

Sept. 28, 1971

WILBUR-WEBB SELLEY ET AL
VACUUM CLEANER AND POWER UNIT

3,608,333

Filed June 20, 1968

12 Sheets-Sheet 1

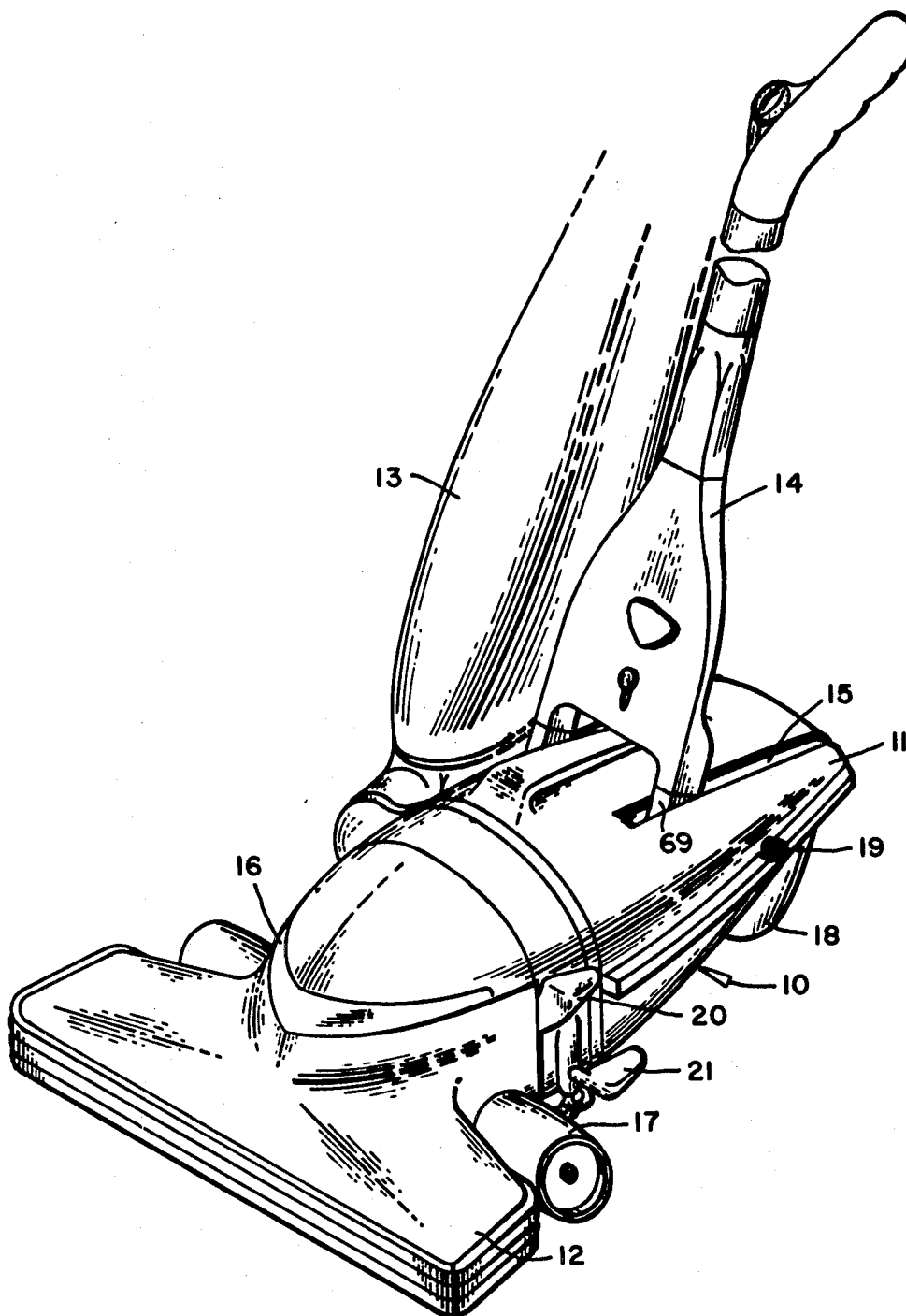


FIG. 1

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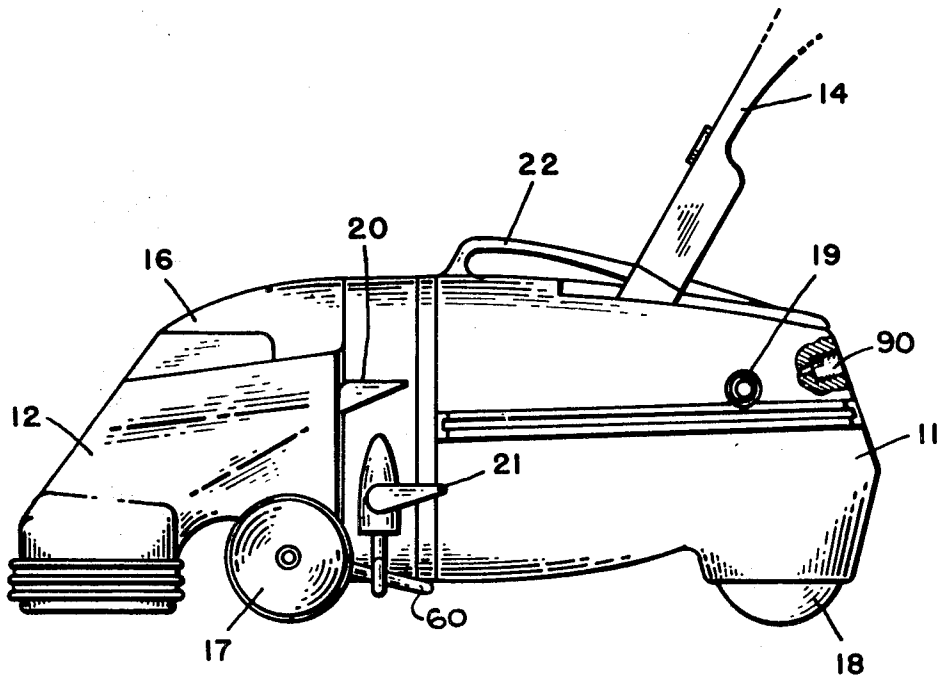


FIG. 2

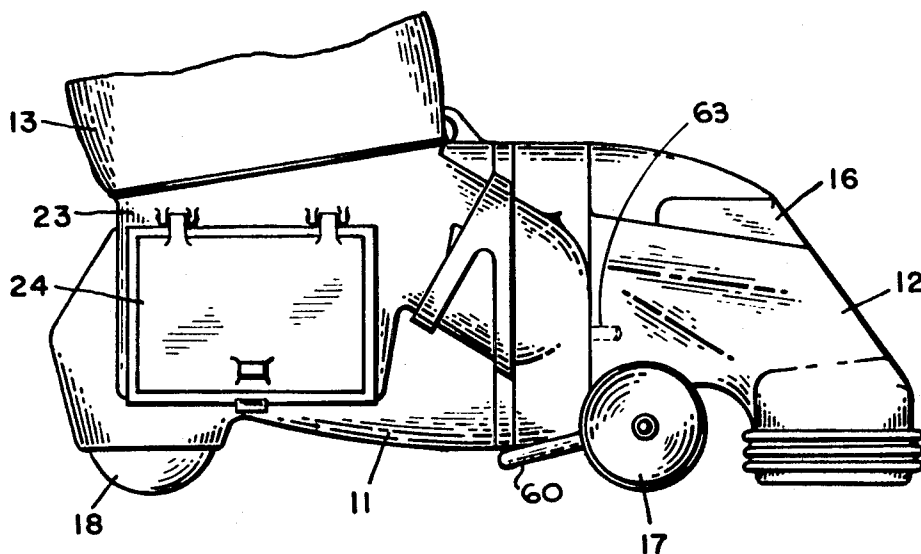


FIG. 3

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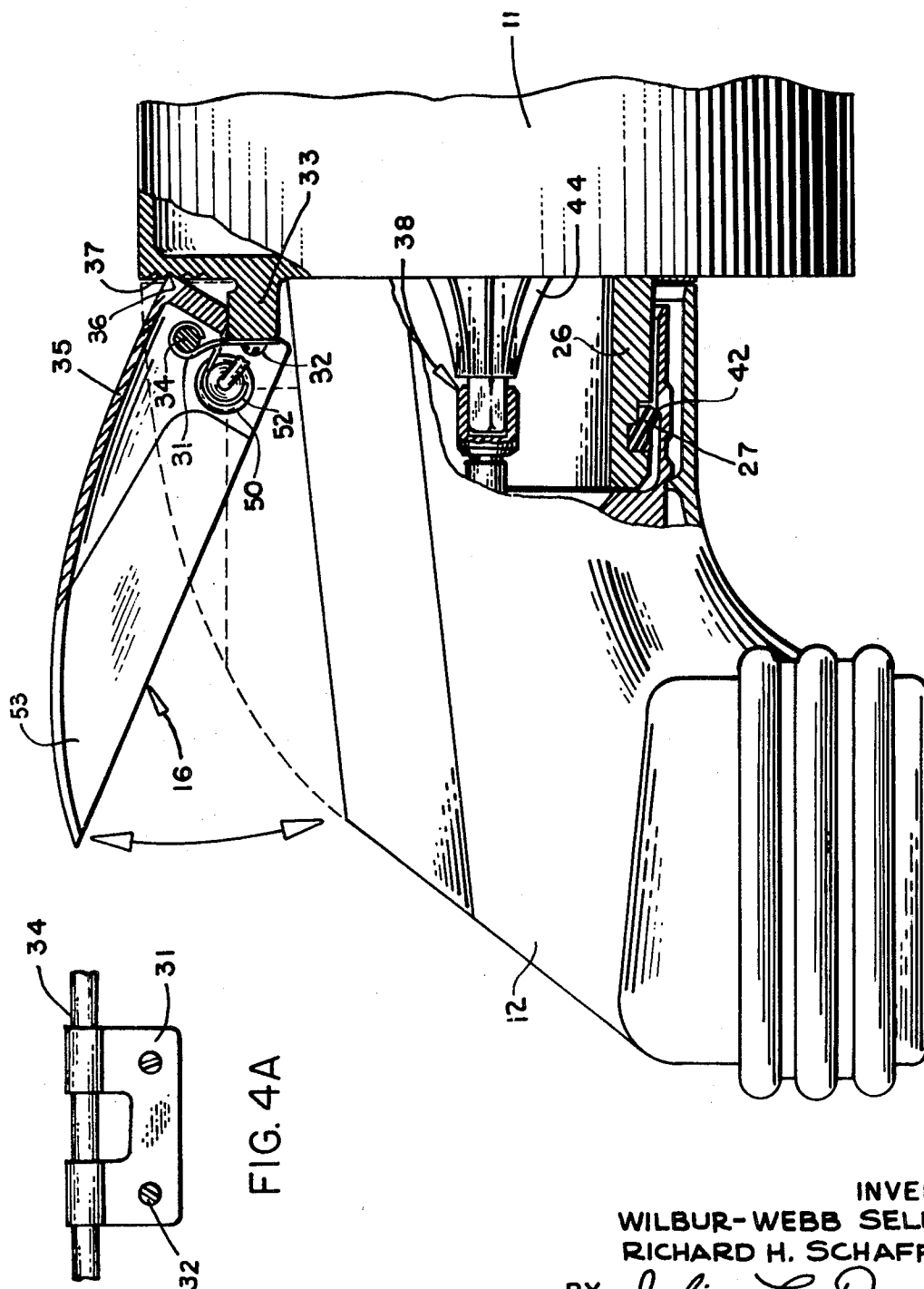


