United States Patent [19]

Blakeslee

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[54] **AUTOMATIC CONTROL SYSTEM FOR DISHWASHING APPARATUS**

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[52] **U.S. Cl.**..... **307/141,** 134/57 D, 340/309.4

[51] **Int. Cl.** **H01h 43/10**

[58] **Field of Search**..... 134/57 D, 58 D; 340/309.1, 309.4; 15/3, 60; 307/116, 141

[56] **References Cited**

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[57] **ABSTRACT**

A control system for a commercial dishwashing apparatus of the orbital conveyor type having washing and rinsing sections is designed to automatically operate the pump units for the washing and rinsing sections in a timed sequence and operate an electrical signal means to indicate when the soiled ware in the conveyor is cleaned and ready for removal. After all the soiled ware on the conveyor has been passed through the washing and rinsing sections, the pump units are sequentially stopped and the electrical signal means changes to inform the operator that the automatic operation is terminated.

8 Claims, 3 Drawing Figures

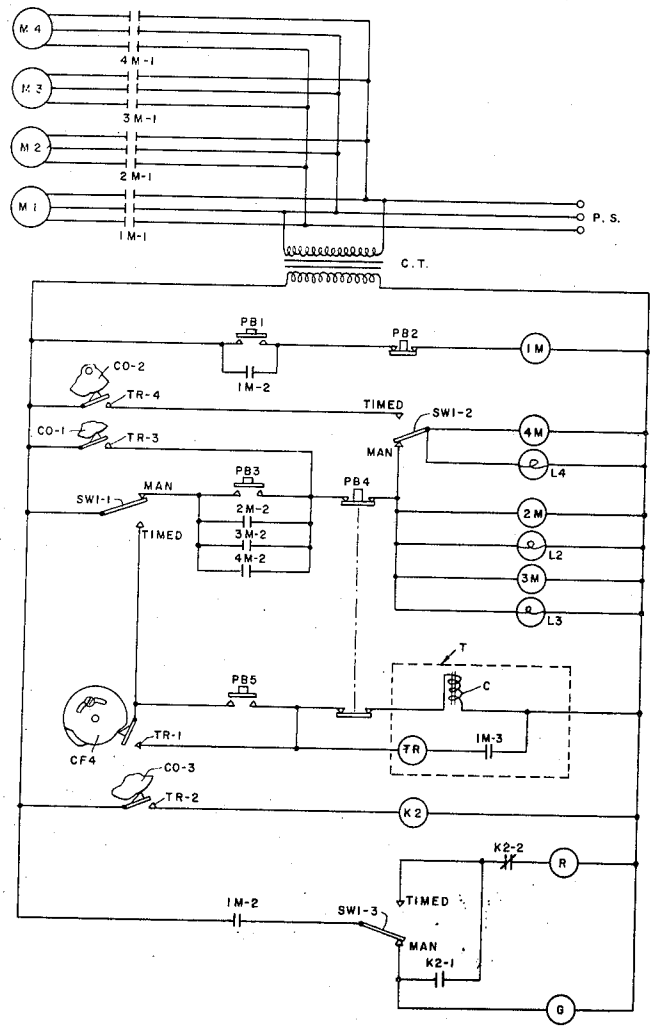


Fig. 1.

