

Feb. 2, 1965

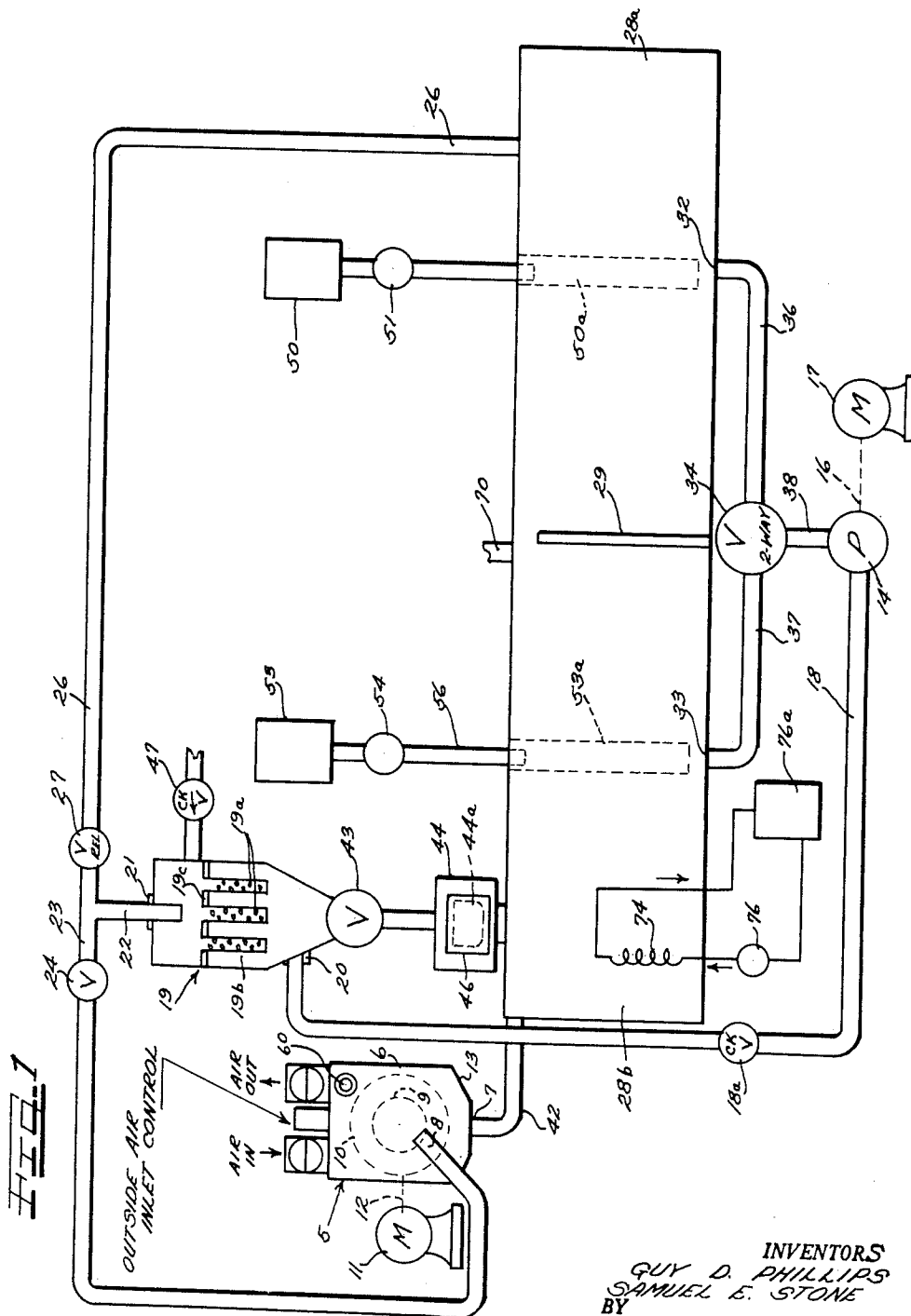
S. E. STONE ETAL

3,168,178

COIN METER AND LAST LOAD CIRCUITRY FOR A DRY CLEANER

Filed March 23, 1961

2 Sheets-Sheet 1



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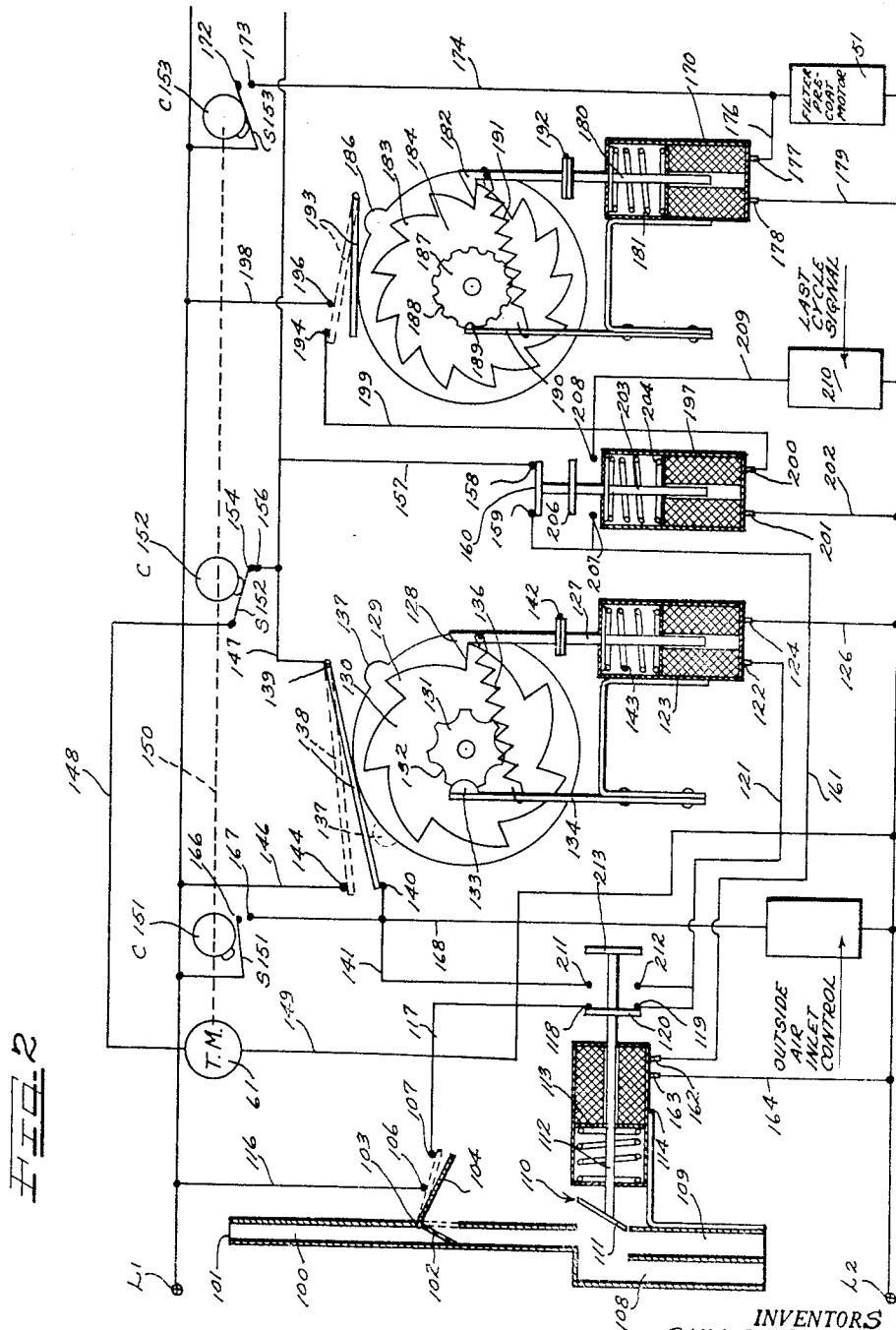
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COIN METER AND LAST LOAD CIRCUITRY FOR A DRY CLEANER

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Filed Mar. 23, 1961, Ser. No. 97,952

10 Claims. (Cl. 194—1)

This invention relates generally to a cleaning apparatus and method and more particularly relates to an improved control means for a dry cleaner apparatus, particularly of the coin-operated type, wherein a coin receiving and counting mechanism for initiating energization of the control circuit is provided with means for rejecting coins inserted in excess of a necessary number of coins for each complete cycle and wherein operation of the machine is precluded after completion of a predetermined number of operating cycles. Although the principles of the present invention are applicable to any coin-operated apparatus, a particularly useful application is made to installations of dry cleaning equipment where it is intended that the apparatus be operated by persons of little skill and wherein the repetitive pattern of use will require periodic servicing of the machine.

For example, with a typical dry cleaning machine, to which the present inventive principles would be applicable, a fluid flow system controlled by a presettable sequential control means could be employed. Thus, there would be activated in programmed sequence a series of operations wherein filters are automatically precoated prior to the cleaning operation, thereby to improve the efficiency of removal of solvent-immiscible components for placing in conditioning contact with the materials being dry-cleaned completely filtered solvent.

The dry cleaning solvent used in the fluid system may be a suitable non-inflammable chlorinated hydrocarbon, thus eliminating fire hazards. In accordance with the principles of the present invention, control apparatus comprising guide means for receiving inserted coins would also include circuit means that is part of the complete dry cleaner circuit including a drive motor and a sequential control for operating the machine through a cycle of separate periods. The control circuit means contemplated by the present invention include an actuator operatively associated with the guide means and with the sequential controller to initiate an operation cycle of the dry cleaner after insertion of a necessary or selected number of coins. Thereafter, excess coins would be rejected. It is further contemplated by the present invention that the control circuit means include a resettable second actuator responsive to a selected number of operating cycles of the machine and operating to reject any coins and thereby prevent operation of the machine until resetting by an operator after completion of a selected number of operating cycles. The end of the predetermined group of cycles can also be signaled, thereby calling the attention of an operator to the necessity of servicing and conditioning the machine for initiation of a subsequent group of cycles.

