April 29, 1952 Q. BERG 2,594,281

SUCTION CLEANER

Filed June 5, 1948

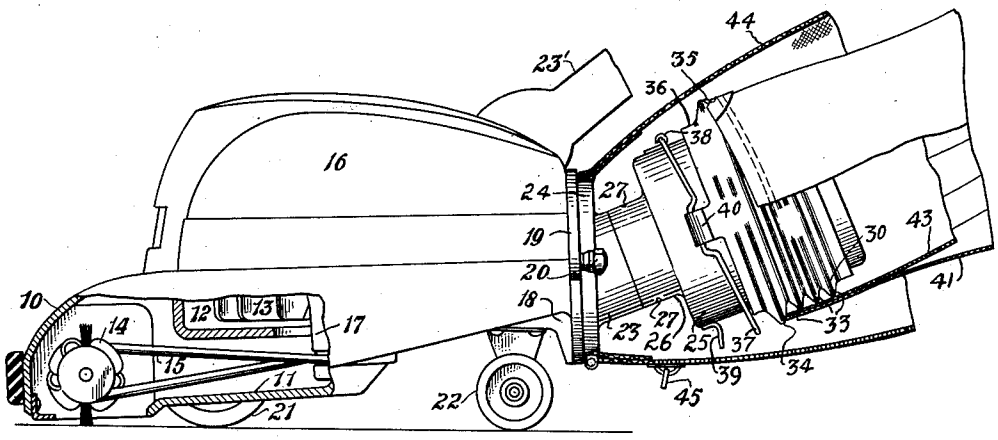


Fig. 1

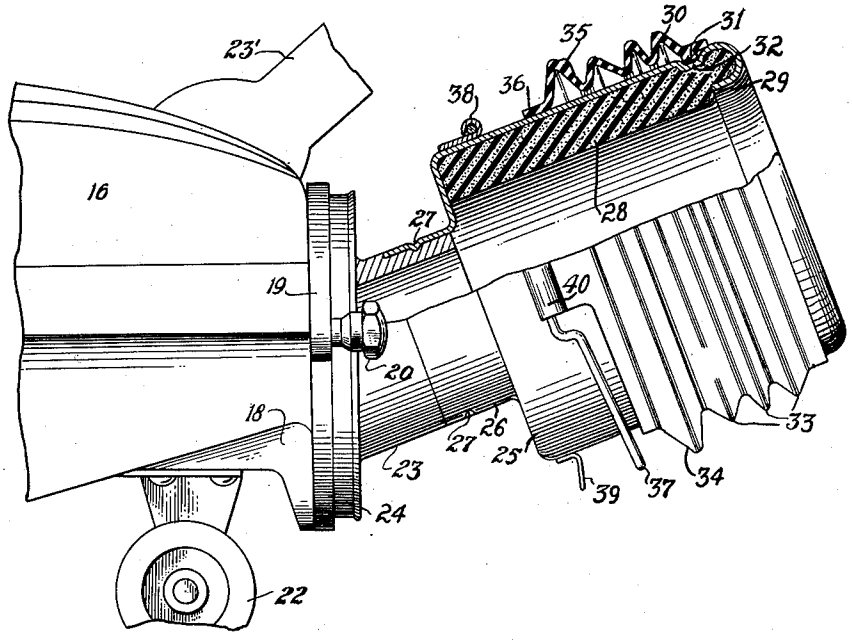


Fig. 2

INVENTOR.
Quentin Berg
BY
Harry S. Blucas
ATTORNEY.

Patented Apr. 29, 1952

2,594,281

UNITED STATES PATENT OFFICE

2,594,281

SUCTION CLEANER

Quentin Berg, New Cumberland, Pa., assignor to The Hoover Company, North Canton, Ohio, a corporation of Ohio

Application June 5, 1948, Serial No. 31,229

17 Claims. (Cl. 183—36)

1

The present invention relates to suction cleaners and more particularly to a novel filter mounting assembly featuring a simple and highly effective self-acting clamp.

One of the perplexing problems attending the use of inexpensive paper filters is a satisfactory means for clamping and sealing the inlet neck to the exhaust of a suction cleaner. Paper filters are notoriously weak structurally and physically. While the neck can be reinforced sufficiently to take the abuse imposed by known clamps which have proven adequate for use with cloth filters, yet the additional cost involved is objectional. This is because the objective in the use of paper filters is to make the cost so low that it is practical to throw them away after each use to avoid the unpleasant task of emptying and replacing a dirty filter.