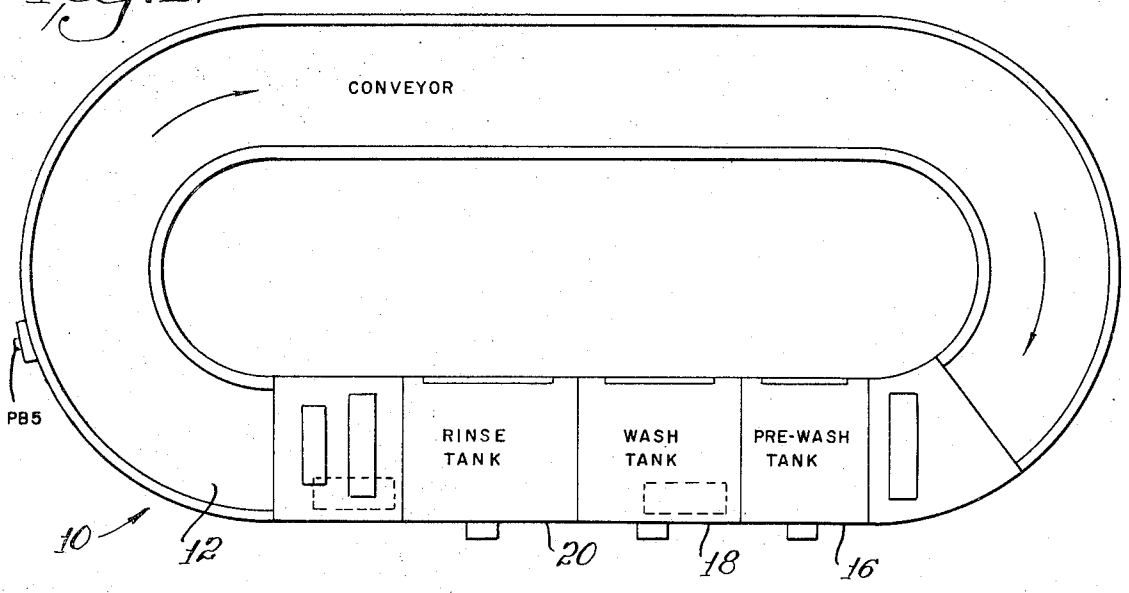
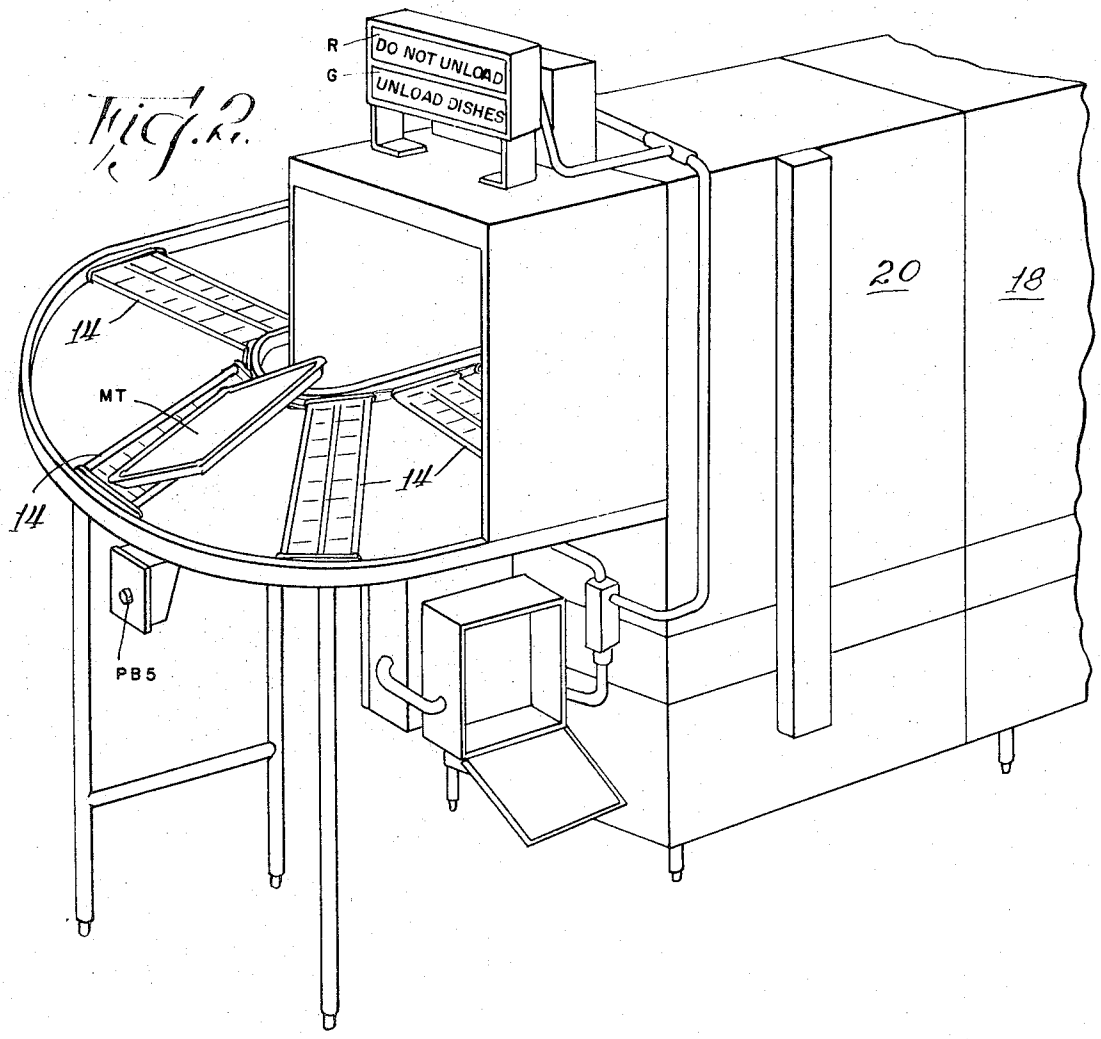

