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FILTER SUPPORT FOR VACUUM CLEANERS

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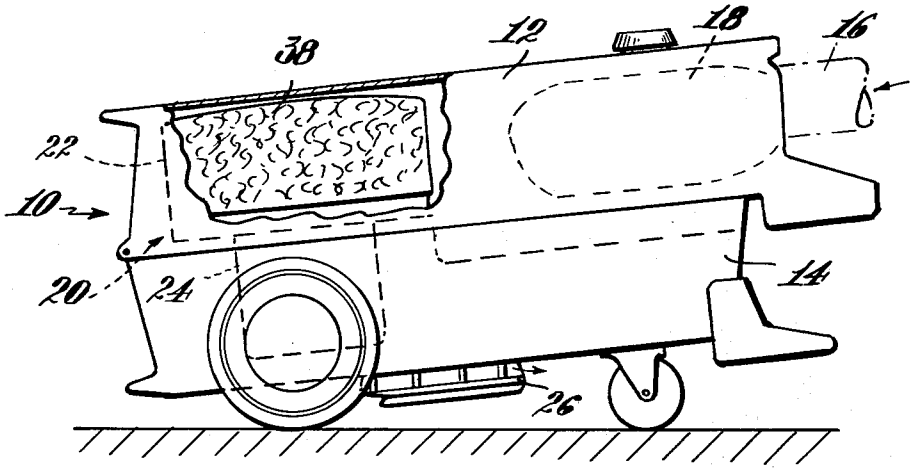


Fig. 1

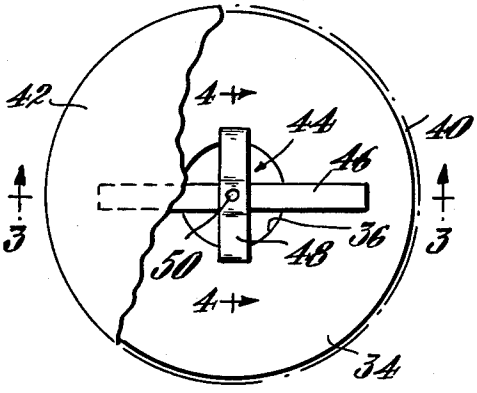


Fig. 2

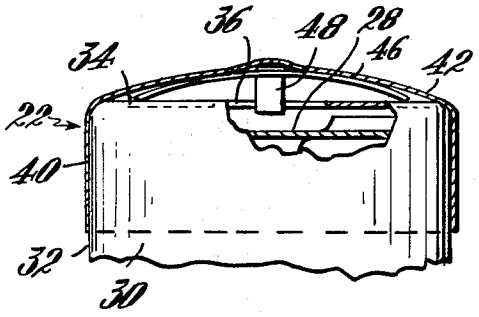


Fig. 3

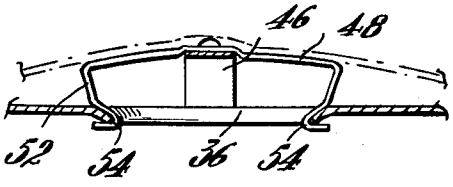


Fig. 4

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FILTER SUPPORT FOR VACUUM CLEANERS

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This invention relates to apparatus embodying a motor-driven fan and especially to a combination of the foregoing kind wherein the motor is located at the discharge side of the fan to provide cooling of the motor throughout operation.

Motor-fan combinations of this kind are conventionally used in vacuum devices and in order to protect the motor from residual dust and dirt which may escape the conventional filter bag, it is necessary to hold a filter element adjacent the intake side of the fan. Usually the fan is enclosed in a protective housing having an intake opening in the wall opposite the end of the fan, and the filtering element is held against this end wall over the opening. The suction induced by the fan holds the filter element tightly against the edge of the hole, thus restricting flow through an area of the filter which is no larger than the opening, which, in turn, limits the useful life of the filter since the relatively small area, through which the flow takes place, becomes loaded within a very short time so that the entire filter must be replaced, and which further reduces the efficiency of the apparatus by reducing the power available for inducing suction.

The objects of this invention are to provide a filter which will have a relatively large effective filtering area so as to be effective over a relatively long period of time and to provide a filter which will not interfere with free flow of air and hence will not reduce the power and efficiency of the apparatus.

As herein illustrated the invention resides in the combination with a motor-driven exhaust fan including a housing enclosing the fan which contains an intake opening; of a filter element applied to the housing to cover the opening, said filter element having a foraminous wall of larger area than the area of the opening in the housing, and a device interposed between the housing and the foraminous wall operative to support a portion of the foraminous wall of larger area than the opening in spaced relation to the opening. The device is preferably detachably secured to the housing in spaced relation to the opening. In one form, the device comprises right-angularly disposed arcuate parts secured together, one part being longer than the diameter of the hole and the other having legs projecting from the concave side of the parts, supporting the one part spaced from the housing, and means at the ends of the legs yieldably holding them engaged with the edge of the opening.

The invention will now be described in greater detail with reference to the accompany drawings wherein:

FIG. 1 is an elevation of a vacuum cleaner of a kind embodying a motor-fan combination, broken away in part to show a filter applied to the intake side of the fan housing;

FIG. 2 is a top view of the fan housing with a filter applied thereto, a portion of which is broken away to show the filter-supporting device;

FIG. 3 is an elevation of the fan housing with the filter applied thereto, broken away in part to show the intake opening, fan, and with the filter sectioned on the line 3—3 of FIG. 2, to show the filter-supporting device; and

FIG. 4 is a fragmentary section taken on the line 4—4 of FIG. 2, showing the filter in phantom.

