

May 21, 1968

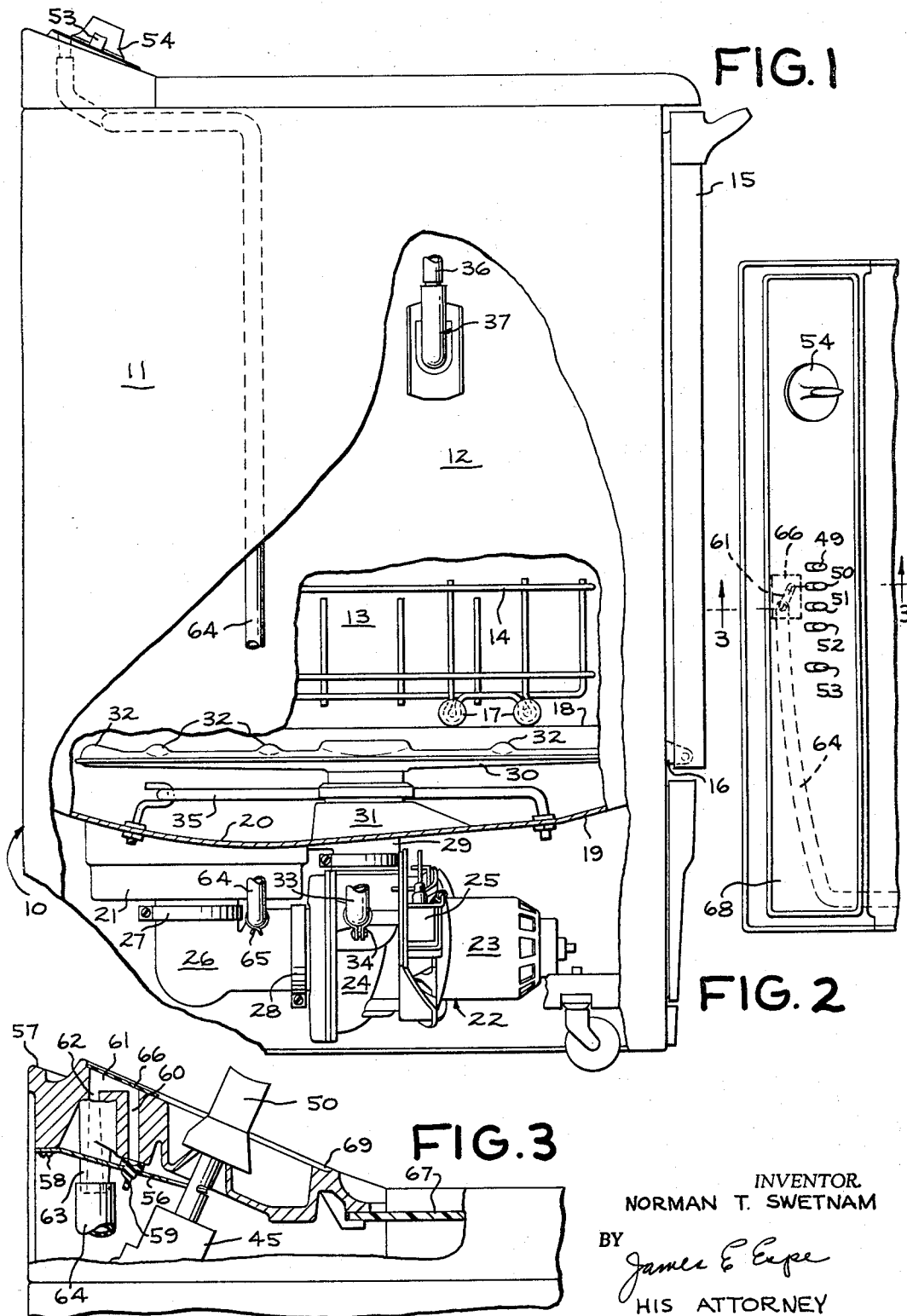
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3,384,098

