Nov. 16, 1971 G. E. RIDEOUT ET AL 3,619,850

VACUUM CLEANER

Filed May 22, 1969 5 Sheets-Sheet 1

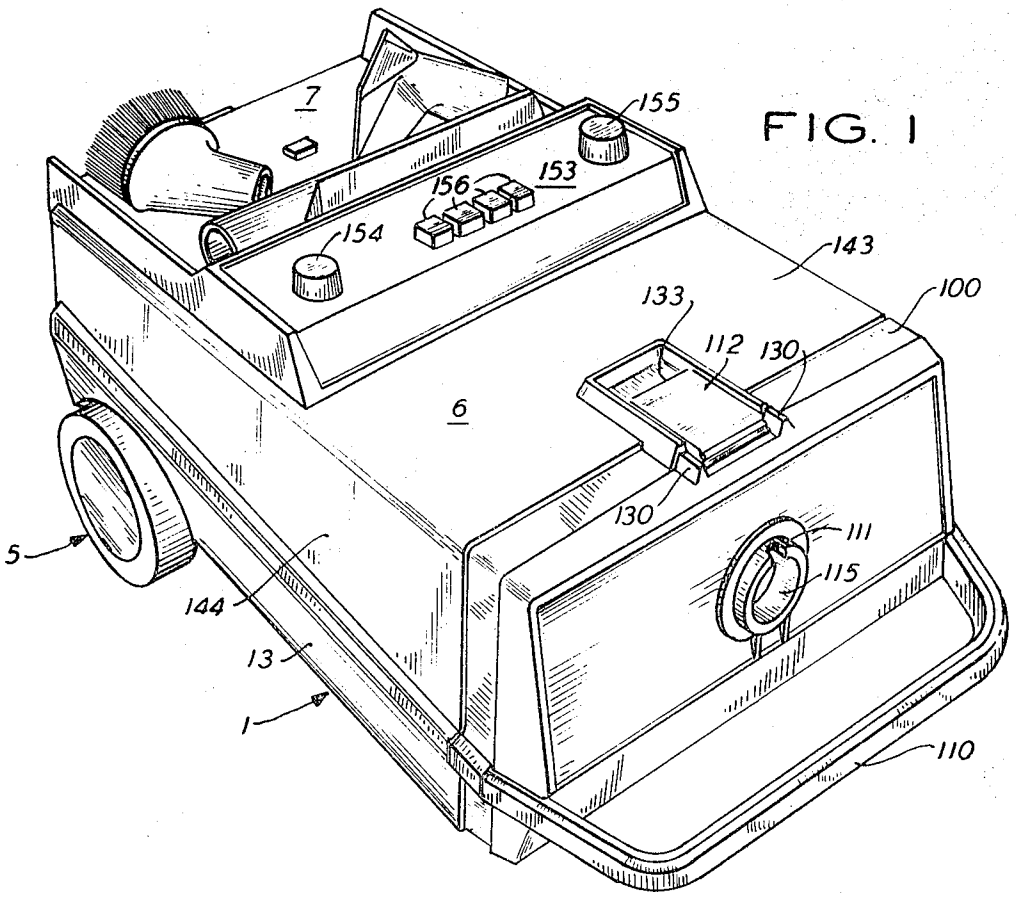

FIG. 1

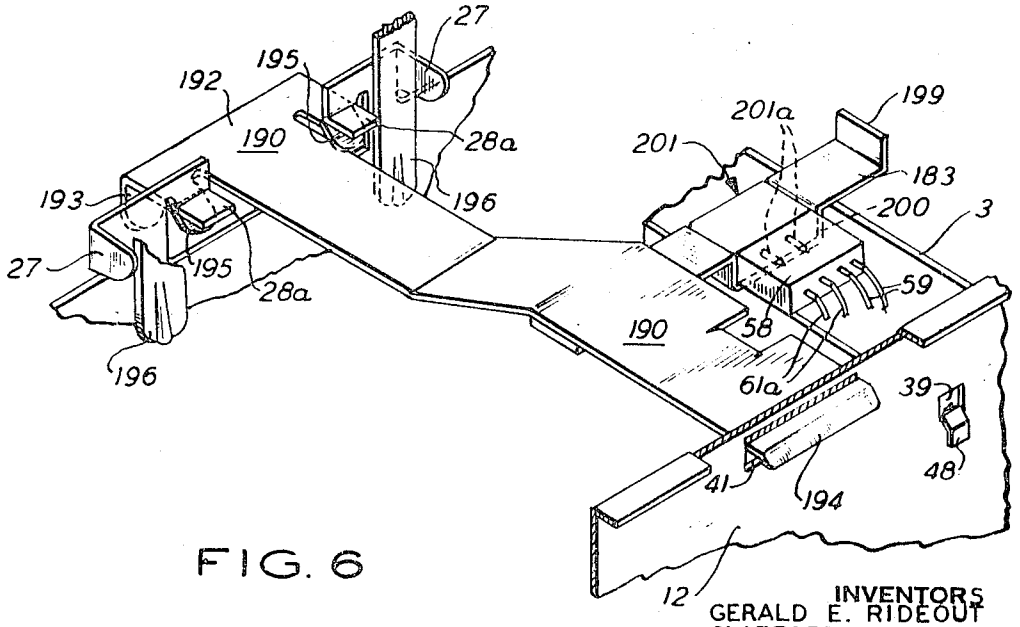

FIG. 6