It is an object of the present invention, therefore, to provide an improved control means for coin-operated apparatus.

Yet another object of the present invention is to provide an electrical control means for starting a machine upon receiving the proper number of coins at the proper time.

A further object of the present invention is to provide a control apparatus for coin-operated machinery wherein coins which are in excess of the necessary number required to initiate the operation of the machine, are automatically rejected.

Yet another object of the present invention is to provide a control apparatus wherein the number of cycles performed by a machine will be counted and a signal will be produced upon completion of a selected number of cycles, thereby to expedite the initiation of servicing and conditioning for subsequent operation of the machine.

A still further object of the present invention is to provide improved methods and means for operating coin-operated dry cleaners.

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 sheets of drawings in which a preferred structural embodiment of the inventive subject matter is shown by way of illustrative example.

On the drawings:

FIGURE 1 is a plumbing diagram of a fluid flow system for a dry cleaning apparatus provided in accordance with the principles of the present invention; and

FIGURE 2 is a fragmentary and somewhat schematic view of the control system provided for the dry cleaning apparatus of FIGURE 1.

As shown on the drawings:

The coin-operated apparatus herein illustrated as constituting exemplary organization in which to apply the principles of the present invention, comprises a dry cleaning method and apparatus for washing, extracting and drying, in one continuous operation, flexible textile material such as clothes. All functions are intended to be combined into a single machine preferably of the so-called horizontal drum type. Thus, there is shown in FIGURE 1 a horizontal drum type machine wherein materials to be dry cleaned are tumbled within a perforate drum positioned within a generally imperforate tank and rotatable therein about a generally horizontal axis. During such tumbling operation, the materials mechanically and 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.

The machine preferably includes liquid injecting means wherein a stream of filtered dry cleaning solvent is continuously supplied into the treatment zone for conditioning contact with the materials during the cyclic manipulation thereof.

Impact of the solvent-saturated materials not only causes maximum flexure of the materials, but forces a substantial portion of the dry cleaning solvent out of the materials, thereby enabling the materials to take on a fresh supply of filtered dry cleaning solvent and replacing that displaced by impact. The action of the impact in forcing the dry cleaning solvent from the materials also flushes away the particles of dirt carried by the materials.

