Aug. 19, 1941. D. G. SMELLIE 2,253,310

SUCTION CLEANER

Filed Dec. 14, 1938 2 Sheets-Sheet 1

Fig. 1

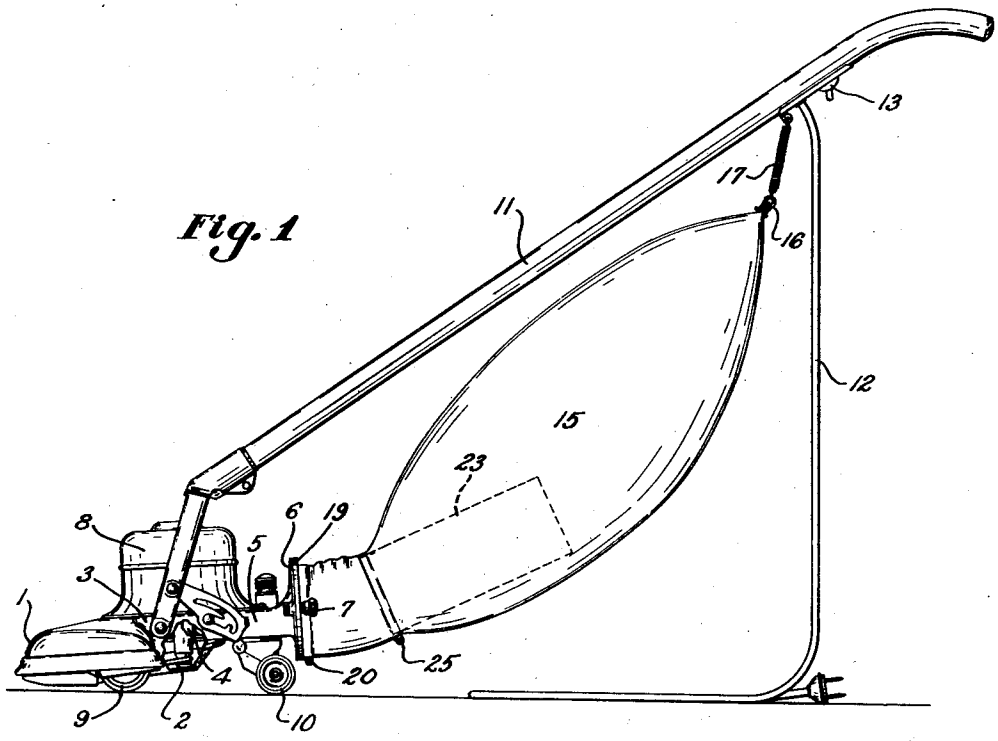
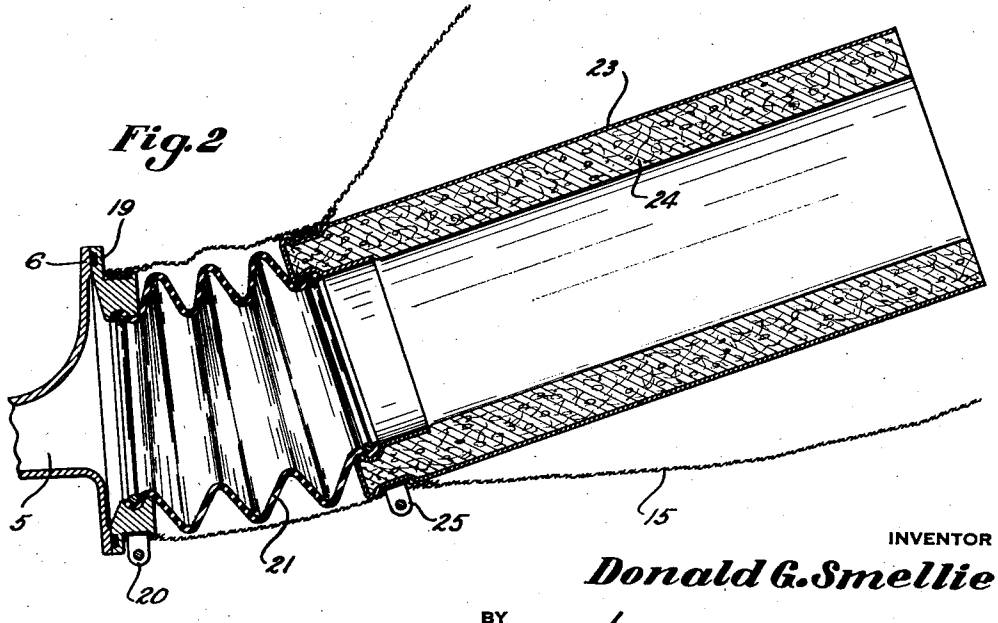