CONVEYOR
PB5
RINSE TANK
WASH TANK
PRE-WASH TANK
10
12
20
18
16

Fig. 2.


R
G
DO NOT UNLOAD
UNLOAD DISHES
14
MT
14
14
PB5
20
18

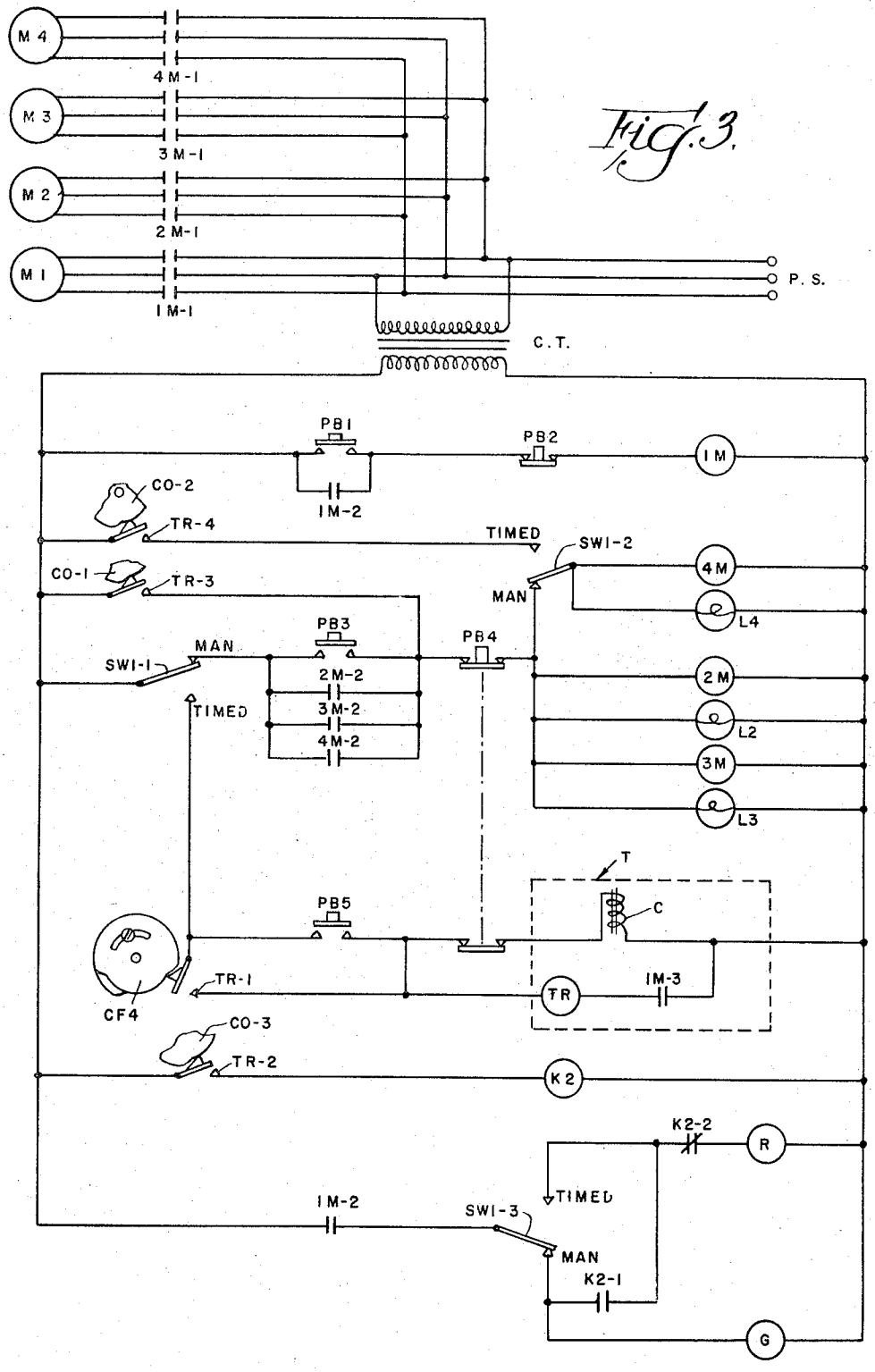

M 4
4M-1
M 3
3M-1
M 2
2M-1
M 1
1M-1
P. S.
C. T.
PB1
PB2
1M
1M-2
CO-2
TR-4
TIMED
SWI-2
CO-1
TR-3
MAN
4M
L4
PB3
PB4
SWI-1
MAN
2M-2
3M-2
4M-2
2M
L2
3M
L3
TIMED
T
C
PB5
TR-1
TR
1M-3
CF4
CO-3
TR-2
K2
K2-2
R
TIMED
1M-2
SWI-3
MAN
K2-1
G

Fig. 3.

AUTOMATIC CONTROL SYSTEM FOR DISHWASHING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to an electric control system for automatically operating various operating units in a commercial dishwashing apparatus.

Many users of commercial dishwashers, such as schools and hospitals, employ one person to both load and unload the dishes. Because of the speed at which the conventional commercial dishwashers are designed to operate, one person cannot possibly load the conveyor system to any significant portion of its full carrying capacity. As a consequence, there is a great waste of water and liquid detergent if the machines are continuously run.

One obvious solution to this problem is to delay turning on the pumps for the various washing and rinsing units until the conveyor is fully loaded. One of the objections to this practice is that there is the inherent danger that some of the soiled ware will not be washed because the operator fails to complete one revolution or someone continues loading soiled ware while unloading is taking place, or even the more likely possibility that some of the dishes will be washed and rinsed twice with the resulting waste of water and detergent. Another objection is that upon simultaneously turning on the washing and rinsing units the scalding water of the rinsing unit will tend to fuse the soiled particles on those dishes that were not previously washed.

This invention provides a solution to the above outlined problem by adding an automatic control system to a commercial dishwashing system which will sequentially operate the washing and rinsing units, actuate a signal means to inform the operator when the dishes are clean, and sequentially deenergize the washing and rinsing units.

SUMMARY OF THE INVENTION

A control system for commercial dishwashing apparatus of the orbital conveyor type having washing and rinsing sections automatically energizes pump units for the washing and rinsing units in timed sequence and actuates electrical signal means to indicate items passing through unload area are clean. After the conveyor completes approximately one revolution, the pump units are sequentially deenergized in the conveyor's direction of travel, and upon the deenergization of the last pump unit the signal means is actuated to inform the operator to cease unloading.