FIG. 4

FIG. 4A

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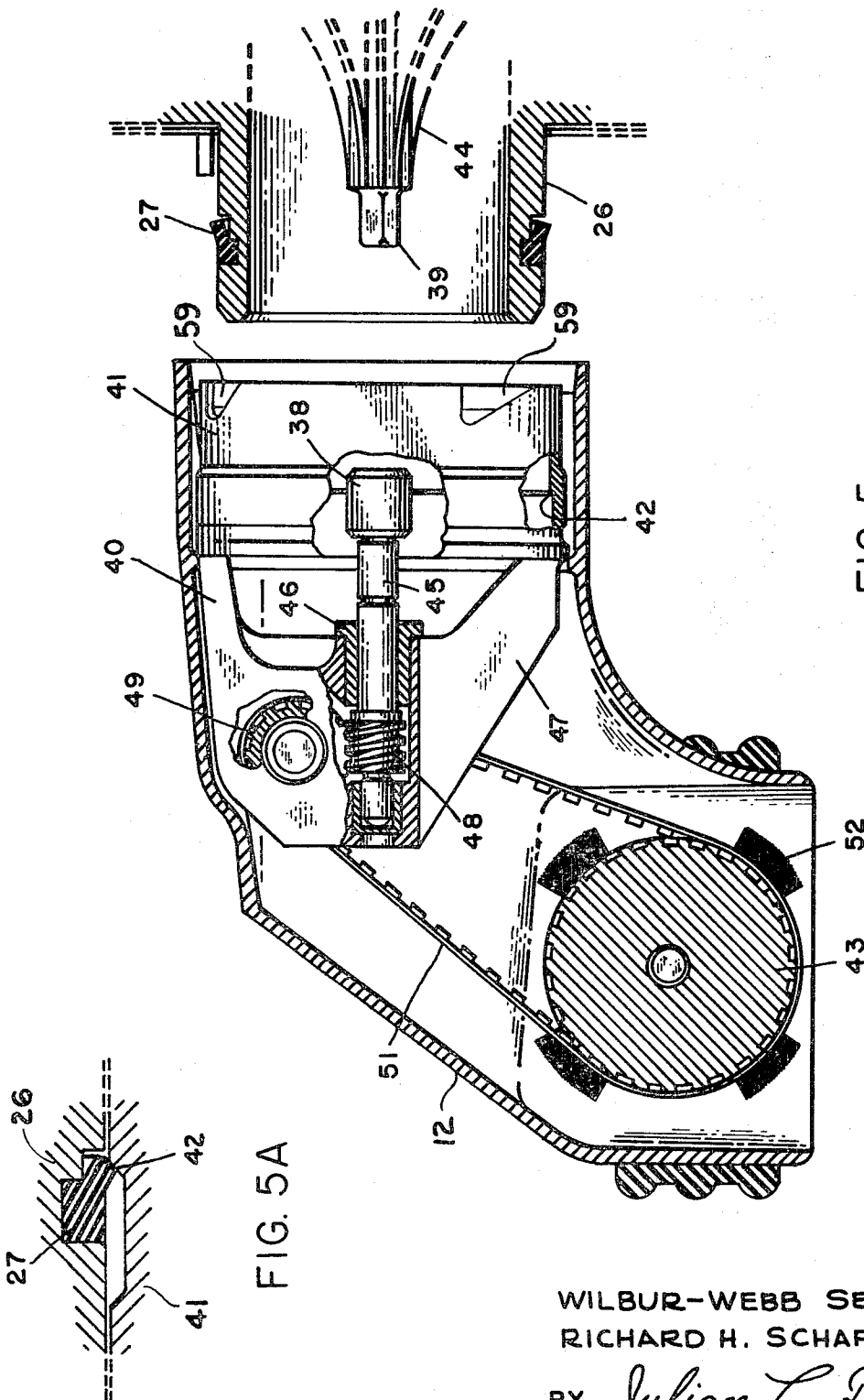
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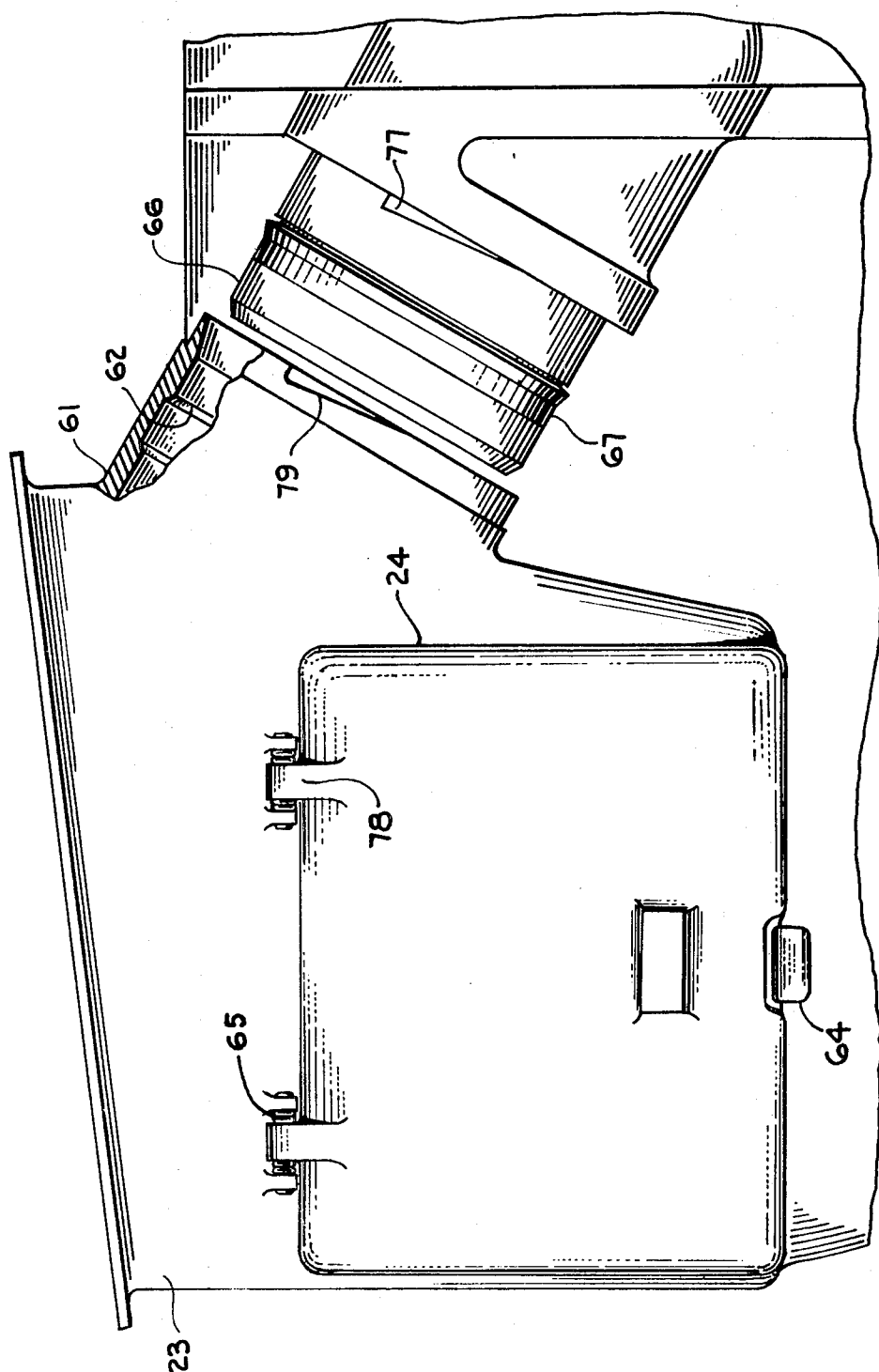


