Jan. 27, 1953 G. M. KELLY ET AL 2,626,418

NOZZLE CASING FOR BROOM-TYPE VACUUM CLEANERS

Filed Sept. 10, 1948 2 SHEETS—SHEET 1

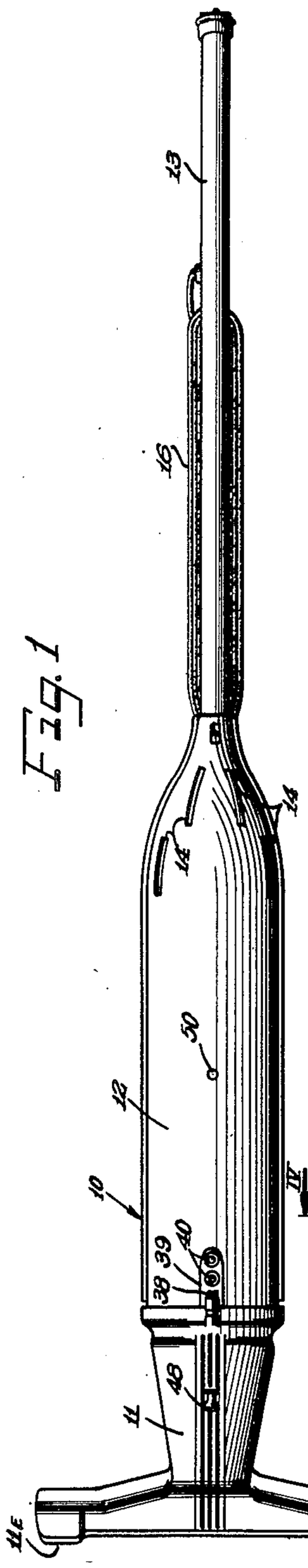