Fig. 2



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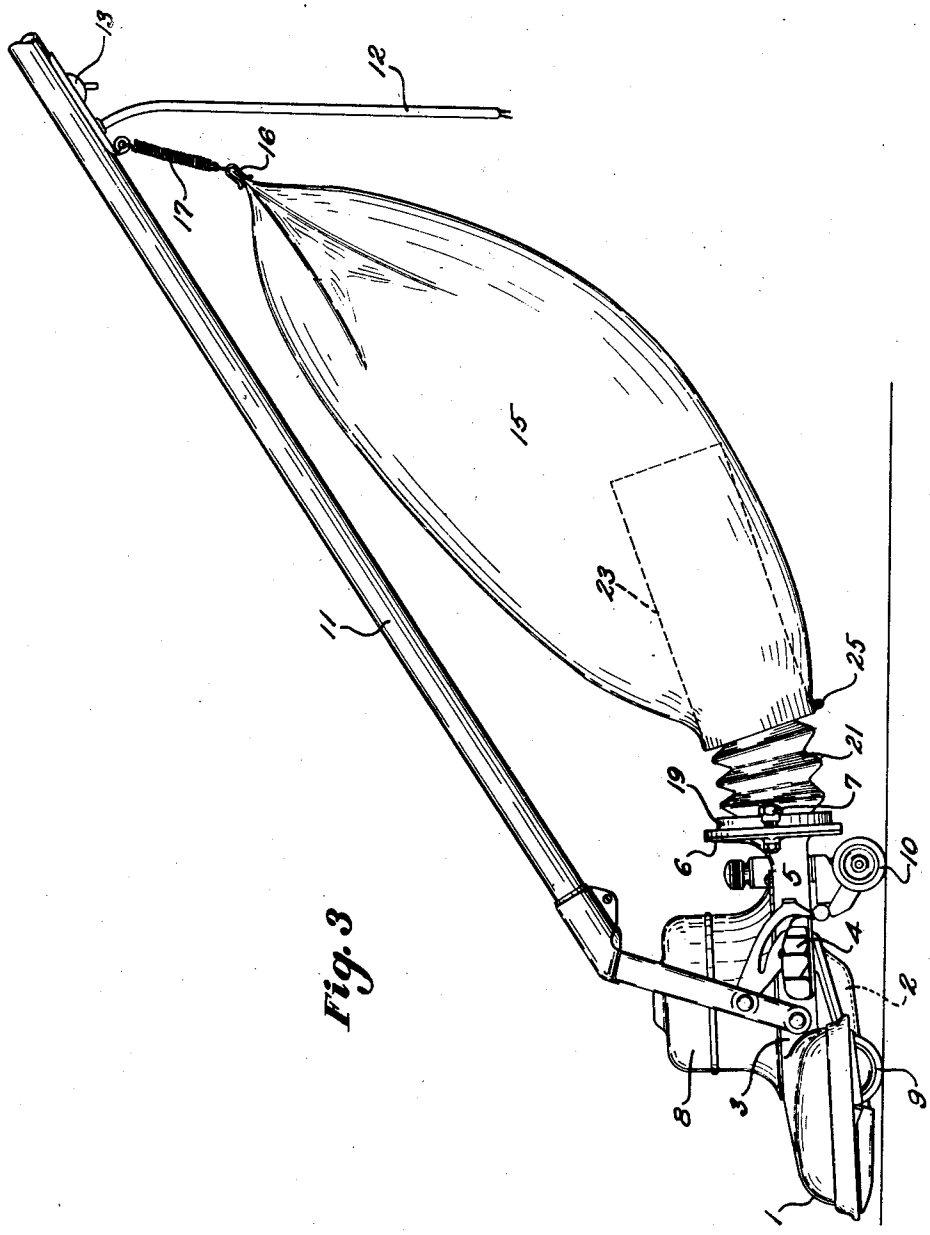


