May 1, 1962 W. C. HUENING, JR 3,031,710

VACUUM CLEANER WITH FLOATING FLOOR NOZZLE LATCH MECHANISM

Filed Sept. 22, 1960

4 Sheets-Sheet 1

Fig. 1.

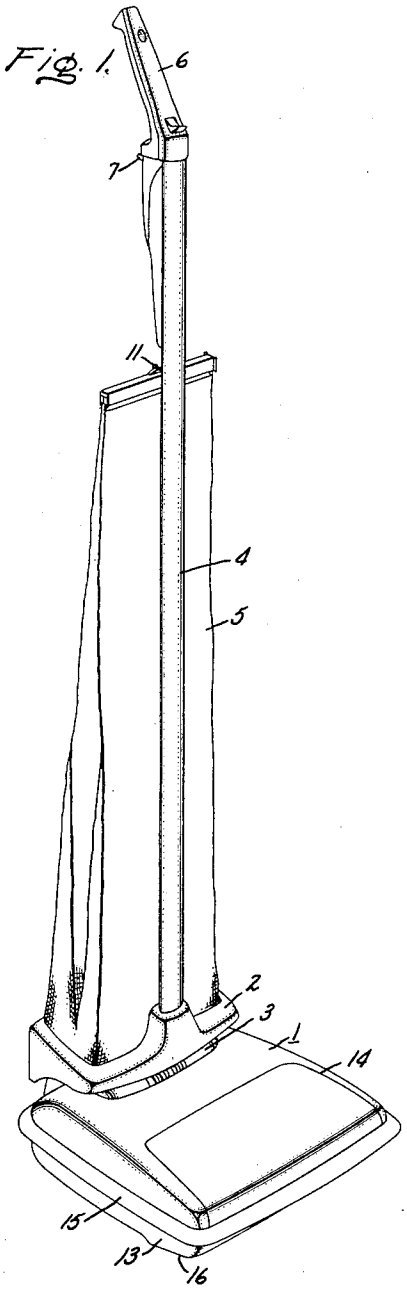
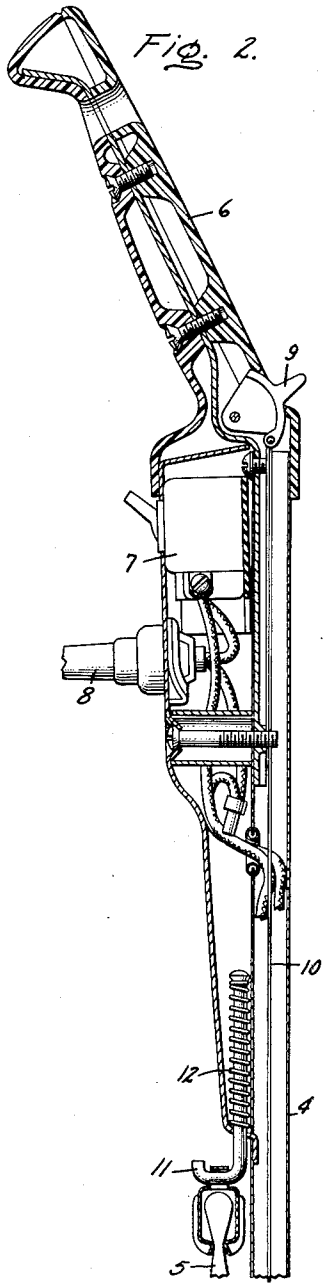


Fig. 2.



Inventor:
Walter C. Huening, Jr.
by T G Dysart
His Attorney.

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Fig. 9.

