Nov. 30, 1965 B. L. BRUCKEN 3,220,426

COUNTERTOP DISHWASHER HAVING DUAL OPPOSED IMPELLERS AND A LABYRINTH DOOR SEAL

Filed Dec. 30, 1963 3 Sheets-Sheet 1

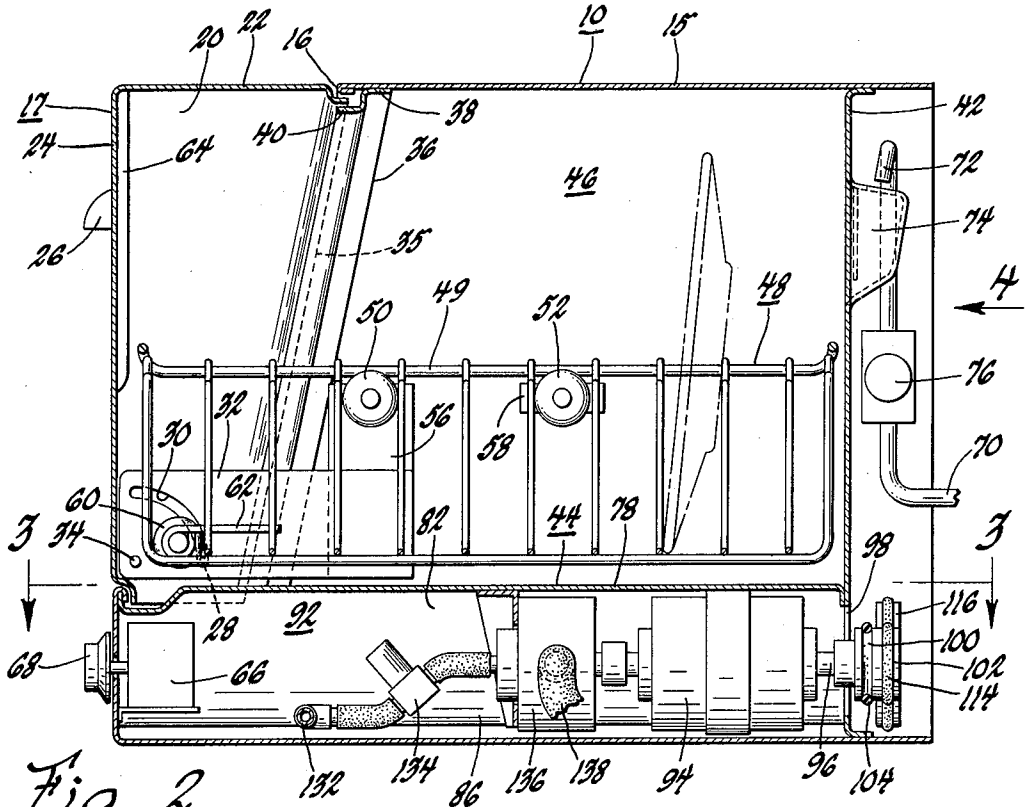

Fig. 2