Previously developed clamps are too harsh for paper filters, or provide too little gripping area, or make inadequate provision for clearance when placing the filter upon the adapter, or are too expensive, or are too complex and troublesome for inexperienced users, or are subject to numerous other disadvantages.

The present invention provides a simple, inexpensive one-piece fitting which overcomes each of the above-mentioned shortcomings of prior clamps. Moreover, the present clamp is self-acting in that it is so designed as to expand automatically to grip the filter neck as soon as the filter is placed thereon. Yet the filter is released instantly upon a slight distortion of the clamp.

Accordingly, it is an object of the invention to provide a suction cleaner with a new filter mounting assembly characterized by its simplicity, high effectiveness, low cost, ease of operation, and greatly improved utility.

Another object is to provide a combined sound muffler and self-acting clamp which is unusually compact and effective.

A further object is the provision of a self-acting clamp having a plurality of resilient gripping areas which grip a paper filter firmly without over-stressing the paper so as to rupture it.

Still another object is the provision of a self-acting clamp which is self-adjusting to accommodate filter necks having a relatively wide range of tolerances.

Yet another object is the provision of a filter mounting in which the clamp provides a pilot for guiding the filter neck into place and which is easily collapsed for placement or removal of the filter.

A still further object is the provision of a clamp

2

which provides a floating, resilient connection between the filter and the exhaust conduit from the cleaner.

These and other objects will become apparent from the following specification and attached drawings in which:

Figure 1 is a vertical sectional view of a suction cleaner incorporating the invention, and

Figure 2 is an enlarged sectional view through the combined filter clamp and sound muffler.

Referring to the drawings, a suction cleaner is disclosed having a nozzle 10 connected by an air passageway 11 to a fan chamber 12 housing a suction creating fan 13. Surmounting the fan chamber 12 is an electric motor concealed by a removable motor hood 16. A rotary agitator 14 mounted lengthwise of nozzle 10 is connected to motor shaft 17 by belt 15. The fan chamber is provided with an exhaust outlet 18 formed with a vertically extending flange 19 to which a combined filter mounting assembly and muffler is removably secured by a pair of thumb nuts 20. The cleaner body is movably supported on front and rear wheels 21 and 22, respectively, and, as is customary, the lower end of propelling handle 23' is pivoted to the rear upper side of the cleaner body.

The combined filter mounting and muffler assembly is best illustrated in Figure 2. A short, upwardly inclined conduit 23 has a flanged lower rim 24 which seats against flange 19 of the exhaust outlet and is held in place by thumb nuts 20. This conduit communicates with the cleaner exhaust passageway 18. A sheet metal conduit 25 has a neck 26 which telescopes over the end of conduit 23 and is detachably secured thereto as by bayonet connectors 27—27. A relatively thick cylinder 28 of sound absorbing material such as sponge rubber is positioned against the interior wall of conduit 25. The sound absorbing material is conveniently held in place by the inturned upper edge 29 of conduit 25.

The automatic self-clamping bag ring 30 is made of rubber, a suitable plastic, or the like, and is molded in the shape of a bellows having the general configuration shown in the drawing. The upper end of the bellows has an inwardly extending flanged rib 31 which seats firmly in a channel 32 formed in the upper end of conduit 25. Rib 31 may be cemented or otherwise secured to the conduit although this has been found to be quite unnecessary in practice. The annularly extending ridges 33 of the bellows are approximately of the same diameter which is somewhat in excess of the inner diameter of the

filter bag neck to be used with the clamp. It will be noted that the bottoms of the valleys between ridges **33** are all spaced substantially from the outer wall of conduit **25** and this is true even when the filter is in place. The lowermost rib **34** of the bellows is of greater diameter than the others and serves as a stop for the lower edge of the filter neck, preferably, the upper side of ring **34** is provided with a rounded abutment **35** which mates with a correspondingly shaped cutout in the upper side of the filter neck. Abutment **35** may be termed a locator since it serves as a guide to the operator in inserting the filter in the proper position upon the clamp and thereafter as an interlock to prevent relative rotation between the filter and clamp. The lowermost rim **36** of the bellows is here shown as closely contacting tube **25** although, as will be readily appreciated, this is not necessary and rim **36** may be spaced from tube **25** similarly to the spacing of the bellows valleys from tube **25**.

