

Oct. 6, 1936.

D. C. DANIELS ET AL

2,056,831

VACUUM CLEANER

Filed Dec. 21, 1933

2 Sheets-Sheet 1

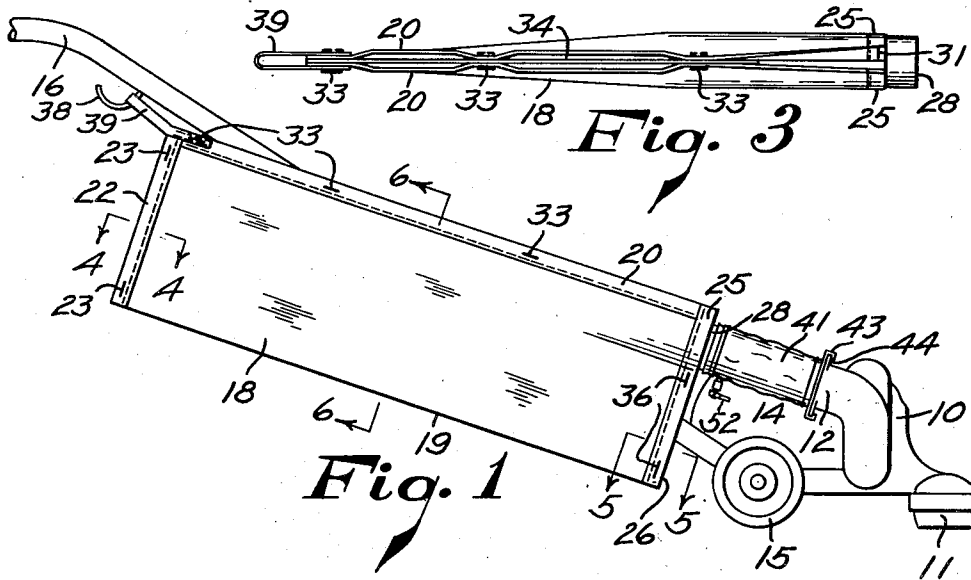
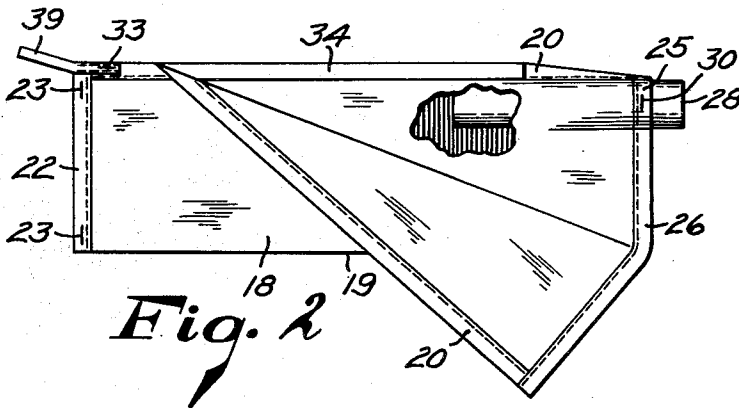
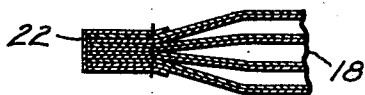
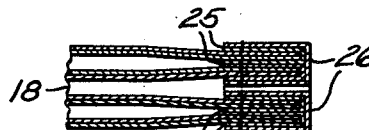