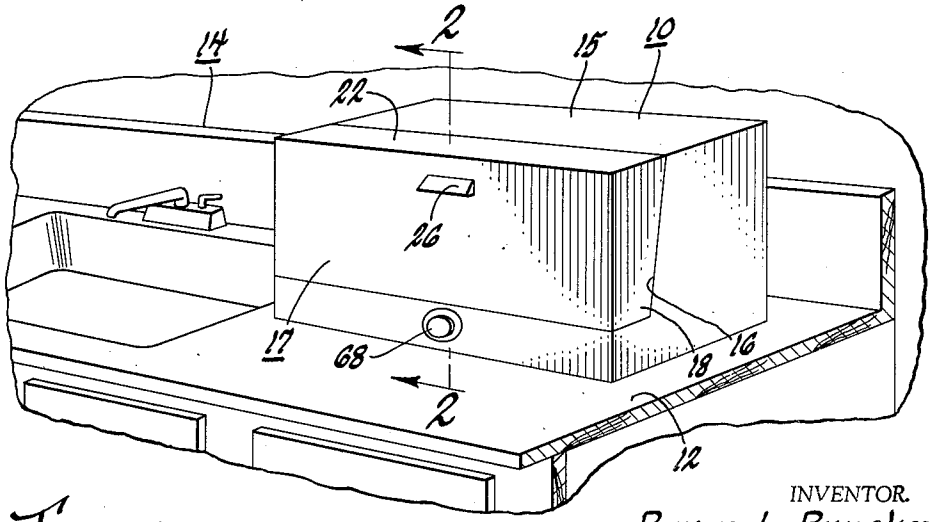

Fig. 1

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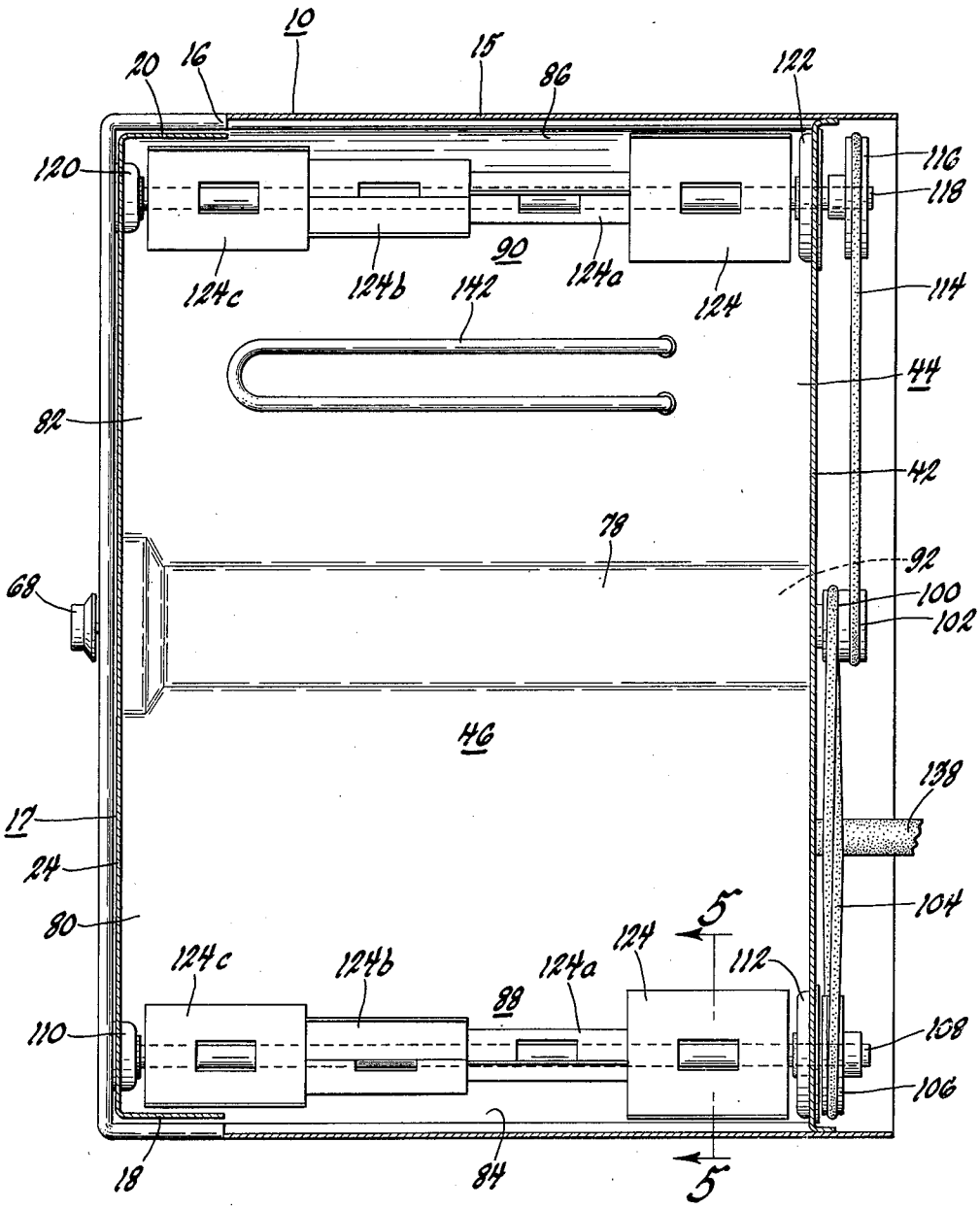

Fig. 3

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Filed Dec. 30, 1963 3 Sheets-Sheet 3