Referring to the drawings, there is shown a vacuum cleaner **10** having hingedly connected upper and lower parts constituting an intake chamber **12** and a discharge

chamber **14**. A hose **16** for conventional vacuum implements is detachably connected to the intake chamber **12** and is in communication, when attached, with a conventional filter bag **18** disposed in the chamber. Preferably the filter bag is of the disposable kind that can be removed and thrown away when filled.

The vacuum within the chamber **12** is induced by a motor-driven fan unit **20** mounted at the rear end of the cleaner with respect to the hose **16**, with the fan **22** located in the intake chamber **12** and with the motor **24** located in the discharge chamber **14**. The bottom of the discharge chamber **14** contains a suitable discharge opening fitted with an adapter **26** for connecting the hose **16** thereto in the event that it is desirable to employ the air discharge from the chamber for the purpose of operating atomizing equipment, and the like.

The fan **22** (FIG. 3) is enclosed within a housing **30** having a cylindrical side wall **32** and a substantially flat circular end wall **34**, the latter containing centrally thereof and substantially opposite the induction end of the fan an induction opening **36**. The opposite end of the fan (not shown) is connected to the motor, the latter being arranged with its shaft coinciding with the axis of rotation of the fan so that the inductive action of the fan draws air through the opening **36** and discharges it through the motor thereby keeping the latter cool.

In spite of the efficiency of the filter bag **18** within the cleaner over a prolonged period a certain amount of residual dust and dirt is drawn into the motor. Moreover, it sometimes happens that through inadvertence a new filter bag is not installed and the cleaner is started with the result that a large quantity of dirt is drawn into the motor and damages it. To lessen the possibility of dirt reaching the motor for the foregoing reasons, it is customary to apply a filter element **38** in the form of a cup-like member having a cylindrical side wall **40** and a circular end wall **42**, to the end of the housing **30** over the opening **36**. Such a filter element is effective to the extent that it catches residual dust and the like and prevents entrance of a full charge of dirt to the motor in the event that the filter bag is accidentally omitted; however it has the disadvantage that the suction induced by the fan pulls the end wall **42** tightly against the edge of the opening **36** so that the effective area of the filter is restricted to a portion which is no larger than the area of the hole **36**. It is obvious that this small area will become loaded quickly with dirt and hence the filter must be replaced frequently. Furthermore, restriction of the flow by contact of this filter with the edge of the opening increases the resistance to flow and correspondingly lessens the power available to induce the desired amount of suction.

The desirable advantages of the filter **38** can be preserved without the foregoing disadvantages, in accordance with this invention, by supporting a portion of the end wall **42** of the filter, of larger area than the opening **36**, spaced from the opening **36** so that flow through the wall **42** of the filter is not confined to an area of precisely the same size as the opening **36**. In other words, flow can take place throughout substantially the whole area of the end wall **42** thereby increasing the filtering capacity of the filter and simultaneously reducing the resistance to flow.

In accordance with the invention the end wall **42** of the filter is held spaced from the opening **36** by a filter-supporting device **44** (FIGS. 2, 3 and 4) comprised of elongate, right-angularly disposed elements **46** and **48** of arcuate shape. The elements **46** and **48** are secured together at their centers by suitable means, for example a rivet **50**, so that the parts thereof at opposite sides of the securing means are symmetrical with respect thereto. As illustrated, the element **46** is longer than the

diameter of the opening **36** so that its ends extend beyond the edges of the opening. The element **48** is shorter and has extending from the concave side thereof, as shown in FIG. 4, spaced legs **52—52** which have at their extremities outwardly facing hooks **54—54**. By engaging the outwardly facing hooks **54—54** with the edge of the opening **36**, the legs may be held substantially perpendicular to the end wall **34** of the housing **30** and they, in turn, to hold the elements **46** and **48** spaced from the end wall except for the extremities of the element **46** which bear against the end wall radially outward of the opening **36**. The device, when disposed in position between the end wall and the housing and the end wall of the filter, holds the latter spaced from the opening **36**.

The specific device herein described is of simple construction, easy to install and effective. However, it is to be understood that any device which is the equivalent thereof, in that it operates to hold a portion of the end wall of the filter, of larger area than the opening **36**, spaced from the opening is within the scope of the invention.

It is to be also understood that, although the filter-supporting device is described herein in conjunction with a motor-fan unit designed especially for vacuuming cleaning purposes, the device can be employed to advantage in conjunction with any system entailing flow through a filter where it is desirable to prevent restriction of the flow to the exact dimensions of the opening through which flow takes place.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claim.

I claim:

The combination with a motor-driven exhaust fan for use in a vacuum cleaner, said fan being contained in a cylindrical housing at one end of the motor and having at said end an intake opening concentric with the axis of the fan which is smaller in diameter than the end wall; of a detachable frame comprising a first curved part, legs at the ends of said first curved part and hooks at the

lower ends of the legs for engagement with the rim of the opening to hold said first curved part spaced from the end wall, said first curved part being slightly longer than the diameter of the opening and said legs being inclined toward each other and yieldingly holding the hooks engaged with the rim of the opening, and a second curved part secured to the first curved part substantially at the midlength thereof and at right angles thereto, said second curved part being longer than the first curved part and of a curvature such that its ends compressively engage the end wall, so that said second curved part applies a force to the first curved part in a direction outwardly of the opening thus forcing the hooks against the inner side of the rim of the opening, said first and second curved parts collectively forming a rib-like support above the opening, and a cup-shaped filter element comprised of a cylindrical side wall corresponding in diameter to the fan housing, and a circular end wall corresponding in diameter to the end wall of the fan housing, fitted onto the housing with the circular end wall engaged with the ribbing, said circular end wall of the filter forming a vault-like space of larger diameter than the opening above and concentric with the opening.

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