Fig. 4

Fig. 5

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2 Sheets-Sheet 2

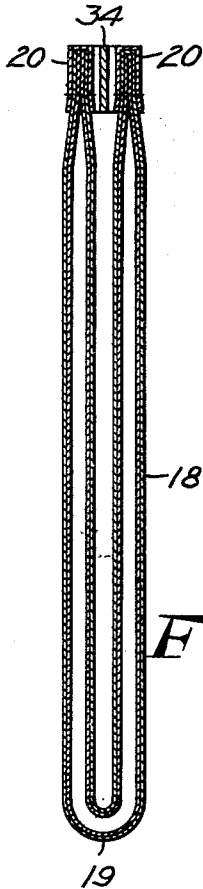


Fig. 6

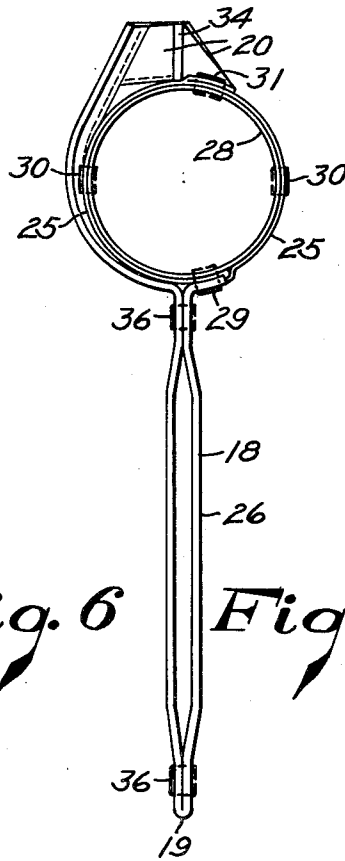


Fig. 7

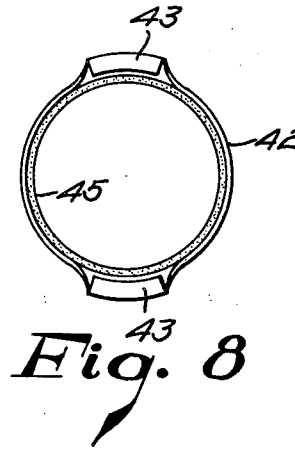


Fig. 8

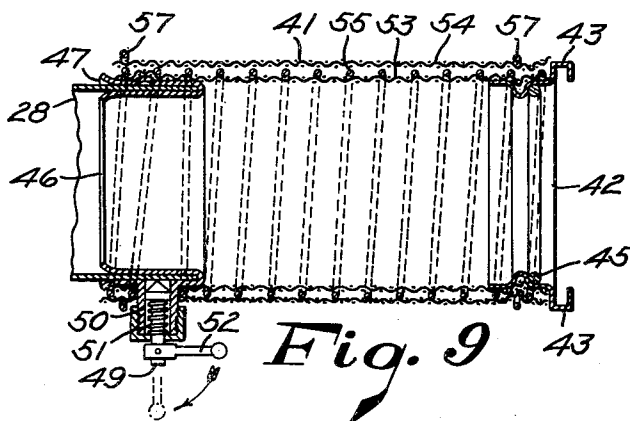


Fig. 9

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2,056,831

VACUUM CLEANER

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4 Claims. (Cl. 183—51)

This invention relates to vacuum cleaners, and more particularly to cleaners of the household type comprising filter bags into which the dirt is delivered by an air blast.

It has been proposed heretofore to construct such filter bags of porous paper so that they can be destroyed after use without emptying the dirt therefrom. With certain of these prior arrangements it is necessary to employ an outer bag of cloth or similar material to support the paper bag, and this not only adds considerably to the cost of the construction but it also makes replacement of the paper bag less convenient. With other prior arrangements there is insufficient filtering area provided, and still others are structurally weak so that the paper frequently bursts and allows the dirt to be discharged.

It is accordingly one object of the present invention to overcome these difficulties and to provide a porous paper filter bag which can be manufactured very cheaply, and which will be compact and yet have ample filtering area and dirt storage capacity.

It is a further object of the invention to provide a porous paper filter bag which will have considerable strength and be capable of withstanding the pressure of the air blast without bursting or appreciable distortion, and which can be used successfully without an outer supporting bag.

It is a further object of the invention to provide an improved flexible tube for connecting the filter bag to the discharge nozzle of the vacuum cleaner, which is so constructed as to ensure a free passage for the air blast at all times.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawings illustrating one embodiment of the invention, and in which like reference numerals indicate like parts,

Fig. 1 is an elevation of a vacuum cleaner with the filter bag in operative position;

Fig. 2 is a detail of the filter bag, partially unfolded and broken away for clearness of illustration;

Fig. 3 is a top plan view of the filter bag;

Fig. 4 is an enlarged section on the line 4—4 of Fig. 1;

Fig. 5 is an enlarged section on the line 5—5 of Fig. 1;

Fig. 6 is an enlarged section on the line 6—6 of Fig. 1;

Fig. 7 is an enlarged view of the front end of the filter bag;

Fig. 8 is a view of the front end of the connecting tube; and

Fig. 9 is a longitudinal section through the connecting tube.

The embodiment illustrated comprises a fan casing 10 provided with the usual laterally flared suction nozzle 11 which extends downwardly at the front of the machine, and the usual discharge nozzle 12 which is directed rearwardly and at a slight upward inclination at one side of the machine. An electric motor 14 is fastened to the rear of the fan casing, and a suitable fan (not shown) is mounted on the front end of the motor shaft and arranged to revolve at high speed within the fan casing. Wheels 15 are shown beneath the motor to support a portion of the weight thereof. An operating handle 16 is hinged to the motor and fan casing assembly and extends rearwardly therefrom, being free to swing up and down in a vertical plane as is customary in machines of this type. These various parts are all well known in the art, and hence do not require detailed description or illustration.

In order to collect the dust which is discharged from the nozzle 12 during the operation of the machine we utilize a filter bag 18 arranged in substantial axial alignment with the nozzle. This bag is formed of a suitable porous paper, so that it may be destroyed without emptying the dust therefrom. In order to provide ample strength and ensure proper filtering, we preferably use two thicknesses of paper for the walls of the bag.

As shown particularly in Fig. 6, the bag is folded upon itself to provide a cavity which is U-shaped in transverse cross-section, the fold 19 extending longitudinally of the bag at the bottom thereof. This construction is compact and yet it provides a large filtering area. The two upper edges of the bag are each reinforced by a binding strip 20, preferably of paper, stitched in place. After the bag is folded a binding strip 22 is stitched to the rear edge thereof and further secured by means of wire staples 23. It will be noted that the binding 22 encloses eight thicknesses of paper, whereas each of the bindings 20 encloses four thicknesses of paper. At the front edge of the bag a binding strip 25 is applied to each double-thick wall of the bag and stitched in place, and then a binding strip 26 is applied over both the bindings 25 and likewise stitched in place, all before the bag is folded. As shown particularly in Fig. 7, the binding 26 extends all the way to the top of the bag at one side, but at

the other side it extends only part way, so that an inlet tube 28 of cardboard or other suitable non-flexible material may be inserted in the bag at the upper front corner thereof. This tube preferably extends into the bag for several inches in a direction parallel to the upper edge thereof, as shown in Fig. 2.