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FIG. 2

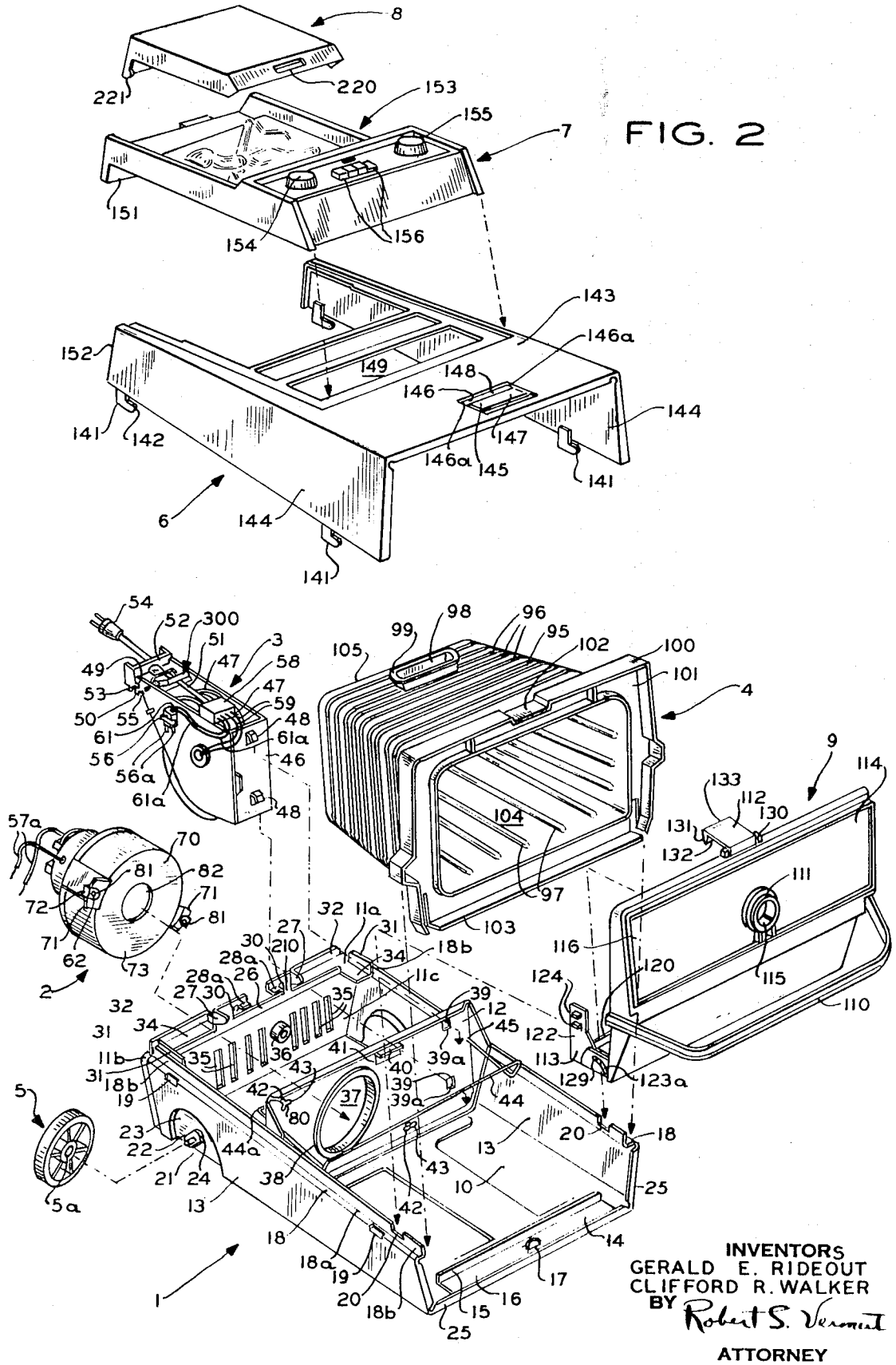

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FIG. 3

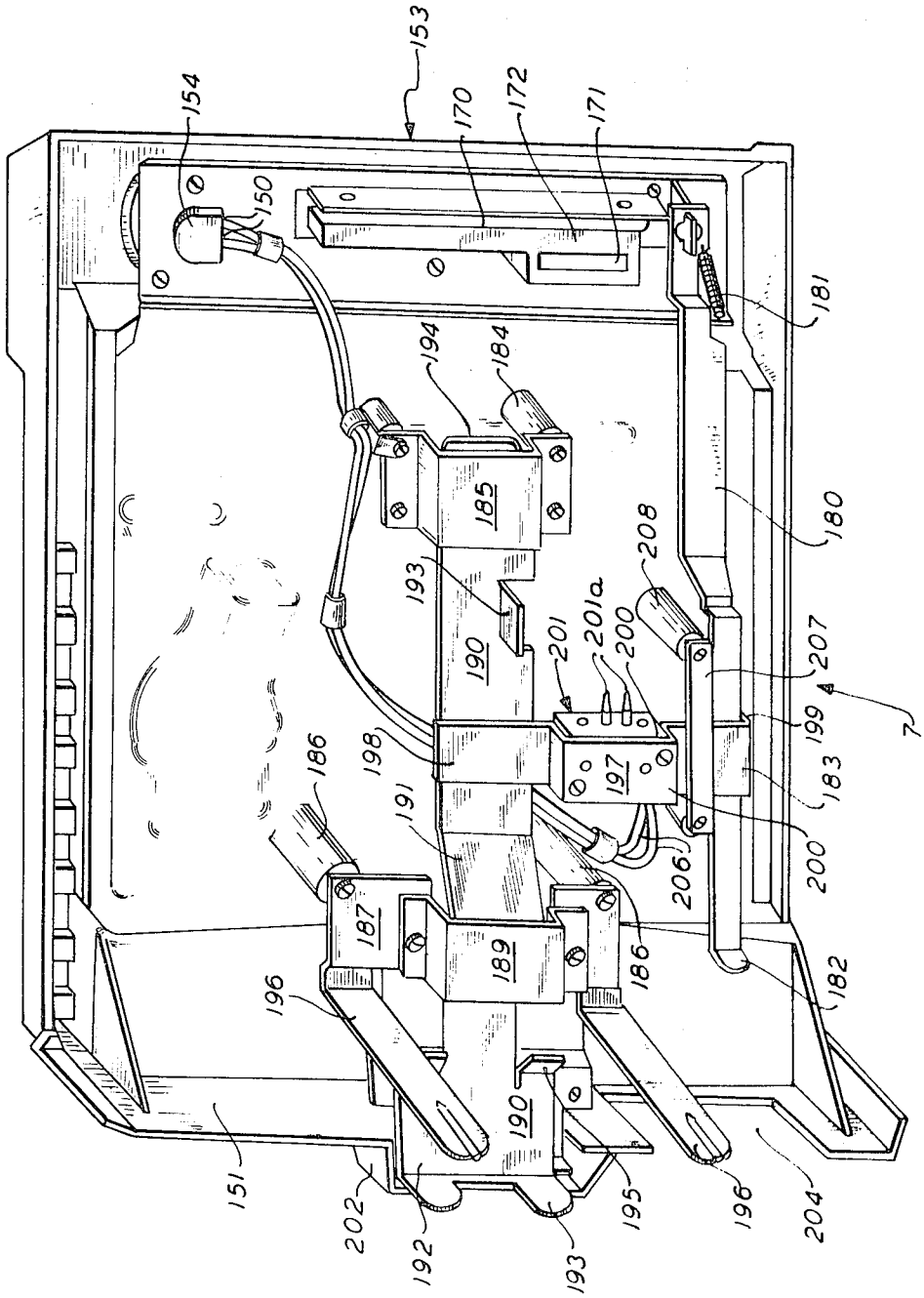