Fig. 1

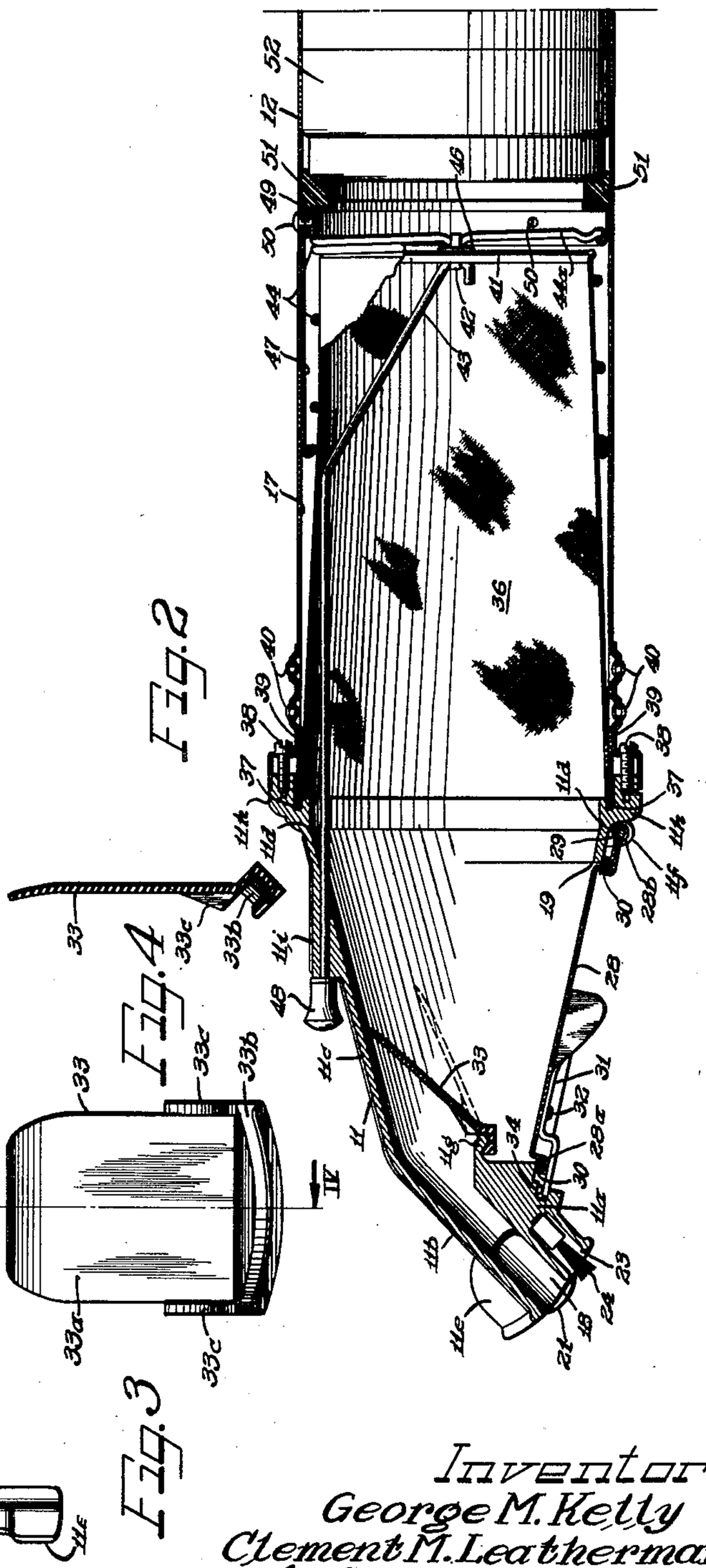

Fig. 2

Fig. 4

Fig. 3

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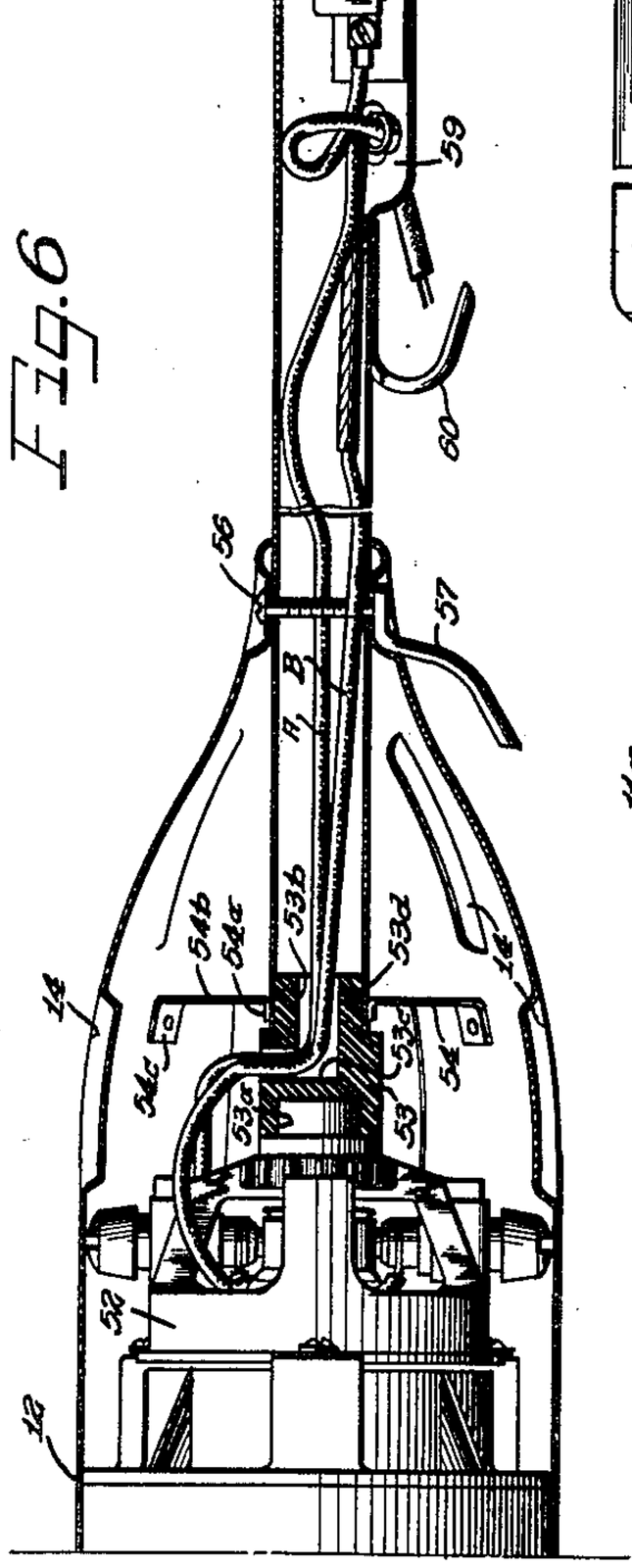