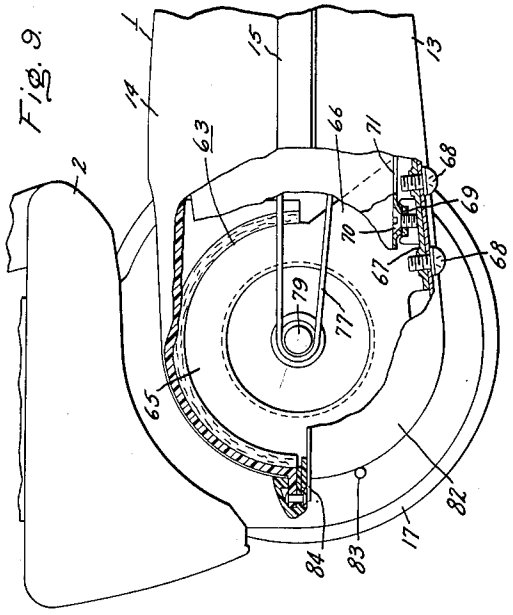


Fig. 3

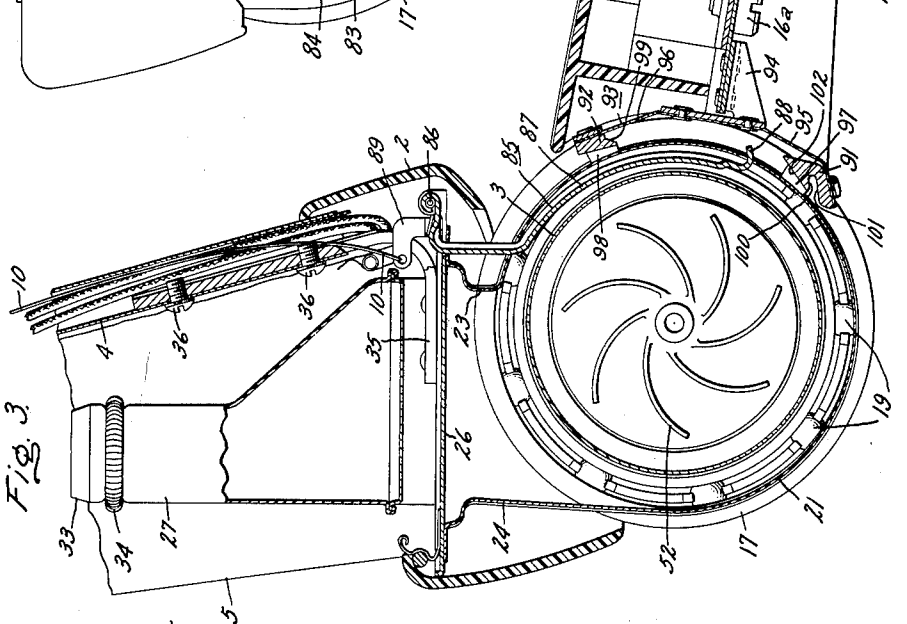
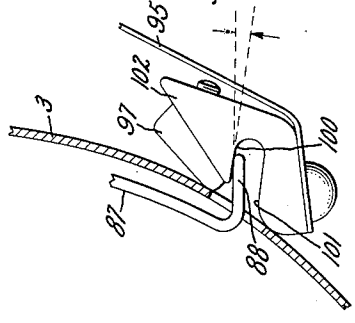


Fig. 10.



Inventor:
Walter C. Huening, Jr.
by T G Dysard
His Attorney.

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Fig. 4.

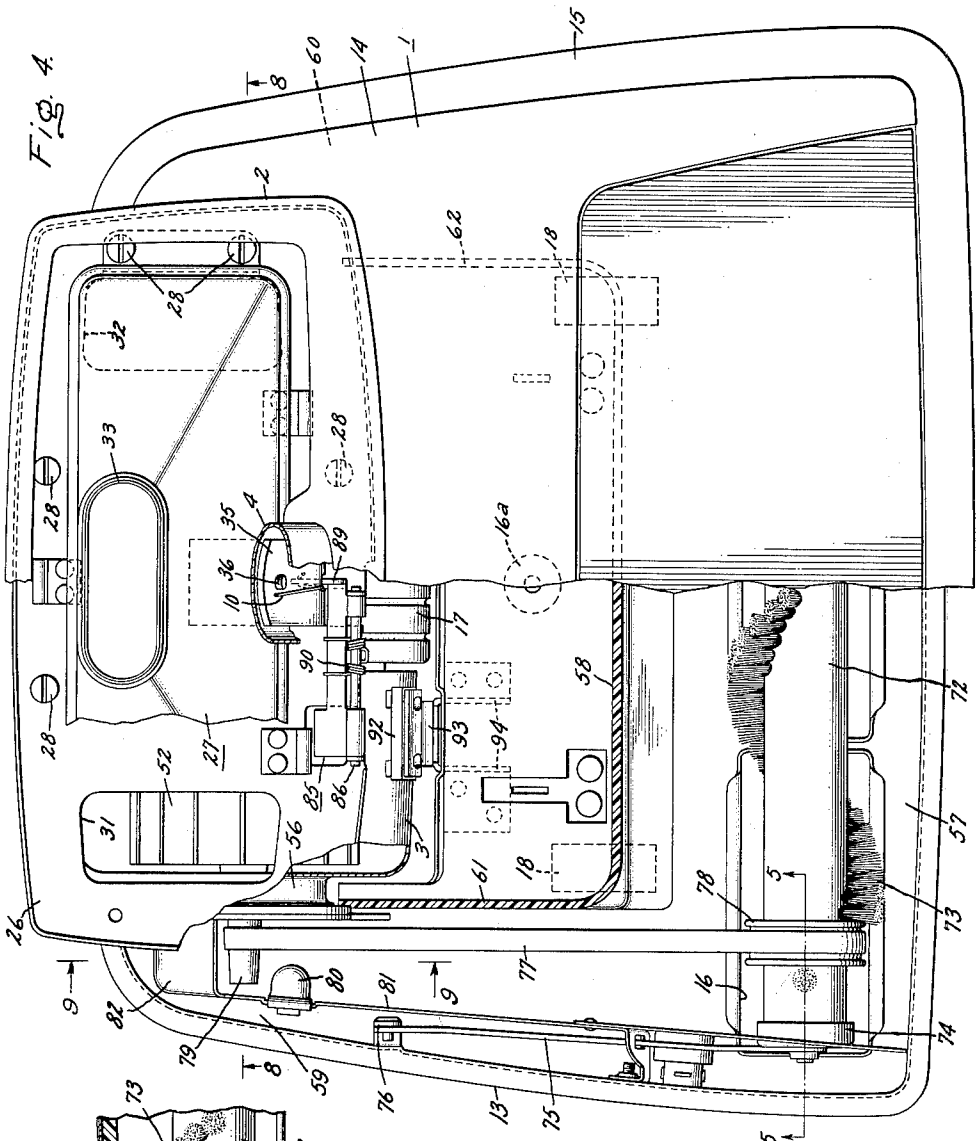
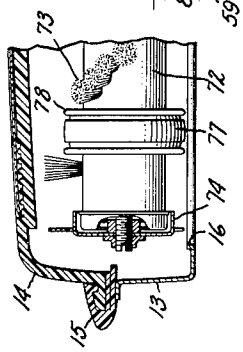