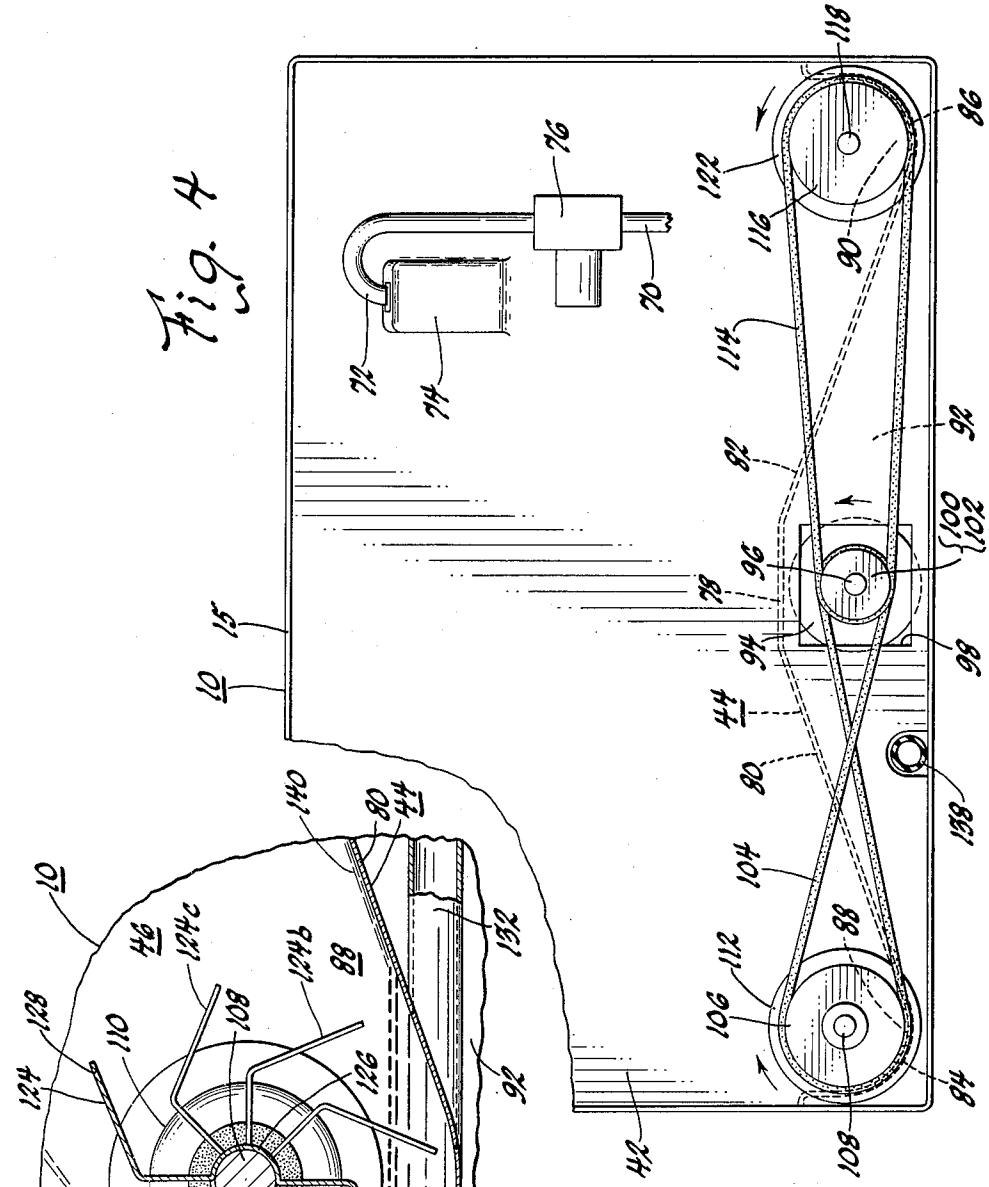

Fig. 4

Fig. 5

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3,220,426

COUNTER TOP DISHWASHER HAVING DUAL OPPOSED IMPELLERS AND A LABYRINTH DOOR SEAL

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1 Claim. (Cl. 134—193)

This invention relates to domestic appliances and more particularly to countertop dishwashers or the like.

An object of the present invention is to provide an improved dishwasher arrangement for cleaning dishes with a minimum of washing fluid including the provision of spray distributing means for maintaining substantially all of the washing fluid constantly in spray cleaning contact with dishes and the like during the dishwashing cycle.