As is characteristic of bellows, extension of the same longitudinally results in a reduction in the diameter of the ridges **33**. Accordingly, conveniently operable means is provided for extending the bellows to facilitate assembly or removal of the filter. As here shown, this means comprises a wire ring **37** surrounding the lower end of conduit **25**. The upper side of this ring is pivotally connected to conduit **25** by hinge **38**. A tab **39** is secured to the under side of the conduit at a point spaced somewhat from the side of ring **37**. Intermediate portions of ring **37** are connected to the sides of the bellows as at **40**.

Referring to Figure 1 it will be seen that a paper filter **41** having a reduced neck portion **42** is telescoped over the three uppermost ridges **33** of the bellows clamp. Its lower edge abuts the upper side of ring **34**. Also, the notch in the upper side of the neck fits about locater **35** on the top side of ring **34**. The filter may be provided with a self-closing paper valve **43** to prevent dirt from falling back into the cleaner during removal of the filter or storage of the cleaner. The filter, as well as the mounting assembly, is preferably enclosed by a fabric appearance envelope **44**, the lower end of which is clamped to flange **24**. Access to the mounting and the filter may be had by a hookless fastener **45** extending along the lower side of the appearance bag.

Operation

Let us assume that the filter mounting is attached to the cleaner as illustrated in Figure 2. To place the filter, the operator grasps the neck of the filter in the right hand while holding ring **37** pressed against tab **39** by the thumb and forefinger of the left hand. This action extends the bellows along tube **25** considerably reducing the diameter of ridges **33**. This enables the operator to slide the filter neck over the bellows very freely. This assembly is greatly facilitated by the inclined forward side of the uppermost ring of the bellows. This inclined surface acts as a pilot to expand and guide the neck onto the bellows. When the lower edge of the filter is in contact with the lowermost ring **34** the operator merely releases his grip on ring **37** thereby allowing the bellows to return toward its normal expanded condition. As it does so, ridges **33** grip the interior surface of the neck very firmly and in an airtight manner. Any force, such as the air pressure within the filter bag, tending to withdraw the filter causes the ridges **33** to expand still further greatly increasing the grip and seal on the filter. In fact, so firm is the grip that it is necessary to manually distort the bellows in some manner such as by means of the ring **37** and finger piece **39** before the filter can be removed. After the filter has been placed, the appearance bag is closed and the cleaner is ready for operation.

The considerable noise created by the operating of the fan and the flow of air through the tortuous passage is largely absorbed by muffler **28** as the air stream passes through the discharge conduit into the filter. The sound absorption is further enhanced by the rubber bellows surrounding the muffler and forming air pockets having inclined sides. The wall of the bellows itself, its inclined sides, and the air pockets all cooperate with the muffler in absorbing audible sound waves created by the cleaner.

Of considerable importance is the fact that the self-acting filter clamp is spaced from the wall of conduit **25** and is connected thereto only through the thin resilient web which also serves as a pilot for the filter in the assembly operation. It will therefore be understood that the filter can be moved through a considerable angle during pivotal movement of the cleaner handle without flexing the side walls of the filter. Instead, flexure occurs in the thin resilient web of the filter clamp. This feature alone greatly extends the life of the paper filter.

When it is desired to remove the filter it is merely necessary to open closure **45**, depress ring **37** to distort the walls of the bellows thereby releasing the grip on the filter, and withdraw the filter. Replacement of a fresh filter is accomplished in the manner previousily described. If preferred, conduit **25** carrying the muffler and self-acting clamp may be detached from conduit **23** and carried to a point of dirt disposal before the filter bag is removed or another one is applied to the mounting. All that is necessary is to detach conduit **25** from conduit **23** as permitted by the bayonet connection **27**. Removal or replacement of the filter is then accomplished in the same manner as described above.

While I have shown and described but a single modification of my invention, it is to be understood that this modification is to be taken as illustrative only and not in a limiting sense. I do not wish to be limited to the particular structures shown and described, but to include all equivalent variations thereof except as limited by the scope of the claims.