Fig. 5.



Inventor:
Walter C. Huening, Jr.
by T. G. Dyer
His Attorney.

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Fig. 8.

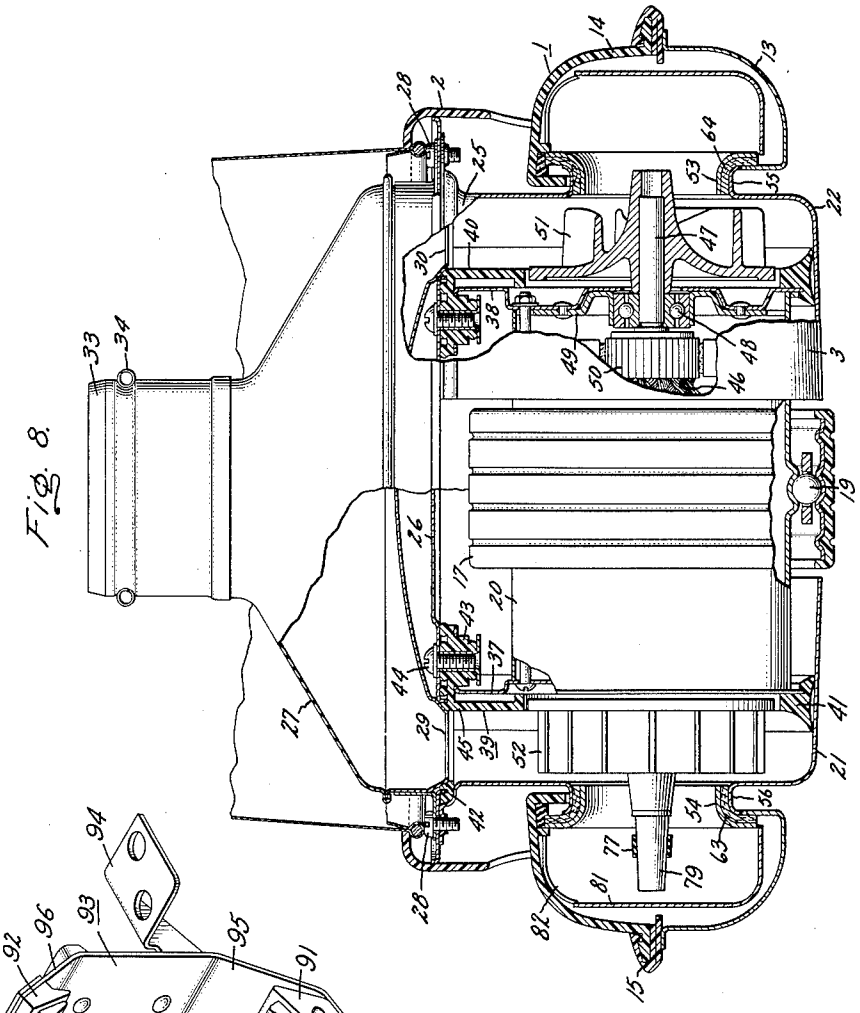
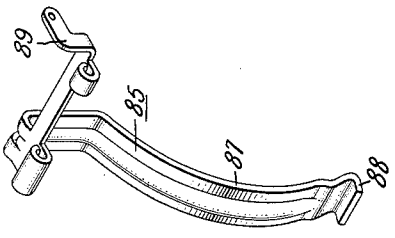


Fig. 6.