DESCRIPTION OF DRAWINGS

For a better understanding of this invention, reference may be made to the accompanying drawings, in which:

FIG. 1 is a top plan view of commercial dishwashing apparatus of the orbital type which includes a control system embodying the principles of my invention;

FIG. 2 is a perspective view of the left end of FIG. 1, and

FIG. 3 is an electrical schematic diagram of a control system for a commercial dishwashing apparatus which embodies the principles of my invention.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring now to FIGS. 1 and 2, there is shown a dishwashing machine 10 having an orbital conveyor

supporting table 12. A series of conveyor sections 14 (FIG. 2) extend transversely of the orbital path and are respectively pivotally interconnected at their inner ends. Each conveyor section has roller means at their inner and outer ends which are in rolling engagement with inner and outer orbital tracks provided around conveyor supporting table 12. A conveyor drive assembly moves the conveyor sections around the orbital path through a series of housings 16, 18 and 20. Mounted within each housing are conventional upper and lower spray boxes from which sprays of water or washing solution are projected upwardly and downwardly as dishes or other articles to be washed are carried through the housings by the conveyor sections. A motor pump unit is provided at the base of each housing for delivering the liquid to the spray boxes under pressure.

By way of illustration, housing 16 may serve as a prewashing tank, housing 18 as a main washing tank and housing 20 as a rinsing tank. For further details concerning the above-described apparatus, which is not per se part of this invention, reference may be made to U.S. Pat. No. 3,565,239, which issued on Feb. 23, 1971, and is assigned to the same assignee as this invention.

The conventional manner of operation of the above-described apparatus is to continuously run the conveyor drive assembly and the three pump-motor units. It will be appreciated that such a procedure can waste a considerable amount of water and electricity whenever the conveyor sections are not continuously fully loaded. It is the object of this invention to provide an optional control system which will selectively operate the various components and automatically shut them off.

Referring to FIG. 3, there is shown an electrical schematic diagram for a dishwashing system having two modes of operation. One mode of operation is effected by placing the SW1 switch in the "MAN" position, and the other mode is made operational when the switch SW1 is moved to "TIMED" position.

The electrical power is supplied from a three-phase voltage power supply connected to input wires labeled PS. Connected across the power input leads are rinse pump motor M4, wash pump motor M3, pre-wash motor M2 and conveyor drive motor M1. A transformer C.T. connected across two of the input power leads furnish the power to the various electrical controls and switches.

To operate in the conventional mode, selector switch SW1 is moved to "MAN" position. The conveyor drive is started by depressing push button start switch PB1, which energizes solenoid 1M to close contacts 1M-1 and 1M-2. Closing contacts 1M-2 establishes a hold circuit across switch PB1. Closing contacts 1M-1 energizes the conveyor motor 1M, and the conveyor sections are moved around the orbital path. To start the motorpump units, push button switch PB3 is depressed to energize solenoid coils 2M, 3M, and 4M. Coil 2M when energized closes contacts 2M-1 to close the circuit to pre-wash pump motor M2, and closes contacts 2M-2 to establish a hold circuit in parallel with switch PB3. Similarly the energization of coils 3M and 4M close contacts 3M-2 and 4M-2, respectively, to establish hold circuits and close contacts 3M-1 and 4M-1 to complete the circuit to wash pump motor M3 and rinse pump motor M4, respectively. Also, indicator lamps

L2, L3 and L4 are illuminated to inform the operator that all three pumps are operating.

To stop the pumps M2, M3 and M4, push button PB4 is depressed, and to halt the conveyor drive, push button PB2 is actuated.

When it is desired to operate the dishwashing apparatus on an economical basis, the selector switch is moved to the "TIMED" position maneuvering contacts SW1-1, SW1-2 and SW1-3 to their respective "TIMED" positions. By virtue of contact SW11 moving to this position, a timer device T is enabled to be energized. Timer device T could be any of a number of commercially available, for example, a timer manufactured by the Eagle Signal Co. of Davenport, Iowa, Type HO-43A601.