The dry cleaning solvent employed thus has introduced into it, within the treatment zone, solvent-miscible and immiscible impurities and constituting components of the total soil contained within the materials. The dry cleaning solvent with such impurities entrained therein automatically drains from the drum containing the fabrics being cleaned and returned to a solvent reservoir included in the hydraulic circuitry of the present invention.

In FIGURE 1, the horizontal drum-type machine is identified generally at 5 and includes a generally imperforate tank or casing 6 having a drain outlet 7 and a solvent circulation injection nozzle 8 which is located on the exterior of the tank 6 and which is directed in an inwardly direction so as to project cleaning solvent

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circulated through that nozzle 8 into an access opening 9 located in the front wall of a rotatable perforate drum 10 which, in turn, is selectively driven at tumbling and extraction speeds by a motor 11 through a conventional power transmission path diagrammatically indicated by the dotted line 12 interconnecting the drum 10 and the motor 11. Solvent emanating from the nozzle 8 passes through the access or loading opening 9, preferably in a fan-shaped stream or spray through which the elevated fabrics fall prior to their forcibly impacting in a flexing action against the solvent-free lower surface of the drum 10.

The tank or casing 6 is provided with a sump 13 which is located below the level of the drum 10 so that all solvent draining from fabrics placed within the drum 10 will not recontaminate either the drum 10 or the fabrics themselves.

In order to get fresh air into and out of the machine, as controlled by an outside air inlet control, the machine 5 is shown as including an air inlet, as well as an air outlet and an outside air inlet control, each of which components is identified by an appropriate legend appearing on FIGURE 1. The outside air inlet control operates circular damper valves in the air inlet and air outlet by any convenient method (not shown). When the outside air inlet control is not energized, the damper valves close the air inlet and air outlet thus allowing internal circulation of the same air for drying purposes.

In order to supply the machine 5 with a stream of dry cleaning solvent, there is provided in accordance with the principles of the present invention a pump 14 driven through mechanical connection 16 by a pump motor 17. The pump pressurizes a supply of dry cleaning solvent and drives the same in the form of a stream through a conduit 18 containing a check valve 18a and connected to a filter apparatus shown generally at 19.

The filter apparatus 19 is preferably of the type wherein a plurality of foraminous or porous tubes 19a are positioned within a filter housing 19b and are supported by a divider or separator plate 19c so that all solvent passing through the filter apparatus passes through the tubes 19a. The tubes 19a are of a type adapted to receive a coating of filter aid material such as diatomaceous earth to restrict their perforations and thereby render the filter tubes more effective in filtering out soil particles of, for example, one micron size or below. The conduit 18 is connected to a filter inlet shown at 20 and a filter outlet is provided at 21 to which a conduit 22 is connected. The conduit 22 leads to two separate branches, one of the branches being shown at 23 and containing a control valve 24. The conduit 23 is connected to the nozzle 8 positioned on the exterior of the tank 6 to diffuse the stream of dry cleaning solvent in a spray pattern passing through the drum opening 9 and extending across the interior of the perforate cylindrical drum 10 for direct impingement against the materials being acted upon in the drum 10 before impact with the non-liquid impact surface.

The control valve 24 may be of a type including electrically actuated controller means, thereby permitting the valve 24 to be regulated by a presettable timing apparatus, or a sequential program control means herein identified generally at 60.

A second branch connected to the conduit 22 is shown at 26 and contains a pressure relief valve 27. The pressure relief valve 27 is of the type which automatically opens as soon as an upstream pressure in the conduit 22 reaches a predetermined quantitative value. Thus, whenever the valve 24 is opened, the cleaning solvent discharged through the conduit 22 will be directed through the conduit 23 to the machine 5. However, if the valve 24 is closed, the pressure exhibited in the conduit 22 will cause the pressure relief valve 27 to open, whereupon the cleaning solvent discharged through the filter apparatus 19 will pass into the branch 26. Accordingly, opening and closing the valve 24 has the effect of inducing auto-

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matic opening and closing of the pressure relief valve 27 insofar as the operation of the fluid flow control system of the present invention is concerned.

The branch 26 leads to a tank means having a tank compartment 28a, sometimes referred to as a "filtered solvent tank." A separate tank compartment at 28b is sometimes referred to as an "unfiltered solvent tank" and the two compartments 28a and 28b are separated from each other by a common weir 29 extending between them so that solvent from the filtered solvent tank 28a may overflow into the unfiltered solvent tank 28b when solvent within the tank 28a reaches a level determined by the weir 29.

Both the filtered solvent tank 28a and the unfiltered solvent tank 28b have bottom outlets as shown at 32 and 33, respectively, connected by means of a two-way valve 34 to the pump 14, whereby the pump 14 may draw a supply of solvent for pressurization to drive the solvent in the form of a stream in the conduit 18 from either the filtered solvent tank 28a or the unfiltered solvent tank 28b. In this regard, the bottom outlet 32 of the tank 28a is connected to the two-way valve 34 by a conduit 36, while the bottom outlet 33 of the unfiltered solvent tank 28b is connected to the two-way valve 34 by a conduit 37. A conduit 38 interconnects the two-way valve 34 and the pump 14.

Cleaning solvent admixed with impurities removed from the materials being dry cleaned, is collected in the sump 13 and drains into the unfiltered solvent tank 28b by way of the outlet 7 and a conduit 42.

The filter apparatus 19 has a dump valve 43 connected to a sediment trap 44 shown generally in diagrammatic form and including a removable filter basket or container 44a and a closure shown generally at 46, whereby the sediment contained within the trap 44 may be periodically removed. The sediment trapped within the basket 44a includes a precoat material, the soil filtered thereon and an adsorbent additive used in the apparatus. The filter basket is intended for periodic removal and, in practice, is normally removed and emptied for residual solvent recovery after every twelve complete cycles. It will be appreciated, however, that any selected number of cycles may be used.

