

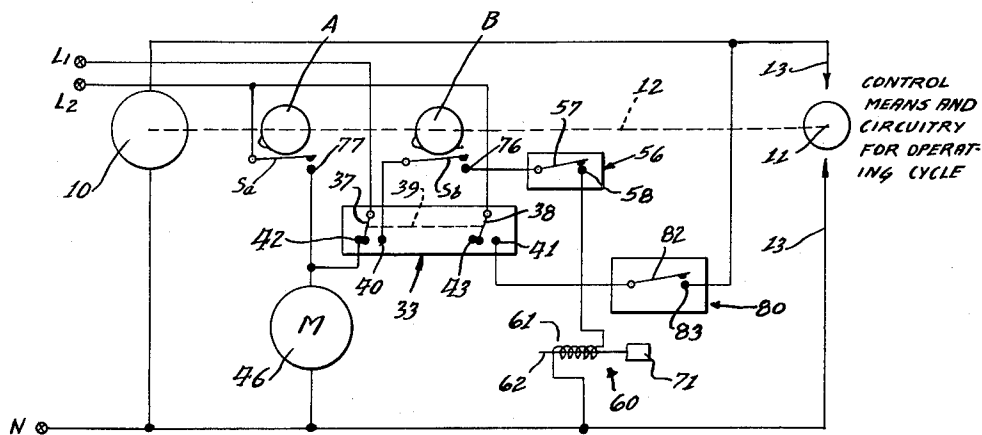
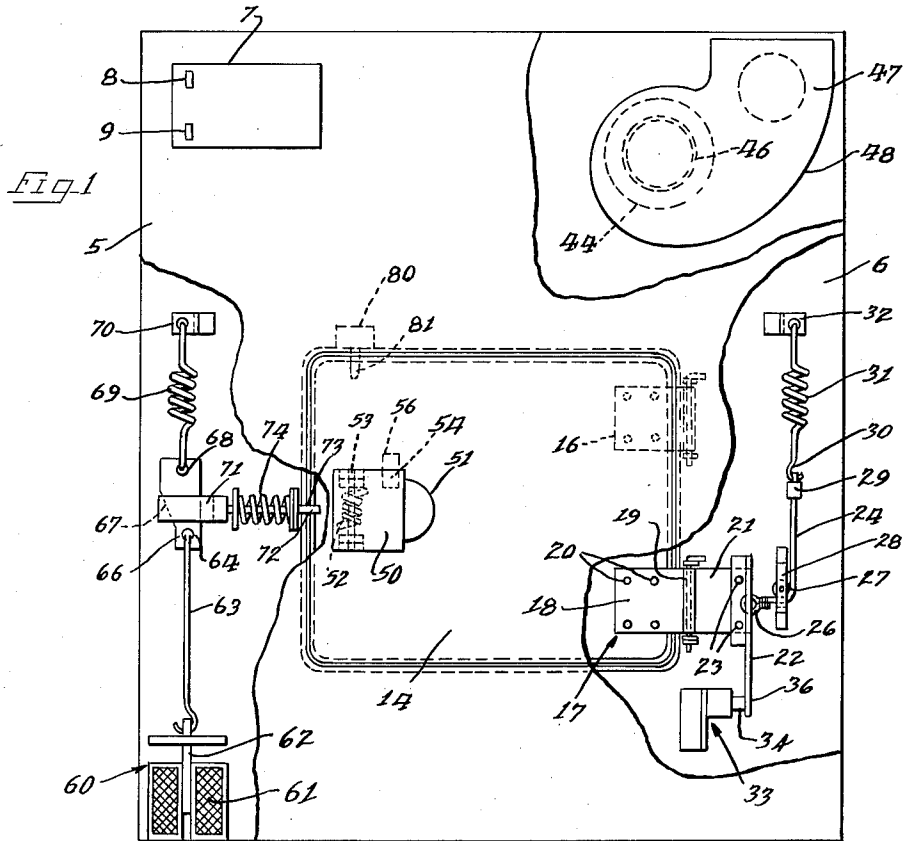
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AUTOMATIC DRY CLEANING MACHINE HAVING DOOR SWITCH CONTROLS

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AUTOMATIC DRY CLEANING MACHINE HAVING DOOR SWITCH CONTROLS

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This invention relates generally to door-operated safety devices and relates specifically to safety devices and controls therefor that are operated by the opening and closing of an access door in a dry cleaner apparatus suitable for use in a coin-operated installation.