FIG. 7

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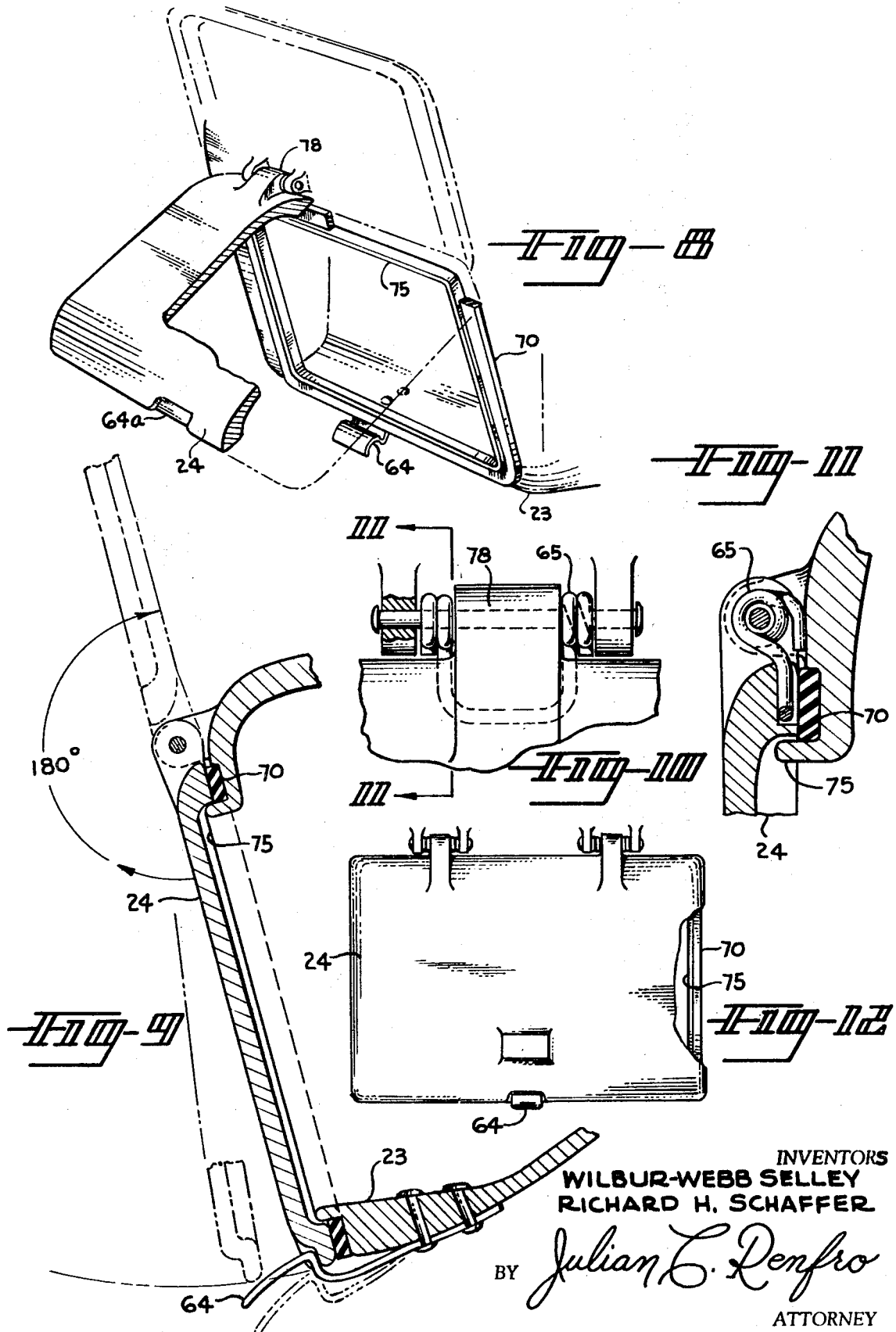
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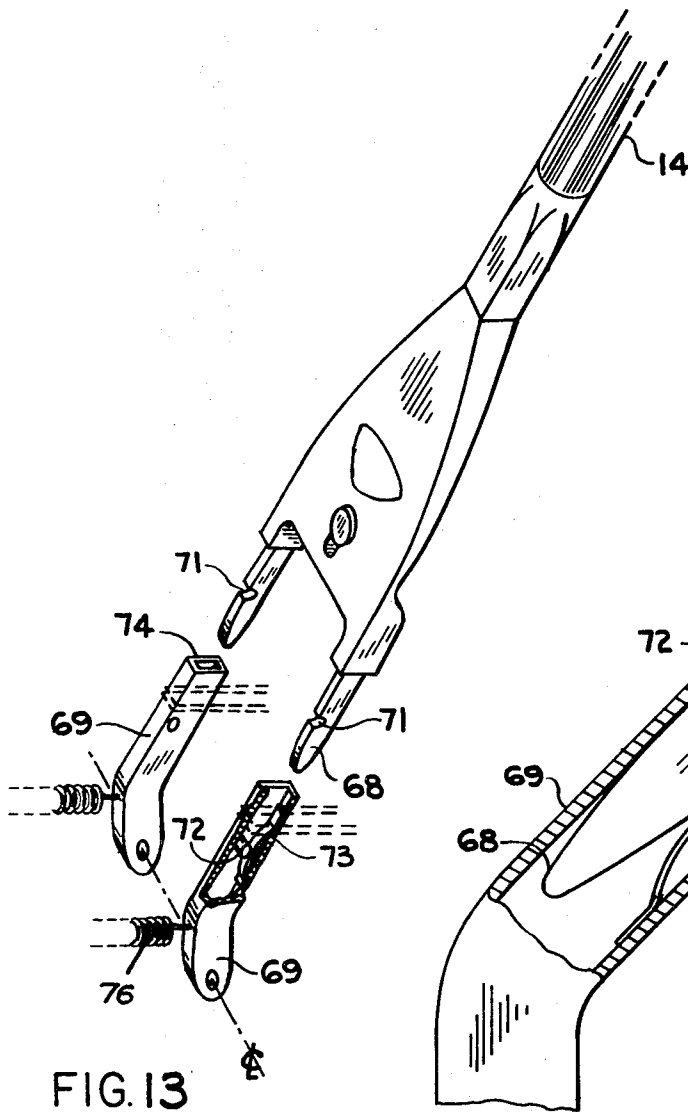
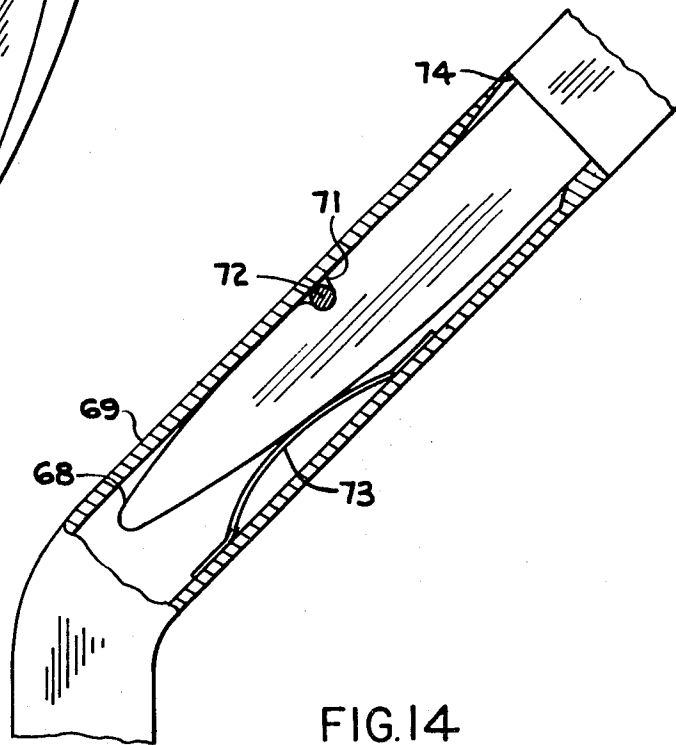
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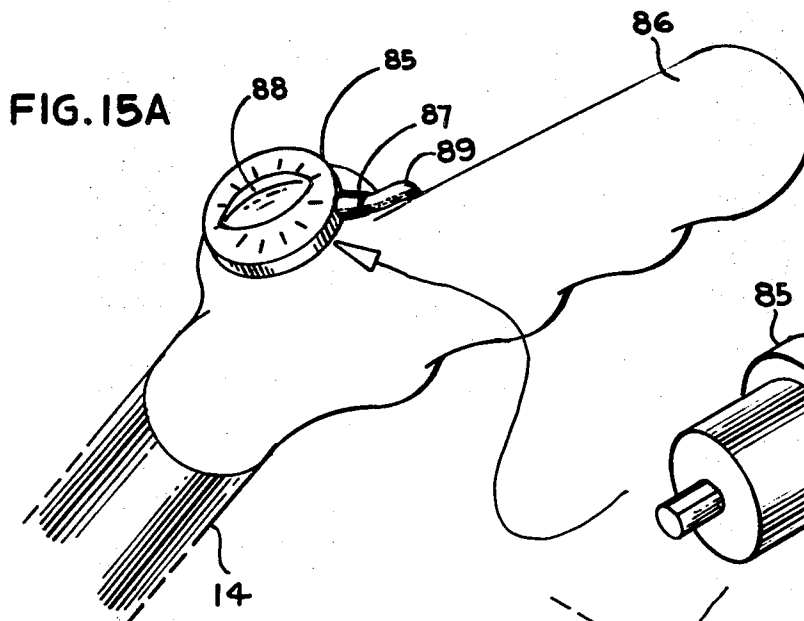
