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Hohulin

[11] **3,779,283**

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[54] **PUSH BUTTON VALVE ASSEMBLY FOR ADJUSTING THE NEGATIVE PRESSURE OF A SUCTION CLEANER**

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[52] **U.S. Cl.** ..... **137/637,** 15/327 R, 251/251, 251/297

[51] **Int. Cl.** **F16k 11/22,** A47l 9/00

[58] **Field of Search** ..... 15/331, 334, 421, 15/327 R; 251/237–241, 297, 251, 262, 263, 326, 145, 257, 258, 259; 137/605, 637

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[57] **ABSTRACT**

A push button valve assembly is disclosed for adjusting the negative pressure developed in the casing and hence at the suction inlet of a canister-type suction cleaner. The valve assembly includes a plurality of different size apertures in the casing, which communicate with the negative pressure zone therein and which permit different bypass flows of air to be established from the exterior of the cleaner to the negative pressure zone. Such different bypass flows serve to control the suction at the suction inlet of the cleaner. A plurality of slides are provided for covering and uncovering the apertures, and a series of push buttons having cam surfaces thereon engageable with reaction surfaces on the slides, effect movement of the slides with respect to the apertures. The arrangement is such that depression of any one of the push buttons will cause movement of one or more of the slides so that the aperture associated with the depressed push button is uncovered while all of the other apertures are covered by the other slides. At the same time, any previously depressed push button is raised to an inoperative position.

16 Claims, 11 Drawing Figures

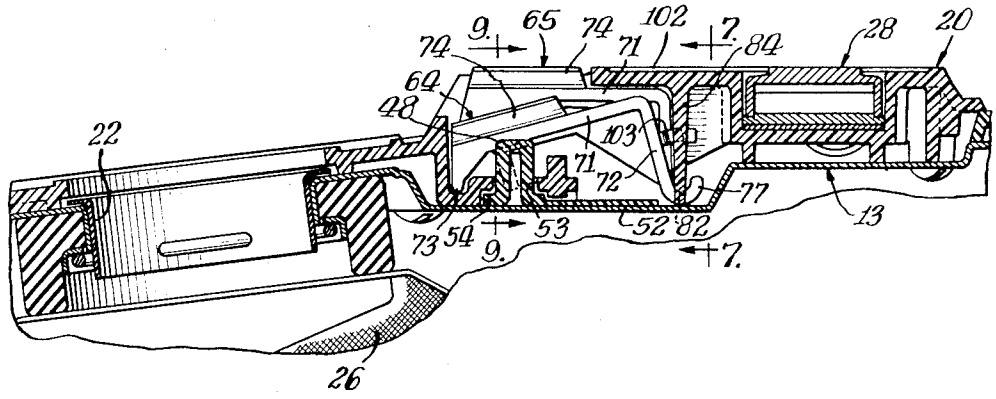

Fig. 1.

