Dec. 19, 1950 R. G. BIELENBERG 2,534,400

FLUID ACTUATED ELECTRIC CIRCUIT CONTROL FOR SUCTION CLEANERS

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FIG. 1

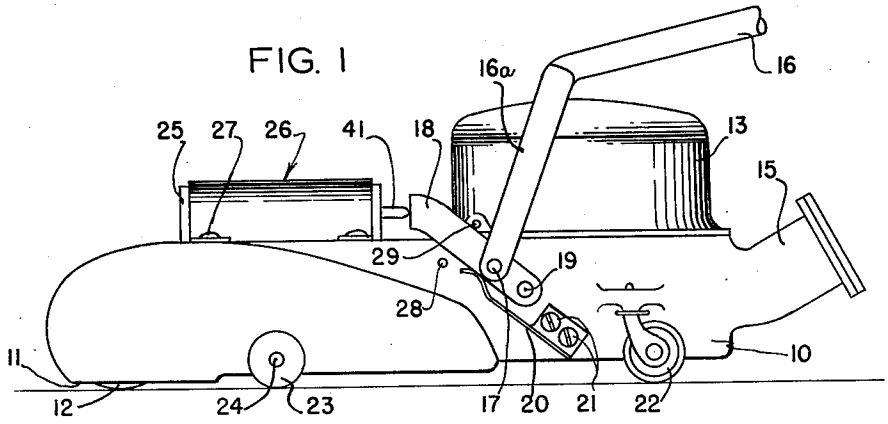


FIG. 2

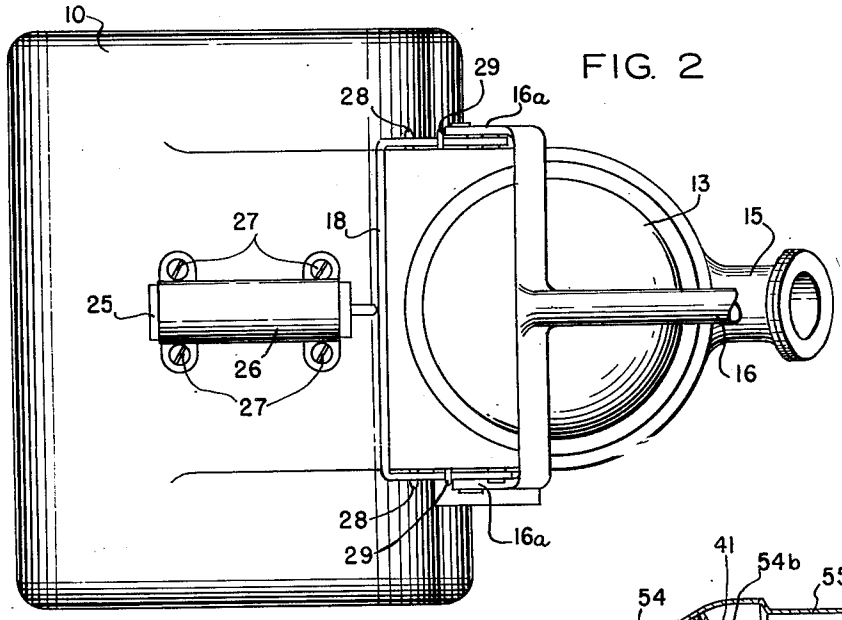


FIG. 3

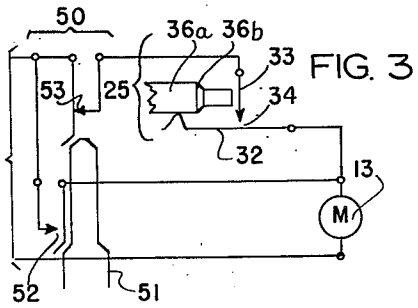
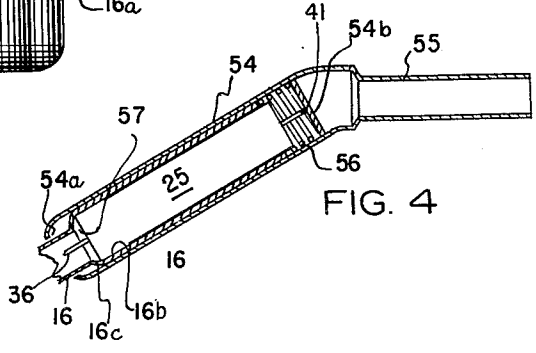