Fig. 7.



Inventor:
Walter C. Huening, Jr.
by T. G. Dysart
His Attorney.

United States Patent Office 3,031,710 Patented May 1, 1962

3,031,710

VACUUM CLEANER WITH FLOATING FLOOR NOZZLE LATCH MECHANISM

Walter C. Huening, Jr., Schenectady, N.Y., assignor to General Electric Company, a corporation of New York

Filed Sept. 22, 1960, Ser. No. 57,728
3 Claims. (Cl. 15—359)

This invention relates to vacuum cleaners, and more particularly to upright vacuum cleaners of the type having a motor-fan unit and a floor nozzle pivotally mounted thereon so that it is in floating relationship with floor surfaces on which it rests.

The general object of my invention is to provide an improved vacuum cleaner of the aforesaid type in which the floor nozzle may be releasably latched to the motor-fan unit so that it is held in fixed relation thereto during certain maneuvers when this is desirable.

Further objects and advantages of the invention will become apparent as the following description proceeds, and the features of novelty which characterize the invention will be pointed out with particularity in the claims appended to and forming a part of this specification.

Briefly stated, in accordance with one aspect of my invention I provide a vacuum cleaner comprising a generally cylindrical motor-fan housing and an upright handle rigidly secured thereto in perpendicular relation to its major axis, a floor nozzle casing pivotally secured to the motor-fan housing, and a latch arm pivotally supported in the motor-fan housing. The latch arm is so positioned that a latch finger thereon is movable through an aperture in the motor-fan housing between a retracted position and an extended position in which it is engageable with a resiliently mounted catch on the nozzle housing when the upright handle is in a predetermined angular relationship to the nozzle casing so that these parts are releasably latched in fixed relation. The mating surfaces of the finger and the catch are so arranged that these parts may be forcibly disengaged by applying a predetermined pivotal force to the nozzle casing, but the latch mechanism is normally disengaged by manually operable means carried by the handle for shifting the latch finger from its extended into its retracted position.

For a better understanding of this invention, reference may be made to the following description and the accompanying drawings in which:

FIG. 1 is a perspective view of a vacuum cleaner embodying the present invention;

FIG. 2 is an enlarged fragmentary cross-sectional view of the upper portion of the handle shown in FIG. 1;

FIG. 3 is a fragmentary side elevation view of the cleaner shown in FIG. 1, some of the parts being broken away to show details of construction;

FIG. 4 is a top plan view of the portion of the cleaner shown in FIG. 3, some of the parts being broken away to show details of construction;

FIG. 5 is a fragmentary cross-sectional view taken along the line 5—5 in FIG. 4;

FIG. 6 is a perspective view of the catch mechanism of the cleaner shown in FIG. 1;

FIG. 7 is a perspective view of the latch arm of the cleaner shown in FIG. 1;

FIG. 8 is a cross-sectional view taken generally along the line 8—8 in FIG. 4;

FIG. 9 is a fragmentary side elevation view similar to FIG. 3, but with other parts broken away substantially along the line 9—9 in FIG. 4; and

FIG. 10 is a fragmentary enlarged view of a portion of the latching mechanism of my invention.

Referring to the drawings, the vacuum cleaner illustrated in FIG. 1 includes a nozzle casing 1 of generally

rectangular configuration, a frame shroud 2, a motor housing 3 pivotally secured to the nozzle casing, a handle 4, and a dust bag enclosure 5. As shown in FIG. 2, handle 4 includes a handle grip portion 6, an electric motor switch 7, an electric power cord 8 and a thumb actuated lever 9 connected to a latch actuating cable 10 extending down through the interior portion of the handle. Dust bag enclosure 5 is supported in its upright position on the handle by a hook 11, and is preferably biased upwardly by a spring 12 associated with the hook member.

Floor nozzle casing 1 comprises a base shell 13 and a mating hood shell 14 jointed at their edges with a combined sealing gasket and peripheral bumper 15 interposed therebetween so as to form a hollow nozzle having a suction mouth 16. Shells 13 and 14 are held together by a single screw 16a, and thus may be easily disassembled. The cleaner is supported on the surface to be cleaned by a relatively large wheel 17 encircling the central portion of motor housing 3 and a pair of smaller wheels 18 secured to the bottom surface of nozzle 1. Preferably wheel 17 is provided with roller bearings 19 so as to be freely rotatable on the motor housing. Thus, the major portion of the weight of the cleaner is supported on a single large wheel, and as more fully described below, the smaller wheels on the nozzle support only the weight of the nozzle itself. Floor nozzle 1 is not rigidly connected to motor-fan housing 3, but instead is connected thereto so that it is free to pivot about the horizontally disposed major axis of the motor-fan housing.