Fig. 3

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SUCTION CLEANER

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13 Claims. (Cl. 15—16)

The present invention relates to suction cleaners in general and more particularly to a suction cleaner which is characterized by its quietness of operation. More specifically the invention comprises an improved suction cleaner construction in which the air passageways, and particularly the exhaust passageways, are constructed and related in a novel manner which results in a reduction in the noise of cleaner operation.

It is an object of the present invention to provide a new and improved suction cleaner. It is another object of the invention to provide a new and improved air passageway in a suction cleaner. A further object of the invention is to provide a new and novel bag and air passageway unit in a suction cleaner. A further object of the invention is to provide a suction cleaner in which the exhaust air passageway extends upwardly into the cleaner bag and is resiliently mounted by a flexible bellows. A still further object of the invention is to provide a removable bag unit in which an air passageway element comprising a metallic sleeve and a sound-absorbing material is positioned within the bag and is resiliently connected to the bag ring by a flexible accordion-like element. These and other more specific objects of the invention will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawings to which they relate.

Referring now to the drawings in which preferred embodiments of the present invention are disclosed:

Figure 1 is a side view of a suction cleaner constructed in accordance with the present invention;

Figure 2 is a section through the bag and air passageway unit at their point of connection to the cleaner body;

Figure 3 is a side view of the cleaner constructed in accordance with the second preferred embodiment of the invention.

In cleaner operation a large part of the resulting noise is carried from the cleaner by the high velocity air stream which is exhausted into the filter bag. The use of sound-absorbing means to quiet the noise of cleaner operation and to absorb the sound vibrations in the exhausted air stream has heretofore received attention in the suction cleaner field. The resulting constructions, however, have been open to severe criticism in many respects and in the present design a construction has been provided which has advantages not heretofore present. It has been found that the noise-creating vibrations can be reduced and minimized by passing the air stream through sound-absorbing material such as sponge rubber or wood fiber. It has also been found that such sound-absorbing material requires a reinforcing construction and must usually be of a length which requires its extension into the cleaner dust bag. In the usual cleaner construction the cleaner handle is pivoted to permit the operator to exert a propelling force with the cleaner at various distances from its body. This movement of the cleaner causes the handle to pivot and, the cleaner bag which is attached at its upper end to the handle, has its angularity changed relative to the cleaner body. The lower end of the cleaner bag is attached to the cleaner body and being of flexible material the relative movement is permissible. With a sound-absorbing unit protruding into the cleaner bag, however, which unit includes a rigid member which will not bend or flex freely, means must be provided to accommodate this relative movement of the cleaner bag relative to the cleaner casing. In the cleaner constructed in accordance with the present invention the cleaner bag and the sound-absorbing element are formed as a unit which is attachable to and removable from the cleaner casing as such, which unit embodies a resilient bendable connection between the bag ring or collar and the sound-absorbing means.

Referring again to the drawings, and to Figures 1 and 2 in particular in which the first embodiment of the invention is disclosed, a modern suction cleaner is illustrated which is seen to comprise a cleaner including a nozzle 1 which is interiorly connected in a common and well known manner by an air passageway 2 to a fan chamber 3 in which is positioned the suction-creating fan 4. A rearwardly extending exhaust passageway 5 from the fan chamber 3 is formed at its rear end with a flange 6 which carries on each side a bag-clamping nut 7. The cleaner casing also includes a motor casing 8 which is positioned directly above the fan chamber 3 and houses an unshown driving motor for the suction-creating fan 4. The cleaner body is movably supported by front and rear wheels 9 and 10, and, as in the usual cleaner, a pivoted handle 11 is provided to which the incoming current conductor 12 connects and through which the operator can exert a cleaner-propelling force. A current-controlling switch 13 is provided on the handle near the upper end thereof by which the operator can control the flow of current to the driving motor and so the operation of the machine.