FIG. 4



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FLUID ACTUATED ELECTRIC CIRCUIT CONTROL FOR SUCTION CLEANERS

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FIG. 7

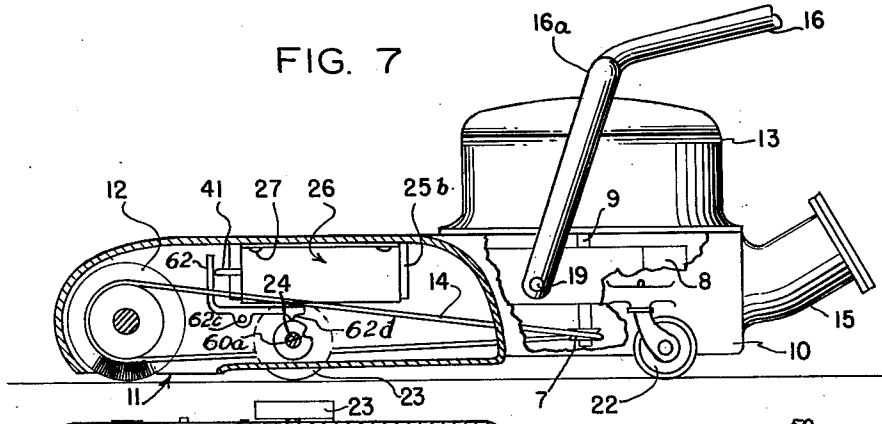


FIG. 8

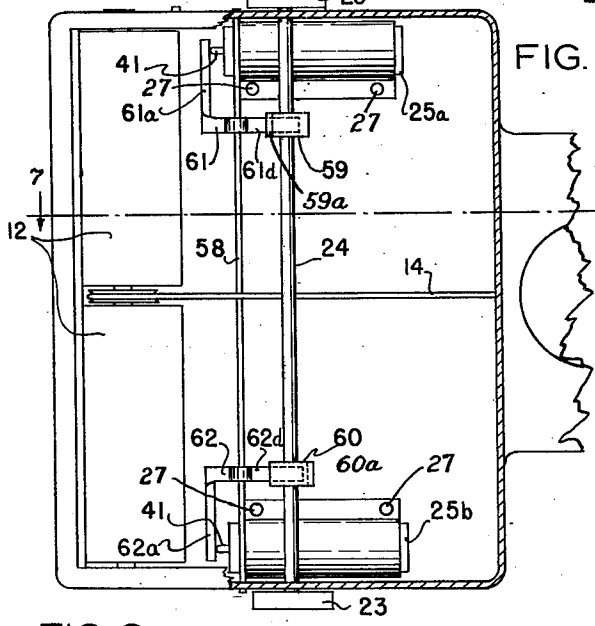


FIG. 9

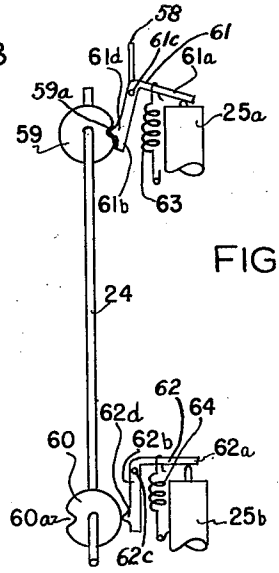


FIG. 6

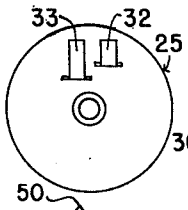


FIG. 5

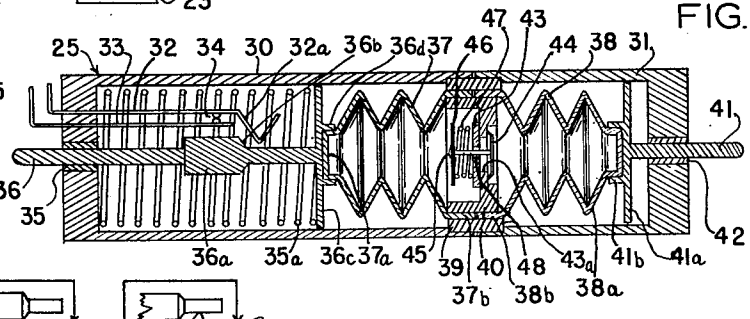
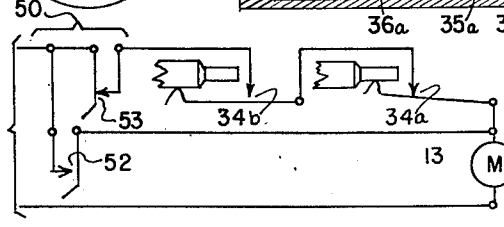


FIG. 10



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Patented Dec. 19, 1950 2,534,400

UNITED STATES PATENT OFFICE

2,534,400

FLUID ACTUATED ELECTRIC CIRCUIT CONTROL FOR SUCTION CLEANERS

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Application February 10, 1944, Serial No. 521,769

16 Claims. (Cl. 15—319)

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The present invention relates to improvements in vacuum cleaning apparatus and more particularly to improvements in vacuum cleaners of the household type conventionally used for cleaning rugs and other household articles.

It is an object of the present invention to provide an improved and exceedingly simple arrangement for automatically starting a vacuum cleaner when movement of the cleaner over a surface to be cleaned is initiated.

It is another object of the invention to provide improved and exceedingly simple facilities for automatically stopping a vacuum cleaner when movement of the cleaner over the surface to be cleaned is arrested.

According to another object of the invention, the automatic starting and stopping controls for the cleaner are concentrated in a simple fluid actuated device which is positive and reliable in operation, may be manufactured at low cost, and is readily adaptable to cleaners of different types in a variety of different ways.

In accordance with still another object of the invention, facilities are provided in the control device for continuing the operation of the cleaner for a short and predetermined time interval after movement of the cleaner over the surface to be cleaned is arrested.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawings, in which:

Fig. 1 is a side elevational view illustrating a vacuum cleaner having the present improved control features embodied therein;

Fig. 2 is a top perspective view of the cleaner shown in Fig. 1;

Fig. 3 is a circuit diagram illustrating the mode of interconnecting the elements of the control circuit for the cleaner shown in Fig. 1;

Fig. 4 is a fragmentary sectional view illustrating a modified arrangement of the control device and certain parts of the cleaner shown in Fig. 1;

Fig. 5 is a side sectional view of the control device forming a part of the cleaner shown in Fig. 1;

Fig. 6 is an end view of the control device shown in Fig. 5;

Fig. 7 is a side sectional view of a cleaner substantially similar to that shown in Fig. 1 but provided with a modified arrangement for actuating two control devices of the character shown in Fig. 5;

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Fig. 8 is a bottom view of the cleaner shown in Fig. 7;

Fig. 9 is a partially schematic view of the control equipment provided in the cleaner shown in Figs. 7 and 8; and

Fig. 10 is a circuit diagram of the circuit equipprovided for controlling the cleaner shown in Figs. 7 and 8.

