J. WYNN, Jr.

SUCTION MACHINE.

APPLICATION FILED SEPT. 3, 1913.

1,165,562.

Patented Dec. 28, 1915.

2 SHEETS—SHEET 1.

Fig. 1.

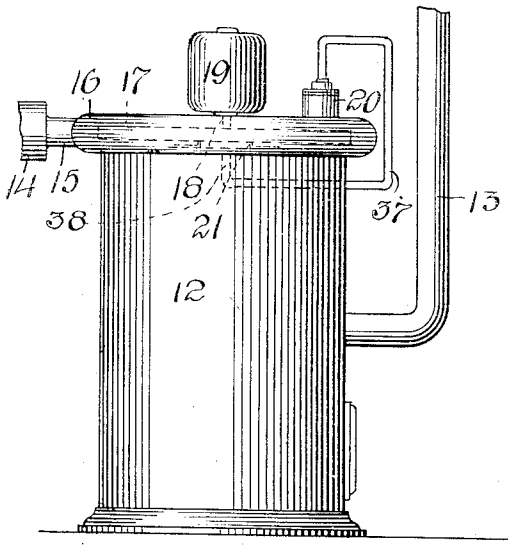


Fig. 3.

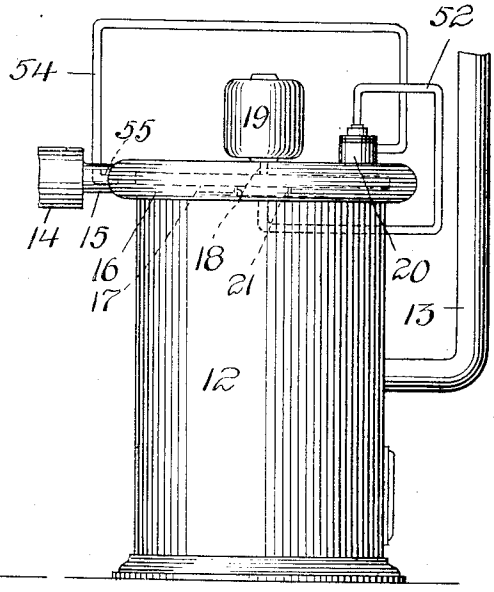


Fig. 2.

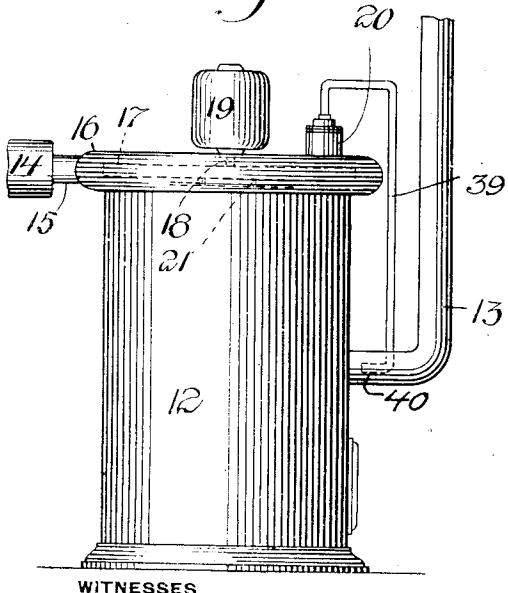
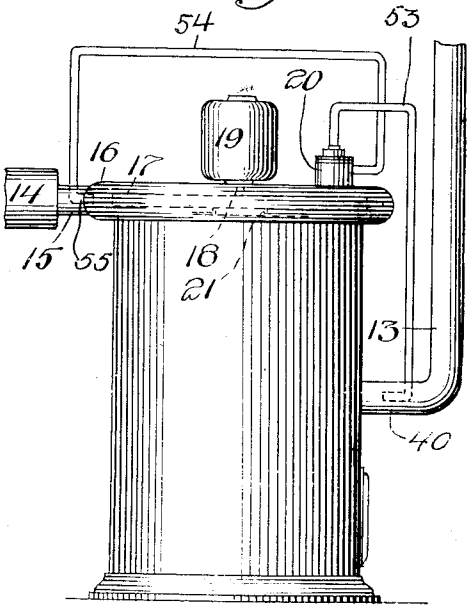


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 5.