CONTROL MEANS FOR AUTOMATIC DISHWASHER

Filed Aug. 17, 1966

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

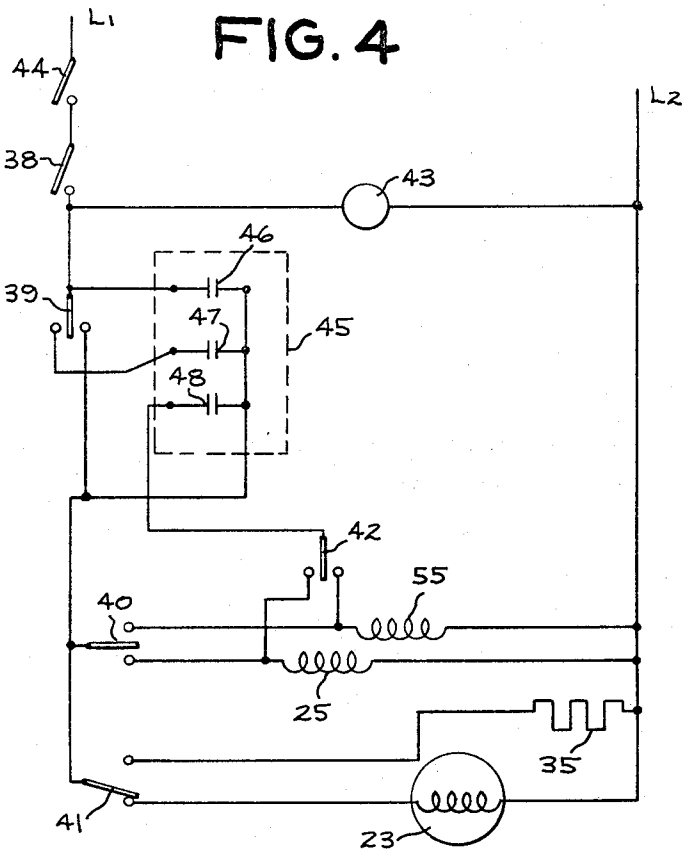


FIG. 5

CYCLE	SWITCH			RINSE	WASH	RINSE	WASH	RINSE	RINSE	DRY	
	46	47	48								
DAILY LOAD	X	O	O	☐	☐	☐	☐	☐	☐	☐	MINUTES
POTS & PANS	X	O	X	☐	7	☐	12	☐	4	23	MINUTES
SHORT WASH	O	X	O	---	---	☐	☐	☐	☐	---	MINUTES
CHINA & CRYSTAL	O	X	O	---	---	☐	☐	☐	☐	14	MINUTES
RINSE & HOLD	O	O	O	---	---	☐	☐	---	---	---	

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CONTROL MEANS FOR AUTOMATIC
DISHWASHER

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Electric Company, a corporation of New York
Filed Aug. 17, 1966, Ser. No. 573,102
13 Claims. (Cl. 134—58)

This invention relates generally to automatic dishwashers and, more specifically, to an improved control means for an automatic dishwasher.

It is known that different washing actions in the same dishwasher are often desirable for different articles. For example, some dishes are quite sturdy and become heavily soiled during use; in such a case, a high energy level of the water impacting against these dishes is desirable. On the other hand, dishes such as fine china and crystal, are quite delicate and do not usually get so soiled. In such a case, a lower energy level may be desirable. Means to achieve such a lower energy level is described and claimed in U.S. Patent No. 3,134,386, issued May 26, 1964, to Thomas E. Jenkins, and assigned to the General Electric Company, assignee of the present invention. The patent to Jenkins describes an arrangement wherein air, or other gas, is admitted to the dishwasher pump inlet to mix with the wash fluid. This creates, at least to a limited extent, air locking of the pump with a resulting decrease of energy level of the wash fluid even though the pump operates at substantially constant speed.

In addition to the energy level of the wash fluid, other variations of the dishwasher cycle of operation have been proposed heretofore to accommodate different articles, and types of articles, in an automatic dishwasher. For example, U.S. Patent No. 3,259,764, issued July 5, 1966 to Norman L. Kendt, and assigned to the General Electric Company, assignee of the present invention, proposes a shortened cycle for fine china and crystal. This shortened cycle subjects the fine china and crystal to less washing action and thus avoids unnecessary consumption of large quantities of water and electricity. Heretofore, no one has proposed a practical and inexpensive means to conveniently combine the advantages of each of the aforementioned arrangements.