Referring now to the drawings and more particularly to Figs. 1 and 2 thereof, the vacuum cleaner there illustrated comprises a housing member 10 having along its bottom portion a suction orifice 11 through which dust, dirt or other foreign matter extracted by the air stream from a rug or other surface may be conducted to a removable dust collecting bag, not shown, through an exhaust conduit 15. For the purpose of creating a suction within the nozzle 10, a fan 8 is provided which is mounted for rotation with the driving shaft 9 of an electric motor 13. This motor is enclosed by a housing member and is mounted upon the upper side of the nozzle member 10. The cleaner further comprises a brush 12 which is mounted for rotation within the housing member 10 in any desired manner, is positioned so that the periphery projects through the orifice 11 transversely of the cleaner to engage a surface being cleaned, and is arranged to be driven from the motor shaft 9 by an endless belt 14 which extends between a pulley 7 carried by the motor shaft and a similar pulley provided upon the brush shaft. In accordance with conventional practice, the brush 12 is provided with bristles around its peripheral surface which are arranged to contact the surface being cleaned, thereby to loosen dirt embedded in the surface so that it may easily be removed by the air stream. The cleaner is supported upon two casters 22 and two rollers 23, the first of which are swivel connected to the nozzle member 10 toward the rear thereof and the latter of which are mounted for rotation with a shaft 24 which extends transversely of the cleaner and is disposed toward the front end thereof. For the purpose of moving the cleaner back and forth over a rug or other surface to be cleaned, it is provided with an operating handle 16 having a bail-like end the legs 16a of which straddle the motor 13. At their extreme ends, the handle legs 16a are pivotally supported upon the legs of a U-shaped member 18 which extends transversely of and straddles the cleaner housing member 10. Pivot pins 17 are utilized pivotally

to connect the ends of the legs 16a to the legs of the U-shaped member 18 intermediate the ends thereof, and pivot pins 19 anchored in the sides of the housing member 10 are utilized to pivot the U-shaped member 18 upon the housing member. With this arrangement, the U-shaped member 18 is pivoted back and forth about the pivot pins 19 when the handle 16 is pushed and pulled to move the cleaner back and forth over the surface being cleaned. Stop pins 28 and 29 suitably anchored to the side walls of the housing member 10 upon either side of this member are provided to limit the pivotal movement of the U-shaped member 18. These pins are adapted to be engaged by the edge surfaces of the legs of the U-shaped member 18. Resilient spring members 20 mounted upon the side walls of the nozzle member 10 by means of screws 21 are arranged to engage the lower edge surfaces of the legs of the U-shaped member 18 for the purpose of normally biasing this member into engagement with the upper stop pins 29.

As best shown in Fig. 3 of the drawings, the driving motor 13 of the cleaner is arranged for selective energization either by a manually operable switch 50, which may be suitably mounted at the operating end of the handle 16, or by an automatic control device 25. The manually operable switch 50 comprises contacts 52 and 53 and a manually actuated control mechanism 51 shown schematically for biasing the contacts 52 in their open position and the contacts 53 in their closed position, Figure 3, for automatic initiation of the motor 13 in response to the first forward movement of the cleaner over a surface to be cleaned. With the control mechanism 51 actuated so that the contacts 52 are closed and the contacts 53 opened, the motor 13 is adapted for manual control. The control device is, in the arrangement shown in Figs. 1 and 2 of the drawings, clamped to the upper surface of the nozzle member 10 by means of a semi-resilient clamping strip 26 which is partially wrapped around the body of the device and is anchored to the top wall of the housing member 10 by means of rivets or bolts 27. This control device is provided with an actuating element 41 which is arranged to engage the transverse portion of the U-shaped member 18 to be reciprocated back and forth in response to the reverse pivotal movement of this member which occurs as the handle 16 is operated to push the cleaner back and forth over the surface to be cleaned.

Briefly considered and as best shown in Fig. 5 of the drawings, the control device 25 comprises a pair of elongated, oppositely facing housing cups 30 and 31 which are formed of Bakelite or other suitable insulating material and are provided centrally of the closed ends thereof with apertures for receiving and rigidly supporting two metallic bearing sleeves 35 and 42. Resilient contact springs 32 and 33 embedded, or otherwise suitably rigidly mounted within the closed end wall of the member 30, extend within this member and are provided with normally engaged contacts 34 adjacent the free ends thereof. For the purpose of normally maintaining the contacts 34 out of engagement, an actuating element 36 is provided which includes an elongated portion journaled within the bearing member 35, a disc-like portion 36c slidable along the inner tubular surface of the member 30, and an enlarged cylindrical portion 36a the right end of which merges with a tapered camming surface 36b. Normally, the actuating element 36 is restrained to the right to a position such that the enlarged portion 36a thereof is engaged by the lower camming edge of the cam follower 32a formed integral with the upper contact spring 32. This is accomplished by providing a coil spring 35a, one end of which abuts the closed end of the tube 30 at the inner side thereof and the opposite end of which abuts the disc-like portion 36c of the actuating element 36.

