Oct. 15, 1940. F. A. BENSON 2,218,035

SUCTION CLEANER

Filed Aug. 9, 1937 2 Sheets-Sheet 1

Fig. 1.

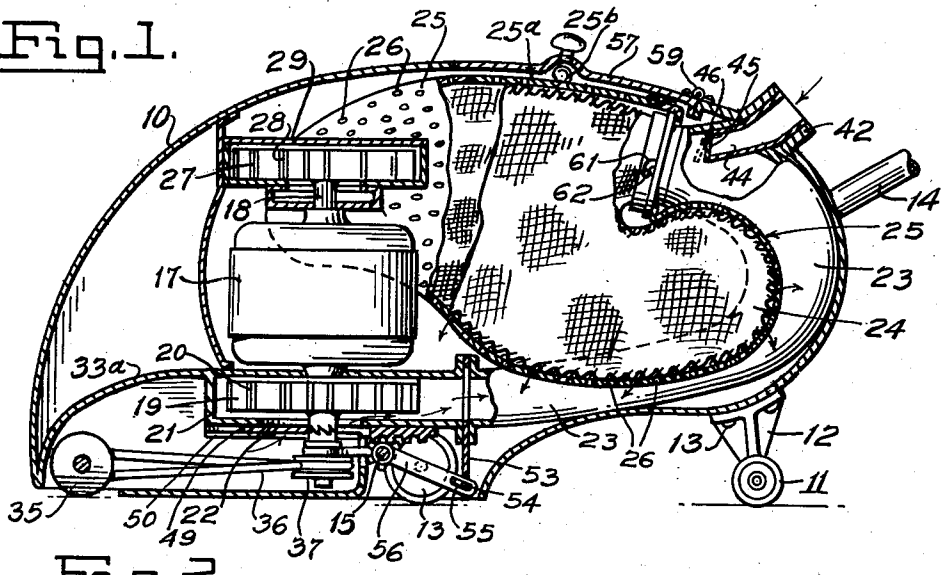
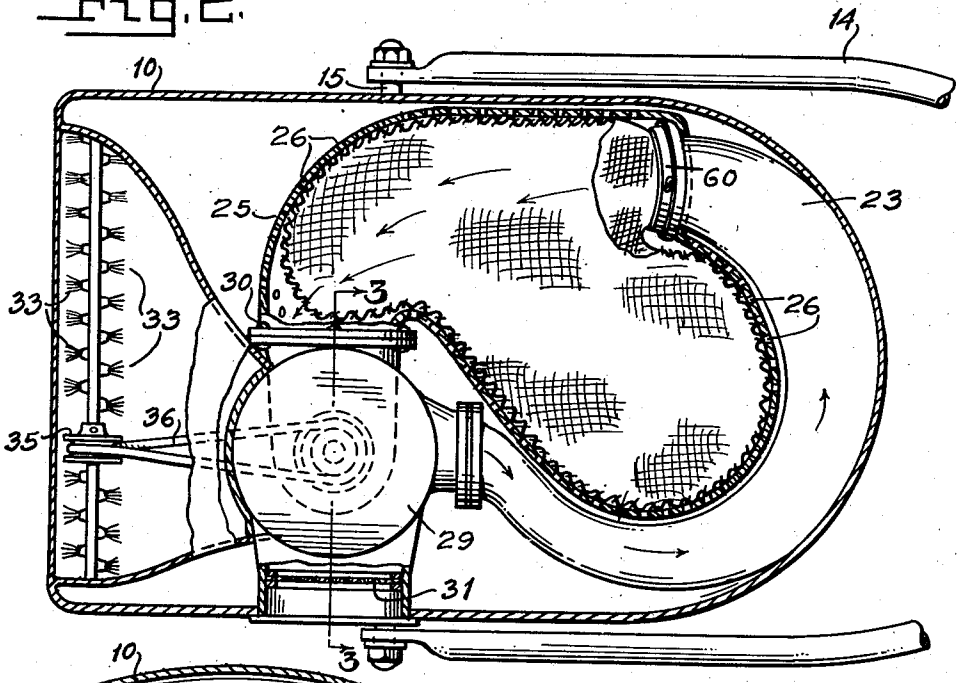


Fig. 2.