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FIG. 4

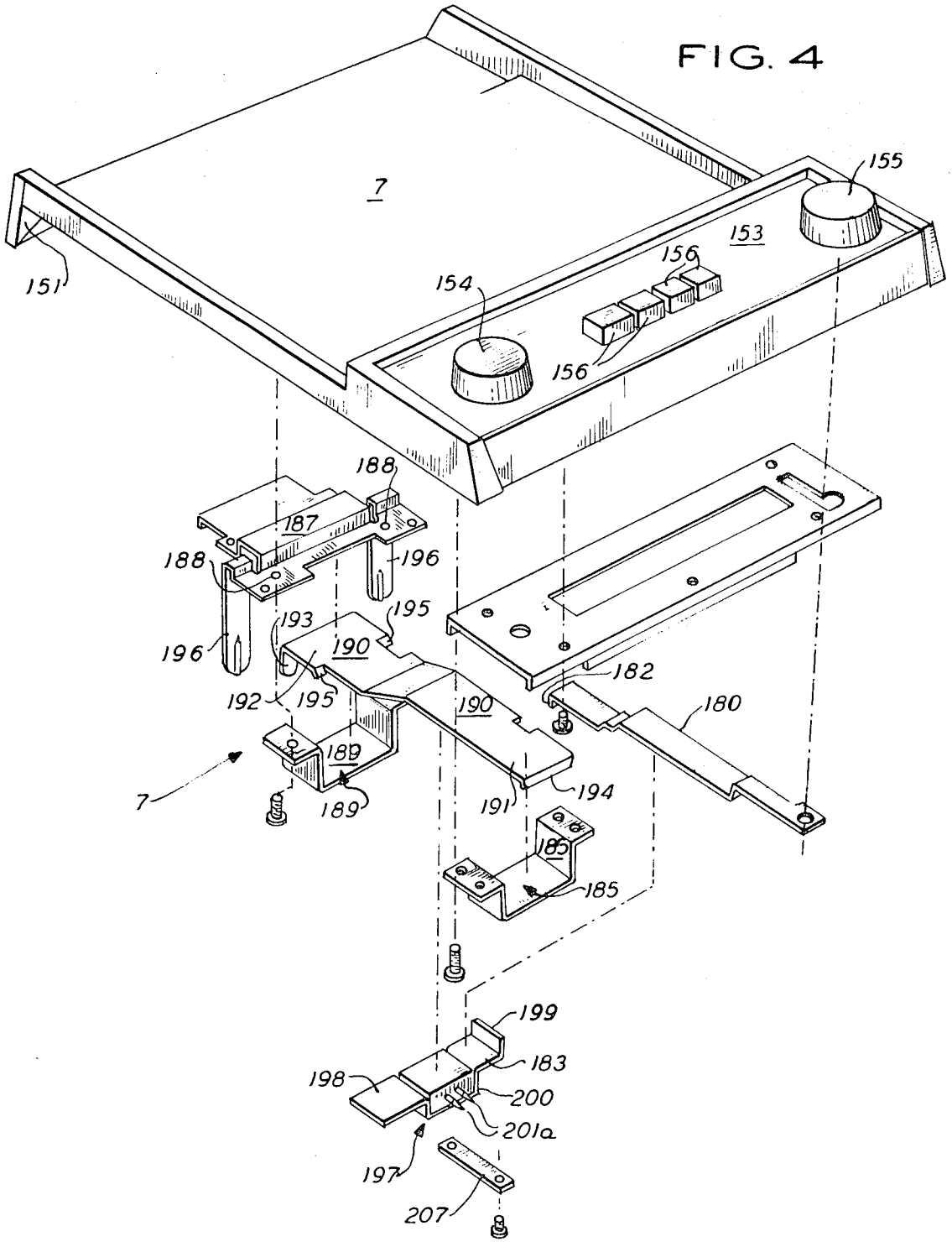

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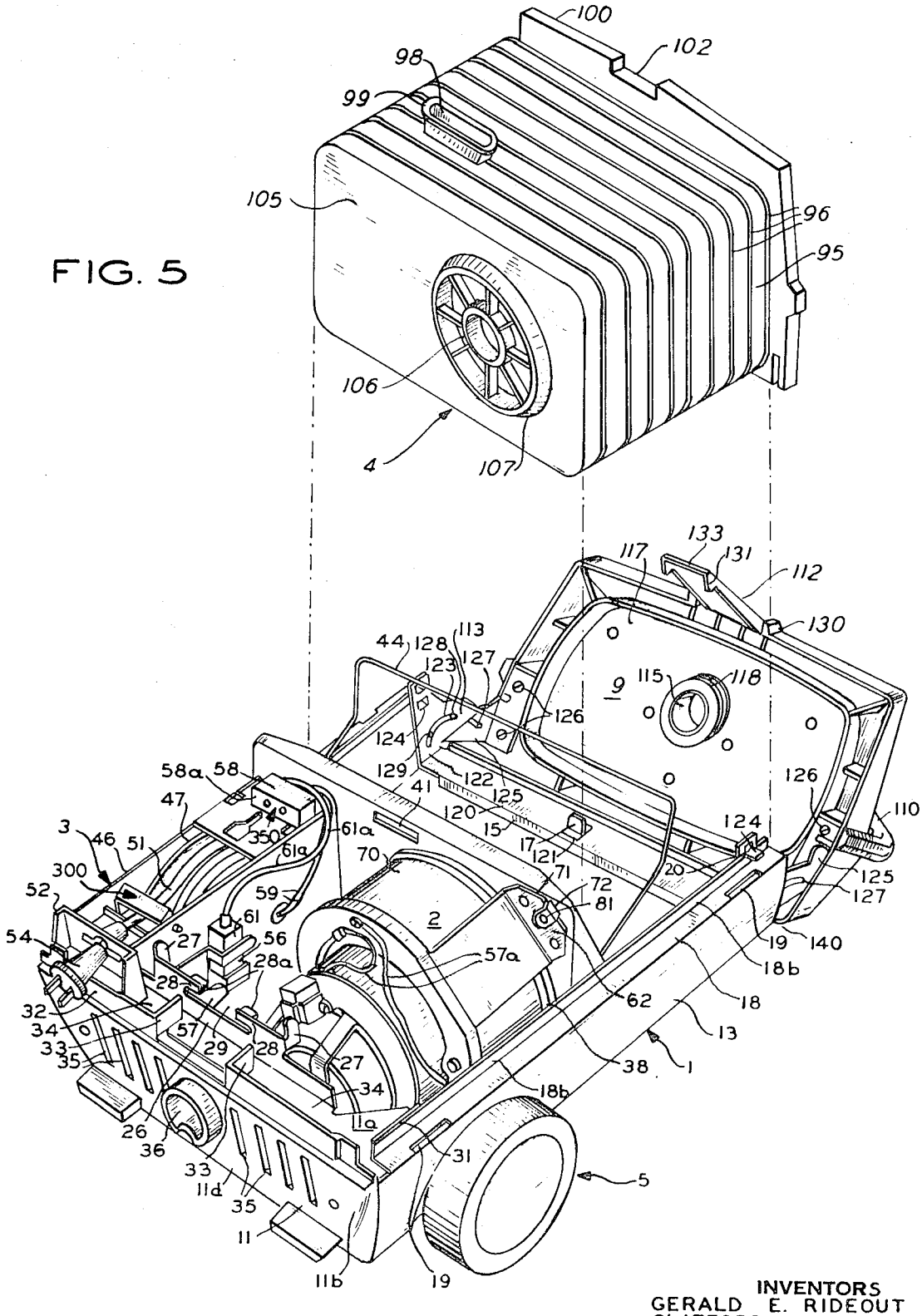
FIG. 5