The reciprocable actuating element 41 which, in the Figs. 1 and 2 arrangement of the cleaner, is engaged by the U-shaped member 18, is slidably journaled in the bearing sleeve 42 and is provided with a disc-like portion 41a which is slidable within the tubular inner surface of the member 31. This element is utilized to move the contact actuating element 36 to the left into a position such that the contacts 34 are engaged, and to maintain the latter element in the established off-normal position in response to back-and-forth movement of the cleaner over the surface to be cleaned. To this end, a connecting link is provided between the two elements 41 and 36 which includes a fluid-filled Sylphon bellows structure. In brief, this structure comprises a pair of flexible corrugated bellows elements 37 and 38 having closed cup-shaped ends 37a and 38a which are respectively seated within annular flanges 36d and 41b respectively carried by the disc-like portions 36c and 41a of the two elements 36 and 41. The abutting rim portions of the bellows elements 37 and 38 are tightly clamped between the outer annular surface of a valve support 40 and the inner surface of an annular retaining ring 39. If desired, the opposed clamping surfaces of the valve support 40 and the retaining ring 39 may be tapered slightly, so that by driving the retaining ring over the valve support with the rim portions of the bellows elements 37 and 38 clamped therebetween, a fluid-tight joint is provided between all four of the named parts. The retaining ring 39 is seated within an annular recess which is divided between the inner rim portions of the two housing cups 30 and 31, and the engaging surfaces of the three named parts may be cemented or otherwise secured together to provide a rigid assembly. In order to permit free fluid flow from the bellows element 38 to the bellows element 37, and to restrict fluid flow in the opposite direction, a leaky one-way valve mechanism comprising the five illustrated parts 43, 44, 45, 46 and 47 is provided for closing an enlarged port 43a formed centrally of the valve support 40. More specifically, the valve member 43 is normally held in seating engagement with the valve support 40 to close the port 43a, by means of the coil spring 47 which is under compressive tension between the valve member and a disc 46 carried by the valve stem 45. The latter element extends through a leak port 48 drilled centrally through the member 43 and is rigidly anchored at its right end to a cup-shaped spider 44, the rim portion of which is seated within a shallow recess disposed centrally of the valve support 40 upon the right side thereof. The enclosed space thus provided within the bellows elements 37 and 38 is partially filled with a suitable fluid, such, for example, as free flowing oil. In this regard, it is noted that the amount of fluid used is insufficient to prevent the contact actuating element 36 from being moved under the influence of the spring 35a to a position such that the enlarged portion 36a thereof engages the cam follower 32a to maintain the contacts 34 disengaged. On the other hand, the amount of fluid provided within the bellows ele-

ments 37 and 38 is sufficient to effect positive disengagement of the cam follower 32a from the enlarged portion 36a of the actuating element 36 in response to reciprocation of the actuating element 41. In this regard it will be understood that as the actuating element 41 is moved to the left, the space within the bellows element 38 is reduced to increase the fluid pressure within this element, with the result that the valve member 43 is unseated to permit the free flow of fluid from the element 38 into the element 37. In response to the fluid flow into the bellows element 37, this element is expanded longitudinally so that the end portion 37a is moved to the left against the force of the restoring spring 35a. As a consequence, the actuating element 36 is moved to the left to disengage the enlarged portion 36a thereof from the cam follower 32a and thus permits engagement of the contacts 34. When the force exerted upon the end of the actuating element 41 is released, the spring 35a tends to move the actuating element 36 to the right, but such movement is restricted due to the immediate seating of the valve member 43 upon the valve support 40 to substantially close the fluid port 43a. A slow fluid flow from the bellows element 37 back into the bellows element 38 is, however, permitted through the leak port 48. As the fluid within the bellows element 37 leaks back into the bellows element 38, the actuating element 36 is moved back toward its normal position. The rate at which the return movement of the actuating element 36 occurs obviously depends upon the size of the leak port 48 through the valve member 43. Preferably, the size of this opening is so proportioned that several seconds are required for the actuating element 36 to return to its normal position after a single actuating of the element 41 to force fluid from the bellows element 38 into the bellows element 37.

From the above explanation with reference to the cleaner shown in Fig. 1 of the drawings and the control device shown in Figs. 5 and 6 of the drawings, it will be understood that during operation of the handle 16 to move the cleaner back and forth over a surface to be cleaned, the U-shaped member 18 is intermittently operated to depress the actuating element 41 of the control device 25. Thus, during actuation of the handle 16 to move the cleaner in a forward direction, the U-shaped member is moved to a position such that it engages the stop elements 28 upon either side of the housing member 10. Incident to this movement, the actuating element 41 is depressed to cause the fluid within the bellows element 38 to flow into the bellows element 37. During the back stroke of the cleaner, i. e. when the handle 16 is pulled to move the cleaner in a backward direction, the U-shaped member 18 is pivoted about the axis pins 19 away from the actuating member 41 to engage the stop pins 29. Thus, the pressure exerted upon the end of the element 41 is released, permitting the fluid within the bellows 38 to flow through the leak port 48 under the influence of the pressure exerted upon the bellows element 37 by the spring 35a. The rate at which the fluid flow through the leak port 48 occurs is, however, insufficiently high to permit the contact actuating element 36 to be moved back to its normal position during the time interval required for backward movement of the cleaner through a cleaner back stroke of average length. In fact, the rate of liquid flow from the bellows element 37 through the leak port 48 into the bellows element 38 preferably exceeds by several times the interval required for operation of the actuating element 36 from its off-normal position back to its normal position.