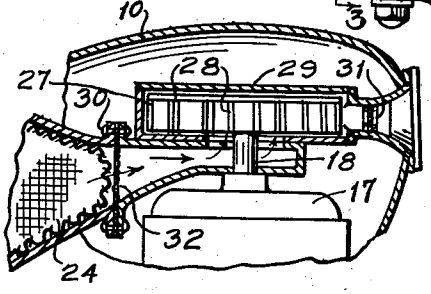


Fig. 3.

INVENTOR.
Frank A. Benson
BY
Edmund A. Stance
ATTORNEY.

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SUCTION CLEANER

Filed Aug. 9, 1937 2 Sheets-Sheet 2

Fig. 4.

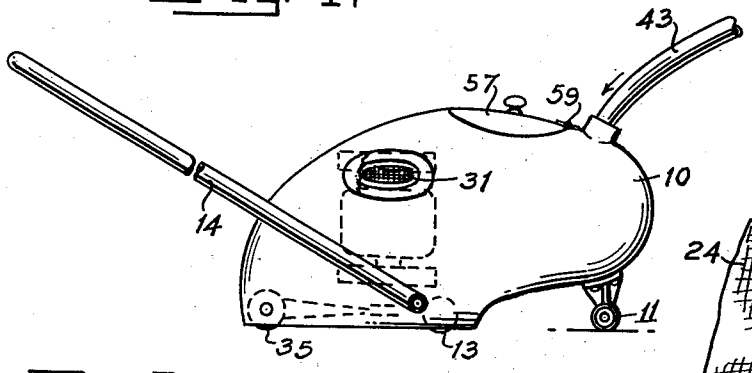


Fig. 6.

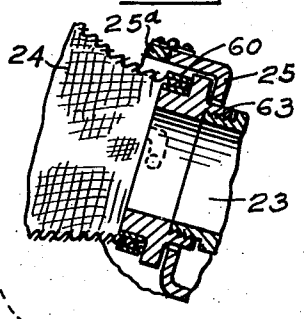


Fig. 5.

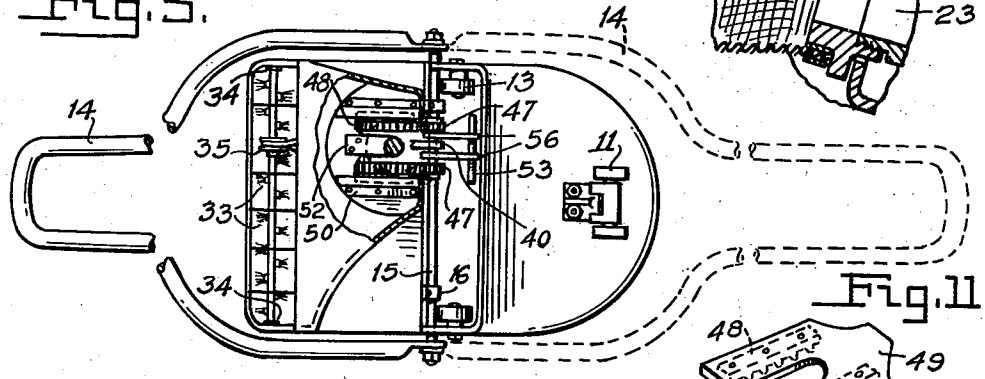


Fig. 11.

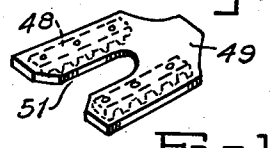


Fig. 7.

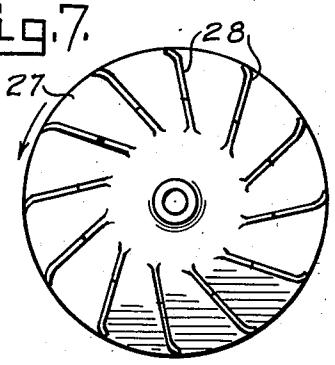


Fig. 8.