Considering first the structural arrangement of motor-fan housing 3 and the parts such as handle 4 which are rigidly associated therewith, it will be seen that this housing includes a motor tube 20 and a pair of cup-shaped end members 21 and 22 spaced so as to accommodate wheel 17 therebetween. Member 21 is generally cylindrical in vertical cross-section, but includes an upwardly extending scroll-like portion defined by a generally vertical front wall 23 and a generally vertical rear wall 24, as best shown in FIG. 3. The configuration of end member 22 is similar to that of end member 21, and it too is provided with an upwardly extending scroll shaped passageway defined in part by front wall member 25. The vertically extending walls of end members 21 and 22, including walls 23, 24 and 25, terminate in horizontally extending flanges to which is secured a horizontally disposed top plate 26 and a hollow duct assembly 27.

As shown in FIG. 4, top plate 26 is of generally rectangular configuration and a plurality of peripherally spaced screws 28 are provided to secure it to the horizontal flange portions of end members 21 and 22. Duct assembly 27 includes a pair of spaced openings 29 and 30 in its lower portion positioned so as to overlie openings 31 and 32 in top plate 26, and an upper conduit portion 33 arranged to provide an air discharge opening. It will be understood that duct 27 forms the air discharge passageway through which dust laden air is discharged into a suitable dust bag enclosed within bag enclosure 5 and that the mouth of the dust bag is secured to member 33 by means such as a coil spring 34 adapted to clamp the mouth of the bag in airtight relation. Also secured to top plate 26 is a bracket 35 to which handle 4 is secured by means of screw fasteners 36, for example. Thus, it will be seen that top plate 26 functions as a frame to which end members 21 and 22, duct assembly 27 and handle 4 are all rigidly connected.

Referring again to the details of construction of motor-fan unit 3, motor tube 20 (see FIG. 8) is rigidly secured to a pair of end plates 37 and 38 and these end plates are in turn resiliently supported within end members 21 and 22 of the motor-fan unit by means of a pair of resilient fan housing gaskets 39 and 40. While only gasket 39 will be described in detail, it will be understood that gasket

40 is its right-hand counterpart and that the latter is constructed in a similar manner. Gasket 39 is generally circular with a scroll-shaped upwardly projecting portion corresponding generally to the cross-sectional configuration of end member 21, as viewed in FIG. 3, and includes an annular portion 41 secured to end plate 37 and in engagement on its outer surface with the inner surface of end member 21. Gasket 39 also includes an integral upper flange portion of generaly rectangular configuration arranged to seal the connection between duct assembly 27, top plate 26 and the flanged portions of end member 21 (surrounding opening 29), a mounting portion 43 secured to top plate 26 by means of screw 44, and a vertical web portion 45 which forms a part of the fan outlet passage. Thus, as shown in FIG. 7, motor tube 20 is secured in a resilient relationship to top plate 26 and is electrically insulated therefrom.

Mounted within motor tube 20 is an electric motor including a stator 46, a motor shaft 47 supported by bearings 48 carried by a bearing plate 49 which is secured to end plate 38, and a commutator 50. A rotary fan 51 is mounted on the right-hand end of shaft 47 (as viewed in FIG. 8) and a similar fan 52 is mounted on the other end of the shaft. Fans 51 and 52 are arranged to draw air through inlets 53 and 54, respectively. Inlet 53 is defined by an axially projecting trunnion 55 formed on the end of end member 22 while inlet 54 is formed by an axially projecting trunnion 56 formed on the end of end member 21. Thus, during operation of the motor, air is drawn through inlets 53 and 54, and discharged through outlet openings 29 and 30 into duct assembly 27. Turning now to floor nozzle 1 and the manner in which it is associated with motor-fan housing 3, it will be seen (FIG. 4) that the floor nozzle casing includes a forward portion 57 in which suction mouth 16 is located, a rear wall 58 (FIG. 3) formed as an integral part of hood shell 14 and a pair of laterally spaced rearwardly extending arm portions 59 and 60 (FIG. 4) arranged to embrace motor-fan housing 3 and provide suction passageways between suction mouth 16 and fan inlets 53 and 54. Rearwardly extending arm portions 59 and 60 are formed in part by walls 61 and 62 formed integrally with hood shell 14 and extending rearwardly from the ends of wall 58. Thus the side and front walls of nozzle casing 1 and walls 58, 61 and 62 form a generally U-shaped suction chamber as viewed from above.