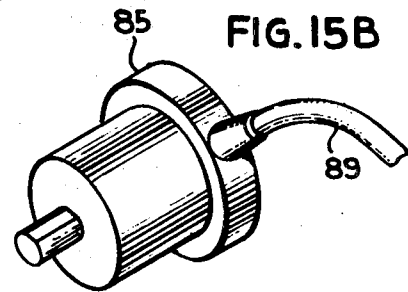
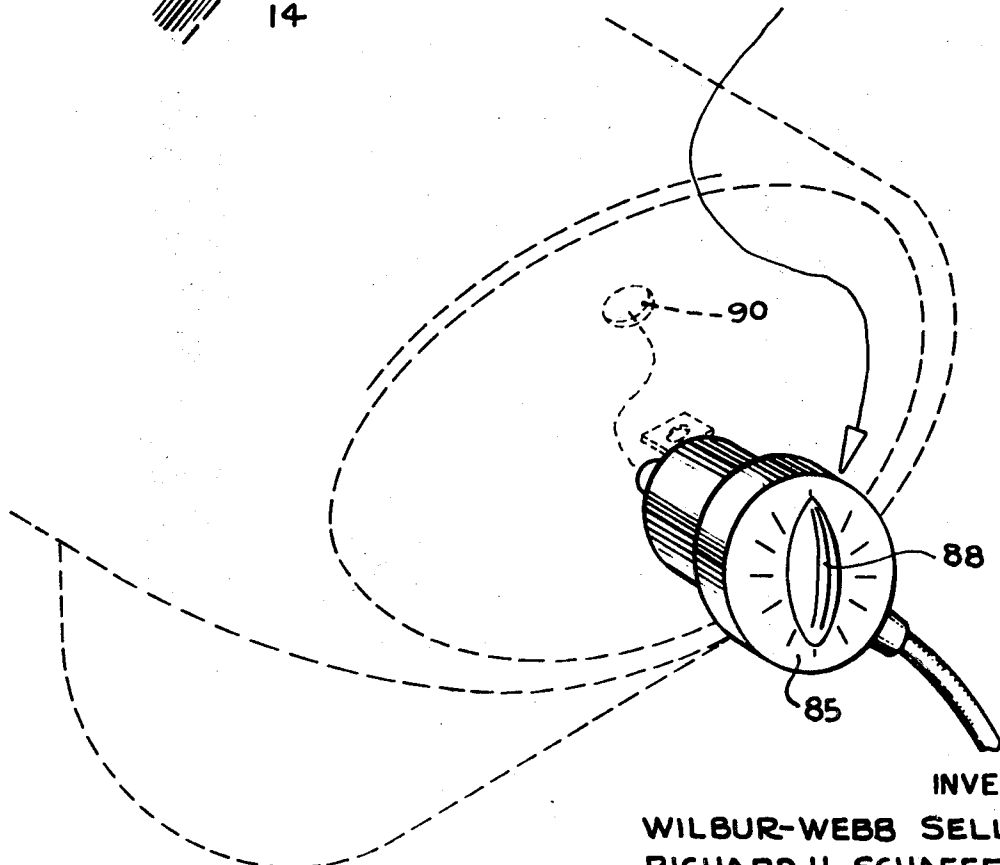
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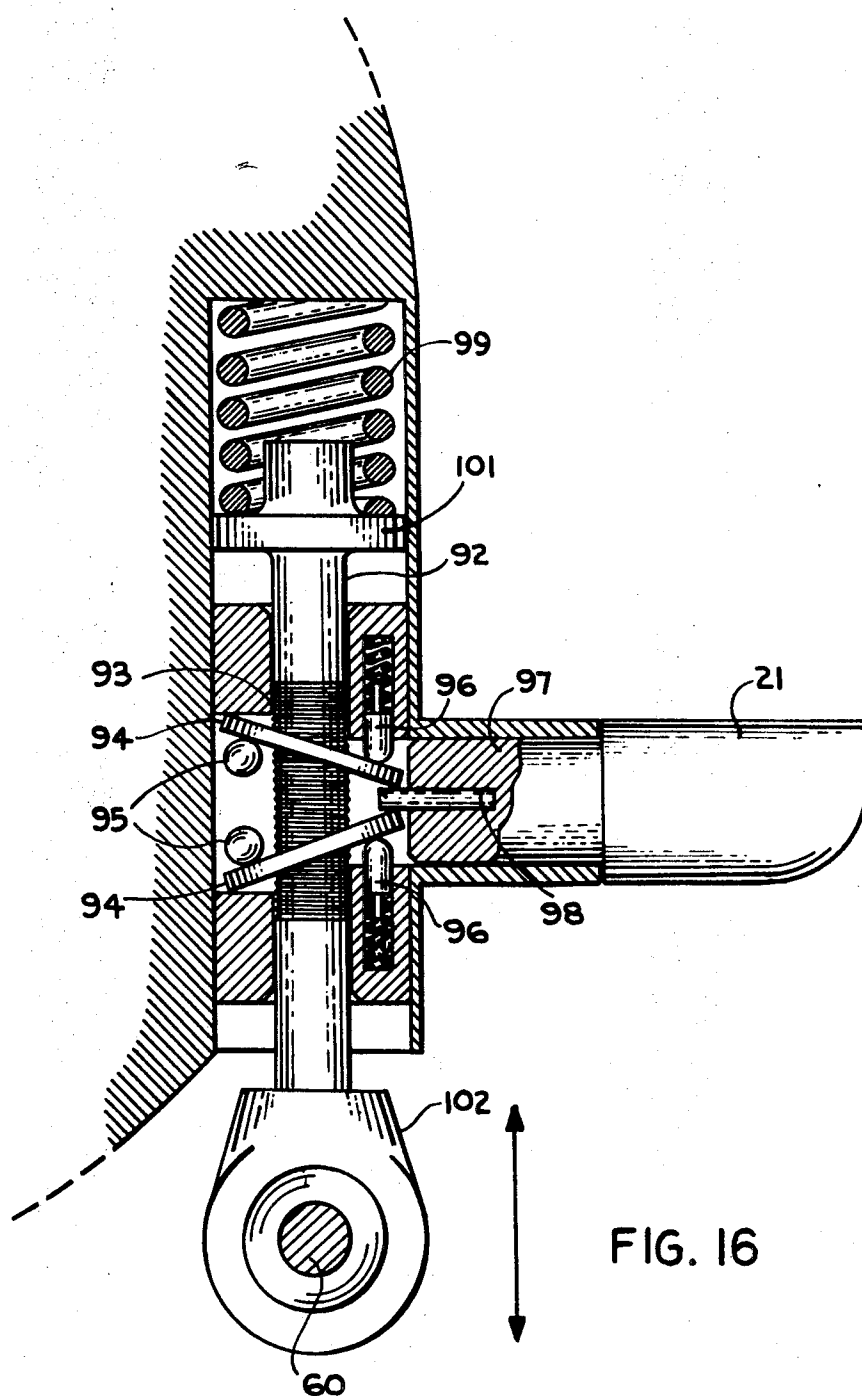
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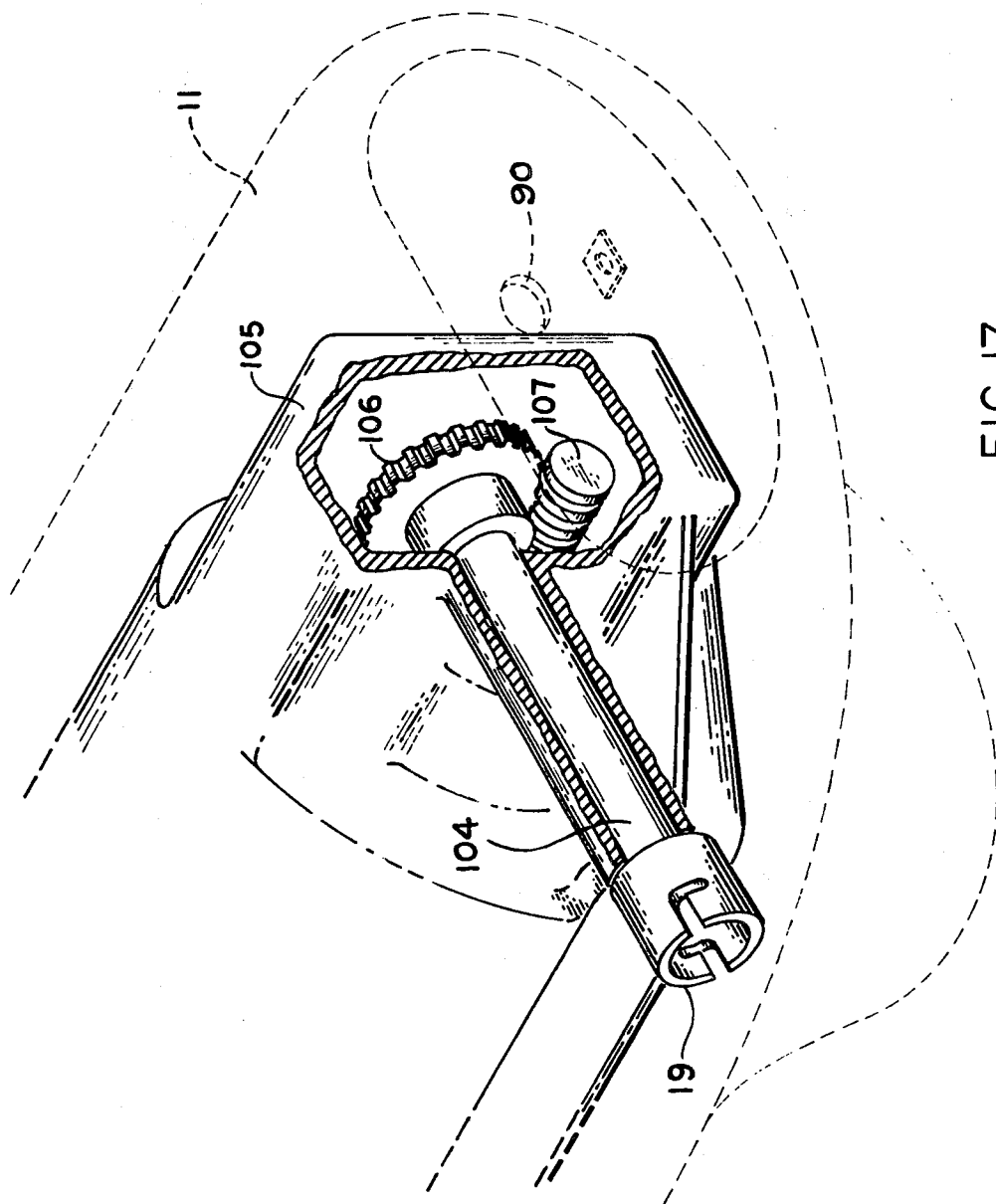