Accordingly, it is an object of this invention to provide an improved control means for an automatic dishwasher.

It is another object of this invention to provide a control means for an automatic dishwasher which provides automatic lowering of the energy level simultaneously with the electrical setting for a fine china and crystal cycle.

It is a further object of this invention to provide an improved valve to admit gas to a dishwasher pump to lower the energy level of the wash fluid leaving the pump.

It is a further object of this invention to provide means to simultaneously operate a valve and a switch in a control system of an automatic dishwasher.

In accordance with one aspect of the present invention, there is provided a control means for an automatic dishwasher comprising a housing having a passageway there-through opening at one end to the atmosphere. A flexible carrier is secured adjacent one of its ends to the housing and a sealing device is supported by the carrier adjacent the end of the passageway which opens to the atmosphere. A manually-operable pushbutton is movable between at least first and second positions and is adapted to flex the carrier between first and second positions. The sealing device is adapted to close the one end of the passageway when the carrier is in the first position and open the one end of the passageway when the carrier is in the second position.

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In accordance with another aspect of the present invention, there is provided a control system for an automatic dishwasher having a wash chamber adapted to receive and contain articles to be washed therein, electrically-operated elements including washing means to effect a washing action upon the articles by spraying liquid toward the articles and means to vary the energy level at which the liquid is sprayed. The control system comprises a sequence control means having a synchronous electric drive motor, a plurality of cams driven by said motor and a plurality of switches operated by the cams. The plurality of switches are in electrical circuit with the electrically-operated elements to control the elements through a series of operations comprising a complete operational cycle of the dishwasher. A selector switch is in electrical circuit with at least one of the switches and in electrical circuit with the washing means. The selector switch includes a plurality of manually-operable buttons, the operation of which serves to select a particular one of a plurality of complete operational cycles of the dishwasher. A valve is associated with one of the plurality of manually-operated buttons whereby movement of the one of the buttons opens the valve. The valve communicates with the washing means to vary the energy level at which the liquid is sprayed, whereby opening of the valve reduces the energy level.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention, it is believed the invention will be better understood from the following description taken in connection with the accompanying drawings, in which:

FIGURE 1 is an elevational view, partially cut away to show details, of an automatic dishwasher employing the present invention;

FIGURE 2 is a fragmentary top view of the dishwasher of FIGURE 1;

FIGURE 3 is a fragmentary sectional view taken along line 3—3 of FIGURE 2;

FIGURE 4 is a schematic representation of the electrical circuitry of the present invention; and,

FIGURE 5 is a chart showing various cycles provided by the sequential operation of the switches of FIGURE 4.

Referring now to the drawings, and particularly to FIGURE 1 thereof, there is illustrated an automatic dishwasher 10 having an outer cabinet 11 and an inner cabinet 12. Inner cabinet 12 defines therein a wash chamber 13 which contains at least one dish-supporting rack 14. Rack 14 is adapted to receive and support articles to be washed within wash chamber 13. A closure member or door 15 is pivotal about a substantially horizontal axis defined by a pair of hinges 16, only one of which is visible in FIGURE 1. Door 15 provides access to wash chamber 13 so that articles may be inserted into or removed from rack 14. In order to facilitate loading and unloading of rack 14, the rack is provided with a plurality of rollers 17 which rest upon a track 18 formed in the side walls of inner cabinet 12. When door 15 is pivoted to its substantially horizontal open position, a track on the inner surface of door 15 (not shown) aligns itself with track 18 so that rack 14 may be at least partially withdrawn from chamber 13 onto the opened door.

The lower extremity of wash chamber 13 is defined by a bottom wall 19 which gradually slopes to a low point 20. Disposed adjacent the low point 20 is a sump 21 within which fluids will collect. Disposed below, and supported by, bottom wall 19 is a motor-pump assembly 22 which includes an electric motor 23, pump 24 and an electrically-operated valve 25. Sump 21 and the inlet of pump 24 are interconnected by a large diameter conduit 26. Conduit 26 is secured to sump 21 by means of a clamp

27 and to the housing of pump 24 by means of a clamp 28. Pump 24 has a main outlet communicating with a conduit 29 which in turn communicates with a rotatable, reaction-type spray arm 30. Spray arm 30 is rotatably mounted atop a pedestal 31 formed in bottom wall 20. Moreover, spray arm 30 is provided with a plurality of orifices 32 which open upwardly to effect a wash action within wash chamber 13 when wash fluid is forcibly ejected therethrough. Some of the orifices 32 are angled so that reaction force of the fluid issuing therethrough exerts a rotary force upon spray arm 30 causing spray arm 30 to rotate about pedestal 31.