In light of the above description it will be clearly apparent that with the manually operable switch 50 occupying its normal position as actuated by the mechanism 51, such that the contacts 52 are opened and the contacts 53 are closed, as shown in Figure 3, operation of the cleaner driving motor 13 is automatically initiated in response to the first forward movement of the cleaner over a surface to be cleaned. Thus, incident to this operation, fluid is pumped from the bellows element 38 through the valve opening 43a into the bellows element 37 to effect disengagement of the enlarged portion of the actuating element 36 from the contact spring cam follower 32a in the exact manner explained above. As a result, the contacts 34 are moved into engagement to complete a circuit through the closed contacts 53 for energizing the driving motor 13. Rotation of the fan 8 and the brush 12 is thus started to initiate the cleaning action. It will also be apparent that so long as the back and forth movement of the cleaner is continued with sufficient rapidity, the enlarged portion 36a of the element 36 is prevented from returning to its normal position to effect deenergization of the driving motor 13. Thus, as long as the U-shaped member 18 is pivoted back and forth between the stop elements 28 and 29 with sufficient rapidity, the rate of fluid flow from the bellows element 37 through the leak port 48 into the bellows element 38 is far too slow to prevent the actuating element 36 from being returned to its normal position.

When, however, operation of the handle 16 to move the cleaner back and forth over the surface being cleaned is arrested, the spring members 20 acting upon opposite legs of the U-shaped member 18 pivot this member in a clockwise direction about the pivot pins 19 until the legs thereof engage the stop elements 29. In this regard it is pointed out that the springs 20 are sufficiently heavy to insure that the U-shaped member 18 will be returned to its normal position against the stops 29 regardless of the position of the handle 16 at the time movement of the cleaner over the surface being cleaned is arrested. With this member occupying its normal position against the stop elements 29, the bellows element 38 is free to reassume its normal configuration by the forced fluid flow thereinto from the bellows element 37 under the influence of the retracting spring 35a. As the actuating element 36 is thus returned to normal, the enlarged portion 36a thereof rides beneath the cam follower portion 32a of the spring 32, thereby to separate the contacts 34. When these contacts are opened, the driving motor 13 is deenergized to arrest the cleaning operation. From the above explanation it will be understood that the relative movement between the handle 16 and the housing 10 of the cleaner is utilized to so control the fluid actuated device 25 that operation of the driving motor 13 to initiate rotation of the suction fan 8 and agitating brush or beater 12 is automatically initiated in response to movement of the cleaner over the surface being cleaned. It will also be understood that operation of the motor 13 is automatically arrested a predetermined time interval after movement of the cleaner over the surface being cleaned is stopped. As previously indicated, the length of the latter interval, i. e. that during which operation of the motor 13 will persist after movement of the cleaner is arrested, is deter-

mined primarily by the size of the leak port 48 through which the fluid within the bellows element 37 is forced into the bellows element 38.

In the arrangement illustrated in Fig. 4 of the drawings, the handle 16 for actuating the cleaner shown in Figs. 1 and 2 is sectionalized, and relative movement between the two sectionalized parts of the handle is utilized to actuate the control device 25. This control device may be of the exact construction and arrangement illustrated in Figs. 5 and 6 of the drawings. More specifically, the handle 16 is provided with a portion 16b of enlarged diameter within which the control device 25 is telescoped. At the juncture point 16c between the enlarged portion 16b of the handle and the remaining handle portion, a disc 57 is provided for seating the end of the control device 25. This disc is provided with an opening therethrough for receiving the end of the element 36 to permit free movement of this element. As indicated above, the handle section 54 is telescoped over the handle portion 16b, and the end thereof which projects beyond the juncture 16c is turned over as indicated at 54a. With this arrangement, the turned over portion 54a of the handle section 54 is adapted to engage the juncture portion 16c when the handle section 54 is pulled to move the cleaner in a backward direction. For the purpose of reciprocating the bellows actuating element 41, thereby to move the contact actuating element 36 to its off-normal position wherein the contacts 34 are closed, a disc 54b is rigidly mounted within the handle section 54 at a point therealong such that the center portion thereof just engages the end of the element 41 when the handle section 54 occupies its retracted position. If desired, a coil spring 56 may be tensioned between the disc 54b and the end of the control device 25 for the purpose of retracting the handle section 54 after pressure which has been exerted thereon to move the cleaner in a forward direction has been released. The handle section 54 is also provided with an angularly extending portion 55 which is adapted to receive a rubber handle or grip, and occupies a substantially horizontal position when the handle 16 is held in its normal operating position. The same control circuit, i. e. that shown in Fig. 3 of the drawings, either with or without the manually operable switch 50, may be utilized to control the driving motor 13 when the control device 25 is arranged in the manner shown in Fig. 4 of the drawings to be actuated in response to relative sliding movement between the two sections of the handle 16. In this regard, it will be understood that as the handle section 54 is pushed to move the cleaner in a forward direction, the bellows actuating element 41 of the control device is operated to pump fluid from the bellows element 38 into the bellows element 37, with the result that the contact actuating element 36 is moved to its off-normal position to close the contacts 34. It will also be understood that so long as the handle section 54 is moved back and forth relative to the main handle section 16 with sufficient rapidity, the flow of fluid through the leak port 48 prevents the contact actuating element 36 from being returned to its normal position, with the result that operation of the motor 13 to drive the cleaning means of the cleaner is sustained. When, however, the handle section 54 is released to arrest movement of the cleaner over the surface being cleaned, it is moved to its retracted position, wherein the portion 54a thereof engages the juncture 16c between the two portions of the handle part 16 and remains in this position. Thus, the actuating members 36 and 41 may be returned to their respective normal positions under the influence of the retracting spring 56, with the result that the contacts 34 are opened to energize the driving motor 13.