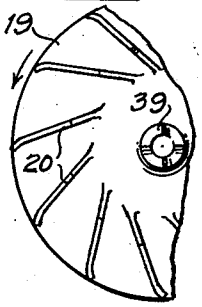
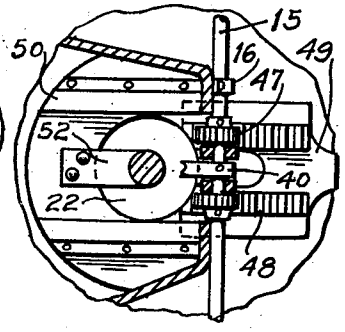


Fig. 10.



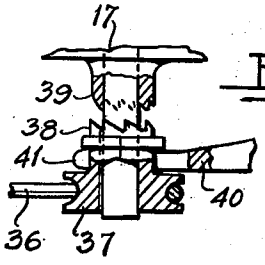


Fig. 9.

INVENTOR.

Frank A. Benson

BY

Edmund A. Thaine

ATTORNEY.

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SUCTION CLEANER

Frank Arthur Benson, Los Angeles, Calif.

Application August 9, 1937, Serial No. 158,099

10 Claims. (Cl. 15—9)

The present invention relates to suction cleaners and particularly to the type wherein the cleaner is adapted for operation upon floor coverings and also upon elements other than floor coverings such as furniture, drapery, etc.

There are many drawbacks associated with the present day construction in operation of vacuum cleaners of the dual type. While many are properly designed for satisfactory operation on floor coverings, they are lacking in efficiency when applied to other furnishings. Accordingly, it becomes a general object of this invention to provide a vacuum or suction cleaner operable efficiently and effectively on both floor coverings and other household effects.

It is a further object of this invention to provide a dual operating, motor driven vacuum cleaner in which the maximum suction effect is produced in cleaning floor coverings, but in which only part of the suction force available is used for cleaning other articles.

Still another object of the invention is to simultaneously rotate a suction fan and a brush for cleaning floor coverings, but to disconnect the brush from rotation whenever the vacuum cleaner is to be used on articles other than floor coverings.

Yet a further object of the invention is to boost a normal suction obtainable in cleaning floor coverings while adding to the cleaning effectiveness by means of a rotatable brush or beater, both the brush and the normal suction being rendered inoperable whenever it is desired to use the booster alone. This object also contemplates a simple control mechanism for performing the stated function of regulating the operability of the brush and usual suction device.

Another disadvantage of the present day vacuum cleaning mechanism lies in the inability of the dust receiving bag to separate the dust from its mixture of clean air drawn into the vacuum device upon filling of the bag container with solid materials removed from the article being cleaned. Invariably, this results in a progressive increase in the back pressure against which the fan must operate with detrimental lessening in the cleaning and suction effects thereof. It is thus another object of my invention to eliminate this tendency to increase the back pressure so that the cleaner will efficiently remove dirt and the bag separate out and hold this dirt until it becomes full.

Another object of the invention is to entirely enclose the dirt carrying bag in the machine structure and thereby eliminate obstructions on the exterior of the device which have heretofore prevented flexible motion of the cleaner over the floor coverings.

It is still a further object of the invention to enclose the bag in the machine structure and both force air into the bag and withdraw it by pressure created through the agency of a mechanical arrangement, the bag chamber serving as a conduit between the normal suction device and a booster mechanism.

Other objects and advantages of the invention will become apparent from a consideration of the following specification when taken in conjunction with the accompanying drawings wherein:

Fig. 1 is a side view, partially in section, of the suction cleaner.

Fig. 2 is a plan view, partially in section, of the cleaner as seen in Fig. 1.

Fig. 3 is a transverse sectional view taken along the line 3—3 of Fig. 2.

Fig. 4 is an elevation of the cleaning device with the auxiliary suction attachment in place.

Fig. 5 is a plan view, parts being broken away, of the mechanism illustrated in Fig. 4.

Fig. 6 is a sectional view on an enlarged scale showing the connection between the dust receiving bag and the spiral blower conduit.

Fig. 7 is an elevation of the booster impeller.

Fig. 8 is an elevation of the normal impeller.

Fig. 9 is a partially sectional view of the clutch mechanism for connecting the brush operating pulley with the motor shaft.

Fig. 10 is a detailed view of the operating mechanism for shutting off the flow of air into the normal impeller.