Pump 24 is also provided with an effluent discharge conduit 33 secured to the housing of pump 24 by means of a clamp 34. Valve 25 includes an element within the housing of pump 24 movable between two positions. In one of these positions, the element closes the effluent discharge outlet and opens the main outlet and, in the other of these positions, closes the main outlet and opens the effluent discharge outlet. An electrical resistance heating element 35 may be provided in the lower portion of wash chamber 13 to heat wash fluid therein and/or to facilitate drying of articles supported by rack 14 upon completion of the normal wash and rinse operations.

An electrically operated fill valve (not specifically shown in FIGURE 1) is provided to admit water to a conduit 36 which communicates with a fill funnel 37. Fill funnel 37 is mounted on one wall of the inner cabinet 12 and opens directly into wash chamber 13 so that, as water passes from conduit 36 into fill funnel 37, it is admitted directly into wash chamber 13.

Turning now to FIGURE 4, there is illustrated a schematic representation of the electrical circuitry of the present invention. This includes a sequence control means which may be mechanically constructed in accordance with well known criteria and includes a plurality of cam operated switches 38, 39, 40, 41 and 42. These switches are operated by a plurality of cams (not specifically shown) which are driven by a synchronous electric timer motor 43. In addition to the cam operated switches, there is a door operated switch 44 which is closed only when door 15 is securely latched in its closed position. Also, there is provided a selector switch 45 having three sets of contacts 46, 47 and 48. Contacts 46, 47 and 48 are operated by manually-operable pushbuttons 49, 50, 51, 52 and 53 (best seen in FIGURE 2). Selector switch 45 is of the variety wherein depression of one of the manually-operable pushbuttons automatically results in retraction of any previously depressed pushbutton so that the operator of dishwasher 10, by depressing any one of the manually-operable pushbuttons, selects a single cycle and cancels any earlier selected cycle.

A manually-operable knob 54 is mechanically linked to motor 43 so that initiation of the operation of dishwasher 10 may be accomplished by manually rotating knob 54 until the cam, normally driven by motor 43, closes switch 38. The closing of switch 38, assuming of course that the door is properly closed so that switch 14 is closed, energizes motor 43 by impressing upon it the voltage across lines L_1 and L_2 . Thus, timer motor 43 remains energized as long as switch 38 is maintained in the closed position by the cam driven by motor 43. The electrical components of the dishwasher, motor 23, valve 25, heater 35 and a fill valve 55 which admits water to conduit 36, are controlled either through contacts 46 or switch 39. If contacts 46 are closed, the operation of switch 39 will have no effect on the electrical components of the dishwasher. However, if contacts 46 are opened, switch 39 will control the components, either through contacts 47 or directly.

As schematically represented in FIGURE 5, the control system of the present invention provides five separate cycles. Each of these will be discussed in detail with the operation of the individual contacts of selector switch 45 explained.

The daily load cycle is achieved by depressing one of button 53 which would close contacts 46, as indicated in FIGURE 5, while maintaining contacts 47 and 48 open. Thus, power from lines L_1 and L_2 bypasses switch 39 so that operation of the motor 23, heater 35, valve 25 and valve 55 are controlled by switches 40 and 41. The cams controlling switches 40 and 41, though not specifically shown, are configured to provide a sequence of operations which include a rinse, a wash, a rinse, a wash, two rinses and a drying operation in that order. This sequence of operations is schematically illustrated in FIGURE 5.

A pots and pans cycle is achieved by depressing pushbutton 52 which maintains contacts 47 open but closes contacts 46 and contacts 48. Thus, power from lines L_1 and L_2 again bypasses switch 39 so that operation of the motor 23, heater 35, valve 25 and valve 55 are controlled by switches 40 and 41. Also, because contacts 48 are closed, operation of valves 25 and 55 are further controlled by switch 42. The cams controlling switches 40, 41 and 42 are configured to provide a sequence of operations as is schematically illustrated in FIGURE 5.

