July 6, 1948. P. E. GELDHOF ET AL 2,444,645

FLUID HANDLING SYSTEM FOR AUTOMATIC CLEANSING APPARATUS

Filed Jan. 22, 1945 3 Sheets-Sheet 1

Fig. 1.

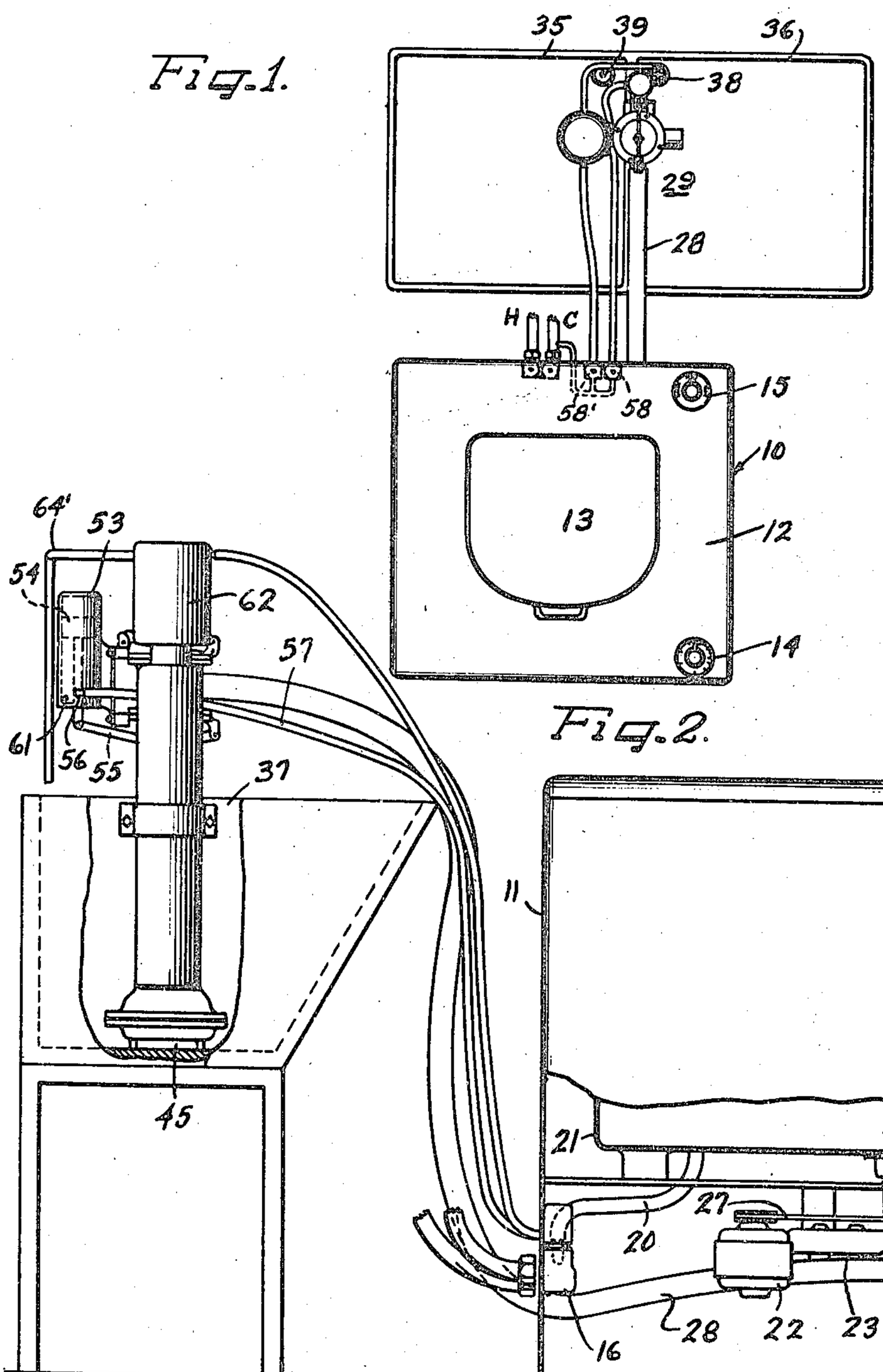

Fig. 2.

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Filed Jan. 22, 1945 3 Sheets-Sheet 2

Fig. 3.