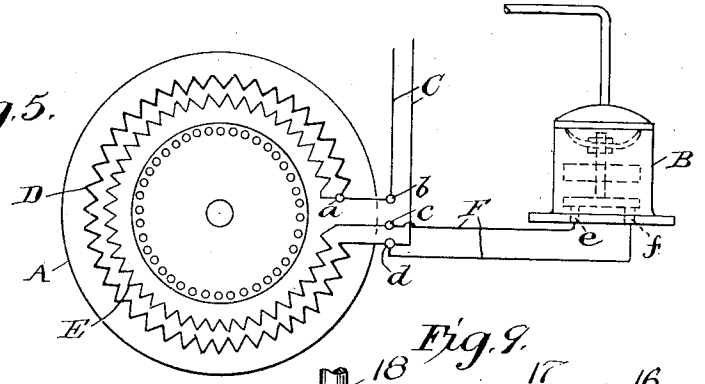


Fig. 9.

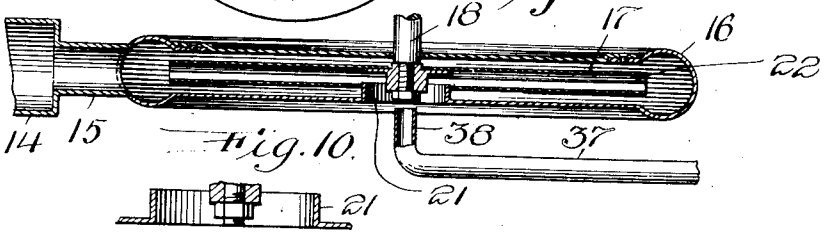


Fig. 10.

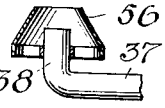


Fig. 6.

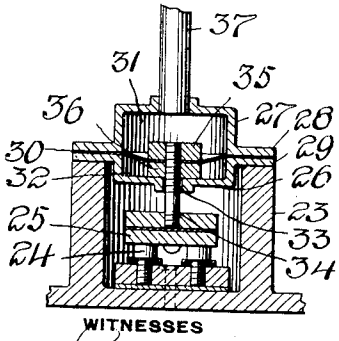


Fig. 7.

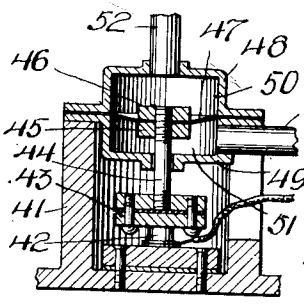
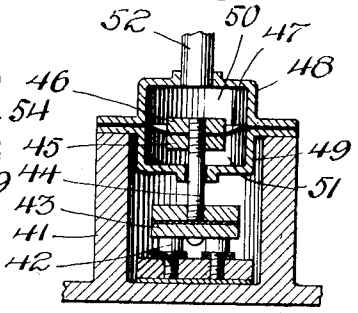


Fig. 8.



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SUCTION-MACHINE.

1,165,562. Specification of Letters Patent. Patented Dec. 28, 1915.

Application filed September 3, 1913. Serial No. 788,021.

To all whom it may concern:

Be it known that I, JOHN WYNN, Jr., a citizen of the United States of America, residing at Canton, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Suction-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to suction machines of the centrifugal type, operated by a split phase induction motor provided with an auxiliary starting circuit, more particularly to an attachment for the machine for use in connection with said circuit, and has for its object to provide means interposed in said auxiliary starting circuit and operated by suction, at the necessary time, to open said circuit, for the purpose of reducing to a minimum liability of destruction of the motor by fire, whereby the life of the motor is materially increased.

Further objects of the invention are to provide an attachment for suction cleaning machines which is simple in construction and arrangement, readily adapted for use in connection with the machine, strong, durable, efficient in its use, automatic in its operation, conveniently installed and inexpensive to set up.

With the foregoing and other objects in view the invention consists of the novel construction, combination and arrangement of parts, as hereinafter more specifically described and illustrated in the accompanying drawings, wherein is shown an embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which come within the scope of the claims hereunto appended.