Fig. 6

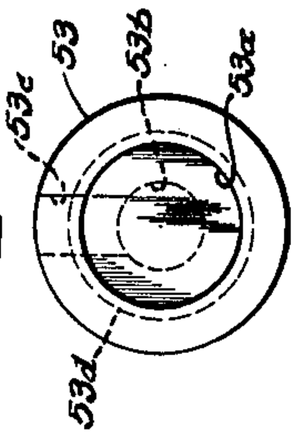

Fig. 7

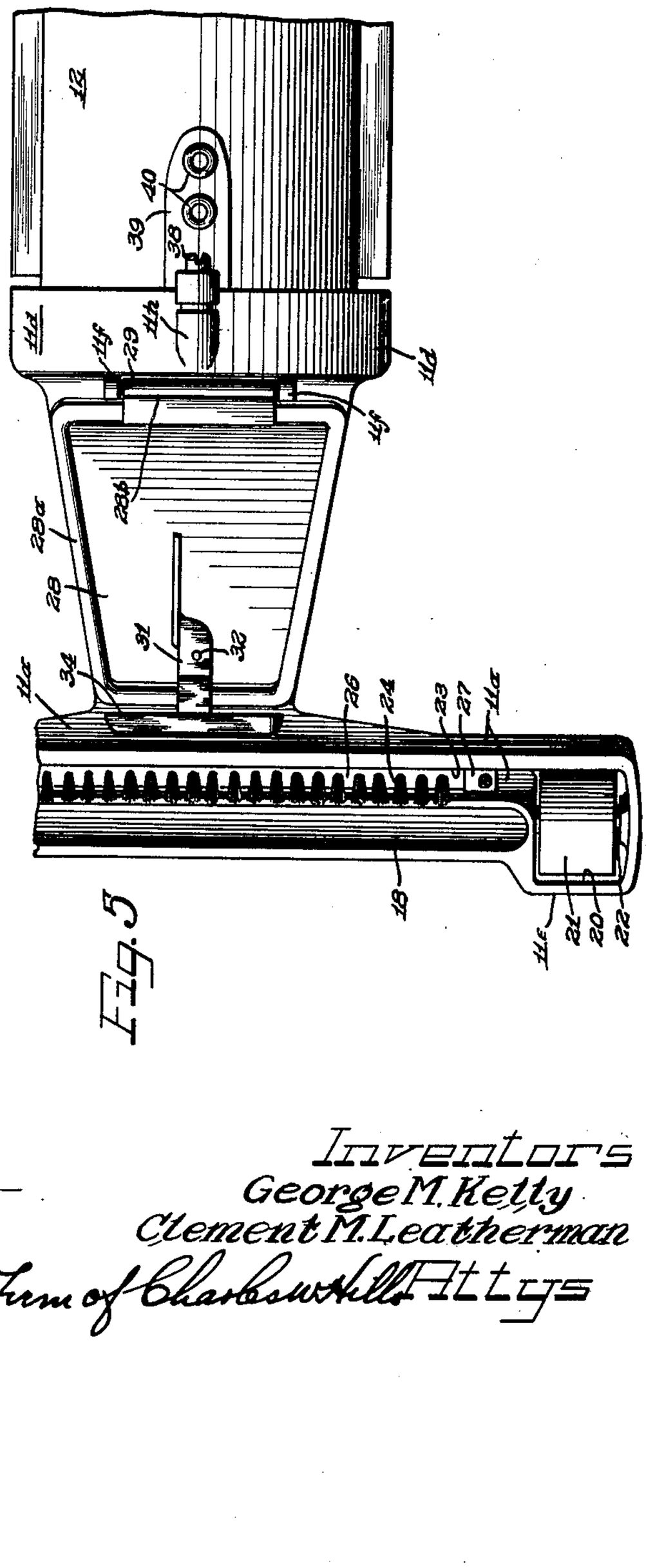

Fig. 5

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NOZZLE CASING FOR BROOM-TYPE VACUUM CLEANERS

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4 Claims. (Cl. 15—352)

1

This invention relates to vacuum cleaners, and more particularly, to an improved construction which permits the manufacture of a rigid "broom-type" vacuum cleaner which is greatly improved with respect to appearance and operation and which affords substantial reductions in cost over constructions heretofore known in the art.