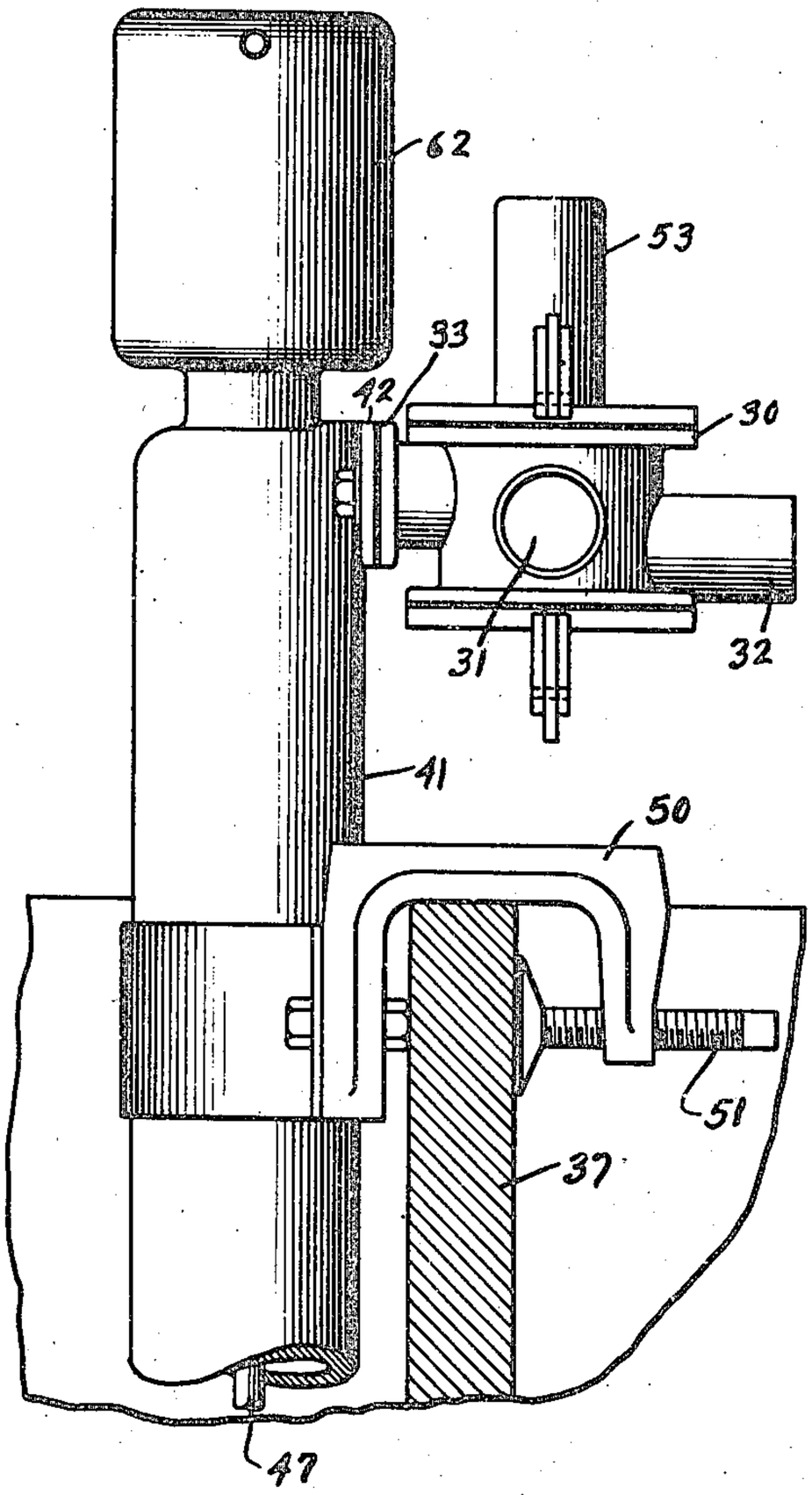


Fig. 4

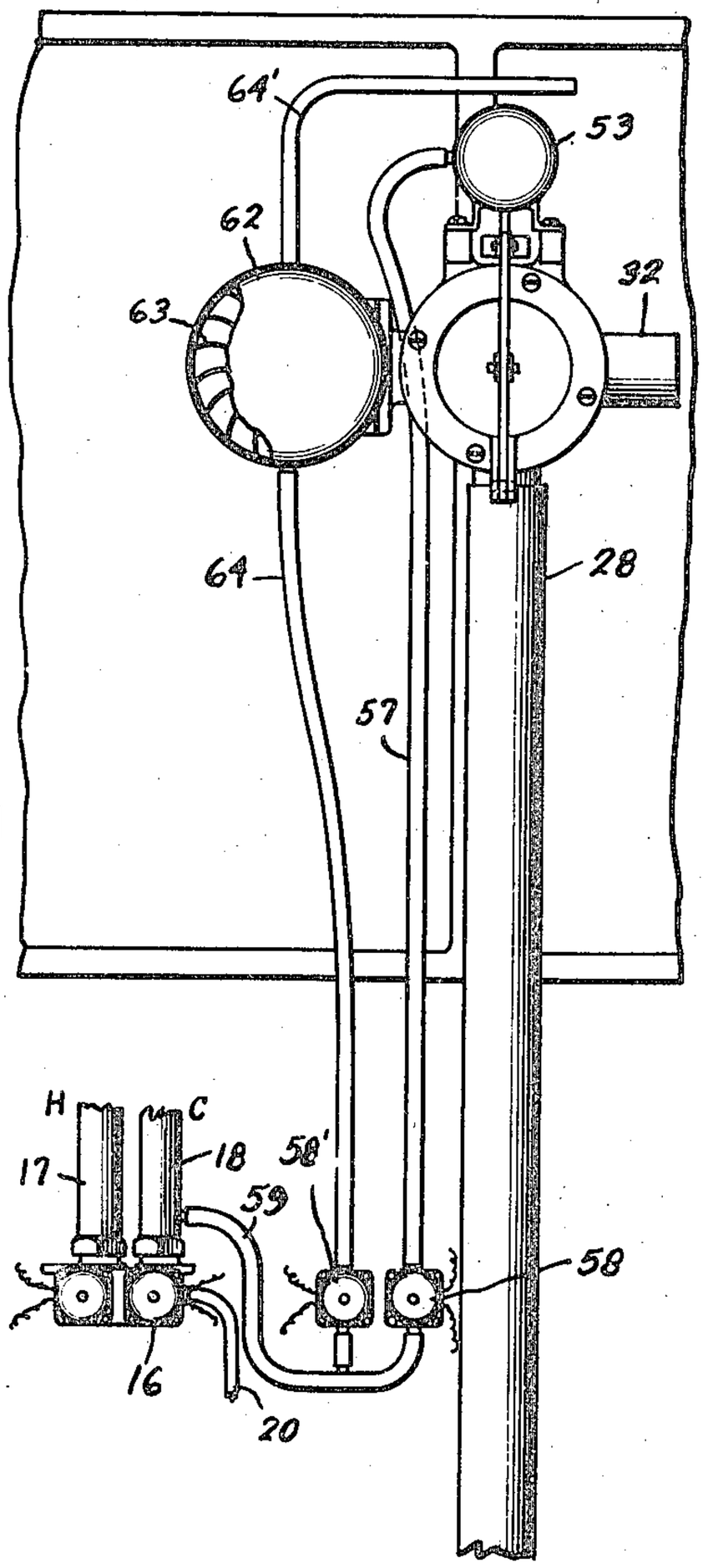
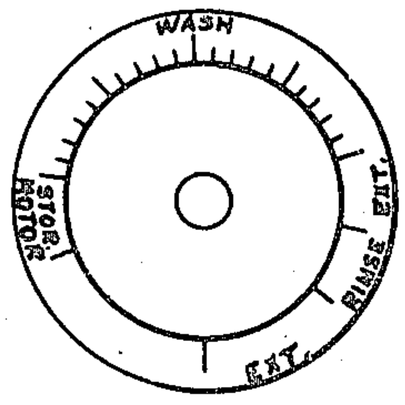


Fig. 7.