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United States Patent Office 3,619,850 Patented Nov. 16, 1971

3,619,850

VACUUM CLEANER

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Filed May 22, 1969, Ser. No. 827,010
Int. Cl. A47l 5/00
U.S. Cl. 15—323 16 Claims

ABSTRACT OF THE DISCLOSURE

A vacuum cleaner has a plurality of components adapted to be assembled and disassembled manually without the use of tools. The components include an upper and a lower shell, a vacuum chamber housing, a motor with housing, a cord rewind mechanism, a tool caddy, and a door; the vacuum chamber and motor housings and the cord rewind mechanism being adapted to releasably interrelate with the lower shell; and the tool caddy and door being adapted to releasably interrelate with both the upper and lower shells. The arrangement of components is such that the interrelation of the tool caddy component with the other assembled components is requisite to an operable electrical circuit.

CROSS REFERENCES TO RELATED APPLICATIONS

The subject matter of the present invention relates to the subject matter of application Ser. Nos. 827,003 and 827,004 filed on May 22, 1969 and on May 22, 1969, respectively, the subject matter of both related applications disclosing, in particularity, components of the present invention. The related applications are assigned to the same assignee as the present invention.

BACKGROUND OF THE INVENTION

(1) Field of the invention

This invention relates to the field of suction devices and, more particularly, to suction cleaning devices such as those generally designated as vacuum cleaners.

(2) Description of the prior art

The prior art in the field of suction devices and, in particular, vacuum cleaners discloses a number of devices which show two parts which are releasably interrelated. Prior art patents of the latter type are directed mainly to vacuum cleaners having hose-connector door components which are clamped to the vacuum cleaner body by manually releasable means so that the vacuum cleaner bag may be removed and emptied. However, no prior art shows the concept of a vacuum cleaner comprising a plurality of components with the intended purpose of having all of the components readily releasable with safe electrical circuitry so that the vacuum cleaner might be serviced by the user without the expense of repair shop services. Also, no prior art shows a vacuum cleaner having all of its component interrelating means manually operable without the use of tools.

Many problems were encountered in reducing the concept to practice. One problem was to create components, many being conventional, which could be readily assembled as a vacuum cleaner and be of somewhat comparable value so that replacement of any one component would cost only a fractional part of the total initial investment for the vacuum cleaner. Another problem was to provide electrical circuitry safe to the user for purposes of self-servicing the vacuum cleaner. A third problem was to provide component interrelating means which, in the preferred embodiment would be manually releasable without the use of tools, would effectively function and would be acceptable to the user.

The above problems have not been recognized by the prior art, the principal reason being the failure of the prior art to conceive of a vacuum cleaner as hereinafter disclosed. Solutions for the above problems are propounded hereinafter.

SUMMARY OF THE INVENTION

The present invention is directed toward a suction device comprising a plurality of components which are capable of being readily assembled and disassembled.

With reference to the preferred embodiment, the suction device is a vacuum cleaner which comprises a body including an upper and lower shell, the lower shell being adapted to releasably receive a motor housing, a cord rewind mechanism and a vacuum chamber housing while the upper shell is adapted to releasably receive a tool caddy. The upper and lower shells are operatively interrelated in part by a door and the tool caddy, and each of the component interrelating means is manually operable without the use of tools.

It is therefore an object of the present invention to provide a suction device comprising a plurality of components which are capable of being readily assembled and disassembled.

It is also an object of the present invention to construct a suction device of a plurality of components, each component being somewhat comparable in value so that replacement of any component upon self-servicing will be at a cost only fractional of the initial investment for the device.

It is also an object of the present invention to provide a vacuum cleaner having the virtues of the prior art but also being constructed from a plurality of components which are capable of being manually assembled and disassembled without the use of tools.

It is also an object of the present invention to provide component interrelating means which are manually operable, effectively function, and are acceptable to the user.

It is also an object of the present invention to provide electrical circuitry safe for the self-servicing user.

These and other objects, features, and advantages will become more apparent when viewing the following description and claims in the light of the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of an assembled vacuum cleaner without a tool caddy cover;

FIG. 2 is an exploded, perspective view of the vacuum cleaner components;

FIG. 3 is a perspective view of an assembled underside of the tool caddy component;

FIG. 4 is an exploded, perspective view of certain sub-components of the tool caddy component;

FIG. 5 is a rear perspective view of the lower shell component with interrelated motor, rewind and door components and with the vacuum chamber component shown in exploded perspective; and

FIG. 6 is a perspective broken away view of the parts of the components affected by the movement of the locking bar to interrelated position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now more particularly to the drawing with reference numerals, in FIGS. 1 and 2 a vacuum cleaner constructed in accordance with the present invention is shown, respectively, assembled and disassembled.. The vacuum cleaner comprises a lower shell component gen-

erally designated at **1**, a motor component generally designated at **2**, a cord rewind component generally designated at **3**, and a vacuum chamber component generally designated at **4**. The latter three components are adapted to be assembled into interrelationship with the lower shell component as hereinafter described. The vacuum cleaner, as shown in FIGS. 1 and 2, also includes an upper shell component generally designated at **6** and a tool caddy component generally designated at **7**.

A tool caddy cover, generally designated at **8** in FIG. 2, is preferably made of a high impact plastic and is adapted to interrelate with the tool caddy component which in turn is adapted to interrelate with the upper and lower shell components. The upper and lower shell components are adapted to be interrelated by certain means to be described hereinafter and, in addition, are held together by a door component generally designated at **9** which includes certain parts which interrelate with respective parts of the upper and lower shell components to aid in maintaining the two in assembled relation.

Prior to discussing the structural details herein involved, it is considered appropriate to initially state that the disassembling of the tool caddy component **7** from the upper and lower shell components will provide for the sequential release and disassembly of each of the other components.

The lower shell component **1**, as seen in FIG. 2, comprises a base **10**, a rear wall or bulkhead **11**, an intermediate wall or bulkhead **12**, preferably made of steel, and two substantially identical sidewalls **13** which taper from the base rear end adjacent the rear bulkhead to the base front end.