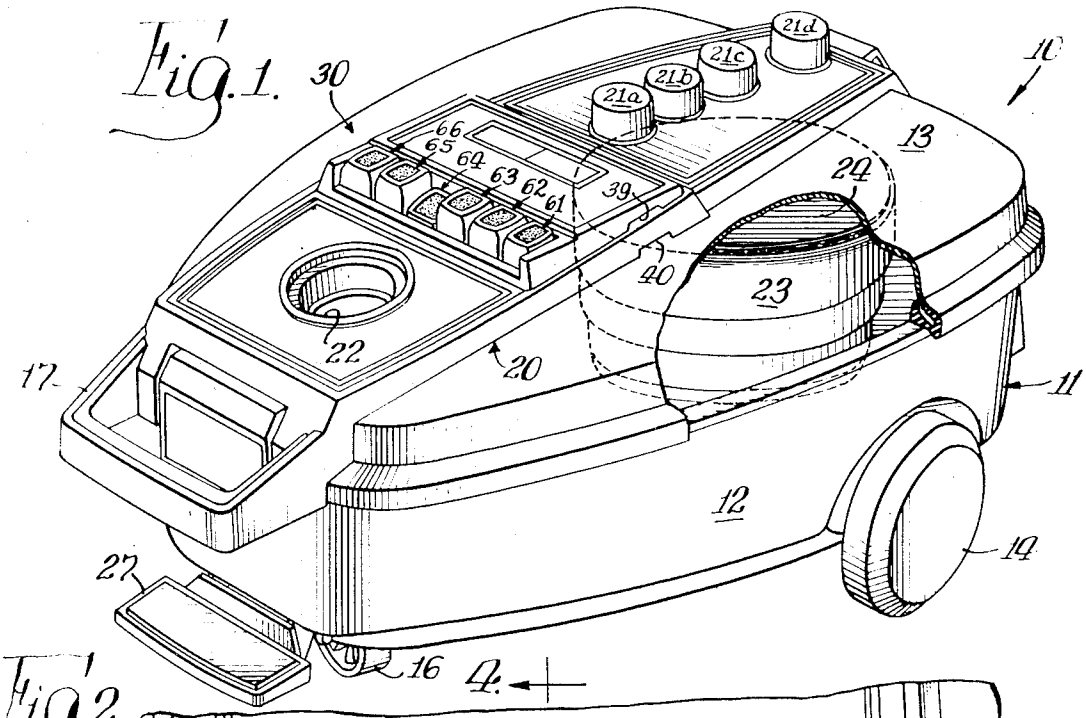
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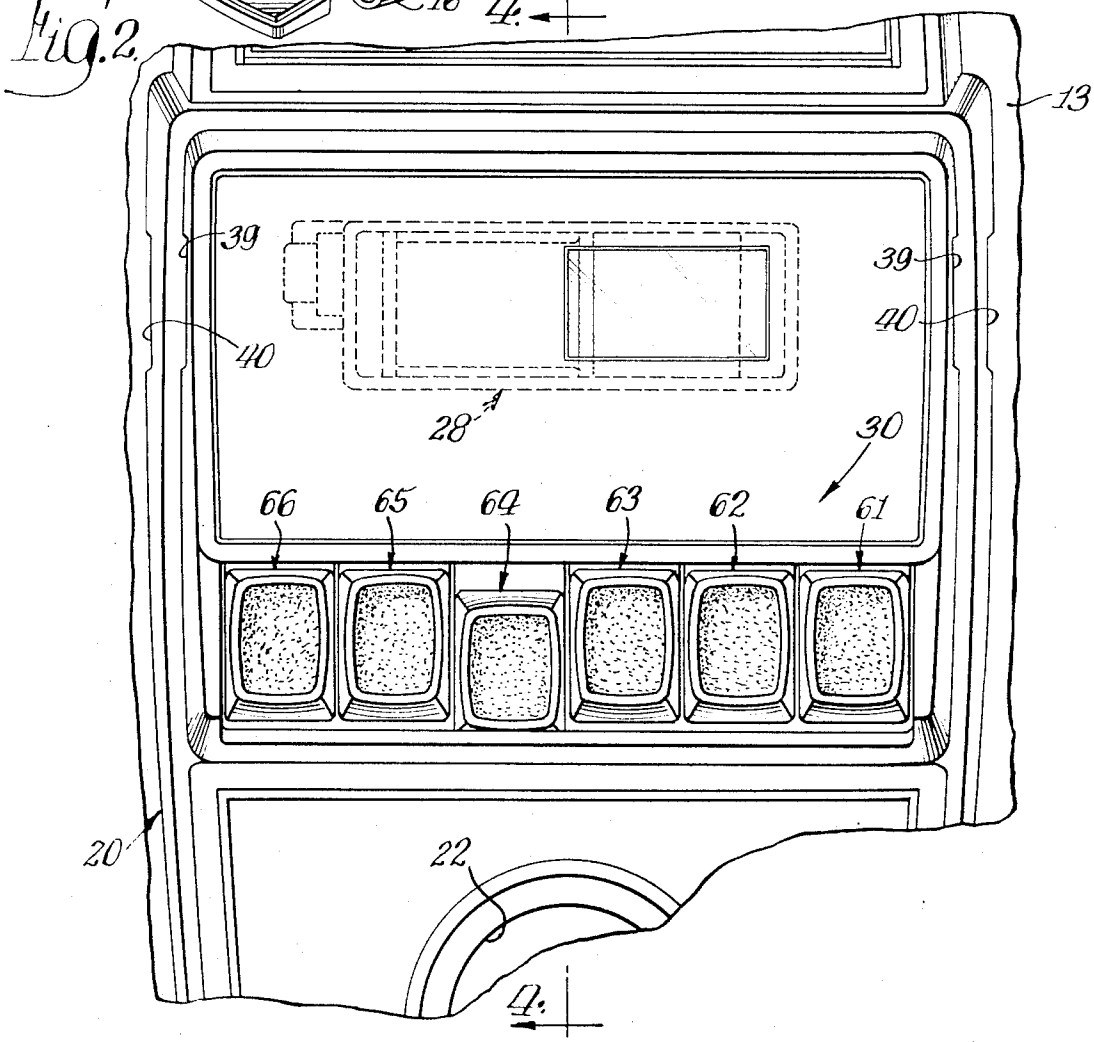
Fig. 2.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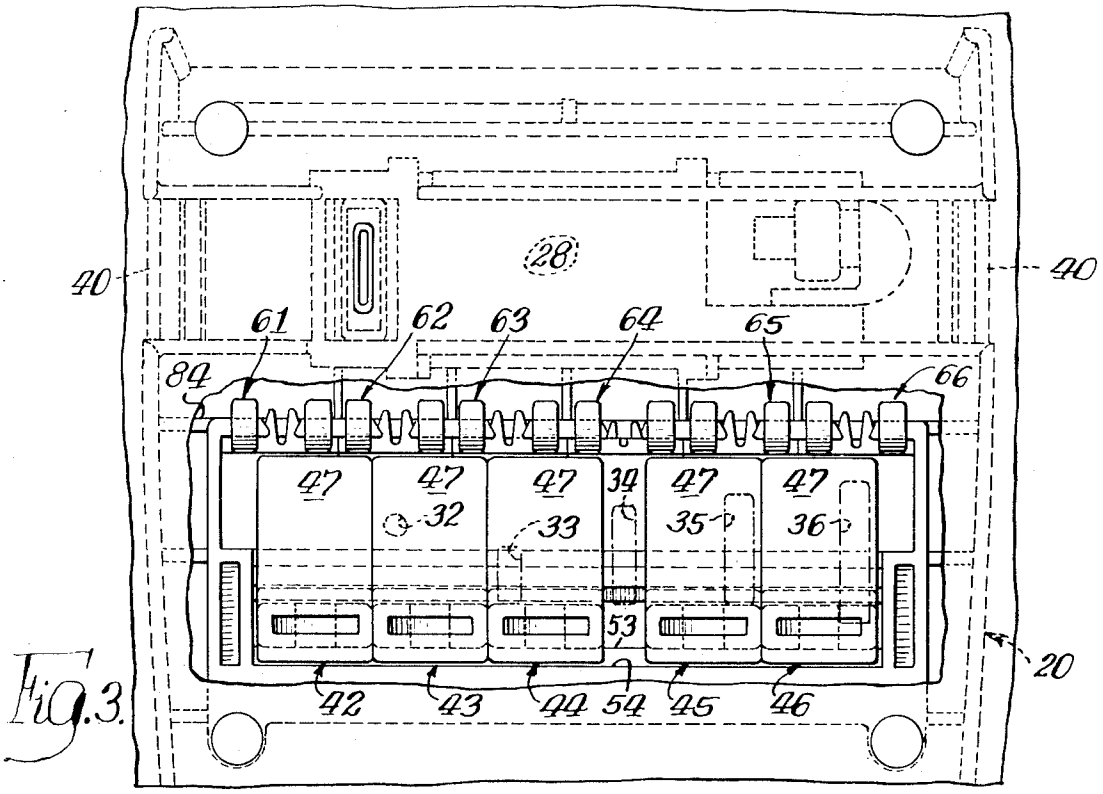

Fig. 3.