Nozzle casing 1 is supported on motor-fan unit 3 solely by means of a pair of bearings 63 and 64 secured to nozzle casing 1 and arranged in pivotal engagement with trunnions 55 and 56 on the motor-fan housing. Bearings 63 and 64 are connected to nozzle casing 1 in a similar manner; as shown in FIG. 9, bearing 63 includes an annular portion 65, a web portion 66 and a flange portion 67, the latter being secured to base shell 13 by means of a pair of screws 68. Bearing 63 also includes a tab 69 having a threaded hole therein adapted to receive a screw 70, and thereby secure a sheet metal dirt shield 71 to the bottom shell 13. Interposed between the outer annular surface of bearing 63 and the inner annular surface of trunnion 56 is a suitable annular sealing member made of felt, for example. Bearing 64 is similarly connected to trunnion 55, and hence nozzle casing 1 is free to pivot about the axis of motor shaft 47 and by the same means suction mouth 16 of the nozzle is connected to the fan inlets of fans 51 and 52 so that high suction without appreciable leakage is developed at the suction mouth. During operation of the cleaner, nozzle casing 1 is free to pivot with respect to motor-fan housing 3 and its wheels 18 support only its own weight. Hence, suction mouth 16 is in floating relationship with respect to the floor surface being cleaned and the desired distance between the suction mouth and the floor surface may be easily maintained.

It is desirable that the surface to be cleaned be agitated during operation of the cleaner, and therefore a rotary brush 72 provided with bristles 73 is mounted in nozzle casing 1 adjacent suction mouth 16 for rotation about an axis parallel to the axis of motor shaft 47. Brush 72 may be pivotally mounted with respect to nozzle casing 1 by means of rearwardly extending pivot arms secured to the ends of the brush shaft, such an arrangement being illustrated in FIG. 4 in which the left-hand end of brush 72 is mounted in a thread guard 74 which in turn is carried by a pivot arm 75 secured at its rear end to a pivot member 76 on casing 1. One suitable brush mounting and positioning arrangement of this nature is disclosed and claimed in application Serial No. 858,104 filed on December 8, 1959, by Warren N. Kemnitz and assigned to the assignee of the present application.

Brush 72 is, of course, arranged to be motor driven, and accordingly a belt 77 connecting pulley 78 which is secured to the brush and tapered pulley 79, which is secured to one end of the motor shaft 47 is utilized for this purpose. As shown in FIG. 4, a belt guide 80 is mounted on a sheet metal vertical wall portion 81 of dirt shield 71. Wall 81 extends from the forward portion of the nozzle casing rearwardly and terminates in a curved wall portion 82 which is shaped so as to direct dust laden air into the fan inlet 54. A similar dirt shield is of course provided on the opposie side of the nozzle casing. It will be seen that since the axis of pulley 79 coincides with the axis about which nozzle 1 pivots on trunnions 55 and 56, the belt and pulley system just described does not interfere with free pivotal movement of nozzle casing 1 with respect to the motor-fan housing.

While nozzle casing 1 is free to pivot with respect to motor-fan housing 3 during normal cleaning operation, it is desirable that certain stop positions be provided in which the nozzle casing may be latched to the motor-fan housing. One such position which has been found to be desirable is that in which handle 4 is forwardly inclined approximately 15° from the vertical and this forwardly inclined position may be located by providing a stop pin 83 (see FIG. 9) projecting from the end of end member 21 of the motor-fan housing and arranged to engage a flanged portion 84 on the rear-most part of nozzle casing 1. In order to latch handle 4 to the nozzle casing when in this forward position a latch arm 85 is pivotally mounted on top plate 26 by means of a pivot pin 86. Latch arm 85 includes a curved intermediate portion 87 located within motor-fan housing 3 and a latch finger 88 which projects through an aperture therein. Latch arm 85 also includes a lever portion 89 to which is fastened the lower end of cable 10, which, it will be recalled, is arranged to be actuated by lever 9 on the upper end of handle 4. Latch arm 85 is normally biased to the position shown in FIG. 3 by spring 90 (see FIG. 4) in which position it will engage catch member 91 when handle 4 is tilted forwardly to the stop position described above, or it will engage catch member 92 if handle 4 is tilted rearwardly to a position in which it is inclined approximately 30° above the horizontal. Catch members 91 and 92 are mounted on the opposite ends of a leaf spring member 93 which in turn is fixedly secured at its midportion to base shell 13 of nozzle casing 1 by means of bracket 94. In the stop position first described, in which the handle is forwardly inclined approximately 15°, the nozzle is releasably latched to the remainder of the cleaner and the cleaner may be moved about from room to room with the nozzle in a lifted position so as to facilitate its movement over obstacles, such as door sills. In the second position just described, in which the handle 4 is rearwardly inclined approximately 30° above horizontal, the suction mouth 16 may be conveniently lifted during normal operation of the cleaner so as to clear small obstacles or whenever it is desired to lift the suction mouth somewhat above the surface being cleaned.