In order to secure the tube 28 firmly in place to prevent leakage and at the same time avoid any weakening of the bag or application of stresses thereto which might result in bursting, the material of the bag is doubled back upon itself at the front edge directly beneath the tube and a staple 29 is inserted through this doubled portion and the wall of the tube, as shown in Fig. 7. Since this staple 29 passes through the cardboard and fourteen thicknesses of paper, including the bindings, it provides a very strong construction. At each side of the tube 28 the bindings 25 are secured to the tube by staples 30, and at the top of the tube the upper edge of the bag is folded over and secured to the tube by a staple 31. In addition the tube is preferably fastened to the surrounding material of the bag by a suitable cement.

When air pressure is applied to the interior of a folded bag of this type there is a decided tendency for the bag to balloon and unfold. It has heretofore been found necessary to support the paper bag by an outer bag of cloth, which adds to the cost and increases the difficulty of replacement. This is avoided in the present construction by providing means such as staples 33 for fastening the two upper edges of the bag permanently together at several spaced points. The upper edge of the bag is also strengthened by providing a longitudinal strip 34 of cardboard located between the two bindings 20 and held in place by the staples 33. Each of these staples 33 extends through twelve thicknesses of paper and one thickness of cardboard, so that great strength is provided to withstand the ballooning action. At the front edge of the bag two staples 36 are inserted through the binding 26 to aid in preventing unfolding of the bag. Each of these staples passes through twenty thicknesses of paper. It will be apparent that the air which flows through the inner walls of the bag can readily escape between the staples, so that there will be no trapping of air to cause excessive pressure on the fan.

The filter bag 18 is supported by the handle 16 of the cleaner, and for this purpose the handle is provided with a suitable hook 38 which engages a loop 39 stitched and stapled to the upper rear corner of the bag.

The inlet tube 28 of the filter bag is releasably secured to the fan outlet nozzle 12 by means of a flexible tube 41 which is illustrated in detail in Fig. 9. This tube is provided at its front end with a collar 42 having opposed hooks 43 which engage lugs 44 on the nozzle 12, an annular gasket 45 being mounted within the collar to contact with the nozzle and prevent leakage. At its rear end the tube is provided with a collar 46 having an annular groove 47 therein to receive the front end of the cardboard tube 28. The tube is held in the groove by means of a pointed pin 49 slid-

able in a sleeve 50 secured to the outside of the collar 46. The pin 49 is urged inwardly by a coil spring 51, and can be withdrawn by a cam lever 52 pivoted to the outer end of the pin. The collars 42 and 46 are connected by an inner sleeve 53 and an outer sleeve 54 between which there is mounted a coil spring 55. The sleeves 53 and 54 are preferably of cloth or other durable and flexible material, and the sleeves and spring are secured to the collars 42 and 46 by means of wires 57 or in any other suitable manner. With this construction the tube 41 presents a comparatively smooth interior and exterior, it will bend readily as the handle 16 is moved up and down, thereby avoiding flexing of the filter bag, and it will always provide a free passage for the air blast discharged by the nozzle 12.

From the above description it will be apparent that we have provided an air filtering equipment for vacuum cleaners which can be manufactured very cheaply and which will operate with entire satisfaction for a considerable period. The construction is compact and yet it provides ample filtering area and dirt collecting space. No outer bag is required, since the filter bag has ample strength in itself to resist the ballooning action of the air blast.

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

1. A vacuum cleaner filter bag formed of porous paper and having one edge reinforced with a binding strip, a non-flexible tube entering the bag close to and parallel to said edge, the binding strip being folded against the tube, and fastening means extending through the binding strip and the adjacent wall of the tube.

2. A vacuum cleaner filter bag formed of porous paper, a tube entering the bag close to and parallel to one edge thereof, the material of the bag being doubled back upon itself close to the tube at a point opposite said edge, and fastening means extending through said doubled portion and the adjacent wall of the tube.

3. A vacuum cleaner filter bag formed of porous paper and having a substantially horizontal upper edge, a tube extending substantially horizontally into the front end of the bag and close to said upper edge, the material of the bag being doubled back upon itself at the front edge directly beneath said tube, and fastening means extending through said doubled portion and the adjacent wall of the tube.

4. A vacuum cleaner filter bag formed of porous paper and having a substantially horizontal upper edge, a binding strip along the front edge of each wall of the bag, a tube extending substantially horizontally into the front end of the bag between the binding strips and close to the upper edge, a third binding strip enclosing both binding strips from the lower edge of the bag to the tube, the front edge of the bag being doubled back upon itself directly beneath the tube, and fastening means extending through said doubled portion and the adjacent wall of the tube.

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