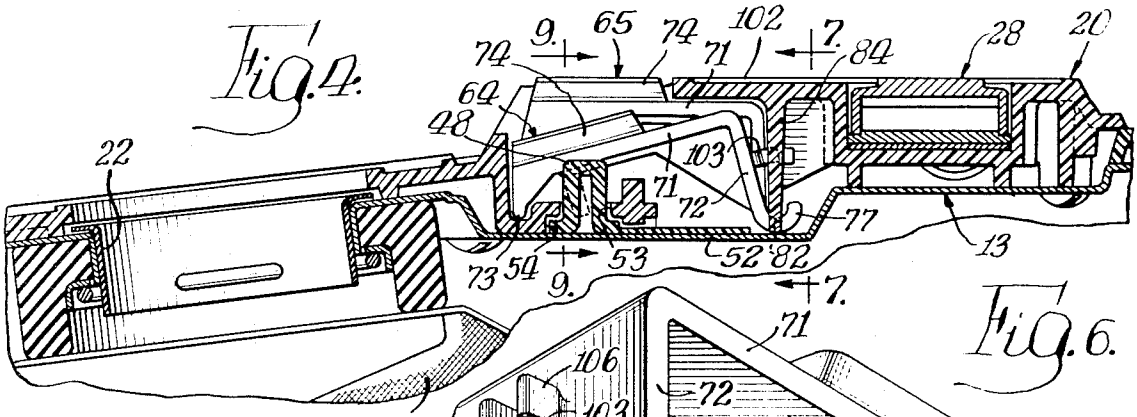

Fig. 4.

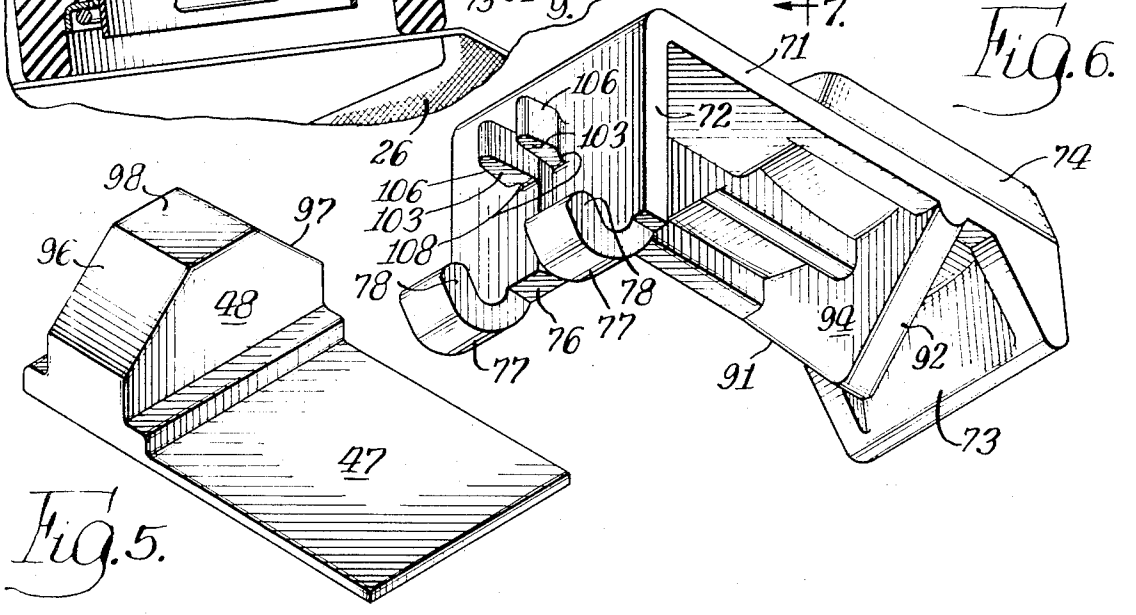

Fig. 6.

Fig. 5.