In the arrangement illustrated in Figs. 7, 8, 9 and 10 of the drawings, two control units 25a and 25b, identical in construction with the control unit 25, are provided for controlling the driving motor 13 of the cleaner. These two control units are mounted upon the underside of the cleaner housing in any suitable manner. The roller actuated shaft 24 which extends through bearings provided in the two sides of the cleaner housing and upon which the rollers 23 are rigidly mounted to the outside of the housing, is utilized for alternately depressing the bellows actuating plungers 41 of the two control devices 25a and 25b. More specifically, the shaft 24 rigidly mounts two camming rollers 59 and 60 which are respectively arranged to rock pivotally supported rocker arms 61 and 62. These arms are in turn arranged respectively to actuate the bellows actuating elements 41 of the two control devices 25a and 25b. They are pivotally supported by means of a rod 58 which is anchored at its ends to the sides of the housing 10, and respectively include portions 61a and 62a which engage the ends of the bellows actuating elements 41 respectively provided in the two control devices 25a and 25b. They also include cam lobes 61d and 62d which are biased by means of springs 63 and 64 to engage the peripheral surfaces of the cam rollers 59 and 60, respectively. Each cam roller is provided with a depression at a point around its periphery for receiving the cam lobe of the associated rocker arm when it is rotated to a predetermined setting. Thus the roller 60 is provided with a peripheral depression 60a for receiving the lobe 62d provided upon the leg 62b of the rocker arm 62 when the shaft 24 is rotated to a predetermined angular setting. Similarly, the cam roller 59 is provided around its periphery with a depression 59a for receiving the lobe 61d carried by the leg 61b. From a consideration of Fig. 9 of the drawings it will be noted that the depressions 59a and 60a as respectively provided in the cam rollers 59 and 60 are displaced 180 degrees from each other, so that during rotation of the shaft the arms 61 and 62 are alternately pivoted about the rod 58 at 61c and 62c respectively.

As shown in Fig. 10 of the drawings, the contacts 34a and 34b respectively provided in the two control devices 25a and 25b are serially included in the circuit for energizing the driving motor 13 of the cleaner. During back and forth movement of the cleaner over the surface being cleaned, the rollers 23 in their frictional engagement with this surface function to rotate the shaft 24 and and the rollers 59 and 60 carried by this shaft. During such rotation of the rollers, the rocker arms 61 and 62 function alternately to actuate the two control devices 25a and 25b. Thus, each time the roller 59 is rotated to a position wherein the depression 59a is in registry with the lobe 61d, the rocker arm 61 is pivoted about the shaft 58 under the influence of the spring 63 to depress the bellows actuating element 41 of the control device 25a. Similarly, each time the roller 60 is rotated to a position wherein the depression 60a is in registry with the lobe 62d, the spring 64 acts to pivot the arm 62 in the direction required to depress the bellows actuating element 41 of the control device 25b. Thus the actuating elements 41

of the two control devices are alternately depressed and then released during sustained back and forth movement of the cleaner over the surface being cleaned. When both of the actuating elements **41** have been depressed, the contact actuating elements **36** of the two control devices are actuated to their respective off-normal positions to effect closure of the contacts **34***a* and **34***b*, such that the motor **13** is energized in an obvious manner. These contacts remain closed to sustain the energization of the motor **13** so long as back and forth movement of the cleaner over the surface being cleaned is continued. When, however, such movement is arrested, one or both the contact actuating elements is returned to its normal position to deenergize the motor **13**. In the normal case, both contact actuating elements **36** will be restored to normal so that both the contacts **34***a* and the contacts **34***b* are opened to interrupt two points in the circuit for energizing the motor **13**. Should, however, the cleaner be stopped with the cam lobe **61***d* of the rocker arm **61**, for example, in registry with the depression **59***a*, the bellows actuating element **41** of the control device **25***a* will necessarily be held in its depressed position to prevent the contact actuating element **36** of this device from being restored to normal. In such case, however, and due to the 180 degree displacement between the two depressions **59***a* and **60***a*, the contact actuating element **36** of the other control device **25***b* must necessarily be restored to its normal position after a predetermined time interval, whereby the energizing circuit for the motor **13** is opened at the contacts **34***a*. Thus, it will be apparent that regardless of the angular setting of the shaft **24** at the time movement of the cleaner is arrested, at least one of the two sets of contacts **34***a* and **34***b* must necessarily be opened to interrupt the motor energizing circuit a predetermined time interval after movement of the cleaner is stopped.

As indicated above, in all three of the disclosed embodiments of the invention, a manually operable switch **50** may be utilized for the purpose of selectively rendering the described automatic control facilities active and inactive. Thus, in the circuits as shown in Figs. 3 and 10 of the drawings, these facilities remain active so long as the switch **50** occupies the illustrated normal setting wherein the contacts **53** are closed and the contacts **52** are open. Should, however, it be desired to render these facilities inactive and rely on the switch **50** for manual control of the motor energizing circuit, this switch may be actuated to its off-normal position by movement of the mechanism **51** to close the contacts **52** and open the contacts **53**. Incident to this operation, the motor **13** is energized in an obvious circuit and the automatic control facilities are rendered inactive or inoperative to arrest the operation of the cleaning motor **13** when movement of the cleaner over a surface being cleaned is arrested. Thus it will be apparent that by selective actuation of the control mechanism **51** of the switch **50**, the motor **13** may either be manually controlled or may be automatically controlled, as desired.