The timer device T operates as a programming means for the operating units of the dishwasher and comprises an electric motor TR which drives an output shaft (not shown) when the clutch coil C is energized. This output shaft carries three ON cams and four OFF cams. The ON and OFF cams are pre-set to automatically energize and deenergize various operating components of the washing machine as will become more clear when described hereinafter.

There are three pairs of ON cam-OFF cam combinations which are closely spaced together to hold a noramlly open switch in the closed position. The setting of the ON cam determines when the switch is closed in the timed cycle and the setting of the OFF cam determines when the switch is released to open. In other words, the OFF cam is adjusted relative to the ON cam setting to hold the switch closed for a desired period of time. Thus, the ON cams actuate switch means to energize the pump units and a "ready to unload" signal indicator in a timed sequence, and the OFF cams actuate the same switch means to deenergize the pump units.

The ON cams are adjusted in the following manner. The conveyor system is energized and a marked tray "MT" (FIG. 2) is placed on one of the conveyor sections 14. At approximately two feet before the marked tray MT enters the pre-wash tank 16, Cam CO-1 is positioned to close contacts TR-3. As the marked tray enters the rinse tank 20, ON cam CO2 is set to close contacts TR-4. When the marked carrier enters the approximate center of the unload area, approximately at the location of push button PB5 of FIG. 2, adjust the cam CO-3 to close contacts TR-2. The marked carrier is then conveyed around the orbital path and when it passes approximately 2 feet beyond the wash spray in wash tank 18, OFF cam CF-1 is set to release contacts TR-3 to allow it to open. Similarly, when the marked carrier passes beyond the center of the rinse spray in rinse tank 20 by approximately 2 feet, the OFF cam CF-2 is adjusted to release contact TR-4 and the OFF cam CF-3 is set to release contact TR-2.

Referring to FIG. 3, it will be seen that contacts TR-3 upon closing complete the circuit through solenoid coils 2M and 3M and lamp indicators L2 and L3. Thus when cam CO-1 closes contacts TR-3, coils 2M and 3M are energized closing the contacts 2M-1 and 3M-1 to permit the energization of the pre-wash pumping unit M2 and wash pumping unit M3. Likewise, upon the closing of contacts TR-4 by ON cam CO-2, the solenoid coil 4M and its associated indicator light L4 are energized to close the circuit to rinsing-pumping unit M4.

When the ON cam CO-3 closes contacts TR-2, the solenoid coil K2 is energized causing the normally closed contacts K2-2 to open and the normally open contacts K2-1 to close with the result that the indicator R is extinguished and the indicator lamp G is lit.

Referring to FIG. 2, the indicator lamp R illuminates the upper sign "Do No Unload" and the other indicator G illuminates the lower sign — "Unload Dishes." It would thus be appreciated that when coil K2 is energized, the signal means on the top of the dishwasher will change from "Do Not Unload" to "Unload Dishes."

Upon the OFF cam CF-1 releasing the contacts TR-3, the coils 2M and 3M and their associated indicator lamps L2 and L3, respectively, are deenergized causing the two wash pump units M2 and M3 to terminate their operation. Likewise, the opening of TR-4 contacts by OFF cam CF2 deenergizes coil 4M and indicator lamp L4 to deenergize the rinse pump unit M4.

When the OFF cam CF-3 opens contacts TR-2, the coil K2 is deenergized causing the signal means to return to its original position with the "Do Not Unload" sign illuminated.

Simultaneously with the deenergization of coil K2 by OFF cam CF2, a fourth OFF cam CF4 is set to release contacts TR-1 with the result that the timer coil TR and clutch coil C are deenergized. The timer T includes a spring-loaded resetting means which repositions all of the ON and OFF cams to their original starting positions upon the deenergization of clutch coil C.