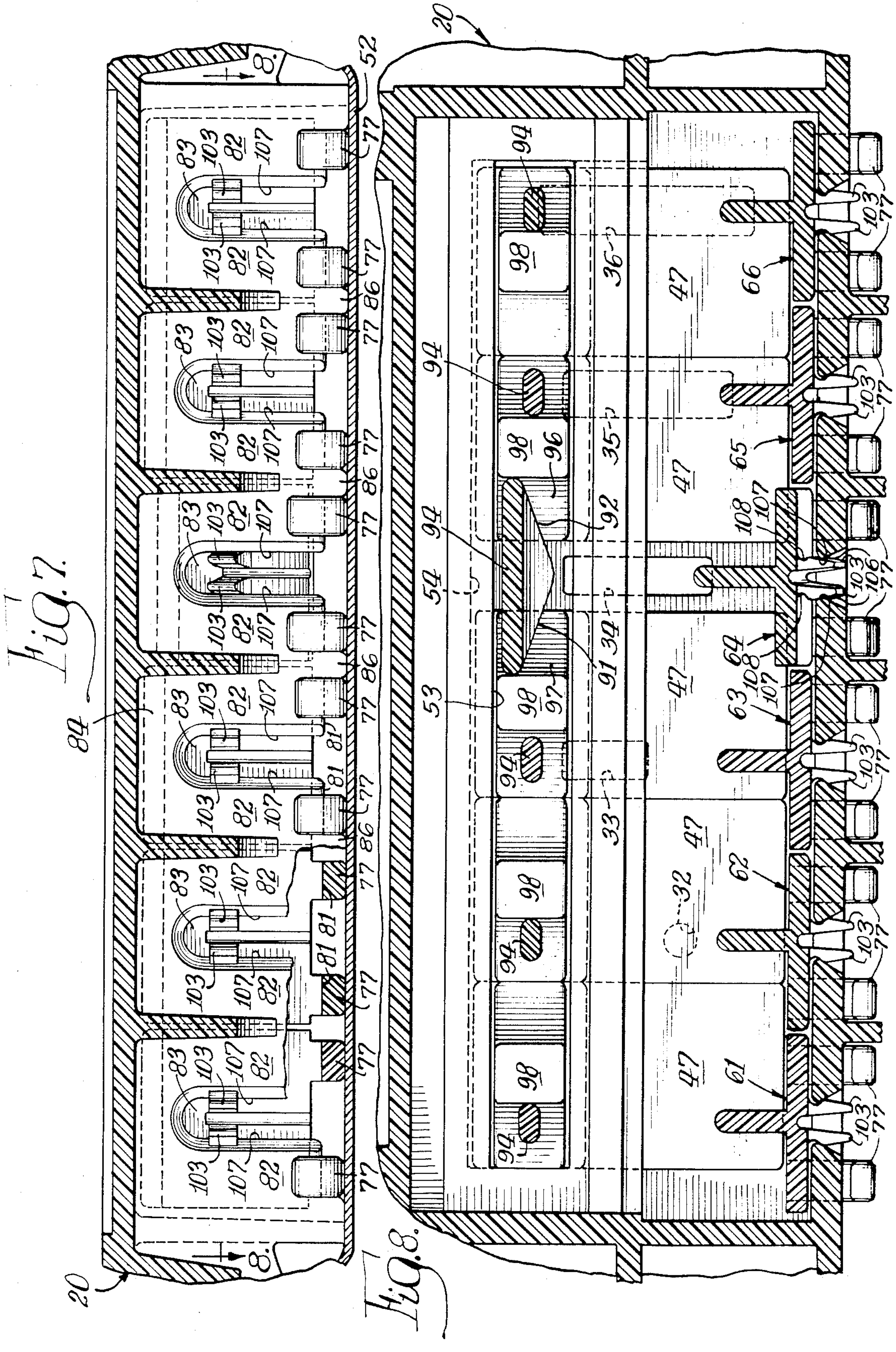
Fig. 7.
Fig. 8.

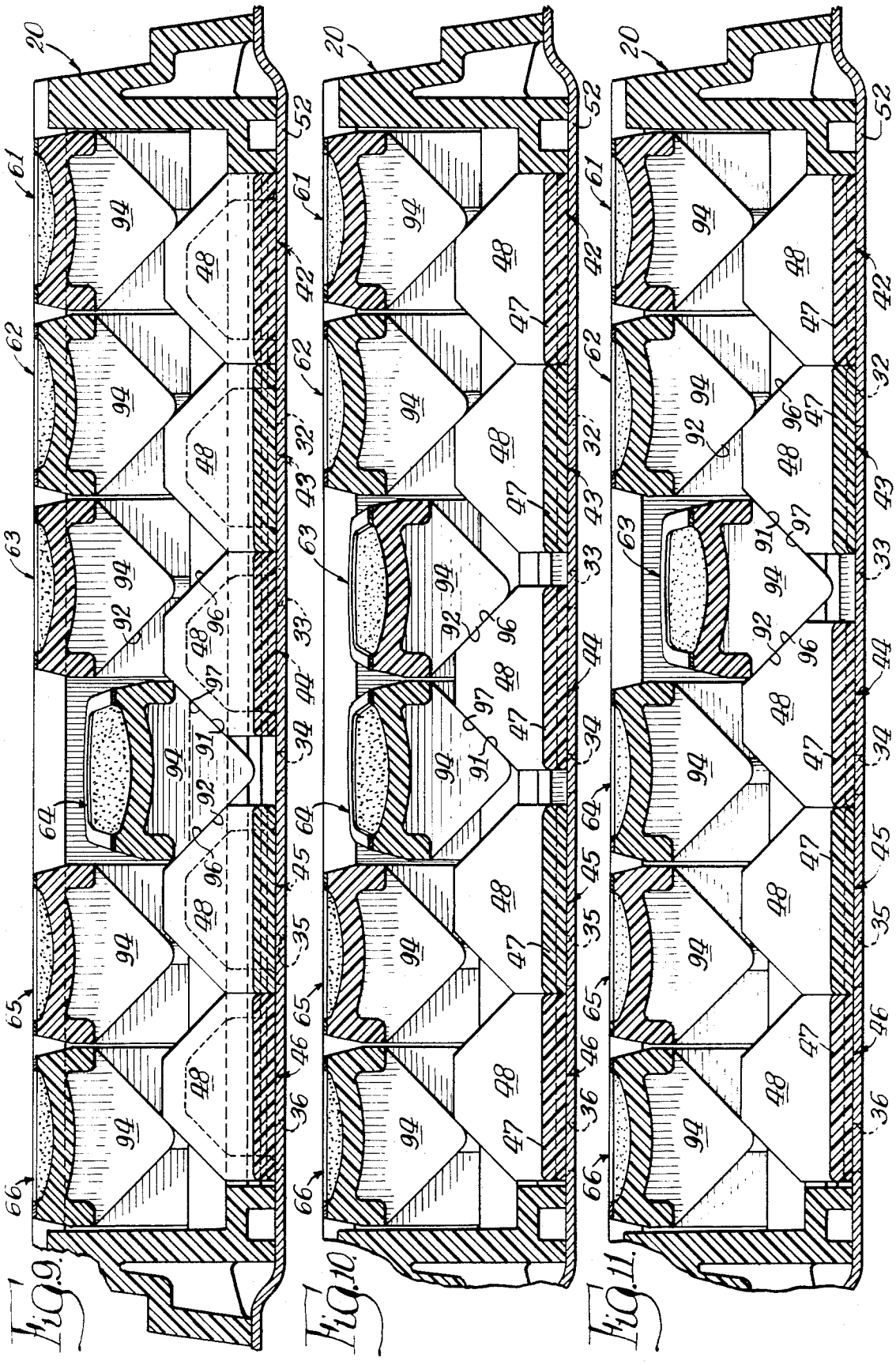

FIG. 9.

FIG. 10.