The base **10** at its front end includes an L-shaped angle member **14** preferably welded thereto along long leg **16** thereof, the leg **16** having an upstanding intermediate tab **17** cut therefrom. The short leg **15** of the angle member is upstanding and acts as a positioning element as described later. The sidewalls **13** are formed integrally with the base from, preferably, sheet metal and include right angle flanges **18**. Each flange **18** has on its leg **18***a* a pair of spaced slots **19** and on its other leg **18***b* a cut-out portion **20**, respective slots and cutout portions of respective sides being in opposition. In addition, the sidewalls and base are jointly indented to form a pair of opposed hemispherical recesses **21**, each adapted to receive a wheel, preferably made of plastic, generally designated at **5**. The recesses **21** include axle members **22** which are connected to the recesses **21** by base plates **24**, the plates **24** being preferably welded to the wall portion **23** of the recesses. The wheels **5** support the vacuum cleaner in operation through axles **22** which are received within wheel sockets **5***a*.

The base and sidewalls also include a contiuous, inwardly extending flange **25** at both ends of the base. The flange **25** at the rear of the lower shell component, although not shown, is utilized to fixedly join the rear bulkhead **11** to the base and sides by, preferably, spot welding, the rear bulkhead forming an end panel for the lower shell component.

The rear bulkhead **11**, as seen in FIGS. 2 and 5, comprises an inner member **11***a*, preferably made of steel, and positioned inside flange **25** and welded thereto and an outer cover mebber **11***b*, preferably made of high impact plastic, secured to the inner member outside of flange **25** as by screws. The member **11***a* includes a face portion **11***c*, an inturned top flange **34**, and an upstanding flange **26** which has a pair of parallel inwardly extending projections **27** and a pair of coplanar projections **28** directed toward each other, the latter pair of projections forming a slot having a neck portion **29** and a pair of undercut portions **30**. The undercut portions **30** are further defined by inwardly directed tabs **28***a*. The inner member also includes a pair of side flanges **31** which abut, for positioning, against the legs **18***b* of right angle flanges **18**.

The outer member **11***b*, as seen most clearly in FIG. 5, has a face portion **11***d* and a pair of substantially coplanar upstanding flanges **32**. The flanges **32** have adjacent their inner ends a pair of flanges **33** at right angles thereto directed inwardly toward flange **26**. Thus, flanges **26** and **32** are parallel with top portion **34** extending from the flanges **31** of member **11***a* and between the inner and outer flanges **26** and **32** to form a support area.

As can also be noted from FIGS. 2 and 5, the rear bulkhead **11** has a plurality of openings **35** formed by aligned openings in faces **11***c* and **11***d*, and a hollow cylindrical projection **36**, part of member **11***b*, which extends through an opening in face **11***c* and which, in conjunction with the openings **35**, vent the closed environment formed by the lower and upper shells adjacent the rear bulkhead to atomsphere. The venting is necessary for the proper functioning of the motor blower within the motor component **2**.

The intermediate bulkhead **12** includes a circular opening generally designated at **37** surrounded at its structural perimeter by an annular gasket **38**, the gasket, as seen in FIGS. 2 and 5 and more fully disclosed in application Ser. No. 827,004 mentioned hereinabove, extending on both sides of the bulkhead. The gasket can be of a conventional construction and may be merely annular in shape with a circumferential groove receiving the structural perimeter of opening **37** but of suffcient axial dimension to extend on both sides of bulkhead **12** to sealingly contact components **2** and **4**. The bulkhead **12** also includes a pair of vertically spaced openings **39** and a transverse flange **40** cut-out from the bulkhead to provide an opening **41**. The bulkhead **12** further includes a pair of openings **42** on diametrically opposite sides of the opening **37**, the openings **42** on diametriaclly opposite sides of the opening **37**, the openings **42** retaining conventional quarter-turn fasteners **43**, and a strap retaining means **44** extending through a pair of openings **45** in the bulkhead, secured behind the bulkhead as by a flange means **44***a*, and being adjustably movable in relation thereto.

The cord rewind component **3**, preferably made of steel, includes a housing **46** for the reel **47** and a pair of vertically spaced tabs **48** which are struck outwardly and extend downwardly from the rear portion of the housing **46**. The portions of the tabs **48** integral with the housing **46** are spaced apart approximately the same distance as the lower structural perimeters **39***a* at openings **39** in bulkhead **12** so that the tabs **48** may be received in the openings and supported on the perimeters **39***a*. The housing **46** also includes a pair of grooves **49** and a pair of downwardly extending support flanges **50**.

The operation of the cord rewind component is of a conventional nature, as disclosed, e.g., in U.S. Pat. No. 2,391,840, issued Dec. 25, 1945, except for disclosed means of interrelating the rewind component to the other components. The rewind component includes a power supply cord **51** and a keeper **52** which precludes full cord retraction, the keeper having a pair of projections **53** fitting into grooves **49** to retain the keeper in position with respect to the housing **46**. The cord **51**, of course, includes a plug **54** which is on the opposite side of the keeper than the housing **46** to prevent the plug from being wound on the reel **47**.

When the component **3** is in position, as shown in FIG. 5, the tabs **48** support the component on the bulkhead **12** and the flanges **50** support the component on the rear bulkhead base portion **34** with the upstanding flange **26** being received in recess **55**.

The housing **46**, as seen in FIGS. 2 and 5, also has connected thereto a terminal box **56** having terminal elements **56***a*, the latter received in socket means **57** connected to the motor leads **57***a*. A plug **61** connects the box **56** to the power supply through line **61***a* and terminal box **58**. The terminal box **58** is connected to the power supply by lines **59** under conventional reel circuitry as described in Pat. No. 2, 391,840 with the electrical connection between the lines **59** and **61***a* being governed by an on-off switch **154** positioned on component **7** for foot actuation. As seen in FIG. 5, the terminal box **58** on the side **58***a*

is adapted as a socket means for releasable contact with the terminal elements **201***a* of the terminal box **201** on contact bar **197** as shown in FIGS. 3 and 4. Thus, even if the reel is connected to the power supply, the socket means at **58***a* will provide a safe terminal for one who undertakes disassembly of the components.

The motor component **2** comprises a housing **70** having a pair of diametrically opposed flanges **71** extending therefrom. Each of the flanges has an opening **62** therethrough and a clip type nut **72** thereon with an opening **81** aligned with the flange opening **62**. The housing **70** has an opening **82** to the motor blower to provide a suction passage from vacuum chamber **104** through the filter standoff **106**, shown in FIG. 5, and the opening **37** when the motor is in position by quarter-turn of fasteners **43** and the gasket **38** is effective.