While different embodiments of the invention have been disclosed, it will be understood that various modifications may be made therein, which are within the true spirit and scope of the invention.

I claim:

1. In a vacuum cleaner which is adapted to be moved back and forth over a surface to be cleaned and includes means for exerting a cleaning action on said surface including a motor, a fluid-actuating device comprising a fluid-pumping member actuated as an incident to the application of a cleaner-operating force in the operation of said cleaner on said surface, an actuated fluid-receiving part biased to a normal setting and operative to an off-normal setting under the pressure of fluid received from said pumping member, a fluid for operating said fluid-receiving part from its normal setting to an off-normal setting in response to sustained operation of said fluid-pumping member, contacts controlled by the movement of said actuated fluid-receiving part between said two settings, means including a circuit controlled by said contacts for controlling the operation of said motor connected to said circuit, and means to actuate said fluid-pumping member as an incident to the application of a cleaner-operating force.

2. In a vacuum cleaner which is adapted to be moved back and forth over a surface to be cleaned and includes means for exerting a cleaning action on said surface, a fluid-actuating device comprising a fluid-pumping member actuated as an incident in the operation of said cleaner on said surface, an actuated fluid-receiving part biased to a normal setting and operative to an off-normal setting, a fluid for operating said fluid-receiving part from its normal setting to an off-normal setting in response to sustained operation of said fluid-pumping member, contacts controlled by the movement of said actuated fluid-receiving part between said two settings, means including a circuit controlled by said contacts for operating said cleaning means only so long as said actuated fluid-receiving part occupies an off-normal setting, a one-way valve through which said fluid is pumped into said actuated fluid-receiving part by said fluid-pumping member for preventing said actuated part from returning to its normal setting during temporary withdrawal of the operative force on said cleaner, and means to actuate said fluid-pumping member as an incident to the application of a cleaner-operating force.

3. In a vacuum cleaner which is adapted to be moved back and forth over a surface to be cleaned and includes a handle and means for exerting a cleaning action on said surface, a fluid-pumping member, means to actuate said fluid-pumping member in response to movement of said cleaner over said surface, a fluid-actuated part internally connected to said fluid-pumping member and biased to one setting and operative to another setting in response to fluid pressure from said pumping member, a fluid in said pumping member and said actuated part, means for operating said cleaning means, means responsive to the movement of said actuated part from said other setting to said one setting for arresting the operation of said cleaning means, and means for transmitting as an actuating force to said fluid-pumping member a force delivered to said cleaner handle as an incident in cleaner operation.

4. In a vacuum cleaner which is adapted to be moved back and forth over a surface to be cleaned and includes means for exerting a cleaning action on said surface, a fluid-pumping member, a fluid-receiving actuated part biased to one setting and operative to another setting in response to fluid pressure created by said fluid-pumping member, means for operating said cleaning means, means responsive to the movement of said fluid-receiving actuated part from

said other setting to said one setting for arresting the operation of said cleaning means, means including a one-way valve through which the fluid of said device is pumped into said fluid-receiving part by said fluid-pumping member for preventing said fluid- receiving actuated part from returning to its one setting during momentary stoppages in the movement of said cleaner over said surface, and means to effect the operation of said fluid-pumping member in the back-and-forth operation of the cleaner.

5. In a vacuum cleaner which is adapted to be moved back and forth over a surface to be cleaned and includes a handle and means for exerting a cleaning action on said surface, a fluid-pumping member, a fluid-receiving actuated part biased to one setting and operative to another setting in response to fluid pressure from said fluid-pumping member, means responsive to movement of said actuated part to its other setting for initiating the operation of said cleaning means and responsive to the return movement of said actuated part from said other setting to said one setting for arresting the operation of said cleaning means, and means to exert a pumping force on said fluid-pumping member as an incident to the application of a cleaner-propelling force through said handle.

6. In a vacuum cleaner which is adapted to be moved back and forth over a surface to be cleaned and includes means for exerting a cleaning action on said surface, a fluid-pumping member, a fluid-receiving actuated part biased to one setting and operative to another setting in response to sustained operation of said pumping member, means responsive to movement of said actuated part to its other setting for initiating the operation of said cleaning means and responsive to the return movement of said actuated part from said other setting to said one setting for arresting the operation of said cleaning means, means including a one-way valve through which the fluid of said device is pumped against said fluid-receiving part by said fluid-pumping member for preventing said actuated part from returning to its one setting during a momentary removal of a propelling force on said cleaner, and means to actuate said fluid-pumping part during the exertion of a cleaner propelling force on said cleaner.

7. In a vacuum cleaner, an ambulatory body adapted for reciprocatory movement over a surface to be cleaned, a handle pivoted to said body, suction-creating means including an electric motor, an electric circuit including said motor and a normally open switch, fluid-pressure-operated means to actuate said switch including a fluid-pressure-creating pump and a fluid-pressure-operated element connected to said pump and operatively related to said switch to close same, means to effect the actuation of said fluid-pressure-creating pump as an incident to the exertion of a cleaner-propelling force through said handle to actuate said fluid-pressure-operated element to close said switch and so the motor circuit, and means to effect the slow release of fluid pressure acting on said fluid-pressure-operated element to effect the opening of said switch and the opening of the motor circuit upon the removal of the propelling force on said handle.