FIG. 17

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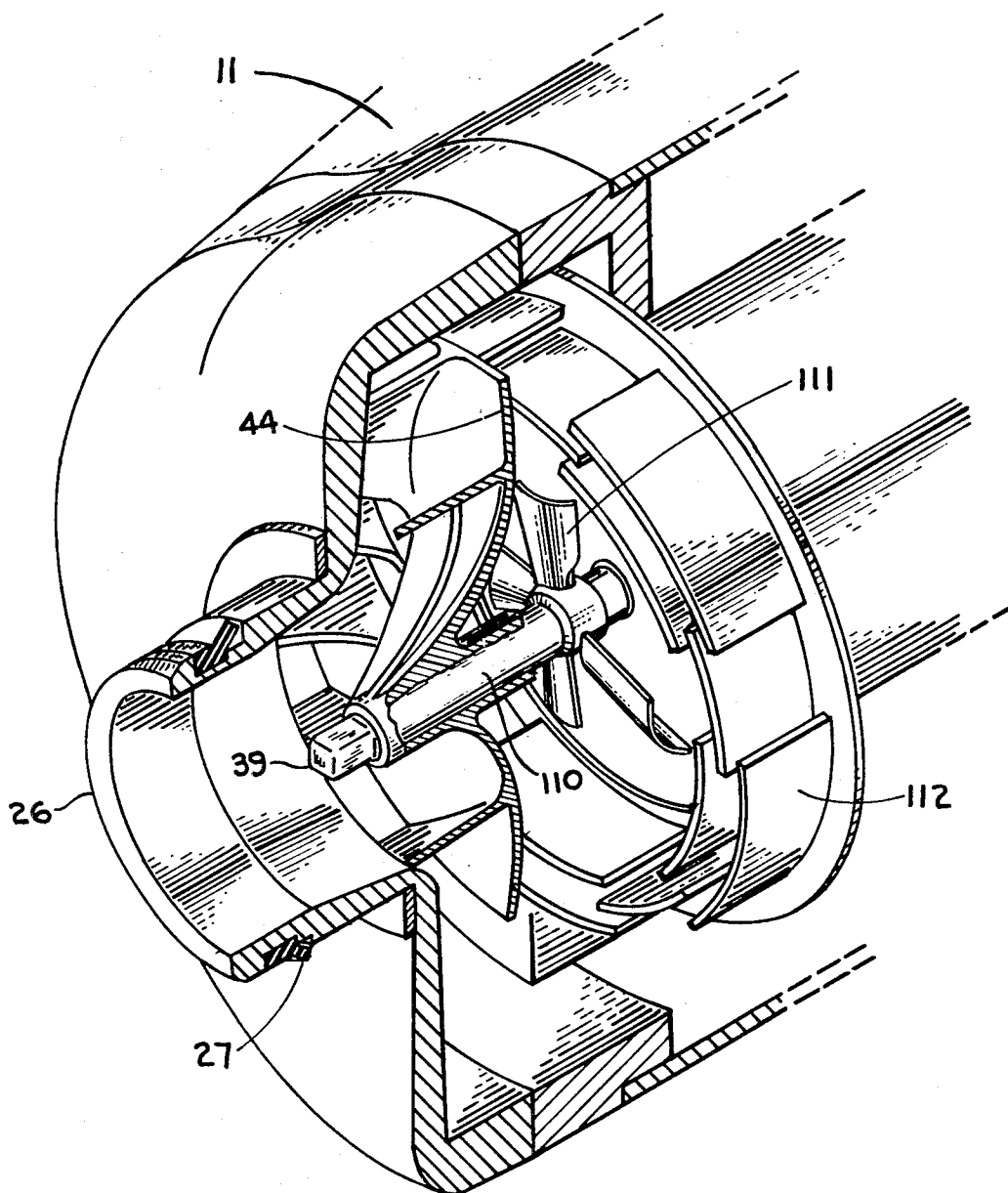


FIG. 18

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VACUUM CLEANER AND POWER UNIT

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2 Claims

ABSTRACT OF THE DISCLOSURE

A power unit usable as the principal ingredient of a vacuum cleaner, or as a means for driving certain accessories in rotation, employing an electric motor as the source of rotation. Our power unit possesses a number of novel features, including an improved brush driving means, a resilient ring for receiving and securing to the unit, components to be operated or driven in rotation, a power take-off arrangement, and various other improvements.

This invention relates to an improved vacuum cleaner of a multi-purpose type, and more particularly to a vacuum cleaner having a particularly powerful powerplant and no-slip drive arrangement as well as improved coupling devices simplifying installation and removal of the nozzle assembly and dirt receptacle, as well as other improvements including simplified bag dumping means, easily removable handle, permanent power takeoff means, and variable position lamp for all-purpose illumination.

In the past, a number of different types of vacuum cleaners have been proposed, and while many housewives have been relatively satisfied with tank-type and hassock-type vacuum cleaners, the universal favorite remains the upright. It is for that reason that the primary version of this device is built around upright vacuum cleaner principles, although as pointed out earlier, it is easily converted into a number of other appliances.

The typical upright vacuum cleaner has had many advantages as well as disadvantages. Machines of this type have characteristically utilized a high-speed rotary brush in their head or nozzle assembly, which brush serves to vibrate the carpet as well as to sweep particles residing on the carpet into such position that they can readily be picked up by the vacuum. Also the upright vacuum cleaner is typically ready for instant use without it being necessary to attach or uncoil hoses and other related devices, and further the handle typically employed by these machines enables the user to push the principal or motor portion of the device in a very precise manner, without any bending or stooping being involved. Because the electric motor is closely adjacent the pick-up nozzle, a ready supply of electric power is available so that an electric light supplying ample illumination can be provided.

However, the prior art upright type vacuum cleaner has had certain disadvantages, and the wheeled motor portion has at times been difficult to move over the floor, particularly if a sideways motion was desirable for cleaning some areas. Also, the bag has characteristically been more difficult to empty than in a tank-type machine, and the rotary brush has necessitated various belt-drive arrangements, most if not all of which have been unsatisfactory. For example, it has been found that from 13% to 20% slippage of the belt is not at all uncommon and such slippage necessarily creates friction and in turn heat, which of course has a deleterious effect on belts. When a belt does break, it is frequently necessary to remove the rotary brush and to install a new belt of the proper size and configuration in order to make the machine operative again.

As a further point, the bristles of the rotary brush must be relatively soft and therefore somewhat ineffective. If

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this rule is not followed, the additional power required to drive the rotary brush creates additional slippage and of course markedly decreases belt life.

Even when the belt remains intact, it frequently causes a great deal of annoyance to the user. If the vacuum cleaner is of a type having a removable head or nozzle portion, it is necessary to utilize a belt lifter in order to temporarily remove the belt from contact with the motor driven shaft used for driving the belt, and the user must of course remember to manipulate the belt lifter in the opposite manner at the time the nozzle or head is re-installed.

In accordance with the present invention, we have provided a vastly improved vacuum cleaner that goes a great distance toward overcoming the disadvantages of prior art vacuum cleaners, in that all hand operated levers including those customarily associated with nozzle removal and handle removal have been eliminated. A positive drive arrangement is provided for the rotary brush, which includes a no-slip belt that in normal use the user never has to touch or in any manner manipulate. When the user wishes to remove the head or power nozzle, he or she need only step upon a small lever which causes an elastomeric ring to release the nozzle or head portion from the wheeled motor portion, with the drive means for the brush being automatically disengaged when the nozzle or head is separated from the main portion of the device. A similar elastomeric ring is utilized in the mounting of the dirt receptacle, which of course means that it may be removed from the machine in a similar simplified manner. If it is merely desirable to empty the bag, it is only necessary to wheel the machine onto a newspaper or the like, with pressure of the toe being sufficient to cause a dumping of the contents of the bag. No compound motions of any component of the dirt receptacle is necessary.

If the user wishes to remove the handle of the machine, such as for example to convert it to a portable unit, it is not necessary to slide any pins or unscrew any screws. Rather, it is only necessary to raise the handle to the upright position and then continue pushing it forward in order to bring about a separation of the handle from the wheeled motor unit.

Another of the difficulties normally encountered in upright vacuum cleaners is the limitation that it can be moved only forward or backward, and never in oblique or sideways manner. We preferably utilize a tail-wheel movable in virtually a 360 degree manner, thus enabling the wheeled motor portion to be moved easily in whatever sideways motion may be desirable.

Another significant feature of this invention involves the use of a particularly satisfactory headlight arrangement that can be maintained in a normal or retracted position at such time as the machine is to be used under the edges of dressers or other pieces of furniture, but then easily and without the use of tools moved into any of several raised positions affording greater dispersal of illumination and ease of installation of certain components of the machine.

Other facets of this invention involve the use of a highly satisfactory height adjustment means, and a permanently installed power takeoff fitting that enables the wheeled motor portion of the device to serve as an easily transportable and highly satisfactory power unit for operating any of a number of sanding, polishing or cutting type devices. It is significant to note that in such instance, power is taken directly from the motor shaft through an appropriate reduction gearing without any driving belt being involved, which of course is prone to slip and overheat. Further features include a control arrangement allowing for an infinite control over the speed of the motor, and a baffle arrangement for markedly decreasing the noise emanating from the motor.