In position, as shown in FIG. 5, the motor component **2** has its housing face **73** in parallel relation to the bulkhead **12** and spaced therefrom but sealed thereto by the gasket **38**, as more fully described in application Ser. No. 827,004 referred to hereinabove, so that the internal low pressure side created by the motor blower and communicating with the other side of the bulkhead **12** through opening **37** is not adversely affected by the external high pressure or atmospheric side. In order to position the motor component **2**, the housing **70** is merely placed into the lower shell component **1** between the rear and intermediate bulkheads **11** and **12**, respectively, with the openings of flanges **71** and nuts **72** in alignment with the openings **42** of bulkhead **12**. The quarter-turn fastener, of conventional construction, has a wing-type turning portion **80** and is received within the openings **62** and **81**, and is permitted a quarter-turn by a stop projection **81***a* on the side of the clip remote from the quarter-turn fastener as seen in FIG. 5. The quarter-turn fastener and clip combination are conventional elements and are here described as only one means of relating the motor component **2** to the lower shell **1** by manual means without the use of tools. The relationship of the component **3** to the lower shell **1**, as seen in FIG. 2, is also accomplished by manual means without the use of tools as by the tabs **48**, flange **50** and groove **55**.

The door component **9**, preferably made of plastic, includes a handle **110**, a hose connector **111**, interrelating means **112**, preferably made of steel, for interrelating the door component and upper shell component **6**, a hinge connector **125** and a hinge member **113** for relating the door to the lower shell component. The body **114** of the component **9** is of the hollow sandwich type which has an aligned opening **115** through the spaced panels, as seen in FIGS. 2 and 5, with the outer panel **116** having an integral hose connector **111** and the inner panel **117** having a gasket **118** secured to the structural perimeter of the opening **115**, the gasket **118** engaging the collar of a vacuum cleaner bag (not shown) received within the vacuum chamber **104**. The engagement of the gasket **118** with the bag collar precludes loss of pressure in the vacuum chamber, and the gasket also precludes undesirable recirculation of air between the panels **117** and **118** because the gasket extends within the door to contact the panel **116** about the opening **115**.

The hinge member **113** comprises, as seen in both FIG. 2 and FIG. 5, a base member **120** having an opening **121** therein which receives the tab **17** of the lower shell component and two side flanges **122** which are upstanding with respect to the base **120**. The flanges **122** each include a slot **123** and a pair of positioning tabs **124** struck out from the flange **122**. The hinge member **133** is connected to the door component **9** by hinge connectors **125** which are connected to the door component at **126**. Each connector **125** has a slot **127** which has the same radius of curvature as the slot **123** of the hinged member **113**. Also, both the hinge member flanges **122** and the hinge connectors **125** have slide pins **128** and **129**, respectively, which slide in the slots of each other to provide a hinge connection between the door component **9** and the lower shell component **1**. The hinge member **113** is connected to the lower shell by means of the tabs **124** whereby the uppermost tab is received in the slots **20** on the leg **18***b* of the right angle flange **18** of the lower shell component and the lower tab is received under the leg **18***a* of the right angle flange **18** so that the right angle flange is in part wedged between the pairs of tabs **124**. The flange **18** is received between the tabs **124** in a secure relation due to the construction of the hinge member **113** of flexible metal thereby making the flanges **122** resilient and capable of moving inwardly to permit positioning of the door component with respect to the lower shell component and then outwardly to their normal position receiving the part of the right angle flange **18**. The door component is also held securely with respect to the lower shell component by the channel formed by leg **15** of the angle member **14** and flange **25**, which channel receives the base **120** with the tab **17** received within the opening **121** in the base **120**, thereby precluding undesirable rotational movement of the hinge member **113** and door component with respect to the lower shell component **1**. Again, it can be noted that the interrelating means of components **1** and **9** are manually operable without the use of tools.

The interrelating means **112** comprises a pivotal connection **130** to the door component and, as seen in FIG. 5, a pair of projections **131** having shoulders **132** transverse to the plane of the body **133** of the interrelating means.

Now that the door component **9** has been interrelated with respect to the lower shell component, the vacuum chamber component **4** may be received within the lower shell component. The vacuum chamber component **4**, preferably made of suitable plastic, comprises a housing **95** which is transversely ribbed on the exterior as shown at **96** and longitudinally ribbed on the interior as shown at **97**. The housing **95** includes an opening **98** which has on its structural perimeter a gasket **99** for purposes hereinafter described. The housing has a substantially perimetric flange **100** which extends transversely about the housing, and has a front sealing face **101**. The flange **100** includes a channel portion **102** on its upper side while the front face **101** includes a flange **103** extending perpendicular thereto and away from the vacuum chamber generally designated at **104**. The closed rear side **105** of the component **4**, as seen in FIG. 5, includes a filter standoff **106** with a tapered, annular flange **107** thereabout. The flange **107** is tapered to facilitate entry thereof into opening **37** and is held in position by the strap retainer **44** as hereinafter described. The flange **103** and face **101** are received outside of flange **25** of the lower shell component as shown in FIG. 1. The component **4** is held in position not only by the flange **25** being behind the face **101** but also by the strap retaining means **44** which can be adjustably moved to fall within any of the grooves defined by transverse ribs **95**. With the combination of the strap retaining means and the flange **25**, the component **4** is held securely in position with respect to the component **1** and, it will be noted, that the interrelating means are manually operable without the use of tools.

With the components **1**, **2**, **3**, **4** and **9**, interrelated, the top shell component **6**, preferably made of sheet metal, may now be interrelated with respect to the lower shell component **1** by means of the downwardly projection foot tabs **141** being received in openings **19** in the right angle flange **18** of the component. **1**. Once the tabs **141** are received within the openings **19**, the component **6** is moved longitudinally with respect to the component **1** toward the door component **9** and is thereafter retained securely in position not only by the horizontal portion **142** of the tab **141** abutting the underside of the flange **18** but also by the interrelation of the means **112** with the component **6**.

The component **6** comprises a base member **143** with integral downwardly extending sidewalls **144**, the sidewalls having the tabs **141** depending therefrom. The base member **143** includes a mating part generally designated at

145 to the means 112, the part 145 received within channel portion 102 and comprising a recess 146 and a retaining member 147 extending therein to provide a shoulder 148 for abutting relation against shoulder 132 of the means 112 thus precluding movement longitudinally of the door component with respect to the upper shell component in operation. The part 145 also includes sidewalls 146*a*, the sidewalls 146*a* being received in portion 102 and defining the recess 146 for snug fit of means 112. Because the part 145 is basically a recess the means 112 may be easily grasped for upward movement to open position.

The upper shell also includes in its base portion 143 a large opening generally designated at 149 to be later discussed.

Again, it can be seen that the component 6 is secured to the other components, i.e., the components 1 and 9, by manually operable interrelating means without the use of tools.

The tool caddy component 7, preferably made of a suitable, high impact plastic, is now positioned on the upper shell component 6 with the rear flange 151 abutting behind the rear flange 152 of the sidewalls 144 of the component 6. The tool caddy component acts as a closure component for the internal components such as the motor and cord rewind components and the electrical circuitry of the vacuum cleaner. The control panel generally designated at 153 is positioned above and into the opening 149 for interrelation with certain of the components below. The control panel includes an on-off switch 154 which can be actuated by the foot and a cord rewind actuator 155 also actuable by the foot. The panel 153 also includes a plurality of push buttons 156 for predetermined negative pressure control of the chamber 104. The component 7 is interrelated with respect to the component 6 by means now referred to in FIGS. 3 and 4.