Many dry cleaning fluids are inflammable and unless proper precautions are observed, static electrical discharges ignite the volatile fluid and cause serious injury to life and property. Noninflammable chlorinated hydrocarbons have been used as cleaning solvents, however, and such materials include carbon tetrachloride, perchlorethylene and trichlorethylene, all of which are used as dry cleaning solvents.

It is contemplated according to the present invention to provide a dry cleaning apparatus for washing, extracting and drying in one continuous operation flexible textile materials such as clothes. Moreover, all such functions are intended to be combined into a single machine, preferably of the so-called horizontal drum-type. The machine includes a generally imperforate tank or casing having a sump formed with a drain outlet and a solvent circulation system including a nozzle which projects a stream of cleaning solvent through an access opening located in the front wall of a rotatable perforate drum which may be selectively driven at tumbling and extracting speeds by a motor through a power transmission path. The tank or casing is also provided with an access opening closed by a door and through which materials to be dry cleaned are charged into the treatment zone.

By the present invention, mechanism is associated with the door hinges whereby opening of the door will energize the machine blower motor, thus drawing ambient air into the dry cleaner through the access door, thereby preventing the escape of cleaning solvent vapors through the open door.

Yet another safety feature provided in accordance with the principles of the present invention is the utilization of a door switch sensitive to even the slightest opening of the door to completely deenergize all of the dry cleaner operating elements.

A still further safety feature contemplated by the present invention is a locking mechanism that prevents the door from being opened at any time during the complete dry cleaning cycle, except during the first minute or during a first selected interval of the cycle, or during the off period between cycles. Thus, the inadvertent splashing or escape of solvent vapors or liquid solvent is prevented and the contents of the machine are also protected against theft during the course of the cleaning cycle.

It is an object of the present invention, therefore, to provide an improved dry cleaner apparatus for coin-operated laundries or the like incorporating safety devices and controls therefor that are operated by the opening and closing of the access door.

A specific object of the present invention is to provide means to prevent the escape of cleaning solvent vapors through an open access door.

Yet another object of the present invention is to prevent damage to property and personnel through the deenergization of all dry cleaning operating elements whenever the door is opened.

Yet another object of the present invention is to provide locking mechanism for a dry cleaner apparatus which

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prevents the door from being opened at any time during a dry cleaning cycle except during an initial selected interval.

Many other features, advantages and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description which follows and the accompanying sheet of drawings in which a preferred structural embodiment of a dry cleaner apparatus incorporating the principles of the present invention is shown by way of illustrative example.

On the drawings:

FIGURE 1 is a front elevational view somewhat schematic and fragmentary in part and illustrating the mechanical arrangement of components contemplated for utilization in an access door construction for a dry cleaner apparatus.

FIGURE 2 is a partial wiring diagram fragmentarily illustrating specific electrical control circuitry associated with the access door of a dry cleaner for accomplishing the specific ends of the present invention.

As shown on the drawings:

Although the principles of the present invention are of general applicability to any casing having an access door and adapted to contain within the interior thereof a supply of volatile liquid, a particularly useful application of the principles of the present invention is made to a dry cleaner. Thus, in FIGURE 1 there is depicted one wall of a horizontal drum-type machine 5 wherein materials to be dry cleaned are tumbled within a drum positioned in the usual manner within a generally imperforate tank 6 and rotatable therein about a generally horizontal axis. During such tumbling operation, the materials gravitationally accelerate through the treatment zone established by the rotating drum and convert the potential energy accumulated upon their elevation in the treatment zone into kinetic energy, which is then used to flex the mass of materials by abruptly changing the gravitational acceleration of the mass through impact against the inner perforate surface of the cylindrical drum wall near the lowermost portion of the treatment zone. A stream of dry cleaning solvent is directed through an access or loading opening formed in the front wall of the rotatable perforate drum, thereby to saturate the materials prior to their forcefully impacting in a flexing action against the solvent-free lower surface of the drum within the casing 6. The dry cleaning solvent preferably comprises a chlorinated hydrocarbon such as perchlorethylene.