The bag - and - sound - absorbing - passageway unit, or bag-and-muffler-unit, which comprises the present invention, is removably attached to the cleaner. It is seen to comprise a filter or dust bag 15 the open upper end of which is normally closed by a channel member 16 which is itself carried from the upper end of the handle by a coil spring 17. At its lower or inlet end the bag is removably secured to the flange 6 at the rear of exhaust outlet 5 by means of a bag ring or collar 19 which is secured by manually operable clamping nuts 7. A surrounding simple clamp 20 secures the bag to the collar. Extending outwardly from the bag collar 19 is a flexible, bendable accordion-like rubber tube 21 which is sufficiently strong to prevent appreciable change in its cross sectional area when flexed or bent. To the outer end of tube 21 is secured a sound-absorbing passageway or muffler unit comprising a cylindrical metallic sleeve 23 which is lined with a sound-absorbing material 24 of sponge rubber, wood fiber or similar sound-absorption material. The inner end of sleeve 23 is doubled back upon itself to clamp the lining 24 in place. The dust bag 15 is also secured to the outer end of the tube 21 by a second clamp 25, similar to the clamp 20, which encircles the bag adjacent the outer end of the tube 21 and clamps therebetween the inner end of the sleeve 23.

Referring now to Figure 3 of the drawings in particular the second preferred embodiment of the invention is illustrated and conforms in all particulars to the first embodiment with the exception that the filter bag does not extend forwardly over the accordion-like tube 21 and is instead connected to its collar 19 through the tube. The functional relationship is the same in the two embodiments.

In the operation of the suction cleaner embodying the present invention as the cleaner is propelled over the floor in the operation, the suction-creating fan draws cleaning air through the cleaner nozzle in contact with the surface covering undergoing cleaning, which air removes foreign material from the covering. The foreign-material-laden air is then drawn through the cleaner and exhausted by the fan from the exhaust outlet 5 into the bag unit. The air traverses the bag collar, the accordion-like tube, the sound-absorbing passageway or muffler unit and enters the bag. In the bag the suspended foreign material is removed and the air itself escapes into the surrounding atmosphere. In passing through the muffler unit the vibrations in the air stream are eliminated by the operation of the sound-absorbing material 24 against which the sound waves in the air have impinged.

The pivotal movement of the handle as the cleaner is moved to and from upon the covering causes the bag to be flexed, particularly at its lower end where it connects to the cleaner body. As previously stated the flexure of the bag itself is entirely permissible for the bag is made of a fabric but the presence of a relatively long sound-absorbing passageway or muffler unit requires the flexible mounting thereof. As the bag is flexed and pulled upwardly the accordion-like element 21 is also bent, the pleats at the upper end compressing somewhat and those at the lower side becoming extended or expanded, all without appreciable variation in the cross sectional area of the tube. This bending movement of the bellows results partially from a lifting force exerted upon the air passageway element itself by the lower side of the bag. In both embodiments of Figures 2 and 3, however, the functional relationship is the same, the accordion-like tube functioning to permit the muffler unit to adjust its angular position to conform, so far as is necessary, to the position of the enclosing bag.

I claim:

1. In a suction cleaner, a nozzle, an exhaust outlet, suction-creating means to draw air through said nozzle and expel it through said outlet, a filter bag connected to said outlet, sound-absorbing means in said bag, and an accordion-like rubber tube flexibly mounting said sound-absorbing means in said bag.

2. In a suction cleaner, a nozzle, an exhaust outlet, suction-creating means to draw air through said nozzle and expel it through said outlet, a filter bag, a ring detachably connecting said bag to said outlet, sound-absorbing means comprising sound-absorbing material in said bag, and an accordion-like rubber tube connecting said sound-absorbing means to said ring.