The tool caddy component underside includes the underside of the control panel 153 with a showing of the underside wiring connection 150 to the on-off switch button 154. The underside of the control panel also shows the negative pressure control valve 170 which has the opening 171 in sealed flow communication with the opening 98 at gasket 99 in the component 4. The push buttons 156 selectively open and close ports in the valve housing 172, permitting predetermined bleeding of the atmospheric air surrounding the valve housing through the opening 171 into the vacuum chamber through opening 98 to thereby control the negative pressure therein. The valve construction is more fully shown and described in application Ser. No. 827,003 referred to hereinabove and does not form a part of the present invention. Thus, any of the many conventional negative pressure control valves may be utilized with the present invention. The push button 155 actuates the cord rewind component 3 under conventional principles, as stated previously, which include, although not shown in detail, the release rod 180, preferably made of steel, spring biased at 181 into normal cord hold position. The cord is held by a conventional clamp bar and release element generally designated at 300 which under normal circumstances holds the cord in desired position. The clamp release element is actuated, i.e., pivoted to cord release position. by the downwardly extending tab 182 of the release rod 180 as the button 155 is actuated to move the tab 182 to pivot the clamp release element out of clamping contact with the cord 51.

The underside of the tool caddy component 7 includes a plurality of integral, spaced stud members which act as connector means at, e.g., the depressed areas of the underside for the various parts of the underside, certain of the parts being shown in exploded view in FIG. 4. The studs 184, as seen in FIG. 3, connect the guide and support plate generally designated at 185 to the underside of the component 7. The studs 186 connect the locking bar plate generally designated at 187 to the caddy underside. The locking bar plate 187 in turn has openings 188 which receive fasteners for connecting a second guide and support plate generally designated at 189 to the underside. The plate 187 also includes downwardly extending parallel centering pins 196 to be discussed hereinafter. Slidably received within both guide and support plates 189 and 185 is a locking bar generally designated at 190 which has an angulated body portion 191 and a grip portion 192. The body portion 191 has a downwardly extending tab 193 cut therefrom to present a stop projection for longitudinal movement of the bar 190 with respect to the plate 185 as the tab 193 abuts thereagainst. The grip portion 192 has a grip flange 193 which may be readily grasped by the fingers of a user to actuate movement of the locking bar longitudinally within plates 785 and 789. The grip portion also has on its side opposite the grip flange a pair of downwardly extending flanges 195 which are located on opposite longitudinal sides of the body portion 191. The body portion 191 also has an electrical contact bar generally designated at 197 welded thereto, as by spot welding, along flanges 198 thereof. The bar 197 has a flange 183 with a downturned projection 199 which fits under the release rod 180 to support and guide the rod when the clamp release element is actuated by the button 155. The contact bar includes a channel portion 200 interposed between flanges 198 and 183, the channel portion receiving a terminal box generally designated at 201 with terminal elements 201*a* projecting therefrom.

The component 7 also includes a housing 202 for the grip portion 192 of the locking bar, which housing provides a stop for longitudinal movement of the locking bar in a direction opposite to the direction to which the tab 193 is adapted to act as a stop projection against plate 185. Thus, the longitudinal movement of the bar 190 is limited by the housing 202 and the plate 185. Also, the component 7 in its flange 151 has an opening 204 for receipt of the keeper 52 of the cord rewind component.

The terminal box 201 receives the leads 206 from the on-off switch 154 and is adapted to move longitudinally with and in fixed relation to the locking bar 190. The contact bar 197 is supported on the underside of the component 7 in addition to the indirect support from plates 185 and 189 by a bar 207 which is connected to the tool caddy under side by a pair of studs 208.

The only component which is electrically operated is the motor component 2. The electrical circuitry requisite for the operation of this component comprises the conventional reel circuitry of cord 51 with plug 64 to the power supply and the various other circuit components, not shown, but as described in the aforementioned Pat. No. 2,391,840, which bring the power supply from plug 54 to the terminal box 58 through lines 59. Current flow through terminal box 58 to line 61, terminal box 56 and motor leads 57 is controlled by switch 154 as hereinafter described.

The completion of the electrical circuit and the assembled interrelation of the plurality of components occurs when the tool caddy component is interrelated with respect to the other components. This results when the flange 151 of the component 7 is placed in overlying relation to the edge 152 of the upper shell component with the control panel 153 superimposed over the opening 149. This interrelation of components 6 and 7 is assisted by the reception of the centering pins 196 within the troughs 210 defined by the adjacent ones of the pairs of flanges 27 and 28*a*. The centering pins 196 may include spring means, not shown, on the side adjacent the rear bulkhead 11 so that on receipt of the underside of the control panel within the opening 149 and the pins within troughs 210, the tool caddy component may be firmly positioned with respect to the lower shell component.

With the locking bar 190 in disengaged position as it initially would be when the component 7 is placed on the component 6 as shown in FIG. 3, the gripping flange 193 abuts against the housing 202 in stop relation. After a proper interrelating of assemblies 1, 6 and 7 by means

of centering pins **196** and the control panel underside, the locking bar **190** may be moved to its engaged position where tab **193** abuts against plate **185**. In this position, as seen in FIG. 6, the end **194** of the locking bar is received within opening **41** of bulkhead **12** to retain one end of the component **7** in secure relation with respect to the component **1**. Also, as seen in FIG. 6, as the locking bar **190** moves to engaged position, the downwardly extending tabs **195** are moved into engagement under flanges **28***a* to thereby securely interrelate the other end of component **6** to the component **1**. With both ends of the locking bar **190** in engagement with fixed parts of component **1**, the upper shell component is securely sandwiched between the components **1** and **6** in addition to being secured to component **1** in its own right as previously described.

In addition, as the locking bar moves to engaged position so that tab **193** abuts against plate **185**, the contact bar **197** moves with terminal box **201** and its terminal elements **201***a* into electrical contact with the socket means generally designated at **350** of terminal box **58** on the rewind component **3**. Thus, the closed electrical circuit of the vacuum cleaner comprises a series relationship between the power supply, terminal box **58**, terminal box **201**, on-off switch **154**, terminal box **56** and motor component **2**. Only when the tool caddy component **7** is inter-related with the other components, when the plug **54** is connected to the power supply, when the locking bar **190** is in engaged position, and when the switch **154** is actuated, may an electrical circuit be completed, thus protecting the disassembler and assembler from electrical shock. Even when connected to the power supply, the terminal box **58** above is safe because it presents the assembler or disassembler with only the socket means **350**. Again, the locking bar provides interrelating means which is manually operable without the use of tools, the interrelating means including the mechanical connection between boxes **58** and **201**.