The dump valve 43 is of the type which preferably includes electrical actuator or control means so that the valve 43 may be placed under the regulation of the presettable sequential controller 60. Moreover, the dump valve 43 preferably provides a large exhaust orifice at the bottom of the conically shaped filter apparatus 19 to facilitate instant dumping of the contents of the filter apparatus 19 into the trap 44. To assist in this action, the filter 19 is provided with a dump aid atmospheric check valve 47.

A first dispensing unit shown at 50 has an electrically operated dispenser actuator 51 for regulating the admission of an additive into the filter solvent tank 28a. The dispenser 50 comprises any convenient hopper-type reservoir, while the actuator 51 may comprise a screw-type dispenser having a suitable actuating motor or any other form of motorized valving device so that the additive contained within the dispenser 50 may be discharged through a conduit 52 into the filtered solvent tank 28a for injection into the hydraulic circuit. It is contemplated the dispenser will be charged with a supply of a filter aid material such as diatomaceous earth. When such filter aid is injected into the hydraulic circuit, it will precoat the filter tubes of the filter apparatus 19, thereby improving the filtering efficiency thereof insofar as removal of solvent-immiscible components from the solvent stream is concerned.

A second dispensing unit 53 is regulated by a suitable electrically controlled actuator 54, thereby to discharge an additive through a conduit 56 into the unfiltered solvent tank 28b. Again the dispenser 53 may comprise any suitable reservoir, while the actuator 54 may com-

prise a screw-type additive dispenser suitably actuated by a motor drive or any other form of motorized valve actuator by means of which the supply of additive dispensed from the dispenser 53, through the conduit 56, may be injected into the hydraulic circuit by means of the unfiltered solvent tank 28b.

The dispenser 53 may be charged with activated carbon and when added to the hydraulic circuit will improve the removal of solvent-miscible components such as dyes which go into solution in the solvent stream. Adsorptive magnesia may also be used since such additive is useful in removing fatty acids from the solvent stream, thus maintaining the solvent in a "sweetened" condition. In practice, the dispenser 53 is loaded with a mixture of approximately 20% activated magnesia, 40% activated charcoal and 40% diatomaceous earth. The activated magnesia and charcoal serve to chemically treat the solvent, while the additional diatomaceous earth maintains the porosity of the filter cake deposited on the filter surface of the tubes 19a and thereby serves to reduce the "layer caking" on the filter by soil particles.

Dispenser wells shown at 50a and 53a are situated immediately below the respective dispensers 50 and 53 within the tank compartments 28a and 28b. The wells are, in turn, respectively positioned above the intake openings of conduits 32 and 33 so that filter aid material and the adsorbent additives are allowed to form a slurry for immediate deposit on the porous filter tubes 19a when these dispensers are operated.

The presettable sequential controller 60 is of the type incorporating a timer motor 61 which may be of the stepping type and which operates to advance, in accordance with predetermined time increments, a series of switch cams. Each switch cam has an appropriate action surface engaging and controlling a corresponding switch blade establishing appropriate electrical connections with electrical contacts.

Suitable cooling means may be provided to maintain the temperature of the solvent below a designated temperature. In this regard, it has been found an excessive amount of dye bleed may be prevented by maintaining the temperature of the solvent below 70° F. Accordingly, suitable solvent-cooling means such as a cooling coil 74 is regulated by a temperature control means 76 for controlling a refrigeration unit shown generally at 76a, it being understood the cooling means could be either a cold water system or a refrigeration system.

In the form of the invention illustrated, a typical programmed sequence of periods for one complete cycle of the dry cleaner apparatus can be broken down into five distinct cycle parts or periods. Such parts are the predry, wash, extraction, dry and deodorizing periods. Whenever the dry cleaner of the present invention is started in a new cycle, all of the dry cleaning solvent will have been completely filtered and the filter elements of the filter 19 will be completely free of filter aid material constituted by the additives dispensed through the dispensing means 50 and 53.

During the predry period, articles placed within the cylinder 10 of the machine 5 will be tumbled while operating the air circulating system and temperature conditioning the stream of air circulated through the treatment zone. For example, air flow for the predry cycle can be effected by operation of the outside air inlet control to take air from the atmosphere, through the air inlet and passing the same over a heater (not shown) located in the machine, through the machine, and out through the air outlet.

In addition to the actual drying of the load, two other important events are taken place during the predry cycle. The first event is that the pump 14 begins to take solvent from the filtered solvent tank compartment 28a and discharges the same through the uncoated filter element 19a and back into the tank 28a through the conduit 26 as regulated by the pressure control relief valve

27. After a short interval of time, the dispenser actuator 51 of the dispenser 50 will be energized and a quantity of filter aid such as diatomaceous earth is injected into the filtered solvent tank 28a from where it is pumped to the filter elements. Such diatomaceous earth then rapidly forms a filter aid coating on the exterior of the filter elements to improve the filtering efficiency thereof.

The second event that takes place during the predry period is the passing of the solvent over the cooling coils 74 to cool the solvent as caused by the solvent circulating in the tanks 28a and 28b due to the pumping action of pump 14.

It should be recognized that a predry using circulation of heated air is not always necessary. When the predry is not used, it is only necessary to allow for approximately three minutes preceding the wash cycle to pre-coat the filter elements as explained.

After predrying, if used, the dry cleaning machine goes into a wash cycle, at which time the air heaters are turned off and the valve 24 is opened so that dry cleaning solvent discharged from the filter 19 through the conduit 22 will be directed through the conduit 23 and into the machine 5 for conditioning contact with the load of tumbling materials in the drum or cylinder 10 of the machine 5.

The two-way valve 34 is operated so the pump 14 will draw dry cleaning solvent out of the unfiltered solvent tank 28b, instead of from the filtered solvent tank 28a. Solvent collected in the sump 13 of the machine 5 will be gravitationally drained back to the tank means designated as the unfiltered solvent tank 28b. Also at the beginning of the wash cycle, the actuator 54 of the dispenser 53 is energized so that additional additive is injected into the fluid flow system, thereby to assist in removing dyes and fatty acids from the solvent. Simultaneously with the addition of such adsorbents, additional "body feed" such as diatomaceous earth is dispensed into the system from dispenser 53 to preserve the porosity of the filter cake or filter elements 19a. Since the drum 10 containing the load within the machine 5 is not rotating through a pool of solvent, the solvent sprayed onto the load is completely filtered, thereby considerably enhancing the dry cleaning operation by minimizing soil redeposition, as well as providing a rigid impact surface for the fabrics.