Fig. 11 shows a perspective of the slide valve rack used in shutting off the flow of air to the normal blower.

The suction cleaning device includes a machine casing 10 which is adapted for rolling along the floor by means of the carrier wheels 11 supported from the machine casing by the supports 12 attached to the casing by means of the rivets 13. An operating handle 14 is pivoted to the machine frame by fastening it to a shaft 15 rotatable at the lower end of the machine structure in the bearing supports 16, said shaft not only serving to mount the handle on the cleaning device but also to operate mechanism associated therewith, as will hereinafter appear.

For creating suction sufficient to produce the requisite cleaning operations, an electric motor 17 is mounted in the casing having fixed at the lower end of its armature shaft 18 an impeller 19 whose blades 20 are suitably pitched so as to pro-

duce a vacuum at the inlet of the blower chamber 21. Rotation of the motor will draw air through the inlet 22 and force it outwardly of the blower chamber through the spiral conduit 23 and into the dust receiving bag 24 carried within an outer bag chamber 25. This chamber has perforations 26 over substantially its entire surface to permit air drawn in by the blowing devices to escape after it has been separated from the dirt in the bag.

The suction effect created by the lower impeller is supplemented or boosted by providing a second impeller 27 fixed on the upper end of the armature shaft of the motor. The blades 28 on this impeller are pitched at a greater angle to that of the lower one so as to create a greater suction effect. Its enclosing chamber 29 is attached to the outer bag chamber by the rivets 30. It will thus be seen that the air blown into the dust bag by the lower impeller is exhausted therefrom, and the suction from the device increased, by the upper impeller which will force the air through the screen 31 to the surrounding atmosphere. As a precautionary measure in ensuring that the air exhausted through the screen 31 will be entirely clean, the filter 32 extends across the inlet to the upper blower chamber being held between the outer bag chamber and the inlet by the same rivets 30 fastening those parts together.

The suction device is also capable of rotating a sweeper brush during floor cleaning operations. The brush 33 is positioned at the front, lower portion of the vacuum cleaner in the nozzle structure 33a pivoted at its ends in the bearings 34 provided in the inner surface of the machine casing. A belt pulley 35 is fixed to the brush, and is adapted to be operated from the electric motor armature shaft by means of a belt 36 encircling the brush pulley 35 and riding over a second pulley 37 rotatably supported on the armature shaft but clutchable for rotation therewith by means of the cooperating clutch elements 38, 39; the former being provided on the pulley and the latter being formed integrally with the hub of the impeller 19. The brush is connectible for rotation whenever the clutch elements are in engagement, such cooperation and disengagement being obtainable by use of the clutch shift lever 40 fastened to the shaft 15 and engaging in the shifter groove 41 formed in the surface of the hub of the pulley 37. By oscillating the shaft 15 in one direction or the other the brush can be connected for rotation or maintained stationary.

The suction cleaner also is constructed for use on articles other than floor coverings. To accomplish this purpose an orifice 42 is provided on the casing structure within which a suitable hose 43, of usual construction, is insertable to conduct a mixture of dust and air from the article being cleaned into the bag receptacle. Such mixture passes through the conduit 44, and by the air pressure opens a check valve in the nature of a flap 45 pivoted to the conduit by the pin 46. That is, when air is being sucked through the conduit 44 this check valve is open. But upon pressure being exerted in the conduit 23 the check valve is maintained closed by such pressure. In this manner, when the vacuum cleaner is being used on floor coverings alone the mixture of dust and air is prevented from blowing through the conduit 44 to the surrounding atmosphere by the automatic closing of the check valve 46.

To realize this last mentioned operation, only the upper impeller is used in cleaning objects other than floor coverings, since this impeller draws dirt and air into the bag by creating a suction therein, rather than blowing, as is performed by the lower impeller. It thus becomes essential that communication between the lower impeller and the dust bag be disrupted whenever the floor cleaning portion of the apparatus is not to be used. Additionally, when such use is not contemplated there is no need for expending power in rotating the brush; nor is the necessity for making use of the handle in moving the vacuum cleaner over any surface essential. The handle is therefore movable to a position wherein it does not obstruct cleaning operations through the use of the hose 43, and at the same time in moving to this non-obstructing position it operates the clutch 38, 39 to disconnect the pulley 37 from functional cooperation with the armature shaft. Such action can be understood from the consideration of Figs. 1 and 4. In Fig. 1 the clutch connects the brush for rotation by the armature shaft and the handle is positioned towards the rear of the cleaning device. In moving it to the forward position shown in Fig. 4, the shaft 15 is rocked in a counter-clockwise direction (as seen in Figs. 1 and 4) to move the clutch shifter 40 downwardly and thus disengage the clutch.