In the drawings, wherein like reference characters denote corresponding parts throughout the several views:—Figure 1 is an elevation of the suction cleaning machine, showing the adaptation thereto of a switch in accordance with this invention, the switch being operated by suction, Fig. 2 is a view similar to Fig. 1, of a modified form, the switch being operated by suction, Fig. 3 is a view similar to Fig. 1, of a modified form, the switch being operated by suction and pressure, Fig. 4 is a view similar to Fig. 1, of a modified form, the switch being operated by suction and pressure, Fig. 5 is a diagrammatic view of the suction operated switch with the wire connected thereto, Fig. 6 is a vertical sectional view illustrating the suction operated switch, for use in connection with the forms shown in Figs. 1 and 2, the suction tube being broken away and the elements of the switch shown in normal position closing the circuit, Fig. 7 is a vertical sectional view illustrating the switch elements, of the form of switch employed in Figs. 3 and 4, the elements of the switch being shown in an inoperative position, that is, opening the circuit, the suction tube and pressure tube being broken away, Fig. 8 is a sectional view at right angles to that shown in Fig. 7, Fig. 9 is a sectional elevation showing the position of the inner end of the suction tube with respect to the intake opening of a suction producer, and Fig. 10 illustrates a sectional detail, of a modified form of the inner end of the suction tube.

In Figs. 1 to 4 of the drawings, 12 denotes, by the way of example, a suction machine of the centrifugal type and which includes an air line 13, and an outlet pipe 14 having a contracted portion 15, the latter communicating with the machine. The machine also includes a casing 16 in which revolves a horizontally disposed suction producer 17, the latter being shown in dotted lines in Figs. 1 to 4, and in full lines in Fig. 9. The suction producer is carried by the shaft 18 of a motor 19 which is mounted upon the top of the machine and in circuit with a source of electrical energy having interposed therein a switch 20. The casing 16 is provided with a centrally disposed air intake 21, the latter opening into the inner end of the air passages 22 of the suction producer 17. The contracted portion 15 of the outlet pipe 14 communicates with the casing 16.

In the form employed in Figs. 1 and 2 the switch includes a chambered support 23 which is secured to the top of the machine and which has arranged therein a pair of stationary electrodes 24, normally engaged by a movable electrode 25 for closing and opening the electric circuit. Conducting means leads from the stationary electrodes to the starting winding of the motor and is connected in series with the winding.

Mounted upon the top of the support 23 is a sectional casing, the sections of said casing being indicated at 26, 27. The sections 26, 27 are provided respectively with lateral flanges 29, 28 having interposed therebetween a flexible diaphragm 30. The sections 26, 27 form a compartment, which is divided by the diaphragm 30 into a suction chamber 31 and a chamber 32. The section 26 is formed with a centrally disposed opening 33, through which extends a vertically movable member 34, having the electrode 25 connected to its lower end, and further having its upper portion threaded. The member 34 extends up through the diaphragm 30 into the suction chamber 31, and has the threaded portion thereof provided with weights, as illustrated, an upper and a lower nut 35, 36 respectively, the latter being arranged within the chamber 32, while the former is positioned within the chamber 31. The nuts 35, 36, not only constitute means for clamping the member 34 to the diaphragm 30, but further provide weights for the diaphragm, so as to give suitable operation for a given suction or pressure, that is to say, under ordinary circumstances maintain the movable electrode in engagement with the stationary electrodes for closing the circuit, but when the suction increases above the pressure caused by the weights, the diaphragm will be shifted upwardly against the action of its weights, whereby the movable electrode 25 will be shifted clear of the stationary electrodes and open the circuit.

In the form shown in Fig. 1, the suction tube, which is indicated by the reference character 37, opens into the chamber 31, at the top thereof, and leads from said chamber into the suction machine, and has an upturned inner end 38 which is positioned centrally with respect to the intake 21 and arranged in close proximity to said intake.

In the form shown in Fig. 2 the suction tube which is indicated by the reference character 39 leads from the chamber 31 and extends into the intake pipe 13, in proximity to the body of the suction machine. That end of the suction tube 39 which extends into the pipe 13, is provided with an angularly disposed portion 40.

In Figs. 7 and 8 of the drawing the construction of switch is illustrated as employed in the forms shown in Figs. 3 and 4 and referring to Figs. 7 and 8, 41 denotes a chambered support, 42 stationary electrodes, 43 a movable electrode, 44 a shiftable member for the electrode 43, and 45—46 the nuts or weights which are secured to the member 44 for clamping the diaphragm 47 to the member 44. Mounted upon the chambered support 41 is a casing formed of two flanged sections 48, 49 which provide a compartment, separated by the diaphragm into a vacuum chamber 50 and a pressure chamber 51. The nut 45 is arranged in the pressure chamber 51 and the nut 46 in the suction chamber 50. Leading to the suction chamber 50 is a suction tube 52 which is constructed and arranged in the manner as the tube 37, or leading to the chamber 50 is a suction tube 53 which is constructed and arranged in the same manner as the suction tube 39. Opening in the pressure chamber 51, at one side thereof, is a pressure tube 54 which establishes communication between the contracted portion 15, of the outlet 14 and the pressure chamber 51. The tube 54 extends into the contracted portion 15 and has an angle-shaped portion 55 leading toward the casing 16.