It is therefore a principal object of this invention to provide a multipurpose vacuum cleaner that is readily interchanged from one mode to another with a minimum of hand manipulation.

It is another object of this invention to provide a vacuum cleaner having a particularly powerful motor that may be varied in its speed and usable for powering any of a number of appliances.

It is a further object of this invention to provide a machine having a removable nozzle or head unit equipped with a high speed rotary brush, which brush is driven by a nonslip belt that in normal circumstances the user never need touch nor in any manner manipulate.

It is yet another object of this invention to provide a elastomeric ring arrangement for mounting a nozzle unit, flexible hose, floor polisher or other such device, which ring enables the quick installation of such component, and which seals against leakage tightly and effectively, yet is caused to release by only toe pressure.

These and other objects, features and advantages will be more apparent from a study of the appended drawings in which:

FIG. 1 is a perspective view of our vacuum cleaner, with a portion of the handle removed;

FIG. 2 is a side-elevational view of the wheeled motor unit, revealing certain details of various components;

FIG. 3 is a side-elevational view from the opposite side of the machine, revealing certain details of the dust receptacle;

FIG. 4 is a side-elevational view generally along the lines of FIG. 2, but drawn to a larger scale so as to reveal details of the headlamp, and with certain portions of the nozzle unit removed to reveal how the nozzle unit is retained in proper position by means of an elastomeric ring;

FIG. 4A is a fragmentary view of the spring used with the headlamp;

FIG. 5 is also generally along the lines of FIG. 2 but representing a number of vital cross-sectional details associated with the brush drive, and the release mechanism for the front portion of the machine;

FIG. 5A is a fragmentary view of the elastomeric ring in cross section;

FIG. 6 is a perspective view of the foot-operated lever arrangement utilized for releasing the front portion of the machine;

FIG. 6A is a fragmentary showing of a typical wedge and recess;

FIG. 7 is an enlarged side-elevational view revealing the dust receptacle as well as the elastomeric ring utilized for its retention;

FIGS. 8 through 12 depict other details of the dust receptacle;

FIG. 13 is a perspective view of the lower portion of the handle, revealing certain attachment details;

FIG. 14 is a fragmentary view to a larger scale of a typical detail associated with the handle retention and release means;

FIGS. 15A through 15C are views revealing certain details concerning the upper end of our machine, including the potentiometer utilized for varying the speed of the motor.

FIG. 16 is a cross-sectional view of the principal portions of the elevating mechanism;

FIG. 17 is a large scale perspective view of the power takeoff arrangement; and

FIG. 18 is a perspective view of the fan, baffle and retention ring arrangement.

DETAILED DESCRIPTION.—FIGURE 1

It will be noted from this over-all perspective view that we have provided a vacuum cleaner 10 having a wheeled motor portion or power unit 11, a removable rug nozzle assembly or head unit 12, a bag 13, and a handle 14. The mid-portion of the handle 14 is not shown in this

figure. The handle is movable with respect to its mounting as will appear in connection with FIGS. 13 and 14 discussed hereinafter, and a pair of slots 15, one of which is visible in FIG. 1, prevent interference with motion of the handle to a variety of positions. As will be explained in connection with FIGS. 13 and 14, the handle can be removed from its mounting by a certain forward motion, and it is not necessary for the operator to remove any pins, screws or the like in order to separate the handle from the wheeled motor unit when such is desired.

The headlight unit 16 visible in FIG. 1 and in greater detail in FIG. 4 may be utilized in the position shown in FIG. 1, or as may be noted from FIG. 4, may be easily tilted upwardly to a position of greater illumination without any tools being involved. Significantly, the headlight remains in the elevated position automatically, or at the whim of the operator can be easily returned to the lowered position.

Also visible in FIG. 1 are the extra-wide front wheels 17, the variously movable tail wheel 18, the power take-off 19, the separation lever 20, and the height adjustment device 21. The separation lever is utilized in the removal of the nozzle unit 12, which unit is normally maintained in the position shown by means of a novel resilient ring in accordance with this invention. When removal of the nozzle unit is desired, such can be accomplished easily by the lever 20, without the manipulation of a belt lifter being involved.

FIGURES 2 AND 3

Turning to FIG. 2 it will be noted from this side view that the nozzle or head unit 12 is disposed in operative position with respect to the wheel motor unit 11, so that an effective vacuum cleaning operation can be carried on with respect to the carpet, rug or floor upon which the machine may be residing. The wheels 17 are mounted upon an axle 60 of somewhat of a modified U-shaped configuration that extends from one side of the machine to the other, with a height adjustment device 21 being provided so that the height of the nozzle above the floor or rug can be altered by rotating the rod 60 with respect to unit 11. The height adjustment means is revealed in greater detail in FIG. 16, and the power takeoff unit 19 is visible in greater detail in FIG. 17. Carrying handle 14 simplifies the transport of the motor unit 11 when used without the long handle 14.

FIG. 3 is a view taken of the opposite side of our novel vacuum cleaner, with the dirt receptacle 23 being disposed in operative position on the wheeled motor unit. The contents of the unit 23 may be emptied in a highly advantageous manner in accordance with this invention by virtue of the placement of the hinged door 24 on the side of the receptacle 23. In order to dump the contents of the receptacle it is only necessary to place the machine upon a newspaper or the like, open the door 24 for a brief interval by the toe, and then reclose same. The receptacle 23, like the nozzle unit 12, is preferably held in place by a novel resilient ring, and this unit can be easily removed, when such becomes desirable, by a simple twisting motion. Pertinent details will be set forth hereinafter.

FIGS. 4 AND 5

By means of the broken away portions of FIG. 4 we have illustrated the significant details of the variously movable headlight unit 16, the coupling 38 between the drive shaft on the motor and the rotary brush disposed in the lower portion in the bottom of the nozzle unit 12, and the use of a novel, specially-contoured elastomeric (resilient) ring 27 for holding the nozzle unit in place on the inlet pipe 26 of the motor unit.

The headlight unit 16 is principally constituted by a curved shell portion 35 supported by a spring 31, which spring is shown in detail in FIG. 4A. The spring may

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be mounted by a pair of screws 32 on a protruding shoulder or ledge 33 disposed near the upper portion of the wheeled motor unit. Disposed in a pair of loops at the upper portion of the spring is a shaft 34, upon the ends of which the curved shell portion 35 of the headlamp is mounted. A transparent or translucent lens portion 53 is utilized so that even when the member 35 is in the closed position shown in FIGS. 1 to 3, ample illumination is provided. However, when the curved portion 35 is raised, light from the incandescent bulb (not shown) is also manifested from the bottom of this member, thus providing greater illumination. Furthermore, when the member 35 is in the raised position, greater access to the front of the machine is made possible, thus simplifying the removal of nozzle 12 or the substitution of a different component or accessory.

Because of the manner in which the spring 31 is configured, it normally serves to bias the curved shell portion of the headlight rearwardly, even when the user lifts it to the position shown in full lines in FIG. 4. The upper rear portion of the headlight shell comes to a fairly sharp edge 36, and as may be noted from FIG. 4, this edge may be disposed or placed in any one of several grooves or notches 37 that are disposed in the upper forward portion of the wheeled motor unit. At such time the headlight shell is stably maintained in the selected notch without danger of it falling to the closed position. When manipulating the headlight shell to new positions, the user in effect is overcoming the spring slightly so as to allow the headlight shell to move slightly forward so as to allow the rear portion of the shell to enter the desired notch. Only the base 50 of the bulb utilized for providing illumination is depicted in this figure, and it is mounted by a bracket 52 on the underside of the headlight shell so as to be movable therewith. A suitable pair of electric wires connected to the source of electric power may carry the current used by the bulb.

The coupling 38 shown in this figure and in the separated condition in FIG. 5 is utilized in the drive train between motor and rotary brush so that the nozzle unit can be removed easily when such is desired. Our novel design makes it only necessary to momentarily overcome the outward force of the elastomeric ring 27 in order that the nozzle unit can be separated, thus making entirely unnecessary the use of belt lifters or the like in order that such separation can be brought about.

Referring to FIG. 5 it will be noted that the forward end of the fan member 44 is equipped with a square end 39 (or end of other appropriate configuration), which fits easily but without slippage in the female portion of the coupling. As will also be noted in FIG. 5, the elastomeric ring 27 normally extends somewhat above the otherwise cylindrical contour of the inlet pipe 26, and in the direction shown in this figure. An inner assembly 40 is fastened in the upper interior portion of the nozzle unit 12 by screws or the like (not shown), with a ring shaped portion 41 of this inner assembly having a hole just slightly larger than the outer diameter of the pipe 26, so that it can easily encircle same. A shoulder 42 is provided around the interior of this hole, which shoulder is designed to substantially coincide with the position of the outermost edge of the elastomeric ring when the nozzle assembly has been installed upon the flange, note FIG. 4. Because of the angularity of the ring 27 and the fact that it extends about the pipe 26 for a full 360 degrees, it not only provides an excellent mechanical means for holding the nozzle unit in position, but also it forms a very effective seal serving to prevent the entrance of air into the fan blade except through the lower portion of the nozzle unit, adjacent the rotary brush 43. Removal of the nozzle unit from the pipe 26 is discussed in connection with FIG. 6.

Referring to the drive means of FIG. 5, it will be noted

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that the shaft 45 upon which the female portion of the coupling is mounted is rotatably disposed in appropriate bearing material 46 that is in turn supported by a type of "spider" arrangement involving one or more legs 47 that form an integral part of the inner assembly 40. Spaced from the forward end of the shaft 45 may be a worm 48 that is arranged to mesh with a worm gear 49 that is transversely mounted in the inner assembly with respect to the shaft 45.