8. In a vacuum cleaner, an ambulatory body adapted for reciprocatory movement over a surface to be cleaned, a handle pivoted to said body, suction-creating means including an electric motor, an electric circuit including said motor and a normally open switch, fluid-pressure-operated means to actuate said switch including a fluid-pressure-creating pump and a fluid-pressure-operated element connected to said pump and operatively related to said switch to close same, means directly connecting said fluid-pressure-creating pump to said handle to receive an actuating force therefrom as an incident to the exertion of a cleaner-propelling force therethrough, means to release slowly fluid pressure acting on said fluid-pressure-operated element upon the removal of the actuating force on said pump, and means to return said fluid-pressure-operated element to its initial relationship upon the removal of the fluid pressure acting thereon thereby to effect the opening of said switch with a time delay action.

9. In a vacuum cleaner, an ambulatory body adapted for reciprocatory movement over a surface to be cleaned, a handle pivoted to said body, suction-creating means including an electric motor, an electric circuit including said motor and a normally open switch, fluid-pressure-operated means to actuate said switch including a fluid-pressure-creating pump and a fluid-pressure-operated element connected to said pump and operatively related to said switch to close same, means to exert an actuating force on said pump upon the exertion of a forward cleaner-propelling force on said handle, said pump thereupon exerting a fluid pressure on said element to move same to actuate said switch thereby closing the motor circuit, and means acting to return said element to its initial position with a delayed time action upon the removal of the actuating force on said pump and including a fluid-pressure-release valve.

10. In a vacuum cleaner, an ambulatory body adapted for reciprocatory movement over a surface to be cleaned, a handle pivoted to said body, suction-creating means including an electric motor, an electric circuit including said motor and a normally open switch, and means to close said switch responsive to the movement of said body over a supporting surface, said means including a fluid-pressure-actuated element operatively connected to said switch and adapted to operate same, a fluid-pressure-generating pump connected to said element and adapted to effect a fluid pressure thereon to actuate said element to operate said switch, means controlled by the physical displacement of said body over a supporting surface to actuate said pump at intervals, and pressure-releasing means to relieve the pressure acting on said element with a time delay period greater than said interval whereby said switch is closed during cleaner operation and thereafter for a time period.

11. The construction defined in the preceding claim in which the means controlled by the physical displacement of said body comprises rotating cams and followers, the latter being directly connected to said pump.

12. The combination with a vacuum cleaner including an electrical circuit, of an automatic control device adapted for energization and de-energization of the electric circuit and actuated as an incident in the manipulation of said cleaner causing energization of said circuit in response to initiation of movement of the cleaner over a surface to be cleaned and deenergization of said circuit when movement of the cleaner over a surface to be cleaned is arrested, said automatic control device comprising a fluid-pumping mem-

ber actuated as an incident in the manipulation of said cleaner, an actuated fluid-receiving part biased to a normal setting and operative to an off-normal setting, a fluid for operating said fluid-receiving part from its normal setting to an off-normal setting in response to sustained operation of said fluid pumping member, contacts in said circuit controlled by the movement of said actuated fluid-receiving part between said two settings, said circuit energized only so long as said actuated fluid-receiving part occupies an off-normal setting, a one way valve through which said fluid is pumped into said actuated fluid-receiving part by said fluid-pumping member for preventing said actuated part from returning to its normal setting during temporary withdrawal of the operative force on said cleaner, and means to actuate said fluid-pumping member as an incident to the application of a cleaner-operating force.

13. In a surface treating apparatus of the type which is moved on the surface to be treated in operation and includes an electrically energized surface treating means, the combination of a propelling handle structure operatively mounted on said apparatus, said propelling handle structure including a part connected for limited movement relative to said apparatus in response to the application of a propelling force thereto, an electrical circuit including a control switch for energizing said surface treating means, a fluid-actuating device operated by such relative movement between said apparatus and said part of said handle structure to actuate said switch to energize said surface treating means, means biasing said fluid actuating device to operate said switch to de-energize said surface treating means, and said fluid actuating device including retarding means to resist operation by said biasing means to delay de-energization of said surface treating means after removal of a propelling force from said handle.

14. An apparatus as claimed in claim 13 in which said handle structure comprises a spring biased means pivotally mounted on said apparatus and a manipulating part pivotally mounted on said spring biased means, and said fluid actuating means is operated by movement of one of said parts relative to said apparatus.

15. An apparatus according to claim 13 in which said handle structure comprises a handle section pivotally mounted on said apparatus and a manipulating handle section slidably connected to said first mentioned handle section for limited movement relative thereto, and said fluid actuating device is actuated by movement of said manipulating handle section relative to said apparatus.

16. In a surface treating apparatus of the type which is moved on the surface to be treated in operation and includes a surface treating means, the combination of a propelling handle structure operatively mounted on said apparatus, said propelling handle structure including a part connected for limited movement relative to said apparatus when a propelling force is applied to said handle structure, means for rendering said surface treating means operative and inoperative including a movable actuating member, said actuating member being positioned to be actuated by said relative movement of said part of said handle structure induced by the application of a propelling force thereto to render said surface treating means operative, means biasing said actuating member for movement to render said surface treating means inoperative, and means for retarding movement of said actuating means by said biasing means to introduce a time delay between removal of said propelling force and actuation of said controlling means to render said surface treating means inoperative.

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