FIG. 11.

PUSH BUTTON VALVE ASSEMBLY FOR ADJUSTING THE NEGATIVE PRESSURE OF A SUCTION CLEANER

This invention relates to a suction control device for a suction cleaner, and more particularly relates to a push button operated valve assembly for adjusting the negative pressure in the interior and hence at the suction inlet of a canister-type suction cleaner.

Various types of control devices have been heretofore advanced for controlling the suction developed by canister-type suction cleaners in order to provide the most effective suction level for a particular cleaning operation. Some of these devices have utilized valves of various types to control a bypass flow of air either from the exterior of the cleaner casing to the negative pressure zone in the interior thereof, or from the exterior of an associated suction hose to the interior of the hose at a point downstream from the inlet or accessory tool-receiving end of the hose. Other of these devices have utilized fan motors capable of being operated at different speeds, to achieve the desired suction level.

While most of the suction control devices heretofore advanced have proved generally satisfactory for their intended purpose, others have not for various reasons, such as difficulty and lack of positive adjustment, inconvenience of location, and unreliability of operation.

Accordingly, it is a general object of the present invention to provide a novel and improved suction control device for adjusting the negative pressure at the suction inlet of a suction cleaner, which overcomes the aforementioned disadvantages of the prior art.

Another object is to provide a novel suction control device of the foregoing character, which permits rapid and positive adjustment of the suction developed at the suction inlet of the cleaner.

A further object is to provide a novel suction control device of the foregoing character, which utilizes a plurality of push buttons for effecting changes in the suction at the suction inlet of the cleaner.

Still another object is to provide a novel suction control device of the character described, which is simple in construction, reliable in operation, and economical to manufacture.

Other objects and advantages of the invention will become apparent from the following detailed description and accompanying sheets of drawings, in which:

FIG. **1** is a perspective view, with a portion thereof broken away to show internal structure, of a canister-type suction cleaner incorporating a suction control device embodying the features of the present invention;

FIG. **2** is an enlarged, fragmentary top plan view of a portion of the cleaner illustrated in FIG. **1**, and showing additional details of the device;

FIG. **3** is a fragmentary view, in full and broken lines, of a portion of the underside of the suction control device illustrated in FIG. **2**;

FIG. **4** is a longitudinal sectional view, taken substantially along the line **4—4** of FIG. **2**;

FIG. **5** is an enlarged perspective view of one of the slide valves utilized in the suction control device illustrated in FIGS. **1–4**;

FIG. **6** is an enlarged perspective view of one of the push buttons utilized in the device;

FIG. **7** is an enlarged, vertical sectional view taken along the line **7—7** of FIG. **4**;

FIG. **8** is a horizontal sectional view taken along the line **8—8** of FIG. **7**;

FIG. **9** is an enlarged, vertical sectional view taken along the line **9—9** of FIG. **4**; and

FIGS. **10** and **11** are views similar to FIG. **9**, and showing the parts of the device in different operating positions.

In FIG. **1** a canister-type suction cleaner is illustrated and indicated generally at **10**. The cleaner **10** is exemplary of one type of suction cleaner with which the suction control device of the present invention is adapted for use. The cleaner **10**, in the present instance, comprises a casing **11** which includes a lower casing portion or shell **12** and an upper casing portion or cover **13** hinged to the lower casing portion **12** at one end thereof. A pair of wheels, only one of which is shown in FIG. **1** and indicated at **14**, may be provided to support one end of the cleaner, and a single castering wheel **16** may be provided to support the opposite end of the cleaner. A carrying handle **17**, comprising a portion of a supplemental housing **20** secured to the cover **13**, is provided at one end of the casing **11**, and a suction inlet **22** extending through the housing **20** and cover **13**, is provided in the casing **11** adjacent said end. The inlet **22** is adapted to receive an appropriate connector fitting (not shown) secured to one end of an associated suction hose (also not shown), and the opposite end of the suction hose is adapted to receive interchangeable accessory cleaning tools. When not in use, such tools may be stored on upstanding posts **21***a*–**21***d* on the cover **13**.

Suction generating means in the form of a motor-fan unit **23**, is mounted in the casing **11**. Such unit includes a motor and a fan in end-to-end relation, the fan having its inlet covered by a secondary filter **24** and communicating with the interior of the casing **11**. The fan outlet communicates with a discharge port in the lower portion **12** of the casing, the fan outlet being isolated from the fan inlet by a motor mounting plate (not shown) also in the lower portion **12** of the casing. A primary, replaceable filter bag **26** (FIG. **4**) is mounted in the casing **11** and supported in sealed relation with the suction inlet **22**. The bag **26** serves to trap dirt or other foreign particles drawn into the casing **11** through the inlet **22**, and may be readily removed from the casing **11** and replaced with a new bag when the need arises. Operation of the motor of the motor-fan unit **23** is controlled by a switch actuated by a foot operated lever or treadle **27**. Thus, when the motor-fan unit **23** is in operation, a negative pressure zone is generated in the interior of the casing **11** and around the exterior of the filter bag **26**.

The cleaner **10** also includes a combination alarm and filter bypass device **28** (FIGS. **2**, **3** and **4**), which provides both a visual and audible signal to warn a user that the filter bag **26** has become substantially fully clogged and in need of replacement. The device **28** also provides a separate flow of cooling air to the motor of the motor-fan unit **23** to cool the motor if the user continues to operate the cleaner while in this condition. The construction and operation of the alarm device **28** is described and claimed in the now pending Daniel J. Kinsella U.S. Pat. application Ser. No. 147,837, filed May 28, 1971, now U.S. Pat. No. 3,678,882, and assigned to the assignee of this application.

The cleaner **10** is intended for use in cleaning a wide range of items of different strength, texture and surface

characteristics. To this end, it is desireable to be able to vary the suction at the suction inlet **22** in accordance with the type of material or item being cleaned in order to avoid damage to the article and to obtain the most efficient cleaning action. To this end, the cleaner **10** includes a suction control device or valve assembly embodying the features of the invention and indicated generally at **30** in FIGS. **1** and **2**, for adjusting the suction developed by the cleaner at the suction inlet **22**.