Fixed to the shaft 15 are the pinions 47 engageable with the racks 48 fixed to the slide valve 49. The side portions of this valve are slidable along the guide rails 50 riveted to the machine structure and serving to hold the valve against the lower impeller casing. This valve has a cut out portion 51 which is adapted to snugly embrace the hub of the impeller; and when the rack is moved towards the armature shaft of the motor it will close off the inlet opening 22 to the lower blower mechanism. A consideration of Fig. 10 will show clearly how this function is accomplishable. From this figure it will be seen that the inlet opening is always partially closed by the element 52 riveted to the outer part of the lower chamber and extending to the armature shaft. This element is complementary to the cut out portion of the slide valve so that when the valve is moved towards the front of the vacuum cleaner the sides of the cut out portion will be in intimate contact with the side faces of the closure element 52 and thereby effectively seal the inlet to the lower blower chamber.

Movement of the handle to the front of the vacuum cleaner will also close the outlet from the lower blower chamber. Such outlet is controlled by the slide valve 53 movable across the conduit entrance 23 to prevent a mixture of dirt and air from entering the conduit. The lower end of the valve carries a pin 54 movable in a slot 55 formed in the lever 56 which is also fixed to the shaft 15. As this shaft rocks counter-clockwise (as seen in Fig. 1), not only will the clutch be disengaged and the inlet valve closed, but the outlet valve 53 will also be moved upwardly to close off the lower blower entirely. The result is that no power is expended in rotating the sweeper brush or in delivering a mixture of air and dust under pressure to the receiving bag. The impeller 19 will merely be rotated freely in its enclosing chamber and serve as a counter balance and flywheel to the action of the impeller 27 moving in the upper chamber to produce a suction in the bag and draw open the back valve 46 so that a mixture of dust and air may enter from any dusting attachment through the hose

43. The suction effect produced by the upper blower, will be sufficient for cleaning articles other than floor coverings, while its combination with the lower blower will produce the greater suction effect essential to proper dirt removal from floor coverings.

The dirt containing bag is removable readily from the vacuum cleaner by opening the cover 57 pivoted to the casing by the hinge 59. Similarly, the outer perforated bag chamber 25 has a pivoted cover 25a, and a handle 25b for raising it so that the bag may be removed. Removal is effected in the usual manner by turning the collar 60 having the bayonet slot 61 cooperating with the pin 62 fixed to the flanged sleeve 63 that is threadedly attached to the end of the conduit 23.

Besides functioning as a vacuum producing device the upper fan can be used as a blower to force clean air through its outlet and into any attachment that might be affixed to its outlet opening.

It will thus be seen that a suction cleaner has been provided to create a most efficient cleaning effect on floor coverings while only providing the suction essential to cleaning of objects other than floor coverings; all at a minimum expenditure of power essential for efficient operation of the cleaning device.

In cleaning floor coverings the suction developed by the lower impeller is decreased nearly 50% by the time it reaches the dust bag thus diminishing the effectiveness of the apparatus. By providing a booster impeller that operates in unison with the lower impeller that creates suction through the dirt bag the diminished suction is boosted to nearly normal.

While the invention has been described in connection with the suction cleaner illustrated on the drawings, it is to be understood that such example is for illustrative purposes only and is not intended as implying any restrictions upon the following claims.

I claim:

1. A suction cleaner comprising a casing having a nozzle at its lower region, a blower having an inlet communicating with said nozzle, a motor for operating said blower, a supplementary blower operated by said motor, means providing an air passage between said blowers, means providing an inlet orifice adapted to receive dusting attachments communicating with said air passage, and means for closing the inlet passage to said first mentioned blower and cause air to enter said air passage by the action of said supplemental blower when it is desired to connect dusting attachments to the inlet orifice.