3. In a suction cleaner, a nozzle, an exhaust outlet, suction-creating means to draw air through said nozzle and expel it through said outlet, a filter bag connected to the exhaust outlet, sound-absorbing means including a rigid metallic element and sound-absorbing material positioned in said bag, and a rubber accordion-like tube connected between said metallic element and the exhaust outlet.

4. A removable filter bag and sound-absorbing air passageway unit, comprising a filter bag having an inlet opening, a mounting collar at the inlet end of said bag adapted to be secured to the port of a suction cleaner, a sound-absorbing air passageway in said bag, and a flexible accordion-like rubber tube between said passageway and said collar.

5. A removable dust bag and sound-absorbing air passageway unit, comprising a dust bag having inlet and outlet openings, a securing collar for said inlet opening adapted to mount said bag on a port of a suction cleaner, a sound-absorbing air passageway including sound-absorbing material and a form-retaining metallic sleeve positioned in said bag and open to the inlet thereof, and an accordion-like rubber tube connecting said passageway to said collar.

6. In a suction cleaner, a nozzle, an exhaust outlet, suction-creating means to draw air through said nozzle and expel it through said outlet, a filter bag connected to said outlet, sound-absorbing means in said bag, and an accordion-like rubber tube adapted to flex without alteration in its effective cross-sectional area mounting said sound-absorbing means in said bag.

7. A muffler structure, comprising an acoustic absorption material, for the dust bag of a vacuum cleaner including a flexible tube connection between the muffler elements and the dust bag collar, said flexible tube connection having means to prevent any alteration in the effective interior cross-sectional area of the tube when such tube is bent.

8. In a vacuum cleaner, an ambulant frame, electric motor, suction fan, suction nozzle and a dust bag, said dust bag having a muffler structure comprising an acoustic absorption material, flexibly mounted therein by means of an accordion-like rubber tube.

9. A vacuum cleaner having an ambulant frame, electric motor, suction fan, suction nozzle and a dust bag, a muffler structure, comprising

an acoustic absorption material, mounted in said dust bag, and a flexible connection, in the form of a bellows structure, between said muffler and dust bag inlet.

10. A bag and muffler construction for a vacuum cleaner of the type including an ambulant frame, an electric motor, a suction nozzle, and an exhaust outlet; said construction comprising a bag, a muffler structure including acoustic absorption material positioned in said bag, and means to connect said bag and muffler to the exhaust outlet of the cleaner including an accordion-like rubber tube flexibly supporting said muffler.

11. In a suction cleaner, an ambulant body, a propelling handle pivotally connected thereto, a suction nozzle, suction-creating means connected thereto, an exhaust outlet to convey dirt-laden air from said means, a dirt-filtering bag to receive air from said outlet supported at its upper end by said handle, a muffler structure including an acoustic absorption material positioned within said bag, and means to connect interiorly said bag and muffler to said exhaust outlet to receive air therefrom including a flexible connection in the form of a bellows structure movably supporting said muffler whereby said muffler may be displaced readily by a force transmitted through the bag from the handle in pivoting.

12. In a suction cleaner of the type having an ambulant body, a propelling handle pivotally connected thereto, a suction nozzle, suction-creating means connected thereto, an exhaust outlet to convey dirt-laden air from said means; a cylindrical muffler structure including rigid supporting means and acoustic absorption material, a flexible connection in the form of a bellows structure between said muffler structure and said exhaust outlet whereby said muffler structure is angularly displaceable, and a dust bag enclosing said muffler, interiorly connected thereto and supported at its upper end by said handle.

13. In a vacuum cleaner, an ambulant frame, electric motor, suction fan, suction nozzle and a dust bag, a muffler structure, comprising an acoustic absorption material, mounted in said dust bag, and a flexible connection, in the form of a bellows structure, between said muffler and dust bag inlet.

DONALD G. SMELLIE.