If for some reason during the operation of the TIMED mode it is necessary to stop the conveyor, a stop button PB2 may be depressed causing the deenergization of conveyor coil 1M and opening contacts 1M-1. Also the deenergization of conveyor coil 1M opens contacts 1M-2 and 1M-3. The opening of contacts 1M-2 deenergizes the signalling means so that neither indicator lamps R or G can be ignited. The opening of the other conveyor coil contacts 1M-3 deenergizes the timer coil TR causing all the pumping units to be deenergized. It will be noted that coil C remains energized so that upon the re-energization of the conveyor drive the timing will continue through the sequence of operations.

To stop the pumping units during the time mode of operation, PB4 may be depressed with the result that the clutch coil C is deenergized and the timer T resets to zero.

I claim:

1. A control system for a dish washer apparatus having an orbital conveyor assembly adapted to move soiled ware through various compartments including washing and rinsing sections and an unload area adjacent said rinsing section, comprising first pump unit for said washing section, second pump unit for said rinsing section, signal means for indicating the removal of cleaned ware at said unloading area, first control means for energizing said first pump unit, second control means for energizing said second pump unit, third control means for operating said signal means, and programming means for sequentially activating said first, second and third control means at predetermined time intervals and after the completion of at least one revolution of the conveyor to sequentially deactivate said first, second and third control means at predetermined time intervals.

2. A control system as defined in claim 1, wherein said programming means comprises timer means, output shaft driven by said timer means and carrying a plurality of adjustable cam pairs, one of said cam pairs adjusted to activate and deactivate said first control means, second of said cam pairs adjusted relative to said first cam pair to activate and deactivate said second control means, and third of said cam pairs adjusted relative to said second cam pair to activate and deactivate said third control means.

3. A control system as defined in claim 2, wherein said programming means further comprises means for resetting said timer means when deenergized, and an adjustable cycle cam carried by said output shaft for deenergizing said timer means simultaneously with deactivating said third control means.

4. A control system as defined in claim 2, wherein said signal means comprises a ready-to-load lamp and not-ready-to-load lamp, and said third control means includes normally-closed electrical contacts in series with said not-ready-to-load lamp and normally-open contacts in series with said ready-to-load lamp, whereby said third pair of cams are adapted to simultaneously actuate said normally-closed and normally-open contacts to alternately turn on said lamps.

5. A control system for a dish washer apparatus having an orbital conveyor assembly adapted to move soiled ware through various compartments including washing and rinsing sections and an unload area adjacent said rinsing section, comprising first pump unit for said washing section, second pump unit for said rinsing section, electrical signal means for indicating the removal of cleaned ware at said unloading area, first switch means for energizing said first pump unit, second switch means for energizing said second pump unit, third switch means for operating said electrical signal means, and programming means for sequentially closing said first, second and third switch means at predetermined time intervals and after the completion of at least one revolution of the conveyor to sequentially open said first, second and third switches at predetermined time intervals.

6. A control system as defined in claim 5, wherein said programming means comprises timer means, output shaft driven by said timer means and carrying a plurality of adjustable cam pairs, one of said cam pairs adjusted to close and open said first switch means, second of said cam pairs adjusted relative to said first cam pair to close and open said second switch means, and third of said cam pairs adjusted relative to said second cam pair to close and open said third switch means.

7. A control system as defined in claim 6, wherein said programming means further comprises means for resetting said timer means when deenergized, and an adjustable cycle cam carried by said output shaft for deenergizing said timer means simultaneously with opening of said third switch means.

8. A control system as defined in claim 6, wherein said electrical signal means comprises a ready-to-load lamp and not-ready-to-load lamp, and said third switch means includes normally-closed contacts in series with said not-ready-to-load lamp and normally-open contacts in series with said ready-to-load lamp, whereby said third pair of cams are adapted to simultaneously actuate said normally-closed and normally-open contacts to alternately turn on said lamps.

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