A short wash cycle is achieved by depressing pushbutton 51 which closes contacts 47 but maintains contacts 46 and 48 open. Thus, switch 39 as well as switches 40 and 41 serves to control the operation of the components of dishwasher 10. As described above, the cams controlling switches 39, 40 and 41 are configured to provide the sequence of operations schematically illustrated in FIGURE 5.

A china and crystal cycle is achieved by depressing pushbutton 50 which again closes contacts 47 while maintaining contacts 46 and 48 open. Accordingly, the electrical components of dishwasher 10 follow a sequence of operations identical to that of the short wash cycle; however, as will be described in greater detail hereinafter, air is admitted to pump 24, driven by motor 23, to lower the energy level at which the wash fluid issues through orifices 32.

Finally, a rinse and hold cycle is achieved by depressing pushbutton 49 which maintains contacts 46 and 48 open so that switch 39, along with switches 40 and 41, control the operation of the electrical components of the dishwasher 10. The cams controlling these switches are configured to provide the sequence of operations indicated in FIGURE 5.

As mentioned above, the china and crystal cycle is intended to provide a low energy spray. This may be achieved as taught in U.S. Patent No. 3,134,386, discussed above, and it is the purpose of the present invention to provide a control means whereby such lower energy spray action may be automatically achieved. In accordance with the present invention, pushbutton 50, which is that button depressed to achieve the china and crystal cycle, has associated therewith a flexible or resilient carrier 56, as best seen in FIGURE 3. One end of carrier 56 is secured to a housing or escutcheon frame 57 by means of a screw 58. Carrier 56 carries a sealing device 59 which may take the form of a small elastomeric member snugly received within an opening in carrier 56. Sealing device 59 is adapted to engage the inner surface of escutcheon frame 57 to seal the open end of one leg 60 of a generally U-shaped passageway 61. The other leg 62 of passageway 61 terminates at a boss 63 which is adapted to be connected to a conduit 64. Conduit 64 extends down between outer cabinet 11 and inner cabinet 12 to communicate with conduit 26. Conduit 64 is secured to conduit 26 by means of a clamp 65.

Thus, whenever pushbutton 50 is depressed, carrier 56 is flexed to withdraw sealing device 59 from engagement with the surface of escutcheon frame 57. This allows air to enter passageway 61 and then conduit 64. The air passes from conduit 64 into conduit 26 from where it enters pump 24 to effectuate a lowering of the energy

level of wash fluid issuing from orifices 32 in the manner described in aforesaid Patent No. 3,134,386.

Carrier 56 may be in the form of a leaf spring biased toward the position wherein sealing device 59 closes the open end of leg 60. Moreover, escutcheon frame 57 is preferably a cast metal part having passageway 61 molded therein during the casting of the escutcheon frame. In such a case, molding of the passageway may be facilitated by making the bight portion of the U in the form of a groove in the top side of the escutcheon frame. When this is done, passageway 61 is enclosed by providing a member 66 bonded to the surface of escutcheon frame 57. Member 66 may take the form of aluminum foil having an adhesive compound on one side thereof to ensure bonding to escutcheon frame 57.

Escutcheon frame 57 serves as a decorative assembly to house timer motor 43 (not shown in FIGURE 3) and selector switch 45. Moreover, escutcheon frame 57 receives one edge of a plastic laminate cover 67 which serves as a decorative member as well as a work surface for the housewife. The air that enters leg 60 is ambient air which finds its way into the area below escutcheon frame 57 by traveling up between inner cabinet 12 and outer cabinet 11 from the area below bottom wall 19. A thin planar member 68 (FIGURE 2) either plastic or metal, is received in recess 69 (FIGURE 3) to provide a smooth decorative surface.

Thus, it can be seen that the present invention provides an improved control means for an automatic dishwasher which provides automatic lowering of the energy level simultaneously with the electrical setting for a china and crystal cycle. Moreover, the present invention provides an improved valve to admit gas to a dishwasher pump to lower the energy level of the wash fluid leaving the pump. Additionally, the present invention provides means to simultaneously operate a valve and a switch in a control system of an automatic dishwasher.

