

March 6, 1962

J. W. JACOBS ET AL
DOMESTIC APPLIANCE

3,024,074

Filed July 18, 1958

3 Sheets-Sheet 1

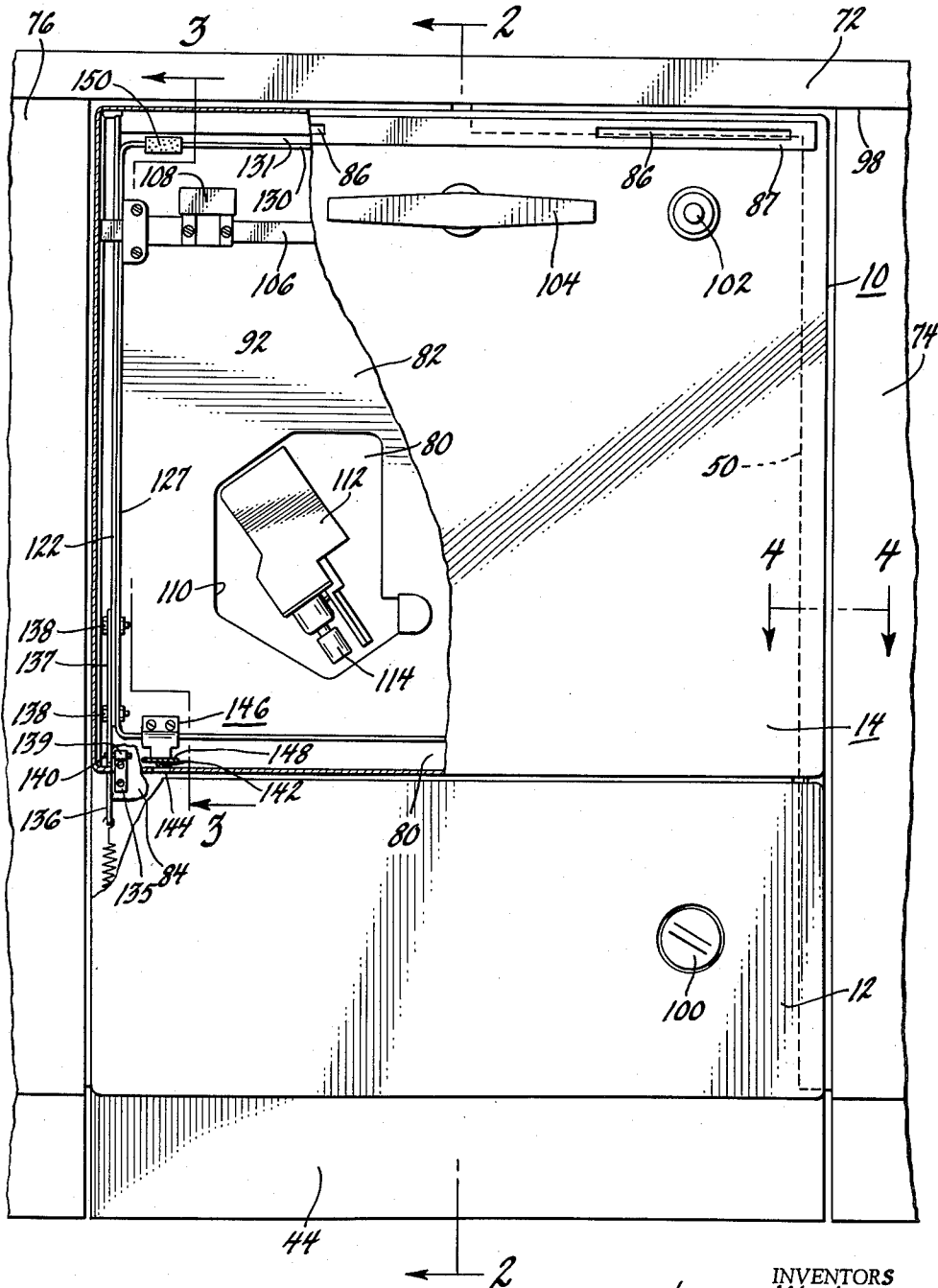


Fig. 1

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3 Sheets-Sheet 2