After the wash cycle, the machine goes into an extraction cycle wherein the cylinder or drum 10 is rotated at centrifuging speed to remove the fluid from the clothes. At this time, the valve 24 is deenergized to allow the filtered solvent to open valve 27 and return to tank 28a through conduit 26. This action continues to condition the entire supply of solvent for the subsequent cycle.

At the completion of the extraction cycle, the timer motor 61 will energize and actuate the necessary components to energize the heating elements and to condition the air flow system for internal circulation with condensing action. Dry cleaning fluid will be reclaimed from the air stream by the condenser (not shown) and restored to the hydraulic circuit or fluid flow system through the conduit 70 leading back into the unfiltered solvent tank compartment 28b.

After the dry cycle has progressed for a long enough period of time so that all of the solvent has been filtered and treated, the solvent circulation pump 14 is stopped by deenergization of the pump motor 17. Backflow of solvent and filter additives from the filter apparatus 19 through the conduit 18 is prevented by the check valve 13a in the conduit 13. Thus, circulation of dry cleaning solvent through the hydraulic circuit is stopped.

At this point, the dump valve 43 at the bottom of the filter apparatus 19 is actuated. Since the filter casing is completely filled with solvent and because of a large orifice size of the filter casing drain, all of such solvent will almost instantly dump into the sediment trap 44 carrying with it the soil and the filter coatings that have been added during the predry and the wash cycles. Such

dumping action is effective in the preparation of the filter elements for new coatings at the beginning of the next complete dry cleaning cycle. The sediment trap 44 at the bottom of the filter 19 will allow the solvent to go back into the unfiltered solvent tank 28b. The soil and filter coatings will be trapped within the sediment container 44a for periodic removal by an attendant via the access means 46. After the filter element dumping period, the machine will continue in its normal timer controlled dry cycle with no further fluid recirculation.

At the end of the dry cycle, the timer motor 61 actuates suitable circuit means to initiate the deodorizing part of the complete cycle. This involves deenergization of the heating elements and adjustment of the air system by operation of the outside air inlet control to circulate air from the atmosphere through the machine and back to the atmosphere, thereby removing undesirable odors from the load and from the machine.

The completion of the deodorizing cycle ends the complete dry cleaning cycle for the batch of materials in the machine 5. Moreover, the entire fluid system has been preconditioned so that a new load can be started immediately if desired.

It will be understood the fluid flow system may employ a so-called "charged" type of dry cleaning solvent in which the solvent includes a suitable quantity of detergent, for example, 1 to 4%. Since the detergent is completely soluble in the dry cleaning solvent, it is not filtered out and, accordingly, a rinse cycle is not needed, thereby permitting the system to go directly from a wash to an extraction cycle.

The dry cleaning apparatus thus described is particularly well suited for use as a coin-operated commercial dry cleaner wherein a full load of clothes is cleaned in a short operating cycle. In accordance with the principles of the present invention, control means are provided to render the entire operation of the machine automatic, thereby eliminating all attention by the operator except for the single act of placing a necessary number of coins in a coin slot. Thus, the control means of the present invention which includes the presettable sequential controller 60 is further characterized by improvements shown in additional detail in FIGURE 2 of the drawings. As therein shown, a coin actuating means includes a coin entry slot 100. It will be understood the coin entry slot 100 may have an insertion opening 101 capable of receiving only a single coin at a time. An actuating member 102 is herein depicted as including an arm hinged as at 103 and normally extending across the coin entry slot to be engaged by a coin passing through the slot 100. Thus, each time a coin is inserted through the slot 100, the arm 102 will be pivotally displaced and will move a switch arm 104 into closing relationship with a pair of contacts shown at 105 and 107, respectively.

In actual operation the coin slot 100 will contain mechanism (not shown) to size the coin and determine if it is real or counterfeit. Only proper coins will be allowed to proceed through slot 100 to member 102.

The coin mechanism includes a coin-reject slot 108 and there is also shown a coin-receiving slot 109. It will be understood the coin-reject slot 108 is arranged to return rejected coins to the operator while the coin-receiving slot 109 leads to a suitable receptacle in which the coins are received and stored. Selector means for regulating the direction of coins from the coin entry slot 100 into either of the slots 108 and 109 are shown generally at 110. Thus, there is provided a deflector 111 carried on a stem 112 which may conveniently constitute an integral part of an armature 113 of a coin-reject relay 114.

A conventional source of electrical power is shown on FIGURE 2 as including L_1 and L_2 , the two power lines necessary to energize the electrical circuitry associated with the complete dry cleaner control mechanism.

The contact 106 is connected to a conductor wire 116, while the contact 107 is connected to a conductor wire

117. The conductor wire 117 and the conductor wire 116 form a part of a first energization circuit controlled by the switch 104, 106, 107. The first energization circuit thus defined further includes a pair of switch contacts 118 and 119 normally bridged closed by a switch blade 120 carried on the stem 112 of the coin-reject relay 114. The contact 119 is connected to a conductor wire 121 leading to a terminal 122 of a coin-count relay 123. A second terminal 124 of the coin-count relay 123 is connected by a conductor wire 126 to L_2 . Thus, it will be observed that the coin-count relay 123 will be temporarily energized whenever the first energization circuit is closed by the insertion of a coin into the coin-entry slot and upon actuation of the arm 102 and the switch blade 104.