A further object of the present invention is to improve the article cleaning characteristics of a dishwasher arrangement by providing means therein for directing opposed spray patterns into a washing compartment with each of the spray patterns being controlled to oscillate from one side to the other and back through the washing compartment.

A still further object of the present invention is to provide an improved dishwasher arrangement that is compact, inexpensive and capable of cleaning articles supported therein with a minimum amount of cleaning fluid.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a view in perspective of the dishwasher of the present invention supported on a kitchen counter.

FIGURE 2 is a view in vertical section taken along the line 2—2 of FIGURE 1;

FIGURE 3 is a view in horizontal section taken along the line 3—3 of FIGURE 2;

FIGURE 4 is a view in elevation looking in the direction of the arrow 4 of FIGURE 2; and

FIGURE 5 is a fragmentary, enlarged view in vertical section taken along the line 5—5 of FIGURE 3.

In FIGURE 1 of the drawings a countertop dishwasher 10 of the present invention is illustrated as being supported on the counter 12 of a kitchen arrangement 14. An outer housing 14 of the dishwasher has an access opening 16 therein closed by an outwardly and downwardly opening door 17 having side panels 18, 20 thereon joined at the upper edge thereof by a panel 22 and at the forward edge thereof by a front surface panel 24 having a handle 26 secured thereto for moving the door into its open and closed positions. On each of the side panels 18, 20 is an inwardly directed pin 28 directed through a grooved, arcuate track 30 formed in a horizontally elongated bracket 32 fixedly secured to the inner surface of one of the side walls of the outer cabinet 15. The door 17 is also pivotally secured to each of the fixed brackets 32 at a lower front portion thereof by means of a pivot pin 34 on each side panel thereof, whereby, upon movement of the door 17 into open and closed positions, the pins 28 move within tracks 30 into stopping engagement with the brackets 32 at the opposite ends of tracks 30.

One feature of the dishwasher of the present invention is that the rear edge of each of the side panels 18, 20 is inclined rearwardly at 35 to be directed between the outer housing 15 and an S-shaped flange 36 having one leg 38 thereof secured to the inner surface of the cabinet 10 and the opposite end 40 thereof spaced outwardly therefrom. The flange 36 surrounds the access

opening 16 in outer housing 15 so that the rear edges on the door 17 form in conjunction with the leg 40 of the flange and the outer housing 15 a labyrinth seal around opening 16 inclined rearwardly at the rear edges of side panels 18, 20 to provide an unusually effective seal against fluid leakage exteriorly of the dishwasher.

The outer housing 15 of the dishwasher also includes a rear bulkhead 42 and a bottom bulkhead 44 forming in conjunction with side and top walls of the housing an interior washing compartment or dish cleaning space 46 in which a suitable dish rack carrier, representatively illustrated as a wire basket 48, has an elongated wire formed side member 49 on each side thereof supportingly engaged by a pair of rollers 50, 52 rotatably mounted, respectively, on brackets 56, 58 fixedly secured to an adjacent side wall of the outer housing 15. A roller 60 is secured on each side of the forward portion of the basket 48 by suitable means, for example, a bent wire frame 62, with each of the roller assemblies 60 being supportingly received on ledges 64 formed on the inner surface of each of the side panels 18, 20 to stabilize the basket 48 when it is in its fully extended position.

In the illustrated arrangement, suitable timer control means 66 including a manually rotatable control knob 68 on the lower front edge of the outer housing 15 below door 17 is manually adjustable into one of a plurality of controlling positions for conditioning any suitable control circuit so as to provide desired fill, wash and drain cycles of operation. Rearwardly of rear bulkhead 42 is located a water inlet line 70, adapted to be connected to a suitable household water supply or the like and having the terminus end 72 thereof directing fluid through a water gap forming funnel 74 on the rear bulkhead 42 into the washing compartment 46. In the illustrated arrangement, fill is controlled by a solenoid actuated valve 76 selectively energized by the timer control means 66.

Another feature of the present invention is the manner in which the bottom bulkhead 44 is shaped. More particularly, as best illustrated in FIGURE 4, the bottom bulkhead has a central ridge 78 extending between rear bulkhead 42 and front opening 16. On each side of the ridge 78 flat surface portions 80, 82 of bulkhead 44 slope downwardly to tangentially intersect generally upwardly directed curvilinear end portions 84, 86, respectively, of the bulkhead. The portions 80, 84 and 82, 86 are integrally formed to thereby form separate sump regions 88, 90 on either side of the central ridge 78 for containing a predetermined amount of washing fluid directed thereto through the fill funnel 74.