A coin-operated dry cleaner of the type with which this invention finds particular utility would operate through a typical cycle without anything being required of the machine operator than to place the required number of coins into the coin slot. Thus, there is shown on the front of the machine a coin receptacle 7 having a coin slot 8 through which one coin at a time of a given denomination, for example, a United States quarter may be inserted by the operator. A coin-reject return is shown at 9.

The machine has a sequential controller of the type incorporating a timer motor 10 which may be of the stepping type and which operates to advance, in accordance with predetermined time increments, a series of switch cams indicated symbolically at 11 via mechanical connections 12. Each of the switch cams has an appropriate action surface engaging and controlling a corresponding switch blade establishing appropriate electrical connections with circuitry 13 embodying control means for automatically operating the dry cleaner through a programmed sequence of periods constituting a dry cleaning cycle.

Generally, the time operation for one complete cycle of the dry cleaner apparatus or fluid flow system can be

broken down into five distinct cycle parts or periods including (1) pre-dry, (2) wash, (3) extraction, (4) dry and (5) deodorizing periods.

In a typical machine to which the principles of the present invention may be applied, the apparatus will automatically progress through a dry cleaning cycle having fifty intervals of one minute each including three minutes of pre-drying during which the filter elements of the dry cleaning apparatus are coated with a filter aid, nine minutes of wash, five minutes of high speed extraction, twenty-nine minutes of drying and four minutes of deodorizing the materials being dry cleaned with fresh outside air to remove any residual perchlorethylene vapors from the clothes.

As shown in FIGURE 1, it is contemplated by the present invention that the machine 5 have an access door 14 supported by two hinges including a top or upper hinge 16 and a lower or bottom hinge 17.

The lower hinge mechanism consists of a square hinge plate 18 mounted on a hinge drum 19 and attached by fastening means such as rivets 20 to an inside panel of the door 14. In between the door 14 and the hinge plate 18 and secured by the rivets 20 is a spring member 21, a hinge switch actuator bracket 22 is connected to the spring member 21 by one or more fasteners such as the rivets 23. Thus, whenever the door 14 is opened, the spring member 21 is rolled up on the hinge drum 19 as it pivots about its pinned axis, thereby moving the actuator bracket 22 to the left, using the orientation of FIGURE 1.

The actuator bracket 22 is connected to a plastic cord member 24 by means of a loop connection shown at 26. The cord 24 extends laterally away from the actuator 22 but its direction is changed by wrapping it around a roller 27 carried in a roller bracket 28 supported on the wall of the casing 6. The other end of the cord 24 is provided with a coupling 29 and is connected to a hook 30 formed on one end of a spring 31, the other end of the spring 31 being fastened in firm assembly to the casing 6 by means of a fastening bracket 32. Thus, whenever the door 14 is opened, the spring 31 is extended and when the door is released, the spring 31 will return the door 14 to a semi-closed position.

A hinge switch is shown generally at 33 and has an actuator 34 engaged by an end portion 36 of the hinge switch actuator bracket 22.

As shown particularly in the circuit diagram of FIGURE 2, the hinge switch 33 is a double-pole, double-throw switch having two movable switch arms 37 and 38, respectively, which are ganged by mechanical connections 39.

When the door 14 is closed, the switch arms 37 and 38 will contact switch contacts shown at 40 and 41 and whenever the door 14 is opened to any other position besides its completely closed and locked position, the switch arms 37 and 38 are moved to engage the switch contacts 42 and 43 respectively.