Inasmuch as vacuum cleaners of the rigid broom-type formed by a coaxial unit structure have long been known in the patented art both in the United States and foreign countries, this invention necessarily relates to structural features of such vacuum cleaners which simplify the procedures of fabrication, reduce the cost of manufacture, enhance the aesthetic appearance and facilitate the efficient operation of a portable vacuum cleaner machine.

Accordingly, it is an object of this invention to provide an improved vacuum cleaner of the so-called rigid broom-type.

A further object of this invention is to provide a novel and improved nozzle casing fabricated from a single-piece casting characterized by having formed therein a dirt-removal opening and an air inlet duct communicating with one another as controlled by a flexible flapper valve or partition.

Another object of this invention is to provide an improved partition for preventing the inadvertent spilling of debris from the dirt-collection chamber upon cessation of sweeping operations.

Another object of this invention is to provide an improved means for selectively partitioning the nozzle casing inlet duct and the dirt-collection chamber by means of a flexible flapper member which does not collect lint or dust and which has a smooth surface not conducive to the adherence of foreign particles.

A further object of this invention is to provide a one-piece nozzle casing with a dirt-removal opening formed therein for cooperation with a door whereby the accumulated contents of the dirt-collection chamber may be speedily and efficiently removed.

Yet another object of this invention is to provide improved means for purging a dirt-laden collapsible fabric receptacle of accumulated dirt by means of a reciprocating spring-biased mechanism.

The specific nature of the invention, as well as other objects and advantages thereof, will become apparent to those skilled in the art from the following detailed description of the annexed

2

drawings which, by way of preferred example only, illustrate one specific embodiment of the invention.

On the drawings:

Figure 1 is an elevation view of a rigid broom-type vacuum cleaner embodying the features of my invention;

Figure 2 is an enlarged cross-sectional view with parts in elevation showing the structural details of the nozzle casing and dirt-collecting chamber of the cleaner;

Figure 3 is a fragmentary detail showing a preferred embodiment of my new improved flapper partition;

Figure 4 is a cross-sectional view taken on the lines IV—IV of Figure 3;

Figure 5 is an enlarged bottom plan view showing the structural features of the nozzle casing;

Figure 6 is a cross-sectional view showing the structural details of my improved bushing for mounting the motor suction unit and the operator's handle; and

Figure 7 is an end view of the bushing mounting.

As shown on the drawings:

Referring to Figure 1, a rigid broom-type vacuum cleaner is indicated at 10 comprising a nozzle casing 11, a body casing 12, and an operator's handle 13. The cleaner is equipped with an electrically powered motor suction unit housed in one end of body casing 12 and operates in a conventional manner well known in the art to induce an upward draft of dust-laden air through nozzle casing 11 into body casing 12 where the air is filtered in accordance with a procedure to be described and then discharged outwardly of the body casing 12 through a plurality of discharge slots 14. Electrical energy is conveyed to cleaner 10 from conventional electrical outlets by a conductor 16 which may be appropriately coiled as shown in Figure 1 when the cleaner 10 is not in use.

Referring now to Figure 2, a portion of cleaner 10 is shown in section as comprising nozzle casing 11 and a dirt-collecting chamber 17 located in one end of body casing 12.

The nozzle casing 11 is preferably fabricated of suitable light-weight metal by forming a single casting. The mold for such a casting is designed so that the completed nozzle casing 11 defines an inlet duct 18 which is bounded on its underside by a shaped shoulder portion 11*a* and on its upper side by an inclined wall portion 11*b*. Shoulder portion 11*a* and wall 11*b* are situated at the throat of a convergent portion of the nozzle cas-

ing which roughly corresponds to the configuration described by an obelisk or a frustrum of a rectangular pyramid. Using the planes of reference of Figures 1 and 2, the inclined wall 11*b* merges in a roof 11*c* which terminates in an annular circumferential flange 11*d*. The bottom of the convergent obelisk section of nozzle casing 11 opposite the roof 11*c* defines a dirt-removal opening 19 which is bounded on the edge corresponding to the base of the obelisk by a rounded wall leading into annular circumferential flange 11*d*.