As will be evident from the foregoing description, certain aspects of the invention are not limited to the particular details of construction of the example illustrated, and it is contemplated that various other modifications or applications will occur to those skilled in the art. It is therefore intended that the appended claims shall cover such modifications and applications as do not depart from the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A control means for an automatic dishwasher comprising:

- (a) a housing having a passageway therethrough opening at one end to the atmosphere,
- (b) a flexible carrier secured adjacent one of its ends to said housing,
- (c) a sealing device supported by said carrier adjacent said one end of said passageway,
- (d) a manually-operable pushbutton movable between at least first and second positions and adapted to flex said carrier between first and second positions,
- (e) said sealing device being adapted to close said one end of said passageway when said carrier is in said first position and open said one end of said passageway when said carrier is in said second position.

2. The invention of claim 1 wherein said carrier is a leaf spring biased toward said first position.

3. The invention of claim 1 wherein said housing comprises an escutcheon frame for the dishwasher control panel, said escutcheon frame being a cast metal part having said passageway molded therein.

4. The invention of claim 3 wherein said passageway is generally U-shaped with one leg terminating at a boss adapted to be connected to a conduit and the other leg of the U terminating at said one end whereby both said boss and said one end are disposed on the same side of said escutcheon frame.

5. The invention of claim 4 wherein the bight portion

of the U is a groove formed in the side of said escutcheon frame opposite said boss and said one end, and further comprising an additional member bonded to said escutcheon frame to form a closed passageway between the legs of the U.

6. The invention of claim 5 wherein said additional member comprises a piece of aluminum foil.

7. A control means for an automatic dishwasher having electrically-operated elements comprising:

- (a) a housing having a passageway therethrough opening at one end to the atmosphere,
- (b) a switch disposed adjacent said housing to electrically control at least one of said electrically-operated elements,
- (c) a manually-operable means movable between at least two positions to open and close said switch
- (d) a flexible carrier secured adjacent one of its ends to said housing and connected at its other end to said manually-operable means and adapted to be flexed between at least two positions as said manually-operable means is moved,
- (e) a sealing device supported by said carrier adjacent said one end of said passageway,
- (f) said sealing device being adapted to close said one end of said passageway when said carrier is in one of its said two positions and open said one end of said passageway when said carrier is in the other of said two positions.

8. The invention of claim 7 wherein said carrier is a leaf spring biased toward the position wherein said sealing device closes said one end of said passageway.

9. The invention of claim 7 wherein said housing comprises an escutcheon frame for the dishwasher control panel, said escutcheon frame being a cast metal part having said passageway molded therein.

10. The invention of claim 9 wherein said passageway is generally U-shaped with one leg terminating at a boss adapted to be connected to a conduit and the other leg of the U terminating at said one end whereby both said boss and said one end are disposed on the same side of said escutcheon frame.

11. The invention of claim 10 wherein the bight portion of the U is a groove formed in the side of said escutcheon frame opposite said boss and said one end, and further comprising an additional member bonded to said escutcheon frame to form a closed passageway between the legs of the U.

12. The invention of claim 11 wherein said additional member comprises a piece of aluminum foil.

13. In an automatic dishwasher having a wash chamber adapted to receive an contain articles to be washed therein, electrically-operated elements including washing means to effect a washing action upon the articles by spraying liquid toward the articles and means to vary the energy level at which said liquid is sprayed, a control system comprising:

- (a) a sequence control means having a synchronous electric drive motor, a plurality of cams driven by said motor and a plurality of switches operated by said cams,
- (b) said plurality of switches being in electrical circuit with said electrically-operated elements to control said elements through a series of operations comprising a complete operational cycle of the dishwasher
- (c) a selector switch in electrical circuit with at least one of said plurality of switches and in electrical circuit with said washing means,
- (d) said selector switch including a plurality of manually-operable buttons the operation of which serves to select a particular one of a plurality of complete operational cycles of the dishwasher, and
- (e) a valve associated with one of said plurality of manually-operated buttons whereby movement of said one of said buttons opens said valve,
- (f) said valve communicating with said means to vary

the energy level at which said liquid is sprayed where-
by opening of said valve reduces said energy level.

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