The flat surface portions 80, 82 and the central ridge 78 of bulkhead 44 in conjunction form a machinery compartment 92 containing an electric motor 94 arranged substantially centrally thereof adjacent the rear bulkhead 42. A drive shaft 96 from the motor 94 is directed rearwardly through an opening 98 in bulkhead 42 to a point spaced rearwardly thereof where a first drive pulley 100 and a second drive pulley 102 are fixedly secured to drive shaft 96 for rotation therewith.

A first drive belt 104 is directed across the drive pulley 100 thence twisted upon itself and directed across a driven pulley 106 fixedly secured for rotation with a driven shaft 108 directed longitudinally through the sump region 88 and having opposite ends thereof respectively rotatably supported in a bearing housing 110 on the front wall of housing 15 and a bearing housing 112 supported on the rear bulkhead 42.

A second continuous drive belt 114 passes over the drive pulley 102 and thence without twisting across a driven pulley 116 fixedly secured on an outwardly directed end of a driven shaft 118 directed longitudinally of the second sump region 90. The opposite ends of the driven shaft 118 are rotatably journalled respectively in bearing

housings 120, 122 supported, respectively, on the front wall of the housing 15 and the rear bulkhead 42. Within each of the sump regions 88, 90 is arranged a plurality of paddle wheels 124, 124*a*, 124*b*, 124*c* each including a central portion 126 fixedly secured to one or the other of the driven shafts 108, 118. Each of the central portions 126 is in turn integrally formed with end portions 128, 130 that are bent with respect to either end of the central portion 126 so as to be substantially perpendicularly arranged with respect thereto. In the illustrated arrangement the paddle wheels are secured lengthwise of each of the driven shafts 108, 118 across substantially the full length of the respective sump regions 88, 90 with each of the paddle wheels 124, 124*a*, 124*b*, and 124*c* being angularly rotated with respect to one another as best illustrated in FIGURE 5.

The spaced apart separate sump regions 88, 90 are each connected to a drain conduit 132 that fluidly communicates through a solenoid actuated drain valve 134 to the inlet of a drain pump 136 located within compartment 92 forwardly of motor 94 to be driven thereby so as to discharge fluid from sumps 88, 90 through a discharge conduit 138 to a suitable exteriorly located drain.

A representative operation of the device more specifically includes setting the control knob 68 in an "on" position so as to cause the timer control 66 to, first of all, condition the solenoid fill valve 76 to allow fluid flow through the inlet line 70 and funnel 74 into the washing compartment 46 to be collected in the sump regions 88, 90. Following a predetermined fill period, the inlet valve 76 is conditioned to terminate fill and the timer 66 conditions a suitable control circuit for energizing the electric motor 94 to initiate a desired washing cycle. By virtue of the arrangement of the paddle wheels 124, 124*a*, 124*b* and 124*c* on each of the driven shafts 108, 118 when the electric motor 94 is so energized, the twisted belt 104 and straight drive belt 114 will rotate the driven shafts 108, 118 in opposed directions so as to cause the end portions 128, 130 on the paddle wheels 124 to move through the sump regions 88, 90 and direct cleaning fluid collected therein in opposite directions through the washing compartment 46 of the dishwasher into intimate cleaning contact with articles supported on the wire basket 48. More particularly, by virtue of the illustrated fluid spray distributing arrangement, it has been found that substantially all of a predetermined quantity of cleaning fluid may be substantially constantly maintained in cleaning contact with the articles to be cleaned. Accordingly, a lesser amount of cleaning fluid for a particular dishwasher design is required to gain effective cleaning action. During any given phase of the pumping action of the paddle wheels 124, 124*a*, 124*b*, 124*c* in the sump regions 88, 90, it is observed that only a relatively thin film of water passes over the upper surface of flat surface portions 80, 82 of the bottom bulkhead 44 into one or the other of the sump regions 88, 90 and that this film of water does not have time to collect appreciably in one or the other of the sumps before being discharged therefrom by the paddles. This operating condition is diagrammatically illustrated in FIGURE 5 with the thin water layer being designated by the reference numeral 140 and with the water discharged by the paddles 124 being shown carried upwardly from the sump regions 88, 90 into compartment 46.