As may be seen in Figures 1 and 5, the nozzle casing 11 extends in transverse symmetry from the longitudinal axis of the cleaner and defines substantially a T-shape. Inlet duct 18 likewise extends outwardly on a transverse axis and is terminated at both ends by a pair of enlarged portions as at 11*e* having formed therein a pair of housings 20 for a pair of wheels 21 mounted on a pair of pin axles 22 suitably located in offsets formed in enlarged portions 11*e* so that the wheels 21 will support the cleaner and place the air inlet duct 18 a predetermined distance from a surface to be cleaned.

Formed within the shoulder 11*a* and lying adjacent the inlet duct 18 is a transverse rectangular shaped notch 23 for receiving a tufted brush 24 of a type well known in the art consisting of a body 26 mounted in the nozzle casing 11 by a conventional leaf-type spring mounting 27 so as to normally bias the brush 24 against the surface to be cleaned. Thus, any lint, thread, or other foreign particles adhering to a rug surface, for example, will be engaged by the brush 24 and subsequently drawn through the air inlet duct 18 by the flow of air therethrough.

Positioned on the underside of the nozzle casing 11 for cooperation with the dirt-removal opening 19 is a door 28 (Figures 2 and 5) made of metal in sheet or plate form and suitably shaped to define a dish-like configuration. The door has a peripheral flange 28*a* and is extended at one end to define a door hinge 28*b* for receiving an axle pin 29 about which the door 28 pivots. The pin 29 is positioned and supported on the underside of the nozzle casing 11 by a pair of lugs 11*f* which are located in a position just forward of the flange 11*d*. The lugs 11*f* may be perforated either as a part of preforming the nozzle casing or by drilling to receive the pin 29 in bearing support.

A peripheral gasket 30, made of a suitable elastic material such as soft rubber, is secured to the flange 28*a* with an adhesive such as rubber cement or the like. Said gasket 30 bears against the side walls of the nozzle casing 11 as well as against the shoulder 11*a* and the trailing edge forward of the flange 11*d* when door 28 is closed, thereby insuring an air-tight seal of the dirt-removal opening 19.

The door 28 is equipped with a latch 31 formed from a bent metal strip and pivotally mounted on a fulcrum pin 32 extending through the door 28 so as to cooperate with a notch 34 formed in the shoulder 11*a* for locking engagement when the latch 31 is pivotally positioned on a line with the longitudinal axis. As may be seen in Figure 2, the gasket 30 is of such a thickness that the relative dimension between the faces of the bearing surface defined by the shoulder 11*a* and notch 34 is normally less than the dimension between the surface of the gasket 30 and the surface of the latch 31. Thus, when the door is closed and latched the gasket 30 is compressed and tends to bias the latch 31 against the shoulder 11*a* resulting in an air-tight sealed assembly of the door 28 and the nozzle casing 11.

As may be seen in Figure 2, the shoulder 11*a* extends inwardly into the nozzle casing 11 and is terminated by a lip 11*g*. Secured to said lip 11*g* by an adhesive, such as rubber cement or the like, is a flexible flapper 33 formed of a molded, elastic, resilient rubber material or the like. The flapper 33 normally defines a rectangularly shaped tongue 33*a* (Figure 3) and a dipper-like configuration disposed on one end with an arcuate groove 33*b* for cooperation with a correspondingly shaped bead formed in the lip 11*g* of the shoulder 11*a*. The points of juncture adjacent each end of the arcuate groove 33*b* are reinforced by a pair of stiffener shoulder portions 33*c* for supporting the tongue 33*a* against longitudinal collapse and to normally urge the tongue 33*a* toward the top of the nozzle casing thereby effectively partitioning the inlet duct 18 from the dirt-collecting chamber 17, as well as the chamber defined by the obelisk portion of the nozzle casing 11.