A portion of the worm gear 49 is configured to receive a belt, and passing around such portion as well as around the mid portion of rotary brush 43 is a continuous belt 51, which preferably is equipped with a large number of teeth on its inner surface. The belt-receiving portion of the rotary brush as well as the belt-receiving portion of the worm gear are fitted with a number of notches dimensioned to receive the "teeth" of the belt, thus assuring that no slippage can occur and therefore making possible the use of stiffer bristles 52 on the brush 43 than would otherwise be possible.

FIG. 6

This perspective view shows in some detail the resilient, elastomeric ring 27 mounted on the pipe 26, which ring is configured so as to hold an encircling member in the desired position. Such encircling member can be the upper portion of a rug nozzle or floor polisher unit, or one end of a flexible hose for example. Because of the job the ring 27 must perform, it is necessarily of a particular configuration and of a rather firm and resilient texture. We prefer to make the ring of polyurethane.

Because of the direction in which the ring is angled, it is a comparatively simple matter as best seen in FIG. 5 to push the ring-shaped encircling member 41 of the interior of the nozzle unit onto the pipe 26 to a preestablished extent, thereby enabling the ring 27 to reside against the shoulder 42 and thus to firmly inhibit the nozzle unit from displacement in the opposite direction; see FIG. 5A.

However, there are occasions that the user will wish to bring about a separation of the nozzle unit from the motor unit and to that end we provide a separation lever 20, which is pictured in some detail in FIG. 6. The center hole in this lever is of a size that fits easily over flange or pipe 26, with two or so screws 55 holding the lever against displacement, but arranged to allow rotative movement of the lever to the extent permitted by the slots 56. A plurality of wedges 57 are disposed at spaced locations around the circular or ring portion 58 of the lever 20, which wedges normally fit into complementary slots 59 shown in FIG. 5 provided at spaced locations around the upper portion of the nozzle means; see also FIG. 6A. A compression spring (not shown) is embedded in the fan case below the ejection ring, which serves to return the eject petal 20 back to its original position when the user's foot is removed.

When the operator desires to cause the separation of the nozzle portion from the wheeled motor unit, he or she steps upon the lever 20 so as to move it downwardly from the position shown in FIGS. 1 and 6. This causes a wedging action of the type shown in simplified FIG. 6A, with the several wedges in effect moving up the angled portions of the recesses, and together contributing a balanced force serving to move the nozzle unit to the left as viewed in FIG. 4. Because the shoulder member 42 as shown in FIG. 5A has a suitably angled surface, the rather considerable force contributed by the wedging action causes a temporary radially inward compression of the elastomeric ring 27, thus allowing the nozzle unit to be removed.

It should be noted in FIG. 6 that a small projecting pin 63 is provided, over which a small female projection on the nozzle unit fits when these components have been secured together as in FIG. 4. This pin effectively pre-

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vents any undesirable rotation of the nozzle unit when the operator steps on lever 20.

The dirt receptacle

Turning now to FIG. 7, it will be noted that the dirt receptacle 23 is equipped with a mounting means in the form of a tubular member 61 configured to encircle and fit upon the outlet pipe 66 of the wheeled motor unit. The outlet pipe can be in the form of a tubular member, around the periphery of which is disposed an elastomeric ring 67 that closely resembles ring 27 of FIG. 5. Both of these rings are of course configured to permit an encircling member to be installed on the respective pipes, but to thereafter inhibit the removal of same. A shoulder 62 is disposed around the interior of the encircling tubular member 61, with the ring 67 being so placed that when the members 61 and 66 are interfitted to the predetermined extent shown in FIG. 3, the ring 67 rests against shoulder 62 and resists separation of the members.

No counterpart of separation lever 20 is utilized with this embodiment, although wedges 77 and recesses 79 are utilized on members 66 and 61 respectively. Normally each wedge 77 resides in its respective recess, but when the operator wishes to remove the receptacle 23, he or she grasps the lower portion thereof, and twists it with respect to member 66, thus causing in effect the wedges 77 to move up the angled portions of the recesses 79, and force the member 61 away from the motor unit, and thus overcome the effect of the ring 67. Thereafter, reinstallation of the dirt receptacle or a flexible hose for example is but a simple matter, for the angularity of ring 67 as previously mentioned, is such that it does not impede movement of the encircling member in the installation direction.

Disposed above the receptacle 23 is bag 13, which is emptied through door 24 provided in the receptacle 23 to make unnecessary the removal of the receptacle for the purpose of emptying same. The door 24 is equipped at its upper portion with a pair of hinges 78 enabling it to open at the bottom as shown in FIG. 8 so that dirt or other debris which has been picked up in the vacuum cleaner can easily fall upon a newspaper or other collection device placed beneath the machine. Because of the angularity possessed by the bottom portion of the dirt receptacle, as indicated in both FIGS. 8 and 9, the waste tends to fall out of the receptacle easily, without it being necessary for the operator to dig it out.

As best shown in FIGS. 8 and 9, a latch means in the form of a toe-operated spring biased device 64 is mounted on the lower portion of the receptacle 23, and secured in place by rivets or the like. The active portion of the latch means can be moved from the latching position shown in full lines in FIG. 9 to the dotted line position at the behest of the operator, thus allowing the door automatically to fly open under the influence of one or more springs 65 associated with the hinges; see FIGS. 10 and 11. Preferably the door is spring biased to the 180 degree position depicted in phantom lines in FIG. 9, thus assuring that it will be out of the way during the emptying process. As will be noted in the same figure, the outer portion of the latch 64 has a rounded contour so that upon the operator again closing the door, relatching is automatic. A recess 64a at the bottom front of the door facilitates secure latching.

It should be noted that the door 24 is preferably disposed at an angle to the vertical as shown in FIG. 9, say 15 degrees, and that the bottom member of the dirt receptacle is also angled, with these two members together defining a modified V-shaped configuration. As will be obvious, this insures that the dirt will find its way to the bottommost portion of the device, and that such dirt will automatically fall out when the door is opened. To insure against undesirable leakage, we prefer to use a gasket 70 around the four sides of the main aperture in the dirt receptacle, which gasket is retained in place

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by being disposed upon a raised portion 75 that extends around the four sides of the aperture; note FIGS. 8, 9 and 11. The peripheral portion of the door 24 is of a flat, rectangular contour designed to fit snugly against the gasket when the latching means is in its latching position. However, the middle portion of the door is recessed, with the raised portion 75 extending somewhat into such recess as shown in FIG. 9, thus further assuring against leakage.

The detachable handle

FIG. 13 represents a perspective view of the handle 14 of our vacuum cleaner that is utilized when the user wishes to use the machine as an upright. In accordance with our invention, we prefer to use a bifurcated construction at the lower end of the handle, involving a pair of insertion members 68. As will be noted in this figure as well as in FIG. 14, the forward end of each insertion member is noticeably rounded, thus to enable each member 68 to be easily inserted in its respective receiving member 69.

The members 69 are pivotally mounted in the upper portion of the wheeled motor unit 11, being movable in the slots 15 shown in FIG. 1. Stops are provided in front of the members 69, against which the latter members rest when the handle 14 is in substantially its vertical position. In this embodiment, the stops may be the forwardmost portions of slots 15, as shown in dashed lines. A tension spring 76 is associated with each member 69 tending to move it against its stop.

Approximately midway along the length of each insertion member 68 is disposed a slot 71 in which a pin 72 that is fixed in member 69 can be received when the insertion members have been fully inserted in the mating position. As will appear obvious, when a fixed pin 72 is residing in its slot 71, the handle cannot be withdrawn, and to assure against undesired displacement, we utilize a leaf spring 73 in each receptacle member, with the force of each spring being such as to bias the member 68 so that its slot is in close contact with the pin 72.

Should the operator desire to remove the handle 14, he or she moves it forward, to the fullest extent of travel of the members 69 in slots 15. The further movement of the upper end of the handle in the forward direction causes a type of pivoting action, with the lower ends of the handle turning about the upper end points 74 of the receiving members, thus bringing about a compression of the springs 73. This of course allows the slot 71 to move away from the fixed pin 72 so that thereafter the ends 68 come free, thus allowing the handle 14 to be removed from the machine.

Speed control and accessories drive

One of the features of our novel vacuum cleaner is the infinite type of speed control used. As will be noted in FIGS. 1 as well as 15A through 15C, a potentiometer is utilized at a location at all times convenient to the user so that he or she can adjust the speed of the electric motor powering the machine as often as conditions warrant. For instance, when cleaning a throw rug of lightweight construction, a minimum speed of the motor would be in order, thus to prevent the undesirable bunching of the rug. A medium motor speed is utilized for cleaning an ordinary carpet or the like, whereas the highest speed of the motor may be particularly desirable when the cleaning of a commercial or particularly heavy duty carpet is involved.

As will be noted from FIG. 15A, the potentiometer 85 may be normally disposed adjacent the grip portion 86 of the handle 14, such as in a vertical recess provided in a bulge or rounded projection 87. In this manner, the user will find the adjustment knob 88 conveniently available should he or she wish to bring about a selected motor speed. The potentiometer 85 may be normally retained in the handle 14 by detent means along the general lines of

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those shown in FIG. 15B, but in the event our invention is to be used as a power supply for driving accessories, when the handle is normally removed, the potentiometer may be removed from the handle and inserted in a recess 90 provided in the posterior portion of the motor unit, as best seen in FIGS. 15C and 17.