Upon energization of the coin-count relay 123, a plunger 127 is drawn downwardly, which plunger 127 may conveniently comprise part of a mechanical stepping mechanism. For example, as shown illustratively herein, the plunger 127 has connected on the end thereof a pawl 128 engaging the circumferentially spaced teeth 129 of a ratchet wheel 130. The ratchet wheel 130 has a hub 131 formed with indexing recesses 132 seating a detent means or indexing device 133 carried on the end of a leaf spring arm 134. The arm 134 and the pawl 128 are interconnected by a continuous biasing means such as a spring 136, thereby operating to center the apparatus and locking the ratchet wheel in position. The ratchet wheel 130 is particularly characterized by a radially outwardly projecting actuator cam 137. The ratchet wheel 130 is provided with a selected number of circumferentially spaced teeth 129 corresponding to the number of coins intended to be required to initiate operation of the machine. For example, in a contemporary dry cleaning installation, it is contemplated that six United States quarters would be suitable and, accordingly, there are six teeth 129 provided on the ratchet wheel 130, plus one additional tooth which is intended to provide a rest position. On each energization of the coin-count relay 123, the ratchet wheel 130 is advanced one position, whereupon the cam actuator 137 is angularly displaced in a clockwise direction. As soon as six coins have been successively introduced through the coin-entry slot 100, the cam actuator 137 will have been moved into position to actuate a switch blade 138 hinged as at 139 and normally engaging a contact 140 connected to a conductor wire 141.

It will be noted that the plunger 127 is shown hinged as at 142 so that when a return spring 143 of the coin-count relay 123 returns the pawl 128 to its uppermost position, the pawl 128 can pivot over any interfering teeth 129 on the ratchet wheel 130 that is braked by detent means 133.

Actuation of the switch blade 138 by the cam actuator 137, engages the switch blade 138 against a switch contact 144 connected to a conductor wire 146 leading to the power line L_1 . The switch blade 138 is also connected to conductor wire 147 forming part of a second energization circuit controlled by the switch blade 138 and the contacts 140, 144 to effect energization of the timer motor 61 and other circuit elements (not shown). The timer motor 61 is shown connected in circuit with the conductor wire 147 by a conductor wire 148. A conductor wire 149 leading from the timer motor 61 leads to the power line L_2 .

As previously noted, the timer motor 61 drives a plurality of cam-operated switches to automatically operate the dry cleaner apparatus through a programmed series of periods constituting a complete cycle. Only such portions of the sequential controller 60 as are pertinent to the specific improvements herein contemplated are shown in FIGURE 2. Thus, the timer motor 61 is shown driving through a mechanical connection 150 a plurality of cams herein indicated at C151, C152 and C153, each cam is associated with a corresponding switch blade herein indicated at S151, S152 and S153, respectively.

Note, therefore, that the conductor wire 147 is connected to the conductor wire 148 through the switch S152 which operates to control a movable contact 154 engageable with a fixed contact 156.

At the same time as the switch 138 is closed, the coin-reject relay 114 is energized through the conductor wire 147, the conductor wire 157, contacts 158 and 159 normally closed by a switch blade 160 and a conductor wire 161 connected to a terminal 162 on the coin-reject relay 114. Another terminal 163 on the coin-reject relay 114 is connected to L₂ power line by a conductor wire 164. Upon energization of the coin-reject relay 114, the stem 112 will be moved to the left using the orientation of FIGURE 2, thereby positioning the baffle 111 to deflect any further inserted coins into the coin-reject slot 108. Also, the switch blade 120 will be moved away from the contacts 118 and 119, thereby preventing further energization of the coin-count relay 123.

The cam C151 actuated by the timer motor 61 controls the switch blade 151 and hence the closing of the contacts shown at 166 and 167 which regulate an energizing circuit provided by a conductor wire 168, in which energizing circuit is located the outside air inlet control identified on FIGURE 2 by legend and corresponding to the outside air inlet control also shown by legend on FIGURE 1.

It will be understood the cam C152 and the switch blade S152 associated therewith also regulates the opening and closing of the contacts 154 and 156 as may be required during the course of an operating cycle.

It is contemplated in accordance with the principles of the present invention to count the number of completed cycles in order to facilitate servicing of the mechanism so after a selected number of cycles have been completed, the necessary maintenance on the machine may be accomplished by a maintenance man. Actually, any portion of the cycle could be used as the controlling variable and by way of illustration, there is shown herein an association of a cycle-count relay 170 with the filter precoat motor 51, the energization of which is controlled by the cam C153 and the switch blade S153 regulating contacts shown at 172 and 173, respectively.

As previously explained, filter precoating is effected once each cycle and, accordingly, the filter precoat motor 51 is energized upon closing of the contacts 172, 173 via a conductor wire 174 forming the energization circuit for the filter precoat motor 51.

The cycle-count relay 170 is connected in the same energization circuit by means of a conductor wire 176 connected to a terminal 177, the other terminal of the relay being shown at 178 connected to a conductor wire 179 leading to power line L₂. Thus, each time the cycle-count relay 170 is energized, a plunger 180 will be pulled downwardly against the bias of a coil spring 181 and will operate a pawl 182 engaging one of a plurality of circumferentially spaced teeth 183 provided on a ratchet wheel 184. The ratchet wheel 184 has an actuator cam 186 and like the ratchet wheel 130 is provided with a hub 187 recessed as at 188 to cooperate with a detent means or indexing device 189 carried on a spring arm 190 interconnected with the pawl 182 by a continuous biasing means such as a coil spring 191. The pawl 182 and plunger 180 are interconnected by suitable hinge means as at 192.

It will be understood that the number of teeth 183 provided on the ratchet wheel 184 will be selected to correspond to the selected number of cycles desired between maintenance. In actual practice, twelve complete cycles have been a satisfactory selection with the apparatus disclosed. Accordingly, each time the cycle-count relay 170 is energized, the ratchet wheel 184 will be advanced one position and the actuator cam 186 will be successively moved clockwise until it is moved into operative relation with a movable switch blade 193, thereby operating to interconnect switch contacts shown at 194 and 196. The contact 196 is part of an energization circuit in which is located a last cycle relay 197, there being provided a

conductor wire 198 connected to the contact 196 and leading to power line L₁. The contact 194 is connected to a conductor wire 199 which, in turn, is connected to a terminal 200 on the last cycle relay 197, the other terminal of the last cycle relay 197 being shown at 201 and connected to a conductor wire 202 leading to power line L₂.