It will be readily apparent that the flapper 33 will be flexibly displaced to a position indicated by the dotted lines in Figure 2 when the motor suction unit causes a stream of air to be drawn through inlet duct 18. However, as soon as such stream of air ceases to flow, the flapper 33 will return to its original position because of its own resilience, thereby preventing accumulated dirt and litter from re-entering the inlet duct 18 and falling on a clean surface. It should be noted especially that when the cleaner is held upright, as, for example, during storage or when it is desirable to dispose of the accumulated dirt through the dirt-removal opening 19, the flapper 33 effectively seals off the inlet duct 18 and prevents entry of dirt therein.

The use of the flapper 33 affords other inherent advantages in that it presents a perfectly smooth rubber surface which is not at all conducive to the adherence and accumulation of dirt, lint and other litter such as frequently has occurred in those structures employing a fabric tube valve to perform the functions associated with partitioning an air inlet duct.

As shown in Figure 2, one end of the body casing 12 defines a dirt-collection chamber 17. Positioned within the chamber 17 is a fabric cylinder 36 for intercepting dirt and litter entrained in the air flowing through the cleaner 10. The fabric cylinder 36 is open on one end for communication with the nozzle casing 11. The flange 11*d* contains an annular groove 37 for receiving the cylindrical wall of the body casing 12. The ends of the fabric cylinder 36 are curled around the body casing 12 and are cemented in said groove 37 with a suitable adhesive thereby providing an efficient sealed union between the nozzle casing 11 and the body casing 12, as well as an adequate support of the fabric cylinder 36. The body casing 12 is retained in firm longitudinal assembly with the nozzle casing 11 by a pair of machine screws 38 which cooperate with a pair of drilled and tapped boss portions 11*h* located on opposite sides of the flange 11*d*. The screws 38 pass through a pair of strip metal clips 39 which are securely fastened to the body casing 12 by a plurality of rivets 40.

The closed end of fabric cylinder 36 is supported by a circular metal ring-like reinforcing member 41. An integral channel-shaped support extending across the diametric axis of the reinforcing member 41 is stamped out at its cen-

ter to define a notch 42 to receive and support a plunger rod 43 in aligned assembly with reinforcing member 41. The end of the coil spring 44 is straightened at right angles to form rod portion 44a which extends transversely across a diametric axis of the reinforcing member. A rectangular end plate 46 suitably stamped out to define a notched receptacle is secured to the reinforcing member 41 and receives rod portion 44a in aligned assembly with plunger rod 43 and reinforcing member 41. The spring 44 is coiled about the fabric cylinder 36 and is retained endwise by a plurality of hooks 47 secured to the body casing 12, thereby normally biasing the fabric cylinder 36 to its fully extended position.

As may be seen in Figure 2, a portion of the rod 43 is acutely inclined with respect to the plane defined by the reinforcing member 41 and the remaining portion of the rod 43 runs substantially parallel to the longitudinal axis of the cleaner 10. A decorative boss 11i is provided in the nozzle casing 11 which is suitably formed to receive the rod 43 in sliding engagement. Said rod 43 terminates in a handle 48. Thus, it will be apparent that when it is desired to dispose of dirt and litter accumulated in the fabric cylinder 36, the cleaner may be held in an upright position, the door 28 is swung outwardly from the dirt-removal opening 19 and the handle 48 is manipulated to reciprocate the plunger rod 43, thereby alternately overcoming and releasing the bias of the spring 44 which results in a snapping effect being imparted to the fabric cylinder 36 for effectively ejecting all foreign particles from its interior.

The dirt-collection chamber 17 is terminated by a flange retainer plate 49 secured to the body casing 12 together with hooks 47 by a plurality of screws 50. The flanges of the retainer plate 49 center and support an annular sponge rubber ring 51 which defines a counterbore for receiving and supporting a motor suction unit 52.

The construction details of the motor suction unit 52 do not constitute a part of this invention. Accordingly, said motor suction unit 52 may take the form of any suitably powered suction unit well known in the art.