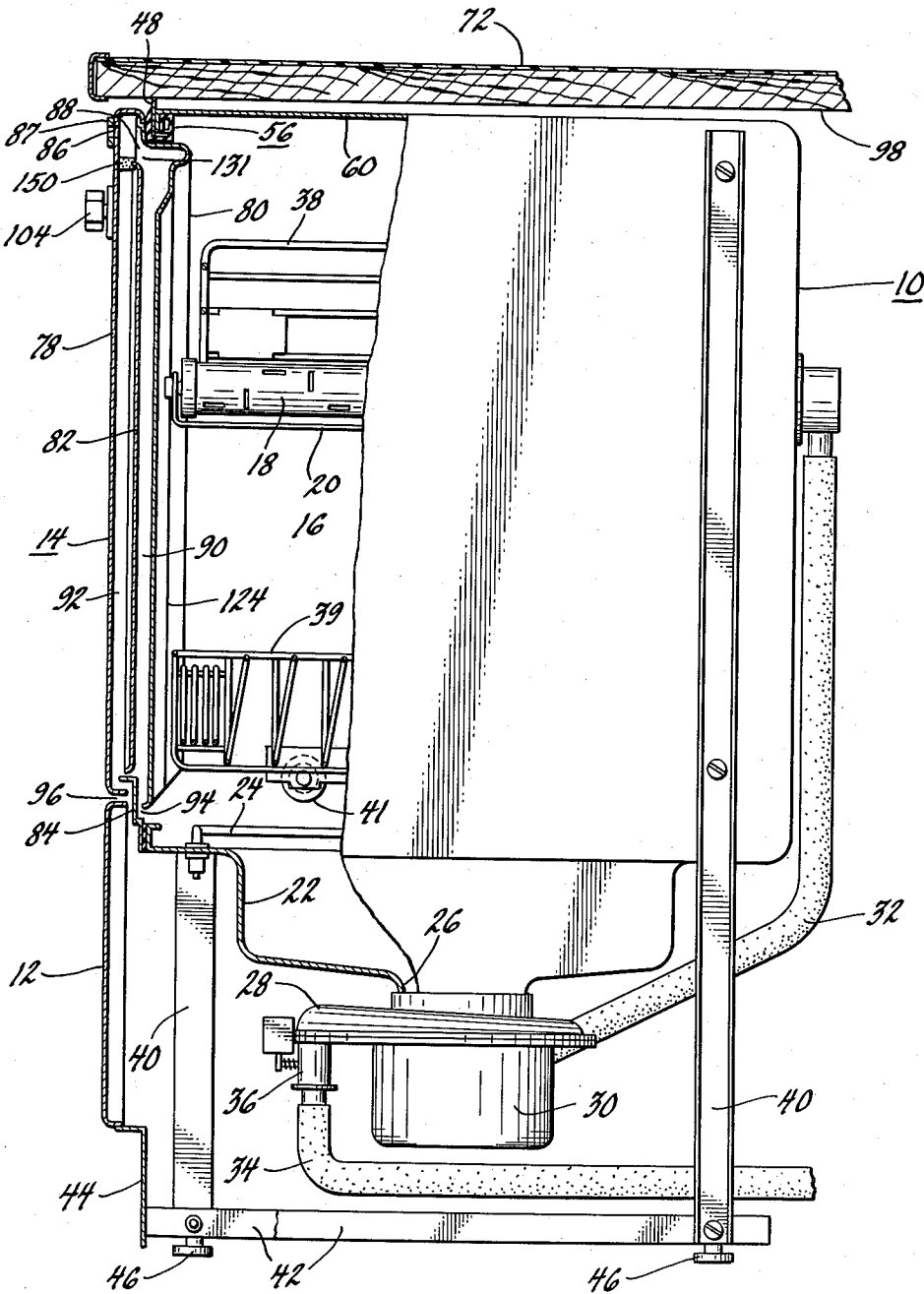


Fig. 2

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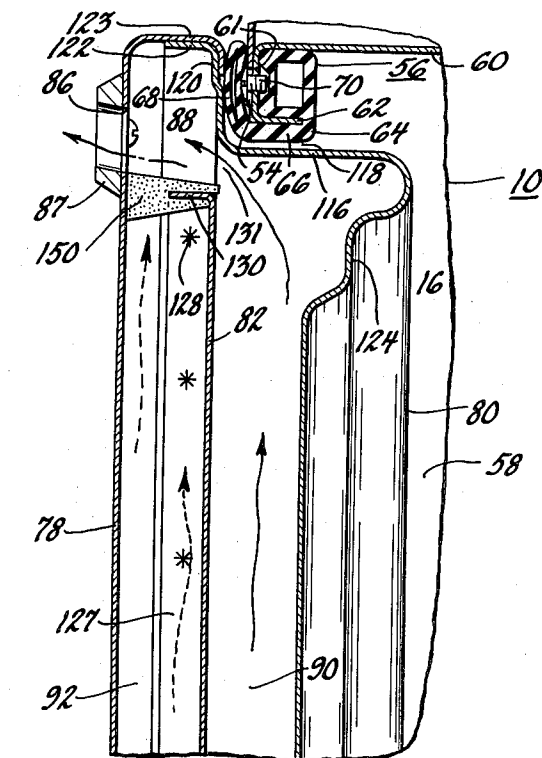
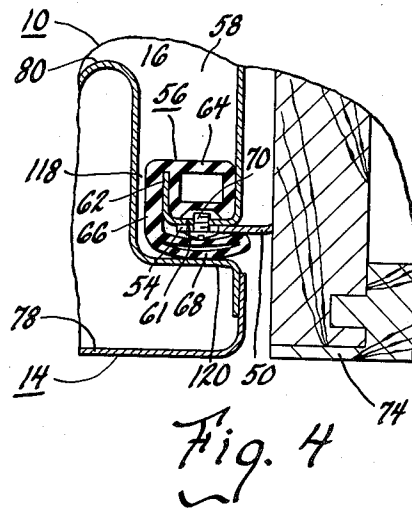