What I claim is:

1. A bag unit for a suction cleaner of the type having an ambulatory body formed with a nozzle and an exhaust outlet and suction-creating means to draw air into said nozzle and to exhaust it from said outlet; comprising a bag-mounting assembly including bag-seating means, a resilient bellows comprising a plurality of collapsible annular rings of substantially the same size and an additional larger ring mounted on the bag-seating means forming bag locating means, a dirt-filtering bag including a reduced inlet neck and an enlarged body provided with expansible pleats, an integrally formed locator on the enlarged annular ring adapted to locate the pleats of the dirt-filtering bag, said inlet neck of the dirt-filtering bag adapted to be positioned on the aforesaid annular resilient rings whereby the dirt-filtering bag is affixed and sealed thereto, the enlarged annular ring providing a stop to position and locate the dirt-filtering bag, said annular rubber rings of the bellows

permitting the mounting of the dirt-filtering bag thereon but preventing the withdrawal thereof, and means formed on the bellows adapted to distort the bellows permitting the attachment and detachment of the dirt-filtering bag upon the annular ridges thereof.

2. As an article of manufacture, a bag-mounting assembly adapted to be detachably connected to the exhaust outlet of a suction cleaner comprising a conduit forming an extension of said exhaust outlet, a sound absorbing muffler detachably connected to said conduit, a resilient bellows surrounding the sound absorbing muffler and having one end affixed thereto and the other end free to slide longitudinally with respect to the muffler, means on the bellows to locate and position a filter thereon, and means connected to the bellows for moving the bellows longitudinally with respect to the muffler to distort the same to facilitate the placement or removal of a filter.

3. A filter mounting assembly for a suction cleaner of the type having an ambulatory body formed with a nozzle and an exhaust outlet and suction creating means to draw air into said nozzle and to exhaust it from said outlet; said assembly comprising a conduit adapted to be secured to the exhaust outlet, a self-acting clamping means for the neck of a filter secured to said conduit, said self-acting clamping means comprising resilient tubular means having a normal perimeter in excess of a filter opening, said resilient means being axially extendable to permit telescopic placement of a filter thereover and being operable thereafter to expand automatically against the walls of the filter opening and prevent withdrawal of the filter.

4. A filter mounting assembly for a suction cleaner of the type having an ambulatory body formed with a nozzle and an exhaust outlet and suction creating means to draw air into said nozzle and to exhaust it from said outlet; said assembly comprising a conduit adapted to be secured to the exhaust outlet, self-acting clamping means for a filter secured to said conduit, said clamping means comprising resilient tubular means having a normal perimeter in excess of a filter opening so as to engage the inner peripheral surface thereof automatically and in airtight manner when the neck is telescoped thereover, and means for distorting said clamp to release the filter so that it may be removed for cleaning or replacement.

5. A bag unit for a suction cleaner of the type having an ambulatory body formed with a nozzle and an exhaust outlet and suction creating means to draw air into said nozzle and to exhaust it from said outlet; comprising a filter mounting assembly adapted to be secured to said exhaust outlet, a self-acting clamp for a filter, said clamping means comprising resilient tubular means surrounding and carried by said outlet, said clamp being formed to contract when extended axially to permit placement of a filter neck thereover and thereafter to expand automatically gripping the inner surface of the filter to prevent withdrawal of the filter as said clamp tends to return to its initial unextended position.

6. A bag unit for a suction cleaner of the type having an ambulatory body formed with a nozzle and exhaust outlet and suction creating means to draw air into said nozzle and to exhaust it from said outlet; comprising a filter mounting assembly adapted to be secured to said exhaust outlet and including a self-acting clamp for a filter, said self-acting clamp comprising a bellows having one end secured to said exhaust outlet and its other end free to move axially of said outlet whereby said bellows can be contracted by extending its free end to permit placement of a filter thereover but expands under its inherent resiliency to grip the filter firmly and in an airtight manner when the free end is released.

7. A bag unit for a suction cleaner of the type having an ambulatory body formed with a nozzle and exhaust outlet and suction creating means to draw air into said nozzle and to exhaust it from said outlet; comprising a filter mounting assembly including a self-acting clamp for a filter, a resilient tubular, axially movable bellows mounted on said exhaust outlet, said bellows being free to contract to permit the insertion thereover of a filter neck and thereafter to expand to grip said neck firmly and in an airtight manner.