When the last cycle relay 197 is energized, a plunger 203 will be moved inwardly against the bias of a spring 204, whereupon the switch blade 160 will be moved away from the contacts 158 and 159 but a switch blade 266 will be moved into switch-closing position relative to normally open contacts shown at 207 and 208. The contact 208 and line 199 are connected by a conductor wire 209 to a last-cycle signal 210 which may comprise either a light bulb or an audible signal, or both, which conductor wire leads to power line L₂. The contact 207 is connected to the conductor wire 161, thereby continuing the energization of the coin-reject relay 114, thereby preventing reception of coins into the coin box slot 109 and effecting return of all inserted coins to the operator via the coin-reject slot 108.

The dry cleaner thus provided is completely automatic in that there is not a single thing the operator has to do other than place the necessary number of coins in the coin slot 101.

Thus, briefly reviewing the operation, the machine is started into its first cycle or any cycle of the selected number of cycles by inserting the coins in the slot 100. The coin-count relay 123 is energized each time a coin is inserted, whereupon the coin-count ratchet wheel 130 is successively advanced a corresponding position and after the requisite number of coins are inserted, the coin-reject relay 114 is energized to move the coin-reject deflector 111 into position to divert any additional coins into the coin-reject slot 108. The opening of the normally closed contacts 118 and 119 also prevents energization of the coin-count relay 123 if any additional coins are inadvertently dropped into the coin-entry slot 100. Simultaneously the timer motor 61 is energized by switch arm 138 moving against contact 144 to initiate operation of the dry cleaning cycle.

The motor operating the dispensers 50 and 53 feed additives into the tank means 28 for coating of the filter tubes 19a and since the cycle-count relay 170 is in parallel with the filter precoat motor 51, the cycle-count ratchet wheel 184 will be advanced one position each cycle. No effect on the machine circuitry is obtained thereby until after completion of a selected number of cycles.

The complete dry cleaner operates automatically as controlled by the timer motor 61 through the remainder of the cycle until approximately four or five minutes from the end of the cycle. At this time the dry cleaner goes into what is referred to as the "deodorizing" part of the cycle when the air flow control is regulated to admit fresh outside air for circulation through the machine and venting to the atmosphere to deodorize the clothes load. The outside air inlet control is energized through the timer switch S151 operated by the timer cam C151. When this happens, a circuit is formed parallel to the outside air inlet control through normally open contacts 211 and 212, now closed by a switch blade 213 on stem 112 and operable by the coin-reject relay 114, which circuit leads to the coin-count relay 123. Thus, the coin-count relay advances the ratchet wheel 130 to its seventh position which moves the cycle-start cam 137 out of contact with the switch blade 138, thereby again reengaging the switch contact 140. Accordingly, all of the dry cleaner circuitry elements that were formerly energized through the upper contact 144 are now energized through the bottom contact 140 and through the switch operated by the cam C151 and the switch blade S151. At this phase of operation, the coin-count ratchet wheel 130 is also in proper position to receive the first coin of the next subsequent cycle.

At the end of the deodorizing portion of the cycle,

the timer motor 61 drives the cam C151 to open its switch S151 which completely shuts off power to the dry cleaner circuitry and thus ends the machine cycle.

The events which take place during each of the first eleven complete cycles are identical with the exception that the cycle-count ratchet wheel 184 is advanced one position for each cycle. The final cycle or twelfth cycle in the present example, is initiated in the same manner as the first eleven, but during this cycle when the filter pre-coat motor 51 is energized to coat the filter, the energization of the cycle-count relay 170 advances the cycle-count ratchet wheel 184 so that the last cycle actuator cam 186 moves the cam follower or switch blade 193 to close the last cycle contacts 194 and 196. Thus, the last-cycle relay 197 is energized through the last-cycle contacts which also energizes a last-cycle light or signal 210, indicating to the operator and attendant that the machine is ready for servicing at the end of the cycle. The coin-reject relay 114 remains energized at the end of the last cycle through the now-closed normally-open contacts 207 and 208 of the last-cycle relay 197. Accordingly, if an operator immediately tries to start another load in the dry cleaner after the final cycle has been completed before the attendant has an opportunity to perform maintenance on the dry cleaner, all of the operator's coins will be rejected through the coin-reject slot 108. Further, since the coin-reject relay 114 is energized, the coin count relay cannot be energized even though coins are inserted and rejected, thereby preventing initiation of machine operation.

After the final cycle, the attendant will normally empty the sludge which has accumulated in the compartment 44 and will also add a new supply of solvent such as perchlorethylene to the system if needed. Further, both dispensers 50 and 53 will be charged. When he has thus completed this servicing task, the attendant or operator will manually advance the cycle-count ratchet wheel 184 to its first cycle position. This action moves the last-cycle actuator cam 186 from out of contact with the cam follower or blade 193, thus opening the last-cycle contacts 194 and 196. The last-cycle relay 197 is then de-energized and its normally open contacts 207 and 208 are again opened, thereby deenergizing the coin-reject relay 114, placing the deflector 111 in proper position and re-closing contacts 118 and 120 to allow insertion of coins through the slot 100 for initiating the next cycle which will be the first cycle of the selected number of cycles counted by the control mechanism.

It will thus be appreciated the circuitry and apparatus shown serves to count the coins, reject the coins, start the machine, stop the machine, indicate when the machine is in its final cycle and prevent the machine from starting another cycle at the end of the final cycle until the attendant has performed the proper maintenance on the dry cleaner.

Although minor modifications might be suggested by those versed in the art, it should be understood we wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of our contributions to the art.

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

1. Control means for a coin-operated machine comprising, machine circuit means including a motor operated sequence controller for automatically operating the machine through a sequenced series of steps in a cycle, coin-receiving means having coin counting means including a switch actuator regulating energization of said motor operated sequence controller and operative to automatically initiate successive cycles of said machine in response to insertion of a selected number of coins, and cycle-counting means having actuating means operatively associated with said coin-receiving means to reject inserted coins in response to completion of a predetermined number of suc-

cessive cycles, thereby to prevent further operation of the machine.