Referring now to FIGS. **3–8**, inclusive, in conjunction with FIGS. **1** and **2**, it will be seen that the suction control device **30** comprises at least one and preferably a plurality of apertures **32–36**, inclusive, formed in the cover **13** and communicating with the interior of the casing **11** downstream from the inlet **22** and with the exterior of the filter bag **26** (FIG. **4**). As best seen in FIGS. **3** and **8**, the apertures **32–36** are of different cross sectional area and are substantially arranged in a row extending transversely or crosswise of the housing **20** in equally spaced relation. In the specific construction illustrated, the aperture **32** is circular while the apertures **33–36**, inclusive, are generally oblong and arranged with their longer dimension extending lengthwise of the housing **20**. The apertures **32–36** each communicate with the exterior of the housing **20** through clearances and spaces in the housing. Such clearances and spaces communicate with the exterior of the housing **20** through two pairs of ports or openings **39** and **40** (FIGS. **1**, **2** and **3**) in the sides of the housing **20**. Thus, when any one of the apertures **32–36** is uncovered and the cleaner **10** is in operation, a bypass flow of air will enter the ports **39** and **40** and flow into and through the housing **20** to the interior of the casing **11** through the uncovered aperture. Such bypass flow causes a reduction in the negative pressure zone in the interior of the casing **11** and on the downstream or outer side of the filter bag **26**. Consequently, the suction force developed by the cleaner is reduced.

Uncovering of a selected one of the apertures **32–36** and covering of all of the other apertures is achieved by valve means in the form of at least one and preferably a plurality of valve members or slides, respectively indicated at **42–46**, inclusive, in FIGS. **3**, **7** and **8**. Each of the slides **42–46** includes an oblong, plate-like base portion **47** (FIG. **5**) and an upraised, generally trapezoidal-shaped abutment portion **48** disposed toward one end of the base portion **47**. The base portion **47** of each slide is adapted to slidably engage an underlying flat portion **52** (FIG. **4**) of the cover **13**. The slides are preferably formed from a strong, wear resistant material such as polypropylene plastic. Consequently, the abutment portions **48** may be hollow.

In order to guide the slides **42–46** during their movements longitudinally of the apertures **32–36**, guide means is provided. Such guide means comprises an elongated slot **53** in the housing **20**, into which the abutment portion **48** of each slide extends. The lower end of the slot **53** is enlarged as at **54** (FIGS. **4** and **8**) to receive a portion of the adjacent end of the base portion **47** of each slide so that the underside of the base portion of each slide fits flush with the portion of the underside of the housing **20** that engages the flat cover portion **52**.

Movement of the slides **42–46** in opposite directions to effect uncovering of a selected one of the apertures **32–36** and covering of the remaining apertures, is effected by actuating means in the form of a plurality of actuating members or push buttons respectively indicated at **61–66**, inclusive, in FIGS. **1–3**, **7** and **8**. The push buttons **61–66** are preferably of a plastic material such as Celcon and, as seen in FIG. **6**, each includes an elongated, generally rectangularly shaped body portion **71** having a depending flange or mounting portion **72** at one end thereof and another depending flange or stop portion **73** at the opposite end thereof. An upraised, generally rectangularly shaped boss **74** having a concave upper surface, is provided on the upper surface of the body portion **71** adjacent the stop portion **73** to facilitate depression and downward movement of the push button from an upraised inoperative position to a depressed operative position.

In order to provide for pivotal movement of each of the push buttons about an axis adjacent the lower edge, indicated at **76**, of the mounting portion **72**, a pair of laterally spaced hooks **77** are provided on such edge with the ends, indicated at **78**, of the hooks extending upwardly toward the body portion **71** and in spaced relation from the mounting portion **72**. The hooks **77** of the push buttons **61-66** extend over and pivot on the lower edges, indicated at **81**, of a series of pairs of transversely spaced wall portions **82** defined by a series of generally vertically extending slots **83** in a wall **84** which extends vertically in the supplemental housing **20** as viewed in FIG. **4** and which extends transversely thereacross as seen in FIGS. **3**, **7** and **8**. Portions of the wall **84**, indicated at **86** in FIG. **7**, extend downwardly below the pivot edges **81** of the wall portions **82** and serve to maintain the push buttons in closely adjacent side-by-side relation as well as to prevent them from shifting longitudinally on the wall **84**. The depending portions **86** also serve to center the push buttons **62–66** over their respective apertures **32-36**, inclusive. The push button **61** does not, however, overlie any aperture.

In order to effect movement of a slide underlying a selected one of the push buttons **61–66** to uncover the aperture corresponding to that push button when the latter is depressed, each of the push buttons includes a cam surface movable into engagement with a corresponding reaction surface on the underlying slide. In the present instance, a pair of such cam surfaces indicated at **91** and **92** are defined on each push button and provided by the inclined edges of a generally triangularly shaped lug **94** which depends from the underside of the body portion **71**. The apices of the lugs **94** on the push buttons **62–66** are in substantial transverse alignment with apertures **32–36**, respectively, as shown in FIG. **8**. Thus, one or the other of the cam surfaces **91** and **92** of a selected push button will engage one or the other of the pair of reaction surfaces **96** and **97** on the abutment portion **48** of the slide underlying the selected push button when the latter is depressed, depending upon the position of the slide with respect thereto.

The cam surfaces **91** and **92** may be inclined at various angles with respect to a perpendicular to the body portion **71**, but are preferably inclined at an angle of about 45°. The reaction surfaces **96** and **97** on each slide are provided by a pair of inclined, flat faces on the abutment portion **48**, the faces **96** and **97** preferably also being inclined inwardly and upwardly at an angle of about 45° with respect to the perpendicular to the base portion **47** of the slide.