Catch member 91 and catch member 92 are made of

compressed and sintered powder metal impregnated with oil and are secured by screws, for example, to spring arm portions 95 and 96, respectively, of leaf spring member 93. Spring arms 95 and 96 are positioned in generally tangential relation to the circumferential portion of motor-fan housing 3 in which is located the aperture through which latch finger 88 may extend, and function to hold catch members 91 and 92 in resilient engagement with the motor-fan housing. Preferably a pair of nylon buttons 97 are secured to catch 91 so as to support it in sliding contact with the motor-fan housing and likewise a pair of nylon buttons 98 are secured to catch 92 for the same purpose.

As best shown in FIG. 3, handle 4 and motor housing 3 may freely move through an arc from a rearwardly extending position 30° above the horizontal to a forwardly extending position 15° in the forwardly inclined direction from the vertical when latch finger 88 extends through its aperture in the motor-fan housing. At the extremes of this arc of movement, the latch finger engages catch 92 (in the rearwardly extending position) while it engages catch 91 in the generally vertical position. Latch finger 88 lies in a plane parallel to the pivotal axis of pivot pin 86 which supports latch arm 85, and is oriented so that a perpendicular line passing therethrough intersects pin 86. Latching surface 99 of catch 92 is generally parallel to latch finger 88 when these parts are in engagement, although, as will be pointed out below, surface 99 is slightly inclined (at an angle of 5° to 10°) with respect to the mating surface of latch finger 88 so that only the nose portion of the latch finger actually touches surface 99.

Catch member 91 includes a slot therein defined by surfaces 100 and 101 positioned so as to receive latch finger 88. Catch 91 also has an inclined ramp surface 102 shaped so as to engage the nose portion of latch finger 88 and force it into a partially retracted position as motor-housing 3 and handle 4 are rotated clockwise, as viewed in FIG. 3, toward its generally vertical stop position. Thus, when handle 4 is moved forwardly somewhat beyond its vertical position, latch finger 88 engages catch 91 and enters the slot formed by surfaces 100 and 101, and thereafter rearward movement of handle 4 causes nozzle casing 1 to move with the motor housing. It will, of course, be understood that forward movement of handle 4 with respect to nozzle casing 1 beyond a forwardly inclined position of approximately 15° is prevented by engagement of stop member 83 and flange portion 84 on the rearmost part of the nozzle casing (see FIG. 9).

Latch finger 88 may be disengaged from either catch 91 or catch 92 at any time by actuating lever 9 so as to retract the latch finger into motor-fan housing 3. Disengagement of latch finger 88 from either catch 91 or catch 92 may also be effected either inadvertently or otherwise, without damage to the parts, by applying a clockwise force to nozzle casing 1, as viewed in FIG. 3, while holding handle 4 in a fixed position. As shown in FIG. 10, latching surface 100 of catch 91 is inclined at a slight angle (5° to 10°) with respect to the plane of latch finger 88 so that only the nose portion thereof engages the catch, and under the circumstances just described spring arm 95 is caused to bend away from the motor-fan housing sufficiently to permit the latch finger and the catch to disengage. As a result of this angular relationship between surface 100 and latch finger 88, catch 91 is forced to twist in a clockwise direction as viewed in FIG. 10 and also to move away from the motor-fan housing, these movements being permitted by the flexibility of spring arm 95. Thus, the latch mechanism of my invention permits nozzle casing 1 to be securely latched to motor-fan housing 3 when it is desired to lift the nozzle casing by means of a rearward and downward force on upright handle 4, and at the same time it "fails safe" if an attempt is made to force the handle to a rear position while holding the nozzle casing in a fixed position.

While the mode of operation of my invention is believed to be apparent from the preceding description, it may be said in summary that motor-fan housing 3 and handle 4 are free to pivot with respect to nozzle casing 1 within angular limits sufficient to permit ordinary use of the cleaner, that these members may be latched together when the handle is in a generally vertical but somewhat forwardly inclined position and that the nozzle casing may be lifted above the floor when the handle is lowered below a 30° inclined position with respect to the floor. When the cleaner is in either of these latched conditions the nozzle casing may be unlatched from the motor-fan housing by actuating lever 9 on the handle, and if the parts are forced out of latching engagement without actuating lever 9 no damage to the latching mechanism results.

While I have shown and described a particular embodiment of my invention, I do not desire the invention to be limited to the particular construction disclosed, and I intend by the appended claims to cover all modifications within the true spirit and scope of my invention.