The power lines for energizing the circuitry of the machine are shown at L₁, L₂ and N. Also, the machine is shown as being provided with a blower 44 driven by a blower motor 46. As shown in FIGURE 2, the blower motor 46 is connected directly across the power source through the switch arm 37 and the contact 42 of the hinge switch 33. Accordingly, the blower motor will be energized to draw room air in through the dry cleaner door 14 whenever the door 14 is opened, thereby precluding the escape of volatilized cleaning solvent.

If desired, the air drawn in through the access door may be vented through a blower outlet 47, herein shown in FIGURE 1 as being provided in the fan scroll 48 of the blower mechanism.

The door 14 is formed with a door handle 50. To facilitate grasping of the handle 50, a finger well is formed at 51. The handle 50 is normally biased by a

spring 52 surrounding a door hinge pin 53 which pivotally carries the handle 50 on the front of the door. The bias of the spring 52 is such as to locate the extreme right end of the handle 50, as shown in FIGURE 1, with its inner surface at an innermost position against an actuating plunger 54 of a handle switch shown generally at 56.

As shown in FIGURE 2, the handle switch 56 includes a switch arm 57 which does not engage a switch contact 58 whenever the door 14 is closed and the handle 50 is biased to its normal innermost position. However, whenever an operator grasps the handle 50 and pulls the handle 50 against the bias of the spring 52, the plunger 54 will be free to be moved outwardly, whereupon the switch arm 57 will close against the switch contact 58.

The door 14 is provided with an electrical latching arrangement. In this connection, an unlatching motor means is shown generally at 60 and includes a solenoid coil 61 which operates upon energization to draw inwardly a plunger 62. The plunger 62 has an extension 63 connected as at 64 to a cam member 66 provided with a wedging surface 67. The cam member is connected as at 68 to a return spring 69, the opposite end of which is connected to a bracket 70 attached in firm assembly to the casing 6.

The cam action surface 67 actuates a lock bolt 71 having a keeper portion 72 which enters and engages openings shown at 73 formed between the door 14 and its frame. A spring 74 normally urges the keeper portion 72 into locking position, however, when the solenoid coil 61 is energized, the plunger 62 will draw the cam member downwardly, thereby camming the bolt 71 to the left as shown in FIGURE 1 and unlatching the door 14.

In connection with the special control means of the present invention, the timer motor 10 drives through the mechanical means 12 a cam A and a cam B, each operatively arranged with a corresponding switch arm shown at S_a and S_b, respectively. The switch S_b closes against a switch contact 76 and the switch thus provided is arranged in series with the handle switch 56, as well as the unlatch solenoid 60.

The switch S_a closes against a contact 77, thereby closing an energization circuit across the power line to the blower motor 46 for effecting energization of the blower motor 46 as a part of the sequenced series of control periods during an operating cycle of the dry cleaner.

In order to incorporate an additional safety device that will be actuated at the slightest opening of the door 14, there is provided at the top of the door a door switch 80 having an actuator shown at 81. The switch 80 may be of the microswitch type, thereby to effect operation of a switch arm shown in FIGURE 2 at 82, which opens and closes against a switch contact 83. Thus, in case of a failure in the door locking mechanism and the door 14 is opened at any time during the operating cycle, the door switch 80 will immediately open, thereby moving the switch arm 82 away from the contact 83 to deenergize all of the operating circuits associated with the control means and circuitry for the operating cycle of the dry cleaner.

The hinge switch 33, of course, is still independently operative to energize the blower motor 46 via the power line L₁, the switch arm 37, the contact 42 and to the neutral line N. Accordingly, vapor will still be prevented from escaping through the door.

The arm 37 and the arm 38 of the hinge switch 33 are set to close before the door switch 80 will close when the door 14 is closed. If, however, the door 14 is opened so that the switch arm 38 is closed against the contact 43, it will be noted that if the door switch actuator is either accidentally or intentionally actuated, then the contact 41 of the hinge switch 33 will not be closed so that protection in addition to the door switch 80 is provided by the arrangement disclosed.