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Filed Jan. 22, 1945 3 Sheets-Sheet 3

Fig. 5.

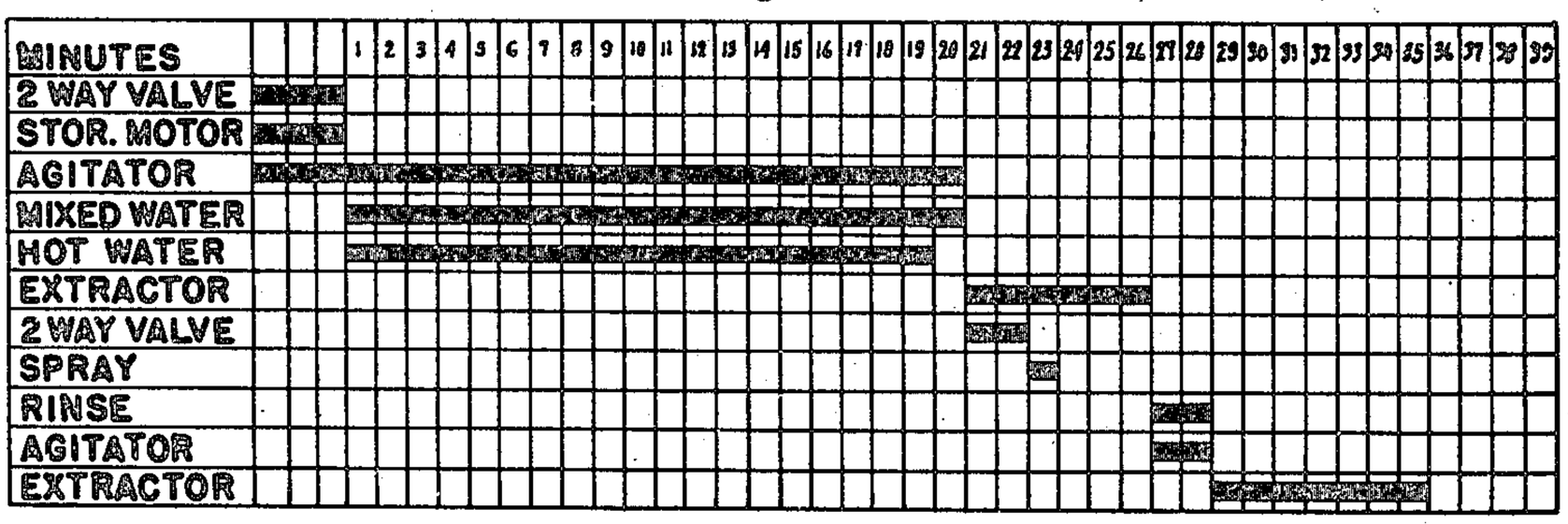
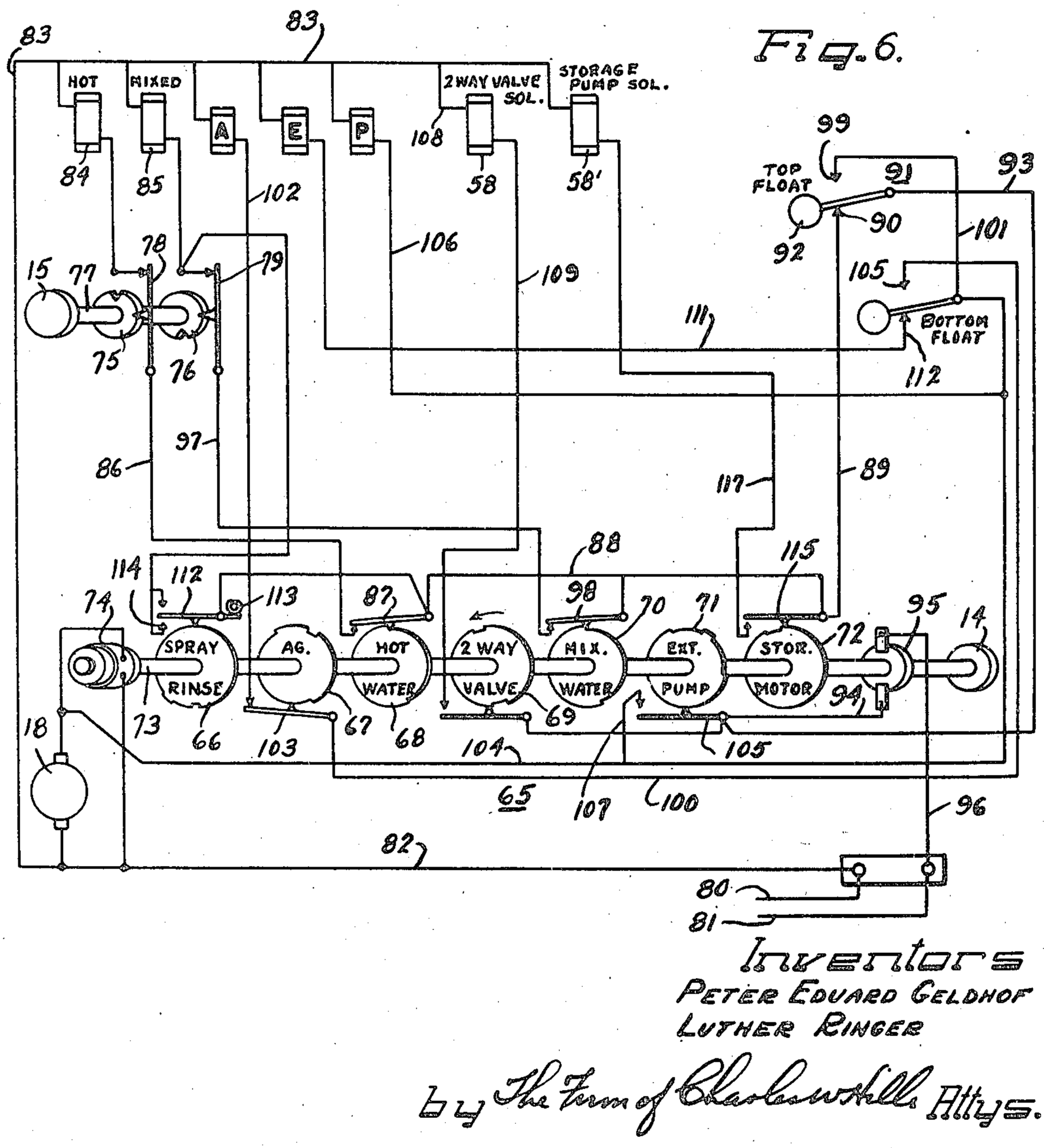


Fig. 6.



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UNITED STATES PATENT OFFICE

2,444,645

FLUID HANDLING SYSTEM FOR AUTOMATIC CLEANSING APPARATUS

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Application January 22, 1945, Serial No. 573,879

6 Claims. (Cl. 68—12)

1

Our invention relates to an automatic cleansing apparatus, and more particularly to a suds water recirculatory system for such apparatus for the discharge of suds water after a certain step in the cleansing operation, and for returning the suds water from a temporary storage arrangement to the apparatus at another step in the operation of the automatic cleansing apparatus, and to a hydraulic arrangement for controlling the operation of the recirculatory system.

The present invention is particularly advantageously adapted for use in connection with laundering operations in which the articles to be laundered are subject to a washing operation in an automatic washing, rinsing and drying apparatus in which heated water is employed containing soap and other suitable detergents for the furtherance of the laundering operation. It is highly desirable to save the prepared soapy water for operation of other laundering operations while the additional steps of rinsing and drying the first batch of laundered clothes are taking place.

Various arrangements have been provided heretofore for the storage of the suds water after the first step in the washing cycle and, for instance, in our patent application Serial No. 523,238, filed February 21, 1944, on an "Automatic cleansing apparatus," we have described and claimed an arrangement including a storage tank placed adjacent the fluid container of the washing apparatus with a heating coil in the auxiliary container for maintaining the temperature of the suds water. This arrangement also includes a two-way valve mounted in the base of the washing machine with a hose leading to the auxiliary storage tank and a second hose leading to a drain. The storage tank is also provided with an auxiliary pump which is connected to the main fluid container of the washing machine through another hose for returning the suds water to the main container.

We have also described in our patent application Serial No. 512,580, filed December 2, 1943, Patent No. 2,391,356, issued December 25, 1945, and entitled "Drain mechanism," a washing machine placed adjacent an auxiliary storage tank and a drain with an oscillatable gooseneck discharge arrangement for the washing machine so that suds water may be discharged into the auxiliary storage tank or to the drain. In this arrangement also there was provided an auxiliary pump placed adjacent the storage means and connected to the fluid container of the washing

2

machine through a hose for returning the suds water to the washing machine.

We have also described and claimed in our patent application Serial No. 573,880, filed concurrently herewith entitled "Automatic cleansing apparatus," a washing machine with a two-way valve and storage pump mounted outside the washing machine casing adjacent to a storage tub and drain and connected to the container inside the washing machine casing in which the various steps of the washing, rinsing and drying are carried out through a single hose connection. An arrangement including an automatic time switch is employed for operating the two-way valve and storage motor so that after a first batch of clothes has been washed the two-way valve will be operated so that the suds water from the main container of the washing machine may be discharged through the two-way valve and storage pump into the storage tub. During rinsing operations, the two-way valve is deenergized so that the rinsing water may be discharged into a drain. Before the operator commences a second washing cycle of operation, the automatic time switch may be reset so as to operate the two-way valve and storage motor so that the storage motor will pump the suds from the storage tub through the two-way valve and into the container of the washing machine.

Since it is ordinarily customary to operate a valve and motor electrically and also since the two-way valve and the storage motor are mounted exteriorly of the main casing of the cleansing apparatus, the operating arrangements for the two-way valve and storage motor are susceptible of being contacted by the operator. It is therefore a general object of our invention to provide an automatic cleansing apparatus with a recirculatory suds system which is so constructed that even though the operator comes in contact with the operating arrangement of the two-way valve and the storage motor with wet hands, there will be no possibility of the operator becoming injured by the source of power which operates the two-way valve and storage motor.

It is a further object of our invention to provide an improved automatic cleansing apparatus of the type mentioned above which is efficient in operation, and which is so constructed as to facilitate the manufacture thereof.

Further objects and advantages of our invention will become apparent from the following description referring to the accompanying drawings, and the features of novelty which charac-

terize our invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

On the drawings:

Figure 1 is a plan view of a typical form of an automatic washing, rinsing and drying machine being provided with our improved arrangement for use in the recirculation of suds water;

Figure 2 is a side view partially broken away of the structure of Figure 1;

Figure 3 is a side view of the two-way valve and storage pump which is employed in the construction of Figures 1 and 2;

Figure 4 is a top view of the recirculatory system including the two-way valve and storage rotor and the hydraulically operated means for controlling the operation of the valve and motor;

Figure 5 is a diagrammatic representation of the schedule of operation of our improved cleansing apparatus;

Figure 6 is a diagram of the control circuit for operating our improved cleansing apparatus to produce the schedule illustrated in Figure 5; and

Figure 7 is a view illustrating the control knob and dial of the timer switch employed to automatically operate our improved cleansing apparatus.

Referring to Figures 1 and 2 of the drawings, we have illustrated an automatic washing, rinsing and drying machine indicated generally by the reference numeral 10. The washing machine 10 includes a cabinet 11 which includes a top panel 12 in which is disposed a cover 13 for facilitating the introduction and removal of articles to be laundered in the machine.

A control knob 14 for the purpose of adjusting and setting a suitable timing mechanism which directs the operation of the washing machine in the performance of its cycle of operation is disposed in one corner of the top panel 12 of the apparatus. This timer mechanism which may be manually set by the control knob 14 will be described in further detail in connection with the diagram of Figure 6. The timer mechanism itself is mounted in the cabinet 11 directly under the top panel 12. A second control knob 15 by means of which the operator may select the desired temperature of the cleansing fluid which is supplied by a suitable mixer valve 16 which is illustrated in Figures 2 and 4 to be employed in the laundering operation is positioned in another corner of the top panel 12 of the cabinet 11. The contacts of the control mixer valve will be described in connection with the circuit of Figure 6. As will be seen in Figure 4, the mixer valve is connected to pipes 17 and 18 which may in turn be connected to any suitable source of hot and cold water (not shown). The mixer valve is also connected through a pipe 20 to a container 21 in which is carried out the various steps of washing, rinsing and drying. It will be understood that the clothes may be inserted or removed from inside the container 21 through the cover 13.

The automatic washing machine 10 is generally of the type described and claimed in detail in our copending application Serial No. 491,618, entitled "Automatic washing, rinsing and drying machine," filed June 21, 1943, and reference may be had to this application for a detailed description of the washing machine structure.

As has been mentioned above, the cleansing fluid which is normally water of a desired temperature is introduced through the mixer valve 16 and pipe connection 20 into the container 21

and the temperature at which the water is introduced into the container 21 is controlled by the setting of the control knob 15 which the operator may set at the beginning of the washing operation. A motor 22 is mounted in the cabinet 11 of the washing machine and this motor is adapted to actuate a reciprocating agitator and a rotatable perforated drying basket (not shown) both of which are mounted on the tub 21 through suitable transmission 23 and any suitable driving connection with which is associated a plurality of automatically operated shifter mechanisms. For a detail description of these features of the automatic washing, rinsing and drying machine, reference may be had to our above mentioned copending application Serial No. 491,618.

In order to provide an arrangement for removing the water from the container 21, it is provided at its base with a port 24 which in turn connects to the intake side of a suitable pump 25 through a hose 26. It will be understood that the pump will be operated at the proper time from the motor 22 which is connected to the rotatable impeller of the pump through a belt 27. The outlet of the pump 25 is connected to one end of a suitable hose connection 28, the opposite end of which is connected to an integral two-way valve and auxiliary pump construction indicated generally by the numeral 29.

As has been brought out above, it is known that it is desirable to save the suds water particularly after the first batch of clothes has been washed so as to conserve both hot water and detergents which are included with the suds. In order, therefore, to provide a convenient arrangement for saving the suds after the washing cycle and also to return the suds at the proper time previous to the second washing cycle as well as to provide a simple arrangement for discharging rinse water to a drain, we provide our two-way valve and auxiliary pump construction 29 which is illustrated in further detail in Figures 3 and 4. Since the two-way valve and storage pump is also described in our copending application, Serial No. 573,880, filed concurrently herewith, only a general description thereof will be given below and reference may be had to this last mentioned copending application for a more detailed descripton of the storage pump and two-way valve.

Referring to Figure 3, the two-way valve includes a casing 30 which has an inlet or first port 31, a second port or first outlet 32 and a third port or second outlet 33. The two-way valve may be of any suitable construction, it being understood that it is of such a type that fluid may be selectively discharged either from one outlet or from the other outlet of the two-way valve. Thus, as described in our copending application referred to immediately above, a suitable arrangement is placed within the two-way valve so that when the valve is energized or moved in one position, the fluid will be discharged from the inlet 31 out through the outlet 33 and when the two-way valve is deenergized or moved to another position, the fluid which passes through the inlet port 31 will be discharged through the outlet port 32. For a further detail description of the operation of this valve, reference may be had to our copending application, Serial No. 513,138, filed December 6, 1943, Patent No. 2,414,196, issued January 14, 1947, and entitled "Drain mechanism."

Customary facilities in most homes where auto-

matic washing, rinsing and drying machines may be advantageously employed, include a stationary tub construction having a pair of tubs 35 and 36 as is illustrated in Figures 1 and 2. It is therefore convenient to mount our integral two-way valve and auxiliary pump mechanism on a wall 37 which divides the two tubs. As is illustrated in Figure 1, a drain 32 of the tub 36 may be left uncovered while a drain of the tub 35 may be provided with a stopper 39. It will therefore be seen that when the two-way valve is operated so that the second port 32 is in communication with the intake port 31 that the fluid from the container of the washing machine will be discharged to the tub 36 and into the drain 38 while, when the two-way valve is energized to its opposite position, the fluid will pass from the intake port 31 of the two-way valve out through the third port 33 so as to discharge the water into the tub 35 which has the stopper 39 therein so that the fluid may be saved. It is therefore into this tub that the operator, if he so desires, may save the suds water merely by inserting the stopper 39 into the drain of the tub 35. It will be understood, of course, that the end of the hose 28 is connected to the intake port 31 of the two-way valve as is illustrated in Figures 1 and 4 so that when the pump 25 of the machine is operated, the fluid will be pumped from the container 21 to the two-way valve and then be discharged either into the drain or into the storage tub. In order to provide an arrangement for returning the suds water from the tub 35 to the washing machine container 21, we provide a convenient arrangement including an auxiliary pump construction 41 which has a port 42 which is tightly bolted to a flange on the third port 33 of the two-way valve. The pump is of any suitable construction such as having a port 45 at its lower end of the tubular housing 41 of the pump with a suitable impeller mechanism (not shown) which is operated through a drive shaft 47 which in turn may be operated in a manner as will be described hereinafter.

The pump housing 41 may be attached to the wall 37 of the stationary tubs in any suitable manner and as will be seen in Figure 3, a bracket construction 50 is attached to the pump housing and includes a screw 51 for supporting the bracket on the wall 37.

It will be seen from the above description that with our two-way valve and auxiliary pump connected to the end of a single hose 28, the suds water when the valve is energized may be forced out from the inlet 31 of the two-way valve through the outlet 33 and then through the pump housing 41 into the tub 35. Also since it is not ordinarily necessary to save the cooler rinse water, the two-way valve may be deenergized or moved in any other suitable manner so that the rinse water will be discharged from the inlet 31 of the two-way valve through the outlet 32 to the tub 36 and into the drain 38. Also in any suitable step in the washing operation, such as, at the beginning of the washing of a second batch of clothes, the pump may be energized and thus pump the water from the tub 35 through the pump and into the third port 33 and out through the port 31 through the hose connection 28 and out through the pump 25, which, of course, will be inactive during this cycle of operation and through the port 24 into the container 21. Any suitable control arrangement may, of course, be employed to operate this auxiliary pump and two-way valve of our invention, and we shall describe briefly below an automatic control arrangement for controlling the operation of the pump and two-way valve so that the two-way valve is operated to discharge the suds into the tub 35 and which is also operated to discharge the rinse water into the tub 36 and into the drain and which also controls the energization of a suitable motor which will be described below for operating the pump 41 so as to withdraw the water from the tub 35 and discharge it into the container 21 of the washing machine previous to the commencing of the washing of a second batch of clothes.

Hydraulic control

As will be illustrated in Figures 1, 3 and 4 of the drawings, the two-way valve and storage motor is adapted to be supported remote from the casing of the cleansing apparatus such as on the stationary tubs and it will be seen that when the two-way valve and storage motor are in this position, they will be susceptible of being contacted by the operator who may have damp hands at the time. In order, therefore, to insure that the operator will not be injured by the power which operates the storage motor and two-way valve, we provide hydraulically operated arrangements for operating both the two-way valve and storage motor. Referring, therefore, to Figure 2, it will be seen that adjacent the two-way valve is provided a small container 53 in which is provided a reciprocating piston 54, the lower end of which is connected through a link mechanism 55 to the operating members of the two-way valve. The casing 53 is provided with a port 56 which connects through a tube 57 to a solenoid operated valve 58 as will be seen in Figure 4. The solenoid operated valve in turn connects through a pipe 59 to a pipe 18 which communicates with a suitable source of water pressure such as the normal cold water which is available in an ordinary dwelling. It will therefore be understood that when the solenoid valve 58 is operated in a manner which will be described hereinafter in reference to Figure 6, water pressure will be conducted through the various pipes to the underside of the piston 54, thus causing it to raise and causing the two-way valve to operate so that water or suds passing through the two-way valve will be discharged through the pump casing 41 to the storage tub 35.

It will be understood that the two-way valve has a suitable biasing spring so that when the force of the water is removed, the water inside the casing 53 will bleed out through a port 61 and the spring will force the two-way valve to its deenergized position and at the same time lower the piston 54 in its housing 53. When in the latter position, the two-way valve will be in a position for discharging the rinse water out through the port 32 and into the drain 38.

In order to provide a hydraulic motor for operating the pump 41, we provide a water motor arrangement 62 which includes an impeller or a plurality of blades 63. The casing of the water motor is connected to a tube 64 which connects to a second solenoid operated valve 58'. It will therefore be seen that when the valve 58' is energized, the force of water from the main pipe 18 will cause the flow of water from the pipe 59 through the solenoid valve 58' through the tube 64, and cause the wheel 63 to rotate. It will be understood that the wheel 63 is mounted on a shaft with the pump 47 so that this will cause the impeller of the pump to operate and therefore pump the water from the storage tank 35

through the two-way valve and hose connection 28 and back into the main container 21 of the washing machine. A discharge pipe 64' may be provided for the water motor so that the water which is employed to rotate the vanes 63 may be discharged into the drain 38.

With the construction described above by operating the solenoid valves 58 and 58', it will be seen that through a hydraulic arrangement, we are able to operate both the two-way valve and pump without using any power such as electricity which will be susceptible of being contacted by the operator particularly when he has damp hands.

It will be understood that the valves 58 and 58' for controlling the water pressure for operating the two-way valve and water motor may be operated in any suitable manner, and it will be understood that the two-way valve particularly when mounted inside the casing 11 of the cleansing apparatus may be operated electrically through circuits controlled by the automatic timer switch which is usually employed in a cleansing apparatus of the type in which my suds water recirculatory system may be advantageously employed. We shall therefore briefly describe below the control circuit of Figure 6 in connection with the schedule as is illustrated in Figure 5 which circuit is essentially the same as that described in our copending application, Serial No. 573,880, filed concurrently herewith.

Electrical control circuit

The control circuit which is shown in Figure 6 will be described with the aid of the schedule illustrated in Figure 5 for a complete cycle of operation of the cleansing apparatus, and the control circuit will be described particularly in its relation to the operation of the suds water recirculatory system, and for a further detail description of this type of control for controlling the operation of the other steps of the washing, rinsing and drying, reference may be had to our above mentioned copending application, Serial No. 491,618.

It will be seen from reference to the schedule in Figure 5 that the washing cycle is commenced by the introduction of the mixed and hot water through the mixing valve by the operator setting the control knob 15. It will be noted from the schedule of Figure 5 that the first two operations are the operation of the two-way valve and storage motor, but, of course, this is on the assumption that the suds have already been placed into the tub 35 or the storage container from a previous cycle of operation, and let us assume for the present description that the operator is commencing the washing and rinsing for the first time and therefore it is necessary to fill the tub first from the hot and cold water mains through the mixed water and hot water valve.

Referring to Figure 6 of the drawings, a timer unit indicated generally by the numeral 65 is provided which may be of any suitable type and in the construction illustrated in the drawings, it includes a plurality of disks numbered 66 through 72, inclusive, which disks are mounted on a timer shaft 73 which is, in turn, rotated by a timer motor 74. It will be seen that the knob 14 is provided on the opposite end of the shaft which is the knob which extends through the top of the machine as is illustrated in Figure 1. Also in Figure 7 is shown the dial which informs the operator where the hand control 14 is positioned.

In Figure 6 it will also be seen that there is diagrammatically illustrated the hand control 15 which controls the setting of the mixing dial for controlling the temperature of the water which is introduced into the apparatus. The water control includes cams 75 and 76 mounted on the cam shaft 77 for operating switches 78 and 79, respectively, and let us assume that the operator has so positioned the hand control switch that both the switches 78 and 79 are closed as is illustrated in Figure 6.

The control of the machine is operated through a source of supply indicated by the numerals 80 and 81 and it will be seen that the source of supply 80 is connected to lines 82 and 83 to the solenoid controls 84 and 85, respectively, which control the operation of the valve. The circuit for the hot water valve may then be traced to the switch 78, a conductor 86 to a switch 87 which is operated by the cam 68 and which is identified as the hot water cam. The circuit may then be traced to conductors 88 and 89 to a lower contact 90 of a float control switch 91. It will be understood that the float control switch 91 is placed adjacent the top of the container so that when the float 92 is raised by the water the lower contact 90 of the top float will be opened. It will, of course, be seen that by controlling the water intake through the top float the machine will never be filled to too high a level, assuming the top float switch operates satisfactorily. The circuit may then be traced through a conductor 93 and 94 through a disk 95 which is a manually controlled switch. The circuit is then connected to the other side of the source of supply to a conductor 96. Since all the controls pass from the conductor 96 to the switch 95, it will be seen that whenever the operator moves the handle outwardly or to the right as is illustrated in Figure 6, all circuits will be deenergized and thus the operator may mechanically move the timer shaft without causing any arcing on any of the automatic timer switches. The mix valve circuit may also be traced from the mixing valve 85 through the switch 79 and a conductor 97 to a switch 98 which is operated by the cam 70 and entitled "Mix Water." It will be seen that the remainder of the circuit is similar to that already traced above.

When sufficient water has been introduced into the container 21 of the cleansing machine the top float will break the lower contact circuit and deenergize the hot and mix valve and will make contact with its upper contact 99 which closes the circuit of the washing machine motor 18 and the timer motor 74. It will be understood that the top float switch is so made that the top contact closes before the bottom contact is opened. These circuits may be traced from one side of the line 80 through the conductor 82, the two motors in parallel to conductors 104 and 101 to the top contact 99. The circuit may then be continued through the conductors 93 and 94 through switch 95 to the other side of the line 81. This will cause the timer motor to operate and rotate the shaft which opens the hot water and mix water switches 87 and 98, respectively, and agitator switch 103 at the end of the washing cycle.

The float contacting its upper contact 99 will simultaneously close the circuit for the agitator solenoid and this may be traced from one side of the line 80 through the conductors 82 and 83 to a solenoid entitled "A" on Figure 6, through a conductor 102 to a switch 103 which is oper-

ated by the agitator cam 67. A circuit may then be traced through a conductor 100 to an upper contact 105 of the bottom float through the bottom float conductor 101, the top contact of the top float 99 through the top float movable contact arm through the conductor 93 to the other side of the line 91. The agitator will continue to operate for a suitable length of time, such as twenty minutes as is seen from the schedule in Figure 5.

After the agitator has operated for a suitable length of time, the timer motor will have rotated the cam shaft 73 sufficiently to open the agitator cam disk contact and close the extractor disk contact marked 105 in Figure 6. Since the agitator disk switch has been opened that particular motor control circuit will be opened, but the extractor switch 105 closes a parallel circuit for the machine motor and time switch motor. Similarly the pump solenoid marked "P" in Figure 6 is energized and this circuit may be traced from the conductor 93 through the solenoid pump P, conductor 106 which in turn connects to a conductor 104, and through a conductor 107, the extractor and pump switch 105 to the other side of the line 91.

It will be noted from the cutouts in the cams 69 and 71 that the two-way valve switch is closed at the same moment that the pump and extractor switch is closed after the washing period. This circuit may be traced from the conductor 93, conductor 108 through the two-way valve solenoid 58, conductor 109 to the two-way valve switch. The circuit may then be traced through the conductor 94 to the other side of the power line.

As has been described above, when the two-way valve solenoid 58 is operated, water will be introduced through the various pipes as is illustrated in Figure 4 so as to energize the two-way valve and connect the intake port 31 with the outlet 33.

In order that the extractor will not operate while there is still water above the bottom float, it will be seen that the extractor solenoid marked "E" in Figure 6 is connected from the conductor 93 and a conductor 111 to the bottom contact 112 of the bottom float. The circuit may then be traced through the conductor 107 and through the extractor switch and then to the other side of the line.

After the two-way valve has been energized for two minutes in the schedule as is illustrated in Figure 5, the two-way valve is deenergized since the cam switch of the two-way valve will open the switch. At the same time, the timer will close the spray rinse switch 112 by having the cam follower drop into the low part on the cam. In timers of the type which are ordinarily manufactured for washing machines and which have operation of a predetermined number of degrees in a stepped manner, it is ordinarily impractical to have a switch close for less than one minute and since it is desirable to only allow the spray rinse to be on for a relatively short length of time, a mechanical time delay 113 is provided for allowing the spray rinse to only be on for about ten seconds. Thus the circuit for the spray rinse may be traced through the mixing solenoid valve 85 to the lower contact 114 of the spray rinse, through the conductor 88 to the bottom contact 90 of the top float 91 and then through the conductor 93 to the other side of the line. At the end of one minute the spray rinse switch will open circuit and the pump will

continue to operate so long as the extractor switch 105 is closed. However, assuming that the pump has drawn sufficient water out of the container so as to close the bottom contact on the bottom float, the extractor solenoid E will then operate so as to rotate the rotatable basket.

After the extractor cam switch 105 has been closed for six minutes as will be seen in the schedule of Figure 5, the timer motor will have operated a sufficient length of time to open the extractor and pump switch 105.

After the extractor switch is opened, it will be seen from the schedule of Figure 5 that the rinse and agitator cam switches will be closed. By this time the hump on the spray rinse cam 66 will have moved under the cam follower of the switch 112 and cause it to close its upper contact and the rinse circuit may be traced in the manner described above in connection with the spray rinse. However, since the cam switch 112 was moved upwardly the mechanical follower 113 will not interfere with this operation. As has been mentioned above, the agitator switch 103 is also closed but since the agitator is connected in series with the top contacts of both the bottom and top floats, the agitator will not begin to operate until the rinse has been operated sufficiently long to fill the tub until both the top contacts of the top and bottom float operate. After the agitator has run for two minutes and it will be seen that this will happen while the cam follower drops into the short valley in the agitator cam, the agitator will be deenergized and at the same time, the extractor will again be energized by closing the switch 105. It will, of course, be understood that during the time the agitator and extractor are operating, the motor and time switch motor will be operated through the same circuits as have already been described above.

It will be understood that by our improved circuit of connecting the agitator through both the top contacts of the top and bottom floats the agitator is prevented from being energized by any inductive kick due to breaking the motor circuit at the end of the twenty-six minute period.

It will be understood that after the extractor has operated for a period of about six minutes, the time switch will be forced to move to open the extractor circuit as well as open all the remainder of the time switch circuits. This will cause the time switch to be completely deenergized and the automatic cleansing machine will not again operate until the time switch is manually reset.

Suds recirculation control

It will be recalled from the above that during the previous washing cycle, the suds were passed into the storage tub 35, and assuming that the operator has previously placed the plug 39 over the drain, the operator will now have saved a considerable quantity of suds which may be used after a second batch of clothes is introduced into the cleansing machine. Referring to Figure 7, the control knob at the conclusion of the first complete cycle of operation will be in a position between the extractor and the storage motor portions of the dial and if the operator desires to return or recirculate the suds back into the container 21, the control knob will be moved until the pointer is opposite the storage motor portion of the dial. This will cause the movable contact 115 to drop into the cutout portion of the cam 72 marked "storage motor" in Figure 6. This will

energize the storage pump solenoid motor 58' through a conductor 117, switch 115, conductor 89 to the bottom contact 90 of the top float and from there the circuit may be traced through the conductor 93 to the other side of the source of supply.

It will be understood from the description given above that the operation of the solenoid 58' will cause water to flow through the pipes as is illustrated in Figure 4 and rotate the water motor vanes 63 thus causing the storage pump 41 to operate.

After the operator has drained all the water from the storage tub 35, the control knob may again be turned until it is within the range identified as "washing" in the dial of Figure 7. It will be understood that since all the water is not removed during the first extraction cycle, the suds which are returned from the storage will not completely fill the tub and the remainder will be filled from the hot and cold water supply, depending upon the setting of the hand control switch 15. Upon sufficient water being introduced to raise the top float until it contacts the top contact, the agitator solenoid A will again be energized and the washing cycle will again be repeated in the manner described above.

It will be understood that after the second cycle of washing operations, if the operator desires to dispose of the suds which have been transferred into the tub 35, this may be accomplished by merely opening the drain by removing the drain cap 38.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

We claim as our invention:

1. In an automatic cleansing apparatus having a fluid container for the performance of a succession of cleansing operations, said container having an outlet, a hose having an end connected to said outlet, two-way valve and storage pump means adapted for mounting remote from said container and adjacent a reservoir and a drain and adapted to have communication therewith, said two-way valve having an inlet connected to said hose, a first outlet in communication with said storage pump and a second outlet positioned to discharge to said drain, hydraulically operated means for operating said two-way valve and storage pump so that when said valve is in one position fluid from said container may pass through said valve inlet and first outlet to the storage pump and reservoir and when in a second position fluid may pass to said drain, said hydraulically operated means operating said storage pump so that fluid may be pumped from the reservoir through said valve and back to said container.

2. In an automatic cleansing apparatus having a fluid container for the performance of a succession of cleansing operations, said container having an outlet, a hose having an end connected to said outlet, two-way valve and storage pump means adapted for mounting remote from said container and adjacent a reservoir and a drain and adapted to have communication therewith, said two-way valve having an inlet connected to said hose, a first outlet in communication with said storage pump and a second outlet positioned to discharge to said drain, hydraulically operated means for operating said two-way valve and storage pump so that when said valve is in one position fluid from said container may pass through said valve inlet and first outlet to the storage pump and reservoir and when in a second position fluid may pass to said drain, said hydraulically operated means operating said storage pump so that fluid may be pumped from the reservoir through said valve and back to said container, and solenoid operated valves mounted adjacent said container for controlling the operation of said hydraulically operated means said hydraulically operated means including fluid transmitting connections to said solenoid-operated valves.

3. In an automatic cleansing apparatus having a fluid container for the performance of a succession of cleansing operations, time switch means for controlling the sequence of operation of said apparatus, said container having an outlet, a hose having an end connected to said outlet, a two-way valve and storage pump means adapted for mounting remote from said container and adjacent a reservoir and a drain and adapted for communication therewith, said two way valve having an inlet connected to said hose, a first outlet in communication with said storage pump and a second outlet positioned to discharge to said drain, hydraulically operated means for operating said two-way valve so that when said valve is in one position fluid from said container may pass through said valve inlet and first outlet to the reservoir and when in a second position fluid may pass to said drain, hydraulically operated means for operating said storage pump so that fluid may be pumped from the reservoir through said valve and back to said container, solenoid operated valves mounted adjacent said container for controlling the operation of said hydraulically operated means, and means including said time switch means for controlling said solenoid operated valves.

4. In an automatic cleansing apparatus having a fluid container, a casing enclosing said container, said container having an outlet, a hose connected to said outlet, two-way valve and storage pump means adapted for mounting outside said casing and adjacent a storage reservoir and drain and adapted for communication therewith so that said valve and storage pump is susceptible of being contacted by the operator of the apparatus, said two-way valve having a first port connected to said hose, a second port connected to said storage pump, and a third port positioned to discharge to said drain, said valve when in one position connecting said first port with said third port and when in a second position connecting said first port with said second port, and hydraulically operated means for operating said two-way valve and storage pump so as to minimize the possibility of the operator being injured by power for operating said valve and storage pump.

5. In an automatic cleansing apparatus having a fluid container, a casing enclosing said container, said container having an outlet, a hose connected to said outlet, two-way valve and storage pump means adapted for mounting outside said casing and adjacent a storage reservoir and drain and adapted for communication therewith so that said valve and storage pump is susceptible of being contacted by the operator of the apparatus, said two-way valve having a first port connected to said hose, a second port connected to said storage pump, and a

third port positioned to discharge to said drain, said valve when in one position connecting said first port with said third port and when in a second position connecting said first port with said second port, and hydraulically operated means for operating said two-way valve and storage pump so as to minimize the possibility of the operator being injured by power for operating said valve and storage pump, and solenoid operated valves mounted within said casing for operating said hydraulically operated means said hydraulically operated means including fluid transmitting connections to said solenoid-operated valves.

6. In an automatic cleansing apparatus having a fluid container, a casing enclosing said container, said container having an outlet, a hose connected to said outlet, two-way valve and storage pump means adapted for mounting outside said casing and adjacent a storage reservoir and drain and adapted for communication therewith so that said valve and storage pump is susceptible of being contacted by the operator of the apparatus, said two-way valve having a first port connected to said hose, a second port connected to said storage pump, and a third port positioned to discharge to said drain, said valve when in one position connecting said first port with said third port and when in a sec-

ond position connecting said first port with said second port, hydraulically operated means for operating said two-way valve and storage pump so as to minimize the possibility of the operator being injured by power for operating said valve and storage pump, solenoid operated valves mounted within said casing for operating said hydraulically operated means, and pipe means for connecting said solenoid operated valves to said hydraulically operated means and to a source of fluid pressure.

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