It should here be noted that the only electrical connections made by the assembler are the interrelation between the motor socket means **57** and box **56** and the interrelation between the boxes **58** and **201**, the latter being accomplished with movement of the locking bar to engaged position.

For ornamental purposes a cover **8** is provided which may be applied oved the tools in the caddy component **7** to thereby give the top of the vacuum cleaner a smooth appearance. The cover **8** also assists in maintaining the tools in the caddy although special clamping means, not shown, are also utilized to maintain the tools in position during operation. The tool caddy cover is provided with an opening **220** for gripping and removal by the user and has a downwardly extending flange **221** which is adapted to fit over the external surface of the flange **151** of the component **7** and is held in place by interrelating means, not shown, on the respective flanges **151** and **221** of components **7** and **8**.

A preferred embodiment of a vacuum cleaner is thus disclosed wherein each of the means which interrelate the components thereof may be manually operated without the use of tools, permitting the assembly and disassembly of its component parts manually without the use of tools. However, the uniqueness of the arrangement of components and the uniqueness of electrical circuitry present an invention which should not be limited to any specific type of interralating means even though operability without the use of tools is very definitely an added benefit. As stated previously, the structuring and arrangement of components as heretofore described permits the replacement of any one malfunctioning component independently of the others and at a cost which is only a fractional amount of the initial investment.

Since the preferred embodiment may be modified within the scope of the present invention, for example, by rearranging components, by reversing the interrelating means on the resective components, et cetera, the preferred embodiment should be viewed as illustrative and not in a limiting sense.

What we claim is:

1. A vacuum cleaner comprising at least four components, means completely releasably interrelating said at least four components to one another, said interrelating means comprising electrical and mechanical elements and being amnually operably without the use of tools to permit ready assembly and disassembly of said at least four components, one of said at least four components comprising a power supply cord, and another of said at least four components being releasably electrically interrelated with said power supply cord so that said cord must be released from electrical interrelation with said another of said at least four components for dissassembly of said at least four components from each other to be accomplished.

2. The cleaner set forth in claim **1** wherein said at least four components include a vacuum chamber component and a shell component, and the means interrelating said vacuum chamber component and said shell component comprises groove means on one of said vacuum chamber and shell components and retainer means on the other of said vacuum chamber and shell components, said retainer means being releasably received within said groove means.

3. The cleaner set forth in claim **1** wherein said at least three components include a lower shell component and an upper shell component, and the means interrelating said lower and upper shell components comprises a plurality of substantially L-shaped tabs projecting from one of said upper and lower shell components toward the other of said upper and lower shell components and a plurality of slots in the other of said upper and lower shell components, said plurality of tabs being received within respective ones of said plurality of slots.

4. The cleaner set forth in claim **1** wherein said at least four components include a closure component and a shell component, and said means interrelating said closure component and said shell component comprises sliding means on one of sair closure and shell components, and keeper means on the other of said closure and shell components, said sliding means being retained within said keeper means.

5. The cleaner set forth in claim **1** wherein said at least four components include a door component and a shell component, and said means interrlating said door and shell components comprises hinge means on one of said door and shell components, said hinge means having flange means, and cooperating flange means on the other of said door and shell components, the flange means of said door and shell components being interrelated.

6. The cleaner set forth in claim **1** wherein said at least four components include a door component and a shell component, and said means interrelating said door and shell components comprises latch means on one of said door and shell components and cooperating recess means on the other of said door and shell components.

7. The cleaner set forth in claim **1** wherein said power supply cord comprises a cord rewind component.

8. A method of interrelating at least three components forming an electric vacuum cleaner comprising the steps of providing a first component with first mechanical means and first electrical circuit means, providing a second component with second mechanical means adapted to cooperate with said first mechanical means, providing a third component with third electrical circuit means adapted to cooperate with said first electrical circuit means, and simultaneously, completely releasably, manually operably interrelating said first and second mechanical means and said first and third electrical circuit means to assemble said three components together without the use of tools.

9. The method set forth in claim **8** further comprising the step of positioning said first component in closure

relation to said second and third components so that upon simultaneous interrelating of said first and second mechanical means and said first and third electrical circuit means, the first and third electrical circuit means become inaccessible to the interrelater.

10. A method of completely releasably interrelating at least four components to form a vacuum cleaner comprising the steps of forming a substantially hollow shell component having at least two openings thereinto, releasably interrelating a door component to said shell component adjacent one of said openings for closing said one opening, inserting at least one other component through the other of said openings and into releasable interrelation with said door component to preclude release of said door and shell components from each other, and releasably closing the other of said openings with at least one closure component to preclude dissassembly of the at least four components from each other without first removing the closure component.

11. The method set forth in claim **10** further comprising the step of providing said closure component and at least one of the other components with cooperating electrical circuit means and cooperating mechanical means and interrelating the cooperating circuit means simultaneously with the cooperating mechanical means.

12. A vacuum cleaner comprising at least four components, said at least four components including a shell component having an opening thereinto, a motor component and a cord rewind component positioned within said shell component, and a closure component for said opening, means completely releasably interrelating said at least four components to one another, said interrelating means comprising electrical and mechanical elements and being manually operable without the use of tools to permit ready assembly and disassembly of said at least four components, one of said at least four components other than said cord rewind component being releasably electrically interrelated with said cord rewind component so that said cord rewind component must be released from electrical interrelation with said one component for disassembly of said at least four components from each other to be accomplished.

13. The cleaner set forth in claim **12** wherein said shell component includes a second opening thereinto, said at least four components further include a door component and a vacuum chamber component, said door component being releasably interrelated with said shell component to open and close said second opening, said vacuum chamber component being releasably interrelated with said shell component and said door component so as to preclude dissassembly of said door component from said shell component in operative position, and said one component is said closure component so that no components may be disassembled from the others of said components until said closure component is released from electrical interrelation with said cord rewind component.

14. A vacuum cleaner comprising at least four components, said at least four components including a shell component having a first and a second opening thereinto, a vacuum chamber component positioned within said shell component through said first opening, a closure component for said first opening and a door component for said second opening, means completely releasably interrelating said at least four components to one another, said interrelating means being manually operable without the use of tools to permit ready assembly and disassembly of said at least four components, said door component being interrelated with said shell component to permit opening and closing of said second opening, and said vacuum chamber component being interrelated with said shell component and said door component to preclude disassembly of said door component from said shell component in operation so that disassembly of said at least four components from each other may be accomplished only upon first disassembling the closure component from the others of said at least four components.

15. The cleaner set forth in claim **14** wherein said at least four components further includes a power supply cord, said interrelating means comprises electrical and mechanical elements, and said closure component is releasably electrically interrelated with said power supply cord so that said cord must be released from electrical interrelation with said closure component for disassembly of said at least four components from each other to be accomplished.

16. The cleaner set forth in claim **15** wherein said power supply cord comprises a cord rewind component.

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