Situated on the upper end of the motor suction unit 52 is an improved mounting of the present invention, which, as indicated in Figures 6 and 7, comprises a bushing mounting 53 preferably made of molded rubber or some similar elastic resilient material and defines a counterbore 53a for receiving the motor suction unit 52 in aligned center support. On its opposite end, the mounting 53 defines a counterbore 53b of a smaller inside diameter than counterbore 53a which terminates in a transverse passage 53c thus forming an integral passageway for introducing a pair of electrical leads A and B into the interior of the tubular operator's handle 13. A reduced diameter portion 53d fits snugly within the extension of the tubular operator's handle 13. The mounting 53 is further supported in radial alignment by a multi-pronged mounting plate 54 preferably formed from a light-weight metal to define a circular hub portion 54a for snugly receiving the extension of the operator's handle 13 and a plurality of radially spaced prongs 54b bent inwardly on the ends to form a plurality of toes 54c. The mounting plate 54 may be secured to the shell of the body casing 12 in any conventional manner as, for example, by passing rivets or screws through the toes 54c or by spot welding said toes 54c to body casing 12.

It will be evident that the entire motor suction unit 52 is adequately supported against radial and axial vibrations by virtue of its forward support in the ring 51 and its rear support in the mounting 53. A cleaner constructed in accordance with this invention is exposed to far less vibration than has been ordinarily the case in past practice, and the operation noise level of the cleaner is drastically reduced.

The body casing 12 terminates in a suitable convergent portion and is secured to the operator's handle 13 by a bolt 56 which engages a threaded conductor cord hook 57. The upper portion of the handle 13 houses a conventional electric switch 58 and a strain-release assembly indicated generally at 59. Lying adjacent to the strain-release assembly 59 is a second conductor cord hook 60.

The operator's handle 13 terminates in a gracefully curved sweep and is closed by a plug 61. A pin 62 connected to the plug 61 supports a ring 63 thereby facilitating suspended storage of the cleaner as may be desirable, for example, in a utility closet.

It will be apparent to those skilled in the art that we have described a rigid broom-type vacuum cleaner of improved performance insofar as casing vibration and noise level are concerned and of simplified and greatly improved construction insofar as economical and efficient maunfacture thereof is concerned.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims and the prior art.

We claim as our invention:

1. In a rigid broom-type vacuum cleaner, the improvement comprising, a nozzle casing having an inlet duct and a bottom dirt-removal opening, and a valve comprising a flexible sheet of resilient material having formed therein an arcuate groove and a pair of stiffener shoulders, said valve having its arcuate groove attached to a correspondingly shaped abutment of said nozzle casing located between said inlet duct and said bottom opening, thereby dividing said nozzle casing into an inlet portion and a dirt-collection portion, said valve being flexibly displaced by the flow of inlet air to admit dirt and other foreign objects, but being resiliently returnable to its normal position upon cessation of flow of inlet air to prevent entry of dirt into said inlet duct, and a door means to close said dirt-removal opening.

2. In a rigid broom-type vacuum cleaner, the improvement comprising a nozzle casing, a resilient flapper valve partitioning said nozzle casing into an inlet portion and a dirt passage portion, said casing having a bottom opening formed in said dirt passage portion, a reciprocable dust bag having an open end, means for mounting said bag with said open end of said bag in communication with the dirt passage portion of said nozzle casing, a reciprocable plunger slidably supported by said nozzle casing and connected to said dust bag, and a door to control said bottom opening in said casing, whereby said door may be opened and said bag may be reciprocated to remove dirt from said bag through said opening.

3. In a rigid broom-type vacuum cleaner, the improvement comprising a nozzle casing, a parti-

tioning flexible valve member in said casing, said casing and said valve member together forming an air inlet duct and a dirt passage portion, a dirt-collecting bag having an open end, means mounting said dirt-collecting bag on said nozzle casing with said open end of said bag communicating with said dirt passage portion, a plunger slidably carried by said casing and having one end extending exteriorly of said casing and having the other end connected to said dirt-collection bag, said nozzle casing having a bottom opening in the dirt passage portion thereof, and a door closing said bottom opening to permit selective purging of said dust bag upon opening said door and operating said plunger.

4. In a rigid broom-type vacuum cleaner including a nozzle casing having a dirt inlet portion, the improvement comprising an air porous fabric cylinder having an open end and arranged to have the open end in communication with the nozzle casing, an end plate connected on the opposite end of said fabric cylinder, spring means engaging said end plate to normally bias said fabric cylinder to a fully extended position, and a reciprocating rod attached to said end plate and having an actuating portion extending through and exteriorly of said nozzle casing for collapsing said bag against said spring means to assist in removing dirt from said fabric cylinder.

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