The flanges 29, 28 of the sections 26, 27 are secured to the chambered support 23 while the flanges of the sections 48, 49 are secured to the chambered support 41.

In Fig. 10 of the drawing the end 38 of the suction tube 37 is shown provided with a cone-shaped hood 56 for the purpose of creating a suction equal to, or about to what is lost when the door of the suction tank is opened.

Although two stationary electrodes are illustrated, yet it is to be understood, that one can be employed, as one lead can be attached to the stationary electrode and the other lead to the movable electrode.

By placing the suction tube, with its free end, at the intake, especially in suction cleaning machines of the centrifugal type, unusually desirable results are obtained for the reason that the suction maintained at the intake, is nearly constant, regardless of the amount of air passing through the machine. In Figs. 3 and 4, the movable electrode, is not only shifted by vacuum, but is also shifted by a supply of pressure conducted by the pressure tube from the outlet of the machine. If the suction should fall, the pressure derived from the outlet would maintain the switch open.

In Fig. 5 there is shown a diagrammatic wiring system connected to a suction machine and includes in detail the current lead wire C that conveys the electricity to the motor and enters at point —*b*— and is passed into the motor to point —*a*— where the current is separated. At this point, part of the current passes through the running winding D, continues and passes out at the point —*d*— to the opposite line C. The remaining portion of the current at the point —*a*— continues and passes through the starting winding E to point —*c*— where it is conducted by wires F to the starting switch B. The current enters starting switch at point —*e*— and returns to point —*f*— to connecting wires F, then to point —*d*— and into line C. This is the operation during the starting of the motor and after the

motor has been started, the vacuum created in the machine opens the circuit of the starting winding and the complete flow of current passes through the running winding.

Experience has shown that a split-phase induction motor, will not assume its phase speed readily when a load is placed upon the motor before the motor has reached its proper speed. This in a mechanically operated switch, does not allow the pawls or brushes to break the circuit of the starting winding, and the latter soon burns out. Clutches and other devices have been placed on the motor shaft, in order to allow the machine to obtain speed enough to operate the pawls or brushes by centrifugal force, thereby increasing the mechanism as well as the cost for the operation of a split-phase induction motor. By utilizing a switch arranged in the foregoing manner, this auxiliary mechanism is eliminated, due to the fact that the motor takes only a load caused by the suction producer handling the air and as the switch is entirely controlled by suction, and the motion of the air produced by the suction producer operated from the motor, thus the switch will operate under any and all conditions when properly attached to the machine. It will furthermore be seen that it is practically impossible for the switch to get out of order. The switches that are automatically operated by centrifugal force, must have means, such as a spring to hold the pawls on the contacts, until the motor has reached a speed that will continue the motor to phase speed without the use of the starting winding. These springs are subjected to breaking, as well as weakening, which under such conditions will cause the motor to never reach its phase-speed and will result in a burn-out of the motor or fuses, and thus it will readily be seen that by setting up a pneumatically operated switch in a manner as hereinbefore set forth, the burning-out of the motor or fuses is reduced to a minimum.

In the operation of a centrifugal vacuum machine operated by a split-phase induction motor, it is necessary, to open the circuit of the starting winding after the machine has reached about two-thirds of its phase speed. This has always been done by hand or automatically by pawls or brushes fastened to the shaft and the circuit is opened by centrifugal force acting upon the brushes. This causes considerable sparking and therefore much wear on the contacts, which soon causes a replacement and usually destroys the motor or blows out the fuses. It reduces the starting torque of the motor by the friction of the brushes rubbing on the contacts. (Split-phase motors have very little starting torque.) It causes the use of heavier fuses by keeping the excess starting current on the line for a long period, due to the friction of the brushes retarding the starting of the motor.