Another feature of the pump arrangement of the present invention is that, in addition to maintaining substantially all of the cleaning fluid more or less constantly in intimate cleaning contact with articles on the basket 48, it acts to continually vary the spray pattern within the washing compartment 46. More particularly, it will be appreciated that at any given moment there will be a greater amount of cleaning fluid on one or the other side of a vertical plane extending centrally through the compartment 46 along central ridge 78. This greater amount of fluid will drain to one or the other of the sump regions 88, 90 with a consequent reduction in the amount of collected fluid in the other of the sump regions. Accordingly, the paddle wheels 124, 124*a*, 124*b*, 124*c* in the sump region having an excess of fluid will discharge the fluid in a first predetermined direction toward one side of the dishwasher so that the fluid excess will then occur on the opposite side of the above-mentioned central plane. At this time the paddle wheels in the other of the sump regions will discharge a greater amount of fluid and the spray pattern in the washing compartment 46 will then be directed toward the opposite side of the compartment. Thus, during the washing cycle operation there is, in effect, a variable oscillating spray pattern within the compartment 46 that includes substantially all of the cleaning fluid directed interiorly of the washing cabinet during the fill period of operation.

In the illustrated arrangement a suitable heater element 142 is located within the sump region 90 closely adjacent flat surface portion 82 to effect a desired heating of the cleaning water during the wash cycle of operation.

Following a desired cleaning cycle of operation, the timer control energizes the drain solenoid valve 134 to drain sump regions 88, 90 through conduit 132, pump 136 and discharge conduit 138 to an exterior drain.

In light of the above discussion, it will be appreciated by those skilled in the art that the present invention reduces the amount of washing fluid required to effect cleaning of a predetermined number of dishes. Furthermore, the reduced water requirements and arrangement of sumps and spray distributing means reduces the overall dimensions of the dishwasher to thereby reduce the amount of counter space or the like required to support the apparatus.

It will also be appreciated that the provision of separately arranged spaced sumps and the water distribution system contemplated by the invention produces an usually complete and constantly varying spray pattern that is unusually well suited for cleaning articles supported at different angles of attack on a dish carrying basket or the like.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

In a dishwasher, the combination of, an enclosure having a first compartment for washing dishes and a second machinery compartment located therebelow, an imperforate bulkhead located between said washing compartment and said machinery compartment having a central ridge portion, a downwardly sloping wall portion on either side of said central ridge portion and generally upwardly directed curvilinear portions on opposite sides of said bulkhead, each of said curvilinear side portions being integrally formed with one of said sloping wall portions for forming in conjunction therewith one of a pair of spaced apart sump regions extending across said washing compartment, fill means for directing a predetermined quantity of cleaning fluid into said sump regions, a driven shaft in each of said sump regions, drive means for rotating said driven shafts in opposite directions, a fluid displacement member on each of said driven shafts including angularly offset end portions located in close spaced relationship with said curvilinear side portions of said bulkhead, said fluid displacement members being driven upon rotation of said driven shafts so that said angularly offset end portions of said members are directed upwardly along said curvilinear side portions for directing the predetermined quantity of cleaning fluid from said sump regions to be discharged generally obliquely across said washing compartment so that during any phase of operation of said fluid displacing members a greater amount of water is collected and discharged from one or the other of said sump regions to produce an opposed oscillatory spray pattern within said washing compartment, said drive means being operated so that said predetermined quantity of cleaning fluid is maintained sub-

stantially continuously in contact with articles to be cleaned, said obliquely discharged cleaning fluid being returned from the washing compartment and directed as a thin film across one or the other of said sloping wall portions into said sump regions, said enclosure having a front opening thereto arranged in a generally vertical plane, each of said driven shafts having its axis of rotation disposed generally perpendicularly to said vertical plane, a door for closing said front opening movable forwardly into a horizontal position, said door having a rearwardly located edge formed continuously therearound being at a predetermined inclination from the vertical on the sides of said door, a flange supported by said enclosure continuously around the front opening thereto forming a forwardly facing door edge receiving opening on said enclosure, said continuous door edge being received within said opening when said door is closed to form a continuous labyrinth seal located substantially in

said vertical plane whereby cleaning fluid discharged by said fluid displacement members does not impinge directly against said labyrinth seal to reduce fluid leakage from said washing compartment.

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