What I claim is:

1. A vacuum cleaner comprising a generally cylindrical motor-fan housing, an elongated handle secured to said motor-fan housing in perpendicular relation to the major axis thereof, a floor nozzle casing pivotally secured to said motor-fan housing for pivotal movement about the major axis thereof, said motor housing having an aperture therein adjacent said nozzle casing, a latch arm pivotally supported in said motor-fan housing, a latch finger on said latch arm positioned adjacent said aperture in said motor-fan housing and movable between a retracted position within said motor-fan housing and an extended position in which it extends through said aperture, spring means biasing said latch arm so as to urge said latch finger into its extended position, a leaf spring arm mounted on said nozzle casing in spaced generally tangential relation to the circumferential portion of said motor-fan housing in which said aperture is located, a catch fixedly mounted on the free end of said spring arm, said catch having a surface thereon positioned to engage said latch finger when it is in its extended position and said handle is in a predetermined angular relationship to said nozzle casing so as to releasably latch said motor-fan housing and the nozzle casing together, and manually operable means carried by said handle for moving said latch finger from its extended position to its retracted position, said latch finger and said surface of said catch being inclined with respect to a radial plane passing through said aperture and the axis of said motor-fan housing so that said latch finger and said catch may be disengaged by forced pivotal movement of said handle with respect to said nozzle casing while said latch finger is in its extended position.

2. A vacuum cleaner comprising a generally cylindrical motor-fan housing, an elongated handle secured to said motor-fan housing in perpendicular relation to the major axis thereof, a floor nozzle casing pivotally secured to said motor-fan housing for pivotal movement about the major axis thereof, said motor-fan housing having an aperture therein adjacent said nozzle casing, a latch arm pivotally supported in said motor-fan housing, a latch finger on said latch arm positioned adjacent said aperture in said motor-fan housing and movable between a retracted position within said motor-fan housing and an extended position in which it extends through said aperture, spring means biasing said latch arm so as to urge said latch finger into its extended position, a leaf spring arm mounted on said nozzle casing in spaced generally tangential relation to the circumferential portion of said motor-fan housing in which said aperture is located, a catch fixedly mounted on the free end of said spring arm, said catch having an inclined ramp thereon

arranged progressively to force said latch finger toward its retracted position as said handle is pivoted forwardly when in a generally vertical position with respect to said nozzle casing, said catch also having a surface thereon positioned to engage said latch finger when it is in its extended position and said handle has been pivoted forwardly beyond the position in which said ramp and said latch finger are engaged so as to releasably latch said motor-fan housing and the nozzle casing together, and manually operable means carried by said handle for shifting said latch finger from its extended position to its retracted position, said latch finger and said surface of said catch being inclined with respect to a radial plane passing through said aperture and the axis of said motor-fan housing so that said latch finger and said catch may be disengaged by forced pivotal movement of said handle with respect to said nozzle casing while said latch finger is in its extended position.

3. A vacuum cleaner comprising a generally cylindrical motor-fan housing, an elongated handle secured to said motor-fan housing in perpendicular relation to the major axis thereof, a floor nozzle casing pivotally secured to said motor-fan housing for pivotal movement about the major axis thereof, said motor-fan housing having an aperture therein adjacent said nozzle casing, a latch arm pivotally supported in said motor-fan housing, a latch finger on said latch arm positioned adjacent said aperture in said motor-fan housing and movable between a retracted position within said motor-fan housing and an extended position in which it extends through said aperture, spring means biasing said latch arm so as to urge said latch finger into its extended position, a pair of oppositely extending leaf spring arms mounted on said nozzle casing in spaced generally tangential relation to the circumferential portion of said motor-fan housing in which said aperture is located, a catch fixedly mounted on the free end of each of said spring arms, one of said catches having a surface thereon positioned to engage said latch finger when it is in its extended position and said handle is pivoted to a rearwardly extending position, the other of said catches having an inclined ramp thereon arranged progressively to force said latch finger toward its retracted position as said handle is pivoted forwardly when in a generally vertical position with respect to said nozzle casing, said other catch also having a surface thereon positioned to engage said latch finger when it is in its extended position and said handle has been pivoted forwardly beyond the position in which said ramp and said latch finger are engaged so as to releasably latch said motor-fan housing and the nozzle casing together, and manually operable means carried by said handle for shifting said latch finger from its extended position to its retracted position, said latch finger and said surfaces of said catches being inclined with respect to a radial plane passing through said aperture and the axis of said motor-fan housing so that said latch finger and said catches may be disengaged by forced pivotal movement of said handle with respect to said nozzle casing while said latch finger is in its extended position.

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