Note particularly with the series arrangement of the

switch S_b and the handle switch 56, the cam B can be arranged to have the switch S_b closed only during specified intervals of the operating cycle, for example, the first minute of operation, or during the off period between successive cycles. Thus, if at any time during the last intervals of the dry cleaner cycle, for example, the last forty-nine minutes of a typical fifty minute cycle, anyone attempts to open the dry cleaner door 14 by pulling outwardly on the handle 50, the switch arm 57 will close against the switch contact 58 but since the switch arm S_b controlled by the timer cam B will not have closed against the contact 76, a circuit cannot be completed to the unlatch solenoid 60 and, accordingly, the door 14 will remain locked since the keeper portion 72 is in place under the continuous bias of the spring 74.

If, on the other hand, at any time between cycles of the dry cleaner or during the first interval of operation (it could be for the entire three minute predry period, if desired), the operator wishes to open the door to insert an additional piece of material, or for any other purpose, all that is necessary is that the operator pull outwardly on the handle 50, whereupon the handle switch arm 57 will close against the contact 58 and the switch S_b will already be closed against the switch contact 76, thereby completing an electric circuit to the unlatch solenoid 60 from the neutral line N to the switch contact 40 of the hinge switch 33.

The hinge switch 33 has a definite operation lag relative to the operation of the handle switch 56. For example, in a typical installation, the door 14 would have to be opened two or three inches before the hinge switch 33 would be actuated to move the switch arms 37 and 38 away from the contacts 40 and 41, respectively. Accordingly, during that lag, the circuit to the unlatch solenoid 60 is completed and the unlatch solenoid 60 operates instantly, thereby pulling the cam member 66 downwardly and operating the bolt 71 to the left and pulling the keeper portion 72 against the bias of the spring 74 for permitting the operator to open the door 14.

When the door 14 is opened enough to clear the keeper portion of the lock bolt, the hinge switch 33 will move the arm 37 away from the contact 40 and against the contact 42, thereby energizing the blower motor 46 to prevent the escape of solvent vapors through the open door.

During the first interval, or first minute of the dry cleaner cycle, namely, during the precoat stage of the cycle, the dry cleaning solvent such as perchlorethylene is being circulated through the hydraulic circuit of the machine and a filter aid is being added to the solvent, thereby to precoat the filter mechanism with the filter aid. Accordingly, during such first interval of operation there is no cleaning solvent whatsoever entering the drum area of the machine 5 adjacent the open door 14. Accordingly, this one interval or one minute at the beginning of the cycle, during which the door 14 is permitted to be opened, affords the operator an opportunity to put all of the articles desired in the machine. If the pre-coating portion of the predry period of the cycle is selected to be longer than the exemplary three intervals or three minutes, it would be permissible, of course, to allow for more than just one interval or one minute of door opening time. In any event, as soon as the selected interval or time period is over, as measured by the movement by the cam B by the timer motor 10, the switch arm S_b will be moved to open the contact 76, whereupon the door 14 will remain latched until the completion of the remaining portion of the dry cleaning cycle. It will be understood that when the door 14 is pushed closed by the handle 50, the unlatch solenoid 60 will again be energized and the lock bolt 71 will be pulled to the left to allow the door 14 to be completely closed and locked.

Although various minor modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon all such modifications as reason-

ably and properly come within the scope of my contribution to the art.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a cleaning machine using a volatile solvent as a cleaning medium comprising, a cabinet enclosing said machine, an access door in said cabinet controlling access to said cleaning machine, a handle for opening and closing said door, an electric switch operated by said handle, a locking device for said door, a solenoid controlling said door-locking device, a sequential controller for operating said cleaning machine through sequenced steps of a cleaning cycle, a switch controlled by said sequential controller, and a control circuit including said handle-operated switch, said locking device solenoid and said sequential controller switch, said control circuit being effective when said sequential controller switch is closed and said handle is moved to actuate said handle switch to operate said solenoid and unlock said access door.