With the foregoing construction, it will be apparent that as a selected one of the push buttons **62–66** is depressed, one or the other of the cam surfaces **91** and **92** on the push button will engage one or the other of the reaction surfaces **96** and **97** on an underlying slide and cause the latter to shift laterally in a direction to uncover one of the apertures **32–36.** Depression of the push button **61,** however, will result in a covering of all of the apertures **32–36,** as will be described more fully in conjunction with the description of the operation of the device **30.**

In order to releasably retain one of the push buttons in its operative or depressed position and all of the other push buttons in their inoperative or upraised positions, releasable retaining means is provided. Such releasable retaining means, in the present instance, comprises at least one and preferably a pair of laterally spaced arms **103** carried on the outer surface of the mounting portion **72** of each push button and extending generally perpendicularly outwardly therefrom. The arms **103** are preferably formed integrally from the material of the push button, and the laterally outer side faces or surfaces thereof, indicated at **106,** are preferably inclined with respect to the direction of movement of the push button. The resilience of the arms **103** bias the inclined surface portions **106** thereof outwardly into frictional engagement with abutments provided by the vertically extending, side edges **107** of the adjacent slot **83** in the wall **84.** Thus, the inclined surface portions **106** coact with the edges **107** to bias each push button toward and releasably retain the same in its operative or depressed position, as shown by the position of the push button **64.** The inclined surface portions **106** and edges **107** thus comprise one portion of the aforementioned releasable retaining means.

In order to releasably retain all of the push buttons, other than a depressed one, in their inoperative or upraised positions, a groove or recess **108** is provided in the outer surface portion **106** of the arms **103** of each push button. The grooves **108** are preferably located closely adjacent the junction of the arms **103** with the mounting portion or flange **72** of the push button. The transverse dimension between the surface portions **106** adjacent to the grooves **108** is somewhat greater than the transverse dimension between the edges **107** of the slots **83.** Consequently, the arms will rapidly spread apart as the grooves **108** move into engagement with the edges **107** with a "snap" action. The resilience of the arms **103** tends to hold the grooves **108** engaged with the edges **107** until disengaged by depression of the push button. The grooves **108** and edges **107** thus comprise another portion of the aforementioned releasable retaining means.

Referring now to FIGS. **9, 10** and **11,** in conjunction with the preceding figures, the operation of the suction control device **30** is as follows: Assuming that the cleaner **10** is in operation, or is about to be put into operation, and the user desires to change the suction developed at the inlet **22** and consequently at the inlet of an accessory tool (not shown) connected to the end of an associated suction hose (also not shown), from the value provided by the depressed push button **64** to that provided by the upraised push button **63,** she need only depress the push button **63.**

Prior to depression of the button **63,** it will be noted that the inclined cam surface **91** on the lug **94** on the underside of the depressed button **64** is engaged with the inclined reaction surface **97** of the slide **44** and that the lug **94** has caused the slides **44, 43** and **42** to shift laterally toward the right so that the apertures **32** and **33** are covered by the plate-like base portions **47** of the slides **43** and **44.** It will likewise be noted that the inclined cam surface **92** of the lug **94** of the button **64** is engaged with the reaction surface **96** on the abutment **48** of the slide **45** and that the base portions **47** of the slides **45** and **46** cover the apertures **35** and **36.** The aperture **34** is thus open and free to provide a bypass flow of air from the exterior of the cleaner casing **11** through the pairs of ports **39** and **40** in the supplemental housing **20** to the aperture **34** and thence to the negative pressure zone in the interior of the casing **11.** Such negative pressure zone is generated by the fan portion of the motor-fan unit **23,** and acts on the exterior of the filter bag **26.**

As the button **63** is depressed, it will pivot about the hooks **77** on the lower edge **76** of the flange or mounting portion **72** thereof. Shortly after the button **63** begins its downward movement, the cam surface **92** thereof will engage the reaction surface **96** on the abutment **48** of the underlying slide **44.** Thereafter, continued downward movement of the push button **63** will exert a lateral force on the slide **44** causing it to begin to move sideways and toward the left as viewed in FIG. **10.** As the slide **44** begins to move toward the left as viewed in FIG. **10,** the engaged relation of the reaction surface **97** thereof with the cam surface **91** on the push button **64** will exert an upward force thereon causing it to move upwardly toward its inoperative position. Such condition is illustrated in FIG. **10.**

As the button **63** continues to move downwardly, the button **64** will continue to move upwardly. Sometime during the course of downward movement of the push button **63,** the grooves **108** in the side surface portions **106** of the resilient arms **103** (FIGS. **6** and **8**) thereof will move past the edges **107** of the slot **83** in the transverse wall **84.** When this occurs, the resiliency of the arms **103,** and the coaction of the inclined surface portions **106** with the edges **107** of the slot, will cause the push button **64** to move rapidly upwardly for its remaining distance of travel to its inoperative, upraised position illustrated in FIG. **11.** In other words, the last portion of upward travel of the push button **64** takes place with a "snap" action.

At about the same time the button **64** reaches its fully upraised or inoperative position, as illustrated in FIG. **11,** the base portion **47** of the slide **44** will have completely uncovered the aperture **33** and covered the aperture **34.** Thus, a new bypass flow path will be established from the exterior of the casing **11** to the aforementioned negative pressure zone in the interior thereof and the desired change in the suction level at the inlet **22** will be obtained. The cleaner **10** will thus be converted for operation or will be operated at the suction level provided by the push button **63.** When fully depressed, the push button **63** is releasably held in such position by the resiliency of the arms **103,** and the coaction between the inwardly inclined side surfaces **106** of the arms **103** with the edges **107** of the slot **83.** (Note FIG. **8**)

A similar sequence of movement will occur when any inoperative or upraised push button of the control device **30** is depressed to change the suction level at the inlet **22,** regardless of which one of the other push buttons is then depressed. However, if the push button that

is depressed is spaced from a previously depressed push button by one or more intervening push buttons as, for example, if the push button **61** were depressed instead of the push button **64** with the conditions as illustrated in FIG. **9**, the previously described sequence of movements would take place except that the lateral movement of the underlying slide **42** would be transmitted to the slide **44** through the intermediate slide **43**. In other words, since all of the slides **42–46** are freely shiftable laterally in the guide slot **53** (FIGS. **4** and **8**) movement of any one of them will be transmitted to any of the other slides in contact therewith so that the depression of any one of the push buttons **61–66** will automatically cancel and return any other depressed push button to its upraised, inoperative position.