2. Electrical control means for a coin-operated machine having an operating cycle comprising, a normally open coin switch having an actuator operating to temporarily close said coin switch in response to insertion of a coin into said machine, a first energizing circuit controlled by said coin switch, a coin-count relay in said first energizing circuit having a ratchet actuator and operating to advance said actuator each time said first energizing circuit is temporarily energized, a normally open cycle-start switch operatively engaged by said ratchet actuator after a selected number of coin insertion actuations, a second energizing circuit controlled by said cycle-start switch, a sequential program controller having plural cam-operated switches and including a timer motor to actuate said switches in said second energizing circuit, a coin-reject relay in said second energizing circuit energized upon closing of said cycle-start switch and having means to reject coins inserted into said machine when said coin-reject relay is energized, a third energizing circuit controlled by one of said cam-operated switches, a cycle-count relay in said third energizing circuit and having a ratchet actuator, said cycle-count relay operating to advance said cycle-count ratchet actuator once each operating cycle, a fourth energizing circuit, and a last cycle relay in said fourth energizing circuit having normally open switch means movable to a closed position when said last cycle relay is energized, and a fifth energizing circuit having a signal means for operating a signal when said last signal relay operates, said switch means operated by said last cycle relay also operating to energize said second energizing circuit, thereby to energize said coin-reject relay.

3. In a dry cleaning apparatus, means forming a clothes dry cleaning solvent circuit including a filter and a filter reservoir, means forming a treatment zone having an inlet and an outlet in which materials to be dry-cleaned are subjected to conditioning contact with said dry-cleaning solvent, and control mechanism including a sequential control means for automatically operating the apparatus through a programmed sequence of washing, extracting and drying periods, said control mechanism including valves and a motor-driven pump in said circuit regulated by said sequential control means to selectively circulate filtered solvent through said treatment zone during a washing period but wherein filtration circulation continues by bypassing said treatment zone during extraction and drying periods, said control mechanism including coin-operated actuating means, a normally open coin switch having an actuator operating to temporarily close said switch each time a coin is inserted into said coin actuating means, an energizing circuit controlled by said switch, a coin-count relay in said energizing circuit having a counting actuator successively advanced upon insertion of each coin, and apparatus circuit means including said presettable sequential control means having a switch operated by said actuator after insertion of a selected number of coins to automatically initiate an operating cycle of said apparatus.

4. In a dry cleaning apparatus, means forming a clothes dry cleaning solvent circuit including a filter and a filter reservoir, means forming a treatment zone having an inlet and an outlet in which materials to be dry-cleaned are subjected to conditioning contact with dry-cleaning solvent, and control mechanism including a sequential control means for automatically operating the apparatus through a programmed sequence of washing, extracting and drying periods, said control mechanism including valves and a motor-driven pump in said circuit regulated by said sequential control means to selectively circulate filtered solvent through said treatment zone during a washing period but wherein filtration circulation continues by bypassing said treatment zone during extraction and drying periods, said sequential control means comprising a sequential program controller having plural cam-

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operated switches and including a timer motor to actuate said switches, a cycle-count relay having a stepping actuator, circuit means controlled by one of said cam-operated switches, thereby to advance said stepping actuator for each cycle, and coin-reject means controlled by said actuator to prevent operation of said apparatus after completion of a predetermined number of cycles.

5. Control apparatus for initiating operation of a coin-operated machine including circuitry for sequentially controlling said machine through separate complete operating cycles comprising, coin-receiving and counting mechanism for initiating energization of said control circuitry automatically upon insertion of a predetermined number of coins, said mechanism comprising coin-counting means in said mechanism for rejecting coins inserted in said mechanism after energization of said machine by a predetermined number of coins, and cycle counting means for precluding operation of said machine by said mechanism after energization of said machine through a predetermined number of complete operating cycles.

6. Control apparatus as defined in claim 5, and a signal device which is energized after said predetermined number of complete operating cycles.

7. In an electrical control means for a coin-operated dry cleaner, a normally open coin switch having an actuator operating to temporarily close said switch each time a coin is inserted into the apparatus, an energizing circuit controlled by said switch, a coin-count relay in said circuit having a stepping actuator successively advanced upon insertion of each coin, machine circuit means having a switch operated by said actuator after insertion of a selected number of coins, a sequential program controller having plural cam-operated switches and including a timer motor in said machine circuit energized upon actuation of said switch in response to insertion of said coins, means to actuate said switches, a cycle-count relay having a stepping actuator, circuit means including said cycle-count relay controlled by one of said cam-operated switches, thereby to advance said stepping actuator for each cycle, and coin-reject means controlled by said stepping actuator to prevent operation of said dry cleaner after completion of a predetermined number of cycles.

8. Control apparatus for a coin-operated machine comprising, guide means for receiving inserted coins, coin rejecting means selectively communicating with said guide

means, machine circuit means including a motor and a sequential controller for operating said machine through separate periods comprising a complete operating cycle, and control circuit means including a first actuator having coin counting means operatively associated with said guide means and with said sequential controller to automatically initiate an operation cycle of the machine after insertion of a selected number of coins and thereafter rejecting excess coins, and said control circuit means further including a resettable second actuator having cycle counting means responsive to a predetermined number of operating cycles of said machine to actuate said coin rejecting means and reject any coins and thereby prevent operation of the machine until resetting by an operator.

9. Control apparatus for initiating operation of a coin-operated machine including electrical circuitry comprising motor-operated sequential control means for sequentially controlling said machine through separate complete operating cycles, switch means controlling energization of said circuitry in said sequential control means, coin receiving and counting mechanism operating said switch means for automatically initiating energization of said control circuitry after insertion of a predetermined number of coins, and coin rejecting means in said machine for rejecting coins in excess of the predetermined number required to energize the machine, said control circuitry including cycle counting means operating said switch means and thereby precluding operation of said machine by said sequential control means after energization of said machine through a predetermined number of operating cycles.

10. Control apparatus as defined in claim 9 in which said machine includes a signal device which is energized after said predetermined number of operating cycles.

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