2. In a cleaning machine using a volatile solvent as a cleaning medium comprising, a cabinet enclosing said machine, an access door in said cabinet controlling access to said cleaning machine, a handle for opening and closing said door, an electric switch operated by said handle, a locking device for said door, a solenoid controlling said door-locking device, a sequential controller for operating said cleaning machine through sequenced steps of a cleaning cycle, a switch controlled by said sequential controller, and a control circuit including said handle-operated switch, said locking device solenoid and said sequential controller switch, said control circuit being effective when said sequential controller switch is closed and said handle is moved to actuate said handle switch to operate said solenoid and unlock said access door, air translation means in said cleaning machine, circuit means including electric drive means for said air translation means, and an electric switch in said circuit means actuated when said door is unlocked and opened to energize said electric drive means for said air translation means to draw room air from the space surrounding said cabinet through said access door into said cleaning machine to preclude the escape of volatile solvent vapors from said cleaning machine.

3. In combination, a sequential controller for a casing-enclosed dry cleaning apparatus having an access door through which materials are charged for treatment in a cycle of sequenced periods, a timer motor for said controller, plural cams driven by said timer motor, a door handle for said access door, a door switch in series with said timer motor and operated upon opening of said access door to deenergize the dry cleaning apparatus whenever the door is opened, circuit means including a motor-operated blower and including a normally open switch operated by the door to closed position for operating the blower whenever the door is opened to draw air inwardly through the door and prevent the inadvertent escape of cleaning solvent vapors through the open door, and separate cam-operated switch means in said controller for energizing said blower motor during selected periods of the cycle, and an electrically operated latch for locking said door, and a door handle switch operated by said door handle and a cam-operated latch switch controlled by said sequential controller and in series with said door handle switch, said door handle switch being actuated by said door handle, whereupon concurrent operation of said door handle switch and said latch switch during a selected period of the cycle is necessary to unlatch said door.

4. In combination, a casing having an access door, a movable door handle on said door, circuit means including a sequential controller for operating mechanism in said casing through sequenced periods of a cycle, an electrically operated latch for locking said door, a door handle switch and a cam-operated latch switch controlled by said sequential controller and in series therewith, said

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door handle switch being actuated by said door handle, whereupon concurrent operation of said door handle switch and said latch switch during a selected period of the cycle is necessary to unlatch said door.

5. In combination, a casing having an access door, a door handle on said door, circuit means including a sequential controller for operating mechanism in said casing through sequenced periods of a cycle, an electrically operated latch for locking said door, a door handle switch and a cam-operated latch switch in series therewith and controlled by said sequential controller, said door handle switch being actuated upon pulling the door handle, whereupon concurrent operation of said handle switch and said latch switch during a selected period of the cycle is necessary to unlatch said door, said casing being adapted to contain a supply of volatile liquid within the interior thereof, circuit means including a switch actuated by said access door, and blower means in said casing controlled by said switch and energized whenever said door is opened to draw air inwardly through said access door for preventing the escape of volatilized vapors.

6. In the combination of claim 5, a door switch actuated by said access door to stop said operating mechanism whenever said access door is opened without affecting the control of said blower means by said switch.

7. In a dry cleaner, a casing having an access door,

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upper and lower hinges supporting said door, said lower hinge having means for biasing the door closed and further including a hinge switch and a flexible strap member yieldable about said lower hinge during movement of said door for actuating said hinge switch, a blower in said casing having a drive motor energized by said hinge switch whenever said door is opened, thereby to draw air in through said door to prevent escape of cleaning fluid vapors.

8. In a dry cleaner, a casing having an access door, first and second hinges supporting said door, one of said hinges having means for biasing the door closed and further including a hinge switch and a flexible strap member yieldable about said one of said hinges during movement of said door for actuating said hinge switch, a blower in said casing having a drive motor energized by said hinge switch whenever said door is opened, thereby to draw air in through said door to prevent escape of cleaning fluid vapors.

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