It will be understood that while the cleaner **10** herein described utilizes **5** apertures **32–36** inclusive of different cross sectional areas, more or less than this number could be provided, if desired. It will also be understood that in the cleaner **10**, when the push button **61** is depressed, all of the apertures **32–36** will be covered by a slide and that the suction at the inlet **22** will be at a maximum since no bypass flow of air will be available to reduce the suction generated by the motor-fan unit **23**.

While the one embodiment of the invention has been herein illustrated and described, it will be understood that modifications and variations thereof may be effected without departing from the scope of the invention as set forth in the appended claims.

I claim:

1. In a suction cleaner including a casing having an inlet, an outlet, and means for generating a negative pressure zone in said casing and communicating with said inlet, a suction control device for controlling the negative pressure in said zone and hence the suction at said suction inlet, said control device comprising a housing adapted to be mounted on said casing, means adapted to provide at least one aperture in said casing for establishing a bypass flow of air from the exterior of said casing to said negative pressure zone, valve means adapted to permit or prevent flow through said aperture to control the negative pressure in said zone, said valve means including at least one valve member carried by said housing and movable between a first position uncovering said aperture and a second position covering said aperture, and an actuating member overlying said valve member and said aperture and movably mounted on said housing in a direction substantially normal to the direction of movement of said valve member, said actuating member being engageable with said valve member for effecting movement thereof to one of said positions.

2. The construction of claim **1**, further characterized in that said valve member is adapted to engage said casing and to be movable thereon in opposite directions between said positions, and said actuating member is mounted on said housing for movement at least toward said valve member to effect movement thereof to said first position.

3. The construction of claim **1**, further characterized in that said actuating member includes a depending portion extending toward said valve member, said depending portion having an edge inclined with respect to the direction of movement of said actuating member and engageable therewith.

4. The construction of claim **3**, further characterized in that said depending portion of said actuating member comprises a generally triangularly-shaped lug, and said valve member includes an abutment portion extending toward and disposed in the path of movement of said lug.

5. The construction of claim **4**, further characterized in that said abutment portion has at least one flat face thereon, and said face is inclined at substantially the same angle as said edge on said lug.

6. The construction of claim **5**, further characterized in that said angle is about 45°.

7. The construction of claim **4**, further characterized in that the apex of said lug is in general transverse alignment with said aperture.

8. The construction of claim **4**, further characterized in that said abutment portion is generally trapezoidal frustoconically shaped.

9. The construction of claim **1**, further characterized in that said actuating member is movable between an operative position holding said valve member in said first position and an inoperative position permitting movement of said valve member to said second position, and releasable retaining means is provided for releasably retaining said actuating member in said operative and inoperative positions, said releasable retaining means comprising at least one edge on a portion of a wall of said housing and at least one resilient arm carried by said actuating member and frictionally engaging said edge.

10. The construction of claim **9**, further characterized in that said actuating member is pivotally mounted on said housing for movement about an axis extending generally parallel to the direction of movement of said valve member, said edge of said wall portion extends generally perpendicularly to said axis, and said resilient arm extends generally perpendicularly to said edge.

11. The construction of claim **10**, further characterized in that said arm has a surface portion engaging and movable across said edge of said wall portion, and said surface portion is inclined with respect to the direction of movement of said actuating member, whereby said inclined surface portion and the resiliency of said arm releasably retain said actuating member in said operative position.

12. The construction of claim **11**, further characterized in that said surface portion of said arm has a recess therein for receiving a portion of said edge of said wall portions, said recess releasably retaining said actuating member in said inoperative position.

13. The construction of claim **10**, further characterized in that said housing has a pair of said wall portions providing an axially spaced pair of said edges, and a pair of said resilient arms are provided on said actuating member, said arms extending between and engaging said edges.

14. The construction of claim **1**, further characterized in that said housing has an elongated slot extending in a direction parallel to the path of movement of said valve member, and said valve member includes an abutment portion disposed in said slot, whereby said slot and said abutment portion coact to guide movement of said valve member between and to prevent movement thereof beyond said positions.

15. The construction of claim **1**, further characterized in that a plurality of apertures are adapted to be provided in said casing, a plurality of said valve mem-

bers are provided for movement between positions covering and uncovering said apertures, and a plurality of said actuating members are provided for effecting movement of said valve members between said positions, said valve members all being of the same shape and said actuating members all being of the same shape.

16. In a canister type suction cleaner including a casing having a suction inlet, an exhaust outlet, and means for generating a negative pressure zone in said casing and communicating with said inlet, a valve assembly for controlling the negative pressure in said zone and hence the suction at said suction inlet, said valve assembly comprising a housing mounted on said casing, a plurality of apertures of different size in said casing for establishing a bypass flow of air from the exterior of said casing to said negative pressure zone, said apertures being arranged in a row, a plurality of valve members shiftably carried by said housing for movement longitudinally of said row, each of said valve members being movable between a first position permitting flow through a respective one of said apertures and a second position preventing flow through said aperture, and a plurality of actuating members for effecting movement of said valve members between said positions, there being at least one actuating member for effecting movement of one of said valve members to said first position and at least one other actuating member for effecting movement of said one valve member to said second position, movement of one of said actuating members to effect movement of one of said valve members from one of its positions to the other of its positions being effective to cause said one valve member to effect similar movement of one or more of the other of said valve members which are engaged with each other and at least one of which is engaged with said one valve member.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,779,283 Dated December 18, 1973

Inventor(s) SAMUEL E. HOHULIN

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 8, Claim 8, line 18, delete "frustoconically".

Signed and sealed this 23rd day of July 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents