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T. F. RATAICZAK ET AL

2,217,705

WASHING MACHINE

Filed May 5, 1937

2 Sheets-Sheet 1

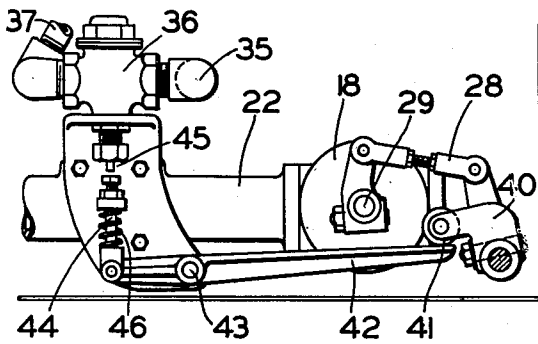


Fig. 2

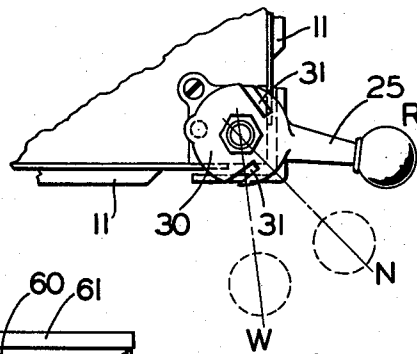


Fig. 3

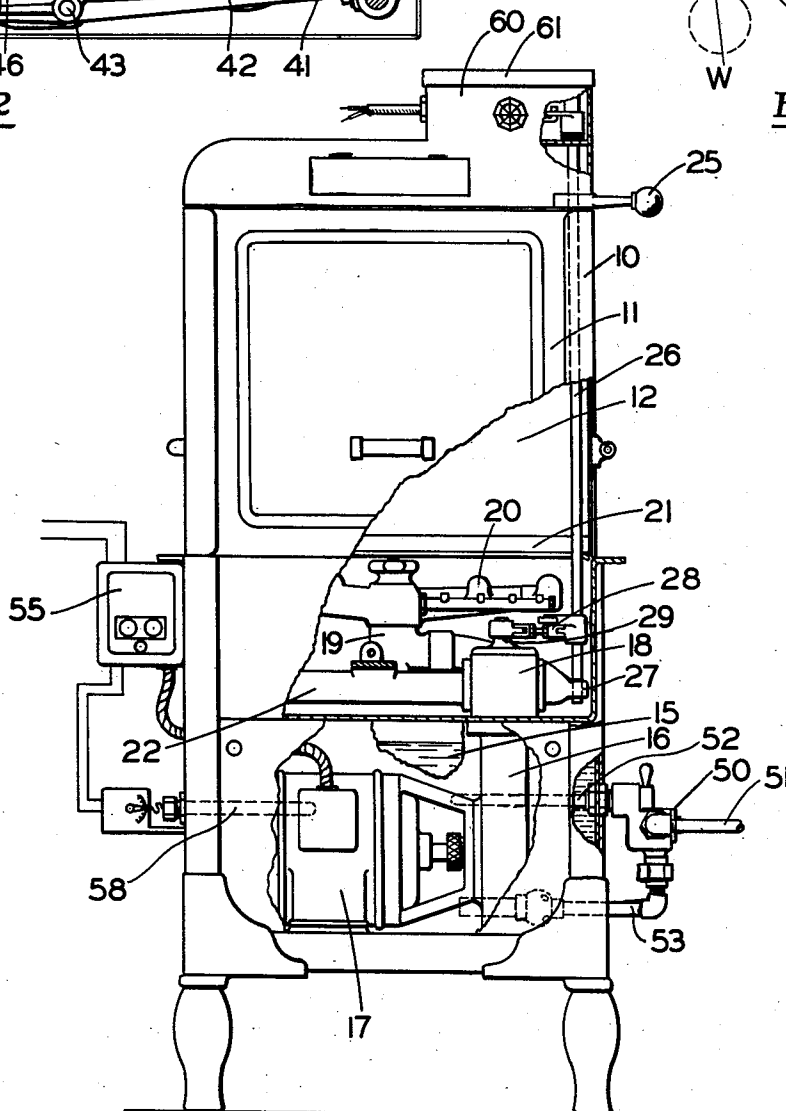


Fig. 1

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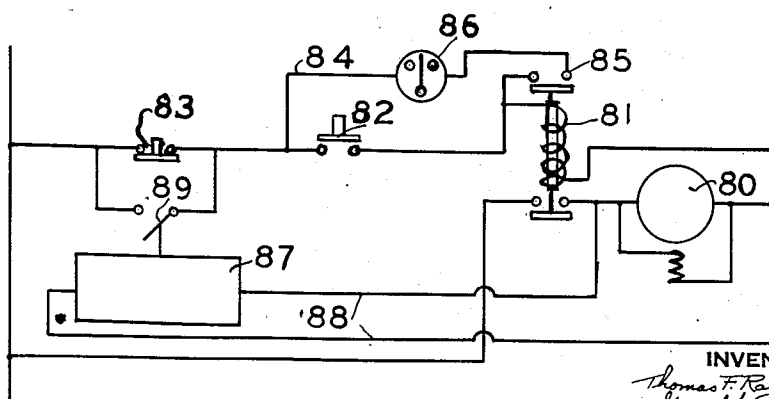
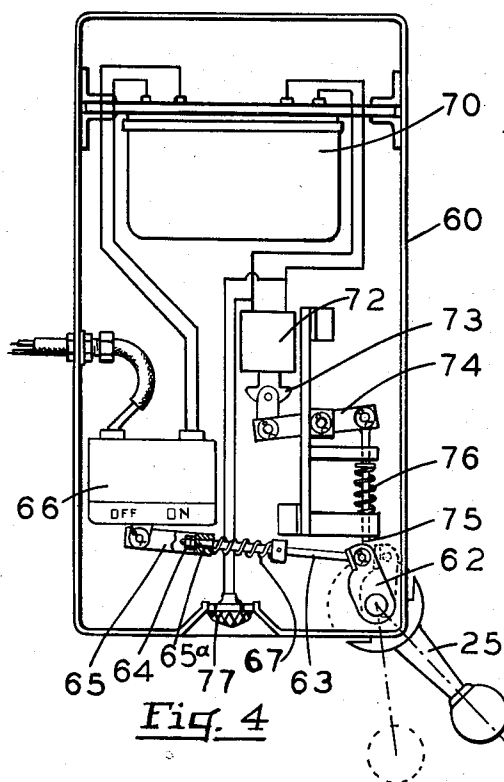
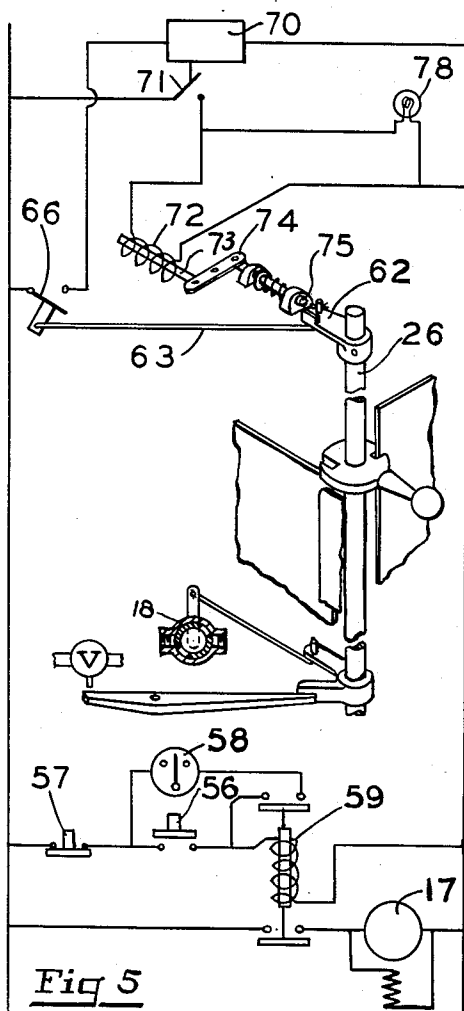
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WASHING MACHINE

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2 Sheets-Sheet 2



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2,217,705

WASHING MACHINE

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12 Claims. (Cl. 141—9)

This invention relates to washing devices.

It is the principal object of the invention to provide a washing device for dishes and the like in which the articles are subjected to predetermined conditions of washing which are controlled with reference to securing desired cleanliness and sterility.

It is a further object to provide a washing device of this character in which a predetermined time of washing is required and in which predetermined temperature conditions are maintained during the washing operation.

It is a further object to provide a device of this character adapted to receive and wash articles and in which the washing operation when initiated is required to be continued for a predetermined period of time and under controlled temperature conditions such as to provide a highly effective and substantially sterilizing washing operation.

Other objects and advantages will be apparent from the description, the accompanying drawings and the appended claims.

In the drawings—

Fig. 1 is a view in side elevation with parts broken away, of a washing machine constructed in accordance with the present invention;

Fig. 2 is a detail elevational view showing the control mechanism for operating the wash valve and the rinse valve.

Fig. 3 is a detail view showing interlocking action secured as between closure members on the washing device and control handle for controlling the washing operation;

Fig. 4 is a top plan view of the control compartment with the top cover removed therefrom;

Fig. 5 is a schematic and diagrammatic representation of the control circuits and interlock mechanism for use in the invention; and

Fig. 6 is a schematic wiring diagram showing a modified form of the invention.

In the washing of articles, more particularly the washing of dishes and the like, it has been determined that the effectiveness of the washing operation varies materially with the conditions under which the operation is conducted. This is especially important in the handling and washing of dishes for foodstuffs where the maintenance of sanitary and sterile conditions is necessary. It has been found that where the conditions of the washing operation are controlled within predetermined ranges, a surprising improvement in the sterility conditions of the washed dishes results, actual bacterial determinations showing that the number of bacteria remaining on the dishes is

very sharply diminished when the washing is carried out under properly controlled conditions as described herein. With a machine having a substantially constant rate of flow of wash fluid it has been determined that the desired superior results in respect to effectiveness of wash and sterility are secured where the washing operation is conducted under controlled conditions of minimum temperature of washing fluid and minimum time of continuance of the washing operation. Where these conditions of the washing operation are maintained, a decided improvement in the bacteria condition on the washed articles results, in comparison with washing operations conducted indeterminately as regards the time and temperature conditions.

While it is not practicable to express such conditions in terms of measurements which are universally applicable to all fields of washing, it may be stated, by way of example, that in the washing of dishes for example in hospitals it has been found that the temperature should preferably be maintained at or above 160° F., and that the time of the washing operation at such temperature should be of the order of substantially a minute. A series of washing operations conducted over a range of varying conditions indicated a sharp reduction in the bacterial conditions on the washed dishes where the temperature of the wash water was maintained in the range described and where the time of wash was of the proper duration, the failure to wash under these conditions resulting in marked increase in the bacteria remaining on the dishes. Further increase in the time and temperature conditions above the predetermined controlled ranges indicated appeared to result in only a small or disproportionate improvement in sterility. While these conditions will vary with different fields and conditions of use, nevertheless in order to secure the desired results in sterility of the washed articles, it is highly important that the washing operations be conducted under suitably controlled conditions of time and temperature. And similarly in other fields relating to the washing of articles generally, in order to secure the most efficient and effective operation of the washing device, certain predetermined conditions of temperature of wash liquid and of time of continuance of washing operation should be observed.

In accordance with the present invention a washing machine is provided for the reception of articles to be washed, with provision for conducting the washing operation under predetermined controlled conditions such as to secure the de-

sired effectiveness in results and cleanliness and sterility of the washed articles. The invention provides for a washing operation to be conducted only when the temperature of the wash water is in excess of a desired minimum for the particular condition of use; and the washing operation is required to be maintained, using such wash water of controlled temperature for a period of time which is likewise controlled in reference to the particular conditions of use, so that combined control of temperature and time of washing are secured, thereby providing for securing the desired results in the final washed articles.

Referring to the drawings which disclose a preferred embodiment of the invention, there is illustrated at 10 a washing machine having a plurality of doors 11 thereon, providing access into the interior of the washing chamber 12. In a machine of this construction one door may be raised to provide for the entrance of a rack containing the dishes or articles to be washed, another door providing for withdrawal thereof after the termination of the washing operation. Preferably the machine is provided with three doors on its three sides to permit adaptation to a variety of uses and locations.

The washing mechanism includes a sump 15 for collection of wash water, from which it is supplied to the rotary pump 16, the pump being driven by an electric motor 17. The water is delivered by the pump through control valve 18 and into a header 19 which provides for rotatably supporting a rotary wash arm 20, positioned beneath the frame 21 for holding the racks of dishes. Preferably a similar rotary wash arm is provided above the washing chamber 12, being supplied by a branch pipe 22 also under the control of valve 18.

Control handle 25 provides for controlling the washing operation, being located at the upper portion of the device, and having means for securing interlocking action of the doors, to prevent undesired opening thereof during the washing operation. This control handle is carried by a shaft 26, suitably mounted at 27 and extending below the washing chamber 12 to a point adjacent the valve 18. A linkage mechanism 28 is provided for connecting the shaft 26 with rotatable valve stem 29, to thereby secure operation of the valve in response to the movement of handle 25.

Handle 25 is provided with a disk-like part 30 having a pair of rectangular slots 31 formed therein at right angles to each other, and in position to receive, respectively, the edges of door members 11 when in alignment therewith. These slots are so related with respect to handle 25 that when the handle is in its neutral or off position (indicated in dotted lines by N, Fig. 3) closing valve 18, the slots 31 are in alignment with, and above the edges of the two door members 11, so that in this position either or both of the doors can be freely raised to provide access to the interior of the washing compartment. And when either door is raised it passes upwardly through its associated slot 31 thereby locking the control handle in such off position and preventing unintentional operation of the handle to cause the commencement of the washing operation with the doors raised. When both doors are closed handle 25 may then be freely moved to the position indicated by reference numeral W in Fig. 3, in which position the valve 18 is actuated to open position, supplying washing fluid from the pump to the headers 19

and 22, thereby securing the washing action. In such position, neither door 11 can be raised and thus access is prevented to the interior of the washing chamber in such position.

Means are likewise provided to secure fresh water rinse of the washed articles, the washing chamber being provided with a fresh water rinse line 35, and a control valve 36 therefor for controlling the supply of water to the rinse line 37, which extends to and is suitably disposed within the washing compartment to provide for the application of upper and lower rinsing sprays to the washed dishes. Control member 25 is likewise arranged to provide for control of the rinsing operation, and is capable of movement from neutral position into the rinse position indicated by R in Fig. 3. In such position shaft 26, carrying a crank 40 upon which is mounted a roller 41, is caused to rotate to bring roller 41 into contact with lever arm 42 pivotally mounted at 43, and carrying a plunger 44 upon its other end. Plunger 44 is adapted to be brought into operating contact with the valve stem 45 of rinse valve 36, and resilient means 46 permits travel of lever 42 without injury to the valve stem. A flow of fresh hot rinsing water thus continues as long as the control handle is held in the rinse position, usually only a few seconds rinsing operation being required. Yieldable means are preferably provided for returning control handle 25 from the rinse position to neutral position. The action of interlocking the doors takes place similarly during the rinsing operation to that described above, as will be evident from the structure of the parts disclosed. Control of the rinsing action as regards time, or temperature, or both, similar in construction and function to that described herein for the washing action, may be provided in case it is desired to secure predetermined conditions of rinse.

In certain washing machines it is desired to have the motor and pump operate in a substantially continuous manner, with the control of the washing operation dependent upon manual operation of a control lever. In order to secure the washing operation under the predetermined controlled conditions described, means are provided in accordance with the present invention to establish the desired conditions of operation. The temperature of the wash water is controlled by a suitable means for supplying heat, such as a steam regulator indicated generally at 50, having connection with a steam line 51, and being under the control of a thermostat 52 extending into the sump 15, to control the supply of steam through valve 50 and supply line 53, in accordance with the temperature condition to be maintained within the wash water. For example, successful results have been secured utilizing a steam regulator of this character adjusted to maintain a temperature condition within the wash water of approximately 170° F.

In order to prevent operation of the washing machine except under a desired temperature condition, means are provided for requiring that the wash water be maintained at some desired temperature condition in order for the machine to be operable in its normal washing operation. Such means is conveniently located in the control circuit for the pump motor 17. Such motor is provided with a control box 55 containing a push button switch 56 for starting the motor operation and push button switch 57 for stopping the operation when desired. A thermostat 75

58 is arranged to be responsive to the temperature condition of the wash water and is connected in circuit with relay 59 which provides for control of circuit to motor 17. As shown in Fig. 5 for example the push button circuit may be so arranged that operation of the start button 56 will cause the operation of relay 59 and the closing of its two sets of contacts, regardless of the temperature condition of the water. Provided however the temperature condition has reached the desired minimum, thermostatic relay 58 will close its contacts, thus establishing a holding circuit for relay 59 so that the energization of the relay will be continued after release of push button 56, and until operation of stop button 57. Such arrangement is usually preferred to permit of direct manual control of the pump motor when required for test or adjustment purposes or the like. It will be evident that unless the thermostatic switch 58 is closed relay 59 will be released and the pump motor 17 stopped, as soon as push button 56 is released, and for practical operating purposes therefore this arrangement requires the establishment of the desired minimum temperature condition before the normal washing operation can be conducted. If desired, the thermostat switch may be located directly in circuit with switch 56 and relay 59 so that under no circumstances can the relay be energized and the motor operated unless the temperature responsive switch 58 has closed.

Means are likewise provided for securing the continuance of the washing operation for the period of time which has been determined to be desirable under the particular conditions of use and preventing removal of the washed articles from the washing zone until the desired effective washing action has been secured. The control means for securing this result is preferably located in control compartment 60 which may be mounted upon the top part of the housing of the device, having a removable cover 61 permitting access to the interior of the compartment. Within the compartment there is provided a timing device which is effective to maintain the mechanism in washing condition for the predetermined period of time. In the embodiment illustrated, the control handle shaft 26 extends upwardly into the compartment 60, and is there provided with a link 62 having pivotal connection with a rod 63 which carries nut 64 upon the end thereof. The end of the rod is received within a hollow portion of link 65, the nut 64 being adapted to bear against an apertured end portion 65a therein to permit of overrunning movement of rod 63 with respect to link 65. The link is connected to the operating portion of a switch device 66, and resilient means 67 provides for yieldable extension of the rod through the end portion 65a, in one direction, while providing for positively operating the link 65 in the other direction of movement.

A timing device or relay, indicated generally at 70 is also positioned within the compartment, this device being of suitable construction to provide for the closing of a circuit, in response to actuation of switch 66, for a predetermined period of time, and to open such circuit only after such predetermined interval. Preferably the device is so constructed as to have a variable time operation, so that it can be adjusted to operate with the particular time period desired for the particular conditions of use. While various forms of time delay device are usable, it is preferred to utilize a time relay incorporating a

substantially constant speed motor for controlling the time during which the circuit is maintained closed, and for automatically resetting itself for subsequent operation. A suitable device of this character is that described in Goff Patents 2,037,572 and 2,071,202 the timing period of which may be regulated to provide for a time delay of any desired range; for the present purposes it has been found desirable to use a timing device having a variable time range of from a small fraction of a minute to a number of minutes.

The circuit controlled by such time delay device includes a switch means 71 which is closed immediately in response to the closing of the energizing circuit through switch 66, this operation starting the running of the timing period. During such period the switch 71 in the controlled circuit remains closed, and is opened only at the termination of the period. Switch 71 upon closing provides a circuit from the line for energizing a solenoid 72. The solenoid has a plunger 73 which is connected through linkage 74 with a locking pin 75 adapted to be moved upon energization of the solenoid, into the range of movement of the lever 62 to lock it in position. As will be evident from Figs. 4 and 5, when control lever 25 is moved into the wash position, rod 63 effects the closing of switch 66, thereby beginning the operation of the time relay 70. Immediately upon operation, such relay energizes solenoid 72, which pulls in its plunger, causing pin 75 to move into the path of operation of the lever 62. In such position the lever 62 and control arm 25 cannot be moved away from the wash position and switch 66 can not be opened to effect deenergization of timing device 70. During this period the washing operation continues uninterrupted, and upon the termination of the predetermined period, the solenoid 72 is deenergized, and resilient means 76 causes retraction of pin 75, making it possible for the operator to manually return control handle 25 to neutral position. Return of control handle 25 to neutral position effects opening of switch 66 in the circuit of the timing device, which is then reset in condition for a subsequent cycle of operation.

In order to indicate the condition of the machine to the operator, a jewel 77 is positioned in plainly visible location upon the compartment, and is arranged to be illuminated by light source 78 which is likewise controlled in the same circuit with solenoid 72. Thus upon the initiation of the washing operation the jewel 77 is caused to be illuminated, and the operator knows that until the termination of such illumination it is impossible to move control handle 25 to neutral to effect the termination of the washing operation and removal of the carrier tray containing the washed articles.

In Fig. 6 there is shown a somewhat modified arrangement, applicable to a washing machine in which interlock mechanism for interlocking the doors is not utilized or required. In such arrangement the control of the washing operation is secured by the starting and stopping of the pump motor, and in accordance with this invention the washing operation is correspondingly made to be dependent upon controlled time and temperature conditions of wash. Thus the motor driving the pump is arranged to be controlled by relay 81. The energizing circuit for this relay includes start push button 82 and stop push button 83. A holding circuit 84 is arranged to be closed through contacts 85 upon the closing of

the relay under the action of the start button, a temperature responsive switch 86 being located in the holding circuit to provide for holding the relay in operated condition only when the temperature of the washing liquid is within the predetermined desired range. The time relay device 87 has a control circuit 88 connected across the motor 80, so that such control circuit is energized upon the energization of the motor. In response to such energization, the relay closes its control switch 89, which is connected in parallel with, or as a by-pass to, stop button 83. This provides for shunting the stop button circuit for a predetermined period of time as determined by the setting of the adjustable time relay. During this interval, following the starting of the pump motor, operation of stop button 83 has no effect upon the motor operation as the circuit to relay 81 is maintained through switch 89. Following the termination of the predetermined time period, relay device 87 effects the opening of switch 89, which thereupon restores control of the motor operation to stop button 83. The motor operation continues, and at any time thereafter operation of stop button 83 will effect the deenergization of relay 81, and the consequent stopping of the motor, thereby restoring the system to its initial condition, in preparation for a subsequent cycle of operations. With this arrangement motor operation is possible, in the normal washing condition, only provided the temperature of the wash water is within a predetermined range, and the operation with such water of controlled temperature is continued for a predetermined period of time. As before, the thermostatic switch 86 may be located in the main energizing circuit to relay 81 to prevent the closing thereof, even under manual operation, except when the desired temperature condition is maintained.

While the forms of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A washing machine of the character described comprising a washing compartment into which articles are placed and removed at the will of the operator, means for supplying washing fluid to the articles positioned within said compartment, and means requiring the establishment of predetermined controlled conditions of temperature of washing fluid and of duration of the period of supply thereof within said compartment to secure an effective and complete washing operation upon the articles, before their removal from the compartment, and manually operable means providing for stopping said washing action immediately following the timed washing operation for removal of the washed articles from said washing compartment and replacement thereof by other articles to be washed.

2. A washing machine of the character described comprising a washing compartment for receiving articles to be washed, means for supplying washing fluid to such articles in the compartment to subject such articles to a washing operation, and means for insuring effective and sterile washing thereof including means for conducting the washing operation only when the temperature of said washing fluid is above a predetermined value, manually operable means for terminating the washing operation, and means

preventing operation of said manually operable means to terminate the washing operation until after a predetermined minimum period of washing.

3. A washing machine of the character described adapted to wash articles comprising a compartment for receiving articles to be washed, means for supplying washing fluid to such articles to subject such articles to a washing operation, manually operable control means for starting and stopping the operation of said supply means, and means for insuring effective and sterile washing of said articles including means for maintaining said supply means in operation for a predetermined minimum period of time and for restoring control of the supply means to said manual control means after said time period, and means for preventing removal of the articles from said compartment until after said predetermined period of operation of said fluid supplying means.

4. A washing machine of the character described having a washing compartment adapted to receive articles to be washed, means for supplying washing fluid to said articles, means for controlling said supplying means to cause the supplying of such washing fluid only when the temperature condition thereof corresponds with predetermined desired values, means preventing removal of articles from said washing compartment during the washing operation, and means for continuing the washing operation for a predetermined minimum period of operation.

5. A washing machine of the character described comprising a washing compartment adapted to receive articles to be washed, doors providing access to said compartment, means for supplying washing fluid to the articles within the compartment, a manually operable control lever for controlling operation of said supplying means, interlock means cooperating with said control lever and said doors to prevent actuation of said control lever to effect supply of washing fluid when said doors are in other than closed position, and means for preventing the termination of the washing operation for a predetermined period of time.

6. A washing machine of the character described comprising a washing compartment adapted to receive articles to be washed, doors providing access to said compartment, means for supplying washing fluid to the articles within the compartment, a manually operable control lever for controlling the supply of washing fluid to said compartment, interlock means cooperating with said control lever and said doors to prevent actuation of said supply means when said doors are in other than closed position, and means associated with said control lever for preventing return thereof to off position for a predetermined time interval following actuation of the control lever to effect operation of the washing fluid supply means.

7. A washing machine of the character described comprising a washing compartment adapted to receive articles to be washed, doors providing access to said compartment, means for supplying washing fluid to the articles within the compartment, a manually operable control lever for controlling the supply of washing fluid to said compartment, interlock means cooperating with said control lever and said doors to prevent actuation of said supply means when said doors are in other than closed position and to prevent opening of said doors during a washing operation, and means associated with said control lever for pre-

venting return thereof to off position for a predetermined time interval following actuation of the control lever to effect operation of the washing fluid supply means.

5 8. A washing machine of the character described comprising a washing compartment adapted to receive articles to be washed, pump means for supplying washing fluid to said compartment, control means for said pump means
10 for effecting operation thereof only when said fluid is above a predetermined temperature, and means effecting continued operation of said pump means to supply washing fluid to said articles within the compartment for a predetermined
15 period of time to secure a desired and effective washing operation thereof as a minimum washing period, and manual means effective after said predetermined minimum period to cause termination of the supply of washing fluid into said washing compartment.

20 9. A washing machine of the character described having a washing compartment adapted to receive articles to be washed, means for supplying washing fluid to said articles, means for
25 controlling said supplying means to cause the supplying of such washing fluid only when the temperature condition thereof corresponds with predetermined desired values, rinse means for rinsing the dishes within said compartment,
30 means preventing removal of the articles from said washing compartment during washing or rinsing operations, and means for continuing the washing operation for a predetermined minimum period of operation.

35 10. A washing machine of the character described comprising a compartment for receiving articles to be washed, means for supplying washing fluid to said articles in the compartment, manually operable means for starting and stop-
40 ping the operation of said supply means, means preventing starting of said supply means under control of said manually operable means except

when the temperature of said washing fluid is above a predetermined minimum, and means preventing stopping of said washing fluid supply means under control of said manually operable means for a predetermined minimum period of time.

11. A washing machine of the character described adapted to receive articles to be washed, means for supplying washing fluid to said articles, control means for supplying washing fluid only when such
10 fluid has predetermined temperature conditions, rinse means, a manually operable control member controlling said washing fluid supply means and said rinse means and having a neutral position, a wash position and a rinse position, and means
15 for retaining said control member in wash position for a predetermined minimum period of time to secure predetermined minimum conditions of time and temperature of wash of said articles.

12. A washing machine of the character described comprising a washing compartment, means therein for receiving articles to be washed, the articles being placed within the compartment before the beginning of the washing operation and being removable from the compartment fol-
25 lowing the washing operation in preparation for receiving other articles to be washed, means for washing the articles while in said compartment by supplying washing fluid thereto, control means
30 actuatable to cause operation of said washing means, means cooperating with said control means to prevent operation of said washing means except when the temperature of said fluid is within a predetermined range, and means for main-
35 taining the washing means in operation for a predetermined minimum period of time and for restoring control of the operation of said washing means to said control means after said time period.

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