Fig. 1 being the most reliable in operation is given as an example of operation. The line switch is closed, and this starts the motor (the starting winding circuit being normally closed through the starting switch) which causes the suction producer to revolve, producing a partial vacuum in the inlet line and tank. As the motor increases in speed the vacuum becomes greater until about two-thirds of phase speed is reached, when the starting switch is opened due to the vacuum produced in the inlet line, thus opening the circuit of the starting winding and the motor continues to phase speed. When the operation of cleaning is commenced a large amount of air is allowed to enter the tank, and this reduces the vacuum in the inlet line which would allow the switch to close the starting winding, and would burn out the motor windings, but by placing the suction tube near the intake of the suction producer where the air is caused to flow through an orifice and by turning the tube in the direction of the air current, the air passing through the orifice causes a suction similar to that produced in an injector which added to that in the line equals nearly that vacuum when no air is flowing. It is also seen that large contacts can be used and of a quality that is not injured by sparking, such as "carbon." It is also evident that the switch can be immersed in oil, thereby setting up an ideal means of opening or closing an electric circuit. Then again, when the machine is cleaned the operator may accidentally leave the door open, and this would have the same effect as the air entering the tank, with results similar to that as by cleaning, and is taken care of in a similar manner.

It is obvious that a device as herein set forth increases the utility of split-phase induction motors operating centrifugal vacuum cleaning machines, and provides what may be termed a fire-proof arrangement, reducing the liability of fire or the destruction of the motor by fire, and furthermore the device is entirely automatic in its operation whether it be operated by suction or suction and pressure.

The device is similar in its operation when the suction tube is connected in the suction tank and a pressure tube is used on the outlet side and connected to the under side of the diaphragm. The velocity head caused by the air passing out the exhaust causes a pressure equal to about the vacuum lost while the machine is cleaning.

What I claim is:—

1. In a suction machine of the centrifugal type, a vacuum chamber having an inlet and outlet, a suction creating element communicating with said outlet and further having

means associated with said inlet to provide for the flow of fluid through the vacuum chamber when said element is operated, a split phase induction motor operating said element and having an auxiliary starting circuit, and a chambered suction-operated circuit opening device interposed in series with said auxiliary starting circuit and having means providing a passage leading from the chamber and communicating with said element and further having contacts and a holding element for maintaining said contacts normally in engagement to close said circuit, the pressure of said holding element on said contacts being so proportioned with respect to the suction creating element and motor that the suction created by said suction creating element will operate said holding element to disengage the contacts to open said circuit when the motor has obtained sufficient torque to accelerate itself to phase or load speed.

2. In a suction machine of the centrifugal type, a vacuum chamber having an inlet and outlet, a suction creating element communicating with said outlet and further having means associated with said inlet to provide for the flow of fluid through the vacuum chamber when said element is operated, a split phase induction motor operating said element having an auxiliary starting circuit, and a chambered suction-operated circuit opening device interposed in series with said auxiliary starting circuit, and having means providing a passage leading from the chamber of said device to the intake opening of said suction creating element, the diameter of the terminus of said passage at said intake opening being such with respect to the diameter of said intake opening that the fluid passing through said receptacle into said intake opening at a high velocity will create a partial vacuum at said terminus thus producing a suction within said passage sufficient to maintain the suction-operated circuit opening device in an open position regardless of the variations of the suction within said vacuum chamber during the operation of the machine.

3. In a suction machine of the centrifugal type, a vacuum chamber having an inlet and outlet, a suction creating element communicating with said outlet and further having means associated with said inlet to provide for the flow of fluid through the vacuum chamber when said element is operated, a split phase induction motor operating said element and having an auxiliary starting circuit, and a chambered suction-operated circuit opening device interposed in series with said auxiliary circuit; said chambered suction-operated circuit opening device having a movable weighted diaphragm with electrodes, the weight on said diaphragm being so proportioned with respect to the suction creating element and the motor that the suction created by the suction creating element will not operate said circuit opening device until said motor has obtained sufficient torque to accelerate itself to phase or load speed, said chambered suction operated circuit opening device further provided with a passage leading from said chamber to the intake opening of said suction creating element, the diameter of the terminus of said passage at said intake opening being such with respect to the diameter of said intake opening that the fluid passing through said receptacle into said intake opening at a high velocity will create a partial vacuum at said terminus thus providing a suction within said passage sufficient to maintain the suction operated circuit opening device in an operative open position regardless of the variation of the suction within said vacuum chamber during the operation of the machine.

In testimony whereof I affix my signature in the presence of two witnesses.

JOHN WYNN, JR.

Witnesses:
H. M. GROSSMAN,
N. B. ROWLEN.