2. A suction cleaner comprising a casing having a nozzle at its lower region, a blower having an inlet communicating with said nozzle, a motor for operating said blower, a supplementary blower operable by said motor, means providing an air passage between said blowers, means providing an inlet orifice for receiving dusting attachments opening directly into said air passage, means for closing the inlet to said first-mentioned blower ineffective whereby said dusting attachments will be acted upon only by said supplementary blower, and means for closing said orifice.

3. A suction cleaner comprising a casing having a nozzle at its lower region, a blower having an inlet communicating with said nozzle, a motor for operating said blower, a supplementary blower operated by said motor, means providing an air passage between said blowers, means providing an inlet orifice adapted to receive dusting attachments communicating with said air passage, a check valve associated with the inlet orifice, and means for closing the inlet to said first stated blower, whereby when the air passage to the first stated blower is cut off the check valve of the inlet orifice will be opened by the action of the supplemental blower.

4. A suction cleaner comprising a casing having a nozzle at its lower region, a blower having an inlet communicating with said nozzle and an outlet, a motor for operating said blower, a supplementary blower operated by said motor, means including a dust receiving bag providing an air passage between the outlet of said first-mentioned blower and the inlet of said supplementary blower, means providing an inlet orifice adapted to receive dusting attachments opening directly into said passage between said blowers, a device for closing said orifice, and means for closing said blower inlet to permit the creation of a suction effect through said orifice upon removal of said closing device.

5. A suction cleaner as defined in claim 4, wherein said last-mentioned means includes instrumentalities for also closing said blower outlet.

6. A suction cleaner as defined in claim 4, wherein opening of said orifice is effected by suction created by said supplementary blower upon closing of said blower inlet, and closing thereof is effected by pressure created by said first-named blower.

7. A suction cleaner comprising a casing having a nozzle at its lower region, a blower having an inlet communicating with said nozzle and also an outlet, a rotatable brush in the nozzle, a motor for driving the blower, means connecting said motor with the brush, a supplementary blower driven by said motor, means providing an air passage from the outlet of said first-named blower to said supplementary blower, means providing an inlet orifice adapted to receive dusting attachments communicating with said passage, a check valve in said orifice operable by pressure in said passage to close said orifice and by suction in said passage to open said orifice and means for simultaneously disconnecting said brush from said motor and closing both the inlet and the outlet of said first-named blower.

8. A suction cleaner comprising a casing having a nozzle at its lower region, a blower having an inlet communicating with said nozzle and also an outlet, valves controlling the opening and closing of said inlet and outlet, a rotatable brush in the nozzle, a motor for driving the blower, means including a clutch for driving the brush by the motor, a supplementary blower driven by said motor, means providing an air passage from the outlet of said first-named blower to said supplemental blower, means providing an inlet orifice adapted to receive dusting attachments communicating with said passage, a check valve in said orifice operable by pressure in said passage to close said orifice and by suction in said passage to open said orifice, and means for simultaneously disengaging said clutch and closing said inlet and outlet valves.

9. A suction cleaner as defined in claim 8, wherein said last-mentioned means includes a single operating instrumentality for initiating the clutch disengaging and valve closing motions.

10. A suction cleaner comprising a casing having a nozzle at its lower region, a dust collecting

bag within the casing, a brush rotatable within said nozzle, an electric motor within the casing having an impeller on each end of its shaft, each of said impellers being rotatable within respective blower chambers, one of said chambers having an inlet opening communicating with said nozzle and an outlet, the other chamber having an inlet opening communicating with said bag and an outlet through the casing, a conduit between the outlet of the first chamber and the bag, said casing being provided with an inlet orifice communicating with said conduit, a check valve in said inlet orifice operable by pressure in said passage to close said orifice and by suction in said passage to open said orifice, means including a clutch for connecting said brush with said motor, respective valves for opening and closing the inlet and outlet of said first chamber, a handle pivoted to the casing for moving it along a floor surface, and means connecting said handle with said clutch and respective valves for disengaging the clutch and closing the valves.

FRANK ARTHUR BENSON.