8. A filter mounting assembly for the filter of a suction cleaner comprising a resilient tubular bellows, a rigid support within and secured to said bellows at the discharged end thereof, said bellows being extendable axially so as to contract when a filter neck is inserted thereover and thereafter to expand under its own inherent resiliency gripping said neck thereby preventing withdrawal of the filter therefrom, and means for distorting said bellows to release said filter for cleaning or replacement.

9. A filter mounting assembly for a suction cleaner comprising a rigid tubular member, a resilient tubular bellows surrounding said rigid member and secured thereto at the outer end thereof, said bellows constituting a self-acting clamp which contracts to receive a filter neck when extended axially and which expands automatically to grip the filter under its own resiliency when released from said extended position.

10. A bag mounting assembly comprising a conduit adapted to be connected to the exhaust outlet of a suction cleaner, a self-acting bag clamping means carried by said conduit comprising a resilient bellows the outer annular ridges of which have a free diameter somewhat greater than that of a bag mouth whereby the annular ridges expand to grip the bag mouth after the bag has been inserted over said bellows, and means to distort said bellows when placing the bag on or removing the bag from said bellows.

11. A filter mounting assembly for connection to the exhaust passage of a suction cleaner comprising a rigid tubular member, means forming an expanding self-clamping support adapted to seal against the internal wall of a filter inlet to support the same in an airtight manner, said self-clamping means having a normal diameter somewhat greater than the interior diameter of a filter inlet and resilient means interconnecting said filter support and tubular member in an airtight manner while permitting limited relative movement between said member and said filter support whereby the diameter of said clamping means can be reduced to permit a filter inlet to be telescoped thereover.

12. A filter mounting assembly as recited in claim 11 including manually operable means for contracting said expanding clamp to release its grip on a filter assembled thereon.

13. A filter mounting assembly for a suction cleaner comprising a conduit adapted to communicate with the exhaust passage of a suction cleaner, means surrounding said conduit for sup-

porting and clamping the inlet end of a filter, and resilient means interconnecting said conduit and said first mentioned means in an airtight manner at one circumferential area thereof whereby the remainder of said filter supporting and clamping means is freely movable with respect to said conduit.

14. A filter mounting assembly as defined in claim 13 in which a portion of said filter clamping means spaced from said resilient means interconnecting said filter supporting means and said conduit flares to form a pilot to aid in guiding the filter inlet onto said supporting means in the placement of a filter on said assembly.

15. A filter mounting assembly for a suction cleaner of the type having an ambulatory body formed with a nozzle and an exhaust outlet and suction-creating means to draw air into said nozzle and to exhaust it from said outlet; said assembly including a tubular member and a muffler mounted therewithin, means for detachably mounting said assembly on the exhaust outlet of the suction cleaner, a filter having an inlet neck, a resilient bellows having its upper end secured to said tubular member and having its other end free to move longitudinally with respect to the muffler, said bellows forming a seal and self-acting clamp for said filter, said bellows permitting the mounting of the filter thereover but preventing the withdrawal of the filter therefrom, and means at the free end of the bellows for distorting the bellows to release the filter.

16. A filter mounting assembly for a suction cleaner of the type having an ambulatory body formed with a nozzle and an exhaust outlet and suction-creating means to draw air into said nozzle and to exhaust it from said outlet; said assembly including a tubular member and a muffler, a filter having an inlet neck and a body, a self-

acting clamping and sealing means having one end secured to said tubular member and its other end free to move axially, said clamping and sealing means including a resilient bellows-like section adapted to receive and grip the inner periphery of said filter neck, said bellows-like section being adapted to permit the mounting of the filter thereon but to prevent the withdrawal of the filter therefrom, and means connected to said clamp operable to distort the same to permit placement or removal of said filter means.

17. The combination with a suction cleaner having an exhaust outlet, of a filter mounting assembly detachably connected to the exhaust outlet, said assembly including a detachable sound absorbing muffler, a bag-seating and clamping means surrounding said muffler, said clamping means comprising an expansible-contractible bellows having a plurality of annular ridges, means on one of said ridges for locating and positioning a filter on said bellows, and means for distorting said annular ridges whereby the filter may be attached to and detached therefrom.

QUENTIN BERG.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,047,735	Hunsdorf	July 14, 1936
2,295,981	White	Sept. 15, 1942
2,328,236	Stoner	Aug. 31, 1943

FOREIGN PATENTS

Number	Country	Date
387,245	Great Britain	Feb. 2, 1933