided by the bracket 13. The arm 21 also carries bristles engaging the end wall of the chamber 16. The other end of the shaft 22 carries a pulley 24 connected by a belt 25 to a drum 26 carried by a shaft, or axle, 27 extending transversely of the housing 9 and supported by bearings 28 secured to the arms of the bracket 13. As best shown in Fig. 2, the ends of the axle 27 project beyond the sides of the housing 9 and serve to carry wheels 29, 29 for supporting the rear end of the housing 9. One wheel 29 is loosely mounted on the axle 27 while the other is connected thereto and is adapted to turn the drum 26 in one direction of rotation only through the provision of a one-way clutch device of any desired type. As shown, the axle 27 carries a collar 30 providing teeth 31 adapted to cooperate with teeth 32 provided on the drum 26 to impart rotation of the axle to the drum in one direction of rotation only. With this arrangement, it is obvious that intermittent rotative movement will be imparted to the drum 26 as the cleaner is moved back and forth on the floor, the rotative movement of one wheel 29 preferably being imparted to the drum 26, through the engaged teeth 31 and 32, on the forward movement of the cleaner.

It is obvious that rotative movement of the drum 26 will be transmitted to the shaft 22 through the belt 25, so that the wiper 18 will be stepped around within the chamber 16 to cause the bristles 19 to sweep the inner surface of the fabric 15. In order to prevent frictional engagement between the spiral wiper rod 20 and the motor casing 6, the end of the rod carries a small roll 33 bearing on the outer periphery of the casing 6. As a result of the above described sweeping action of the wiper 18, it is obvious that any dirt or other particles deposited on the inner surface of the fabric 15 by the passage of the air therethrough will be removed from the fabric each time the cleaner itself is pushed forward on the floor, and my invention further contemplates the collection of this dirt in a receptacle, or tray, 34, removably carried by the housing 9. As shown in Fig. 3, the bottom of the housing 9 provides an opening 35 and the material of the screen cage 12 is secured to the sides of this opening 35. The tray 34 provides a flange 36 the dimensions of which are somewhat greater than the dimensions of the opening 35, and this flange 36 carries a suitable dust-proof packing 37. The tray 34 is secured to the lower side of the housing 9, with its packing 37 closely surrounding the opening 35, by means of a projecting pin 38 carried at one end of the tray 34 and received in an opening 39 provided in a portion of the plate 8 and housing 9 extending below the opening 35, see Fig. 1. The other end of the tray is provided with a turned-over handle 41, whereby the tray may be readily seized, and a spring latch 42 carried by the lower surface of the housing 9 serves to tightly hold the tray 34 in position with its packing 37 in close engagement with the edges of the opening 35.

In operating the cleaner, it is obvious that rotation of the blower 2 by the motor 5 will deliver a blast of dust laden air into the central chamber 16 and that the air in escaping from the chamber 16 will pass through the surrounding walls of the fabric 15, leaving the dirt deposited on the fabric. As the cleaner is moved back and forth on the floor, rotation of the wheels 29 will impart intermittent rotative movement to the wiper 18, thereby cleaning the inner surface of the fabric 15, at frequent intervals. It is obvious that the dirt and dust removed from the fabric 15 by this sweeping action will fall through the opening 35 at the bottom of the housing 9 and will be deposited in the tray 34. After the cleaner has been in use some time, the tray 34 can readily be removed by releasing the spring latch 42, thus permitting the tray to be quickly withdrawn by the handle 41 and emptied of the accumulated dirt. While the dirt is collecting in the tray 34, it is obvious that the inside surface of the fabric 15 will be kept clean, so that the cleaner always operates with the same efficiency.

While the cleaner is in operation, the motor 5 is kept cool by the rotation of a small fan 43 carried at the inner end of the shaft 4, within the motor casing 6. The warm air circulated by the operation of the fan 43 is drawn into and exhausted from the casing 6 through vents 44 provided in the end flange 6*a* of the casing 6, as indicated in Fig. 5 and by the portion not sectioned in Fig. 1. The amount of circulation of warm air by the fan 43 will depend largely upon the difference in temperature and pressure between the air within the motor casing and the air outside. Obviously, when the air within the motor casing becomes warmer than the outside air, the warmer air will tend to be exhausted through the upper vents 44, while the cooler air enters the lower vents, the flow of air being accelerated by an increase of pressure within the motor casing.

While I have shown my invention in a preferred form, it is obvious that modifications thereof may be carried out without departing from the invention. In addition, as shown in Fig. 4, the cleaning effect could be increased by providing a reinforced fabric lining 45 on the inside of the tray 46, with suitable openings 47 in the tray 46 to permit escape of the cleaned air. With a fabric screen in the tray, obviously the dirt and dust deposited in the tray 46 would tend to be collected more or less compactly around its bottom and sides, without any possibility of its being stirred up by the air exhausted into the chamber 16. This compacting of the dirt within the tray 46 would also assist in its ready removal.

I claim:

1. In a vacuum cleaner construction adapted for movement over a surface to be cleaned, a chamber having walls of porous material, means for drawing air from the surface to be cleaned and passing said air into said chamber, the walls of said chamber operating to remove dirt and other matter from the air and leave it on the walls of said chamber, and a brush rotatably driven by movement of the cleaner over the surface to be cleaned for sweeping the walls of said chamber to remove the matter deposited thereon by the air sifting action.

2. In a vacuum cleaner adapted for movement over a surface to be cleaned, a chamber having walls of porous material through which air drawn from the surface to be cleaned is sifted to remove dirt and other matter therefrom and leave it on the walls of said chamber, and a rotary brush automatically actuated by movement of the cleaner over the surface to be cleaned for intermittently sweeping the walls of said chamber to remove matter accumulated thereon by the sifting action.

3. In a vacuum cleaner adapted for movement over a surface to be cleaned, a chamber having walls of porous material through which air drawn from the surface to be cleaned is sifted to remove dirt and other matter therefrom and leave it on the walls of said chamber, a rotary brush automatically actuated by movement of the cleaner over the surface to be cleaned for intermittently sweeping the walls of said chamber to remove matter accumulated thereon by the sifting action, and a separate chamber communicating with and located beneath said first chamber in which the matter swept from the walls of the first chamber is collected.

4. In a vacuum cleaner adapted for movement over a surface to be cleaned, a chamber having walls of porous material through which air drawn from the surface to be cleaned is sifted to remove dirt and other matter therefrom and leave it on the walls of said chamber, a rotary brush automatically actuated by movement of the cleaner over the surface to be cleaned for intermittently sweeping the walls of said chamber to remove matter accumulated thereon by the sifting action, and a separate removable chamber communicating with and located beneath said first chamber in which the matter swept from the walls of the first chamber is collected.

5. In a vacuum cleaner adapted for movement over a surface to be cleaned, a cylindrical chamber having walls of porous material through which air drawn from the surface to be cleaned is sifted to remove dirt and other matter therefrom and leave it on the inner walls of said chamber, and a rotary brush actuated in response to movement of said cleaner in one direction over the surface to be cleaned to remove matter deposited on the walls of said chamber.

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