The power takeoff unit 19 shown in FIG. 17 may be utilized by means of a flexible cable arrangement to drive a lathe, for example, in which instance the potentiometer control arrangement is indispensable insofar as assuring that proper cutting speeds will be involved. The unit 19 is driven by a shaft 104 rotatably disposed in a projection at the rear portion of the inner casing 105 of the machine, on the inner end of which shaft is disposed a worm gear 106. This gear is driven in rotation by a worm 107 which may be mounted upon a rearward extension of the motor shaft. As will be apparent, a considerable amount of power is delivered to the power take off 19, making it suitable for a wide range of applications. For example, the motor unit may be used on the floor, with the shaft of a rotary brush inserted in unit 19, with the brush used for polishing shoes. Alternatively, the unit may be carried from place to place by handle 22 or a shoulder harness, with power from the unit being delivered by means of a flexible cable or the like. The potentiometer unit 85 contains an on-off switch, so by having the unit 85 conveniently disposed in the posterior of the motor unit, the user need not carry any ancillary equipment. The electric wire 89 used to interconnect the series wound electric motor and the potentiometer may extend along the handle 14 when such is used, or coiled up near the posterior of the motor unit when the handle has been removed and the potentiometer has been inserted in recess 90.

Height adjustment device

In FIG. 16 the height adjustment device is seen to utilize a vertically movable member 92 that is used to control the position of the rod 60 upon which the wheels 17 are mounted. As previously mentioned, this rod is generally U-shaped, with the wheels mounted on turned out portions adjacent each arm of the U. The middle portion of the rod is secured to the underside of the motor unit in such a manner that the rod can rotate about its support in order that the wheels may be selectively positioned. The vertically movable member 92 is equipped with a comparatively large number of small grooves or notches 93 disposed around its center portion, with the lower end 102 of the member 92 encircling the rod 60 associated with the wheels as will be noted in FIGS. 1 and 2.

A pair of case hardened washers 94 are disposed at the location of the encircling grooves, with these washers normally being in the eccentrically disposed locking positions shown by virtue of the fact that a pair of pins 95 hold the edges of the washers apart at one location, and the spring biased members 96 normally tend to push the washers together at a location 180 degrees away.

As will be noted from FIG. 1, the lever 21 can be rotated under the influence of the user's foot, with the inner rotative member 97 having a separating member 98 that resides between the washers. This latter member is of a width such that when it is rotated by 21, it serves to move the washers apart, thus overcoming the bias of members 96 and causing the washers to assume a more nearly parallel arrangement. Upon this taking place, the vertically movable member can be adjusted upwardly or downwardly with respect to the motor unit as the pile of the carpet or the preference of the user may dictate.

It should be noted that the height adjustment device may be disposed in a slightly enlarged portion of the outer case, as is to be seen in FIG. 1 adjacent the lever 21. Disposed in the upper portion of the height adjustment cavity is a comparatively large compression spring 99, which is arranged to push down on a disk 101 forming an upper part of the vertically movable member 92. This spring is of sufficient force to bias the active portion of

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the nozzle unit 12 away from the surface to be cleaned, thus making it possible for the user to lift the nozzle away from the surface by using only enough force with his or her foot to merely rotate the member 21 to "unlock" the vertically movable member 92. However, should the user wish to lower the nozzle, he continues adding more pressure to the lever 21 after the vertically movable member has been unlocked, thus causing the nozzle to move downwardly until it is in desirably firm contact with the carpet or other surface.

Sound suppressor

At the right hand side of FIG. 18 a casing is shown inside of which is located the electric motor utilized to turn the suction fan 44 utilized for drawing a vacuum up through the nozzle unit. This fan is keyed upon motor shaft 110 so that as the motor turns, the fan is forced to turn at the same speed. In addition to the fan 44, a cooling fan 111 is utilized so that in keeping with good motor design, the motor is kept from overheating while in operation.

In accordance with this invention we have arrayed a number of curved baffles 112 radially outwardly from the cooling fan, so as to knock out any "line of sight" noise from the cooling fan and thus markedly reducing the noise of the motor. The baffles are disposed on three or so different radii, and their positions overlap somewhat as shown in FIG. 18 so as to act as a muffling device that serves to inhibit the noise of the cooling fan. The baffles deaden or diminish the vibrations of the fan 111 as well as noise from the motor brushes and the like, thus making our machine much quieter than the ordinary.

As to the suction fan 44, it should be noted that the blades are of a specially designed configuration as to define a tapered cross sectional configuration, with the back of the fan as well as the front of the blade being disposed say 5 degrees to the vertical. This configuration may therefore be seen to involve a thinned tip section, which contributes to enabling a constant pressure to be maintained from the central portion of the blades out to the radial limits. In other words, by virtue of the tapered cross section of the fan, a greater pressure is maintained at the radially outward portions of the fan than would be the case if a fan having straight or flat forward and rear surfaces were used.

Tail wheel

As will be noted in FIGS. 1 through 3, the rear or tail wheel 18 is substantially spherical, consisting of two hemispheres, with a diaphragm and an axle therebetween. The two hemispheres have an axle which extends perpendicular through the diaphragm, which diaphragm is fastened by its own axle into the wheel fairing. As will be apparent, this spherical wheel is capable of rolling in a forward as well as a rearward motion and in addition may be rolled at an angle. Therefore, the user is not restricted to forward and rearward sweeping motions as in the past, for quite obviously it may be moved in oblique directions also. This spherical tail wheel can be patterned along the lines of that set forth in Pat. No. 622,449, issued Apr. 4, 1899.

Other constructional details

We prefer to make the exterior portions of the motor unit, the nozzle unit 12, as well as other components such as the inner casing 105 of die cast aluminum, this material being preferred from the standpoints of lightness and strength. To enhance the appearance of our novel vacuum cleaner, the external portions of the wheeled motor unit and the nozzle 12 are polished to a high lustre or else have another type of pleasing surface.

The elastomeric rings 27 and 67 must be of firm, tough, yet resilient material and preferably have a durometer hardness of 100. This material obviously must be capable of moving radially inwardly into a recess just below the

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angled portion of the ring, in which instance it is approximately the same diameter of the external portion of the pipe 26 or 66.

The electric motor utilized in the wheel motor unit is not limited to a certain size or power, but we have preferred a series wound electric motor manufactured by General Electric Company of the general nature of motor 5BA45LN, which consumes 740 watts when delivering a 6,000 r.p.m. output. This output may be obtained by virtue of going through a gear box in which the speed is geared down from an armature speed of 12,000 r.p.m.

We may prefer to use helical gears in the nozzle unit in lieu of the worm 48 and worm wheel 49, and we prefer a 1.83 to 1 ratio with regard to the pulleys over which the belt 51 extends. Inasmuch as the brush may turn between 3,000 and 4,000 r.p.m., the bristles should be of durable fibrous material so that melting of the bristles will not occur at high speed.

Because the nozzle unit can be built around a design in which the roller 43 is 15 inches long, our machine may be somewhat heavier than ordinary machines and for that reason we prefer the wheels 17 to be of particularly wide construction. These wheels bear most of the weight of the machine and because of the considerable surface involved, they will leave no marks even though the machine be utilized on very soft carpet materials.

Although we have principally described our new machine along the lines of being an upright vacuum cleaner, it manifestly is not so limited. For example a floor polisher unit may be substituted in lieu of the nozzle unit 12, with a similar type of drive being responsible for driving a polishing brush in high speed rotation without slip. In such instance the upper end of the floor polisher unit has an encircling member designed to fit upon and encircle the pipe 26 shown in FIG. 5, and to have the counterpart of shoulder 42 into which the angled portion of the elastomeric ring extends.

Whether the nozzle unit or the floor polishing unit is used, a small female fitting on the side thereof substantially coinciding with the position of pin 63 in FIG. 6 is utilized to prevent undesirable rotation of such unit when the user steps on lever 20.

By removing the handle 14 and placing a flexible hose upon the pipe 26 designed to be held in place by the elastomeric ring 27, we can convert the unit 11 into a portable cleaner that can be carried around by handle 22. Also, if we need a source of air, we can connect the flexible hose instead onto the outlet pipe 66, with elastomeric ring 67 then holding the hose in place.

As previously indicated, a variety of rotational devices can be driven by our permanently available power take off 19, with a wide range of speeds available by virtue of the utilization of our highly advantageous potentiometer unit 85.

We claim:

1. A power unit which can be utilized as the principal ingredient of a vacuum cleaner, or as a means for driving certain accessories in rotation, said power unit having an electric motor therein, mounting means on said power unit by the use of which a component having therein a rotative member can be removably secured upon said unit, said mounting means being constructed to receive and automatically retain the component, such that the component can be quickly pushed without twisting into an installed position on said power unit, and at a later time quickly disengaged without twisting, drive means extending between said motor and said rotative member so that said member can be driven in rotation, and coupling

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means in said drive means, at which separation can automatically take place when said component is to be removed from said power unit, without the necessity of a belt lifter or the like, said mounting means involving a tubular member arranged to receive an encircling member representing a part of the component to be secured to said power unit, and a resilient ring disposed between said tubular member and said encircling member, said ring being of a comparatively small diameter at a location nearest said encircling member, and then gradually enlarging in diameter to thus define a ring having an angled cross section disposed and configured so that the latter members can be easily interfitted, said ring, because of its angularity, serving thereafter to inhibit the separation of said members, and selectively operable force applying means serving to bring about a momentary change in the effective diameter of said ring so that said members can be separated.

2. A power unit which can be utilized as the principal ingredient of a vacuum cleaner, or as a means for driving certain accessories in rotation, said power unit having an electric motor therein, mounting means on said power unit by the use of which a component having therein a rotative member can be removably secured upon said unit, said mounting means being constructed to receive and automatically retain the component, such that the component can be quickly pushed without twisting into an installed position on said power unit, and at a later time quickly disengaged without twisting, drive means extending between said motor and said rotative member so that said member can be driven in rotation, and coupling means in said drive means, at which separation can automatically take place when said component is to be removed from said power unit, without the necessity of a belt lifter or the like, and a foot operated separation lever utilized to cause said component to be disengaged from said power unit, said separation lever being connected to at least one separation member disposed essentially between said mounting means and said component, with the movement of said separation lever causing said separation member to undertake a type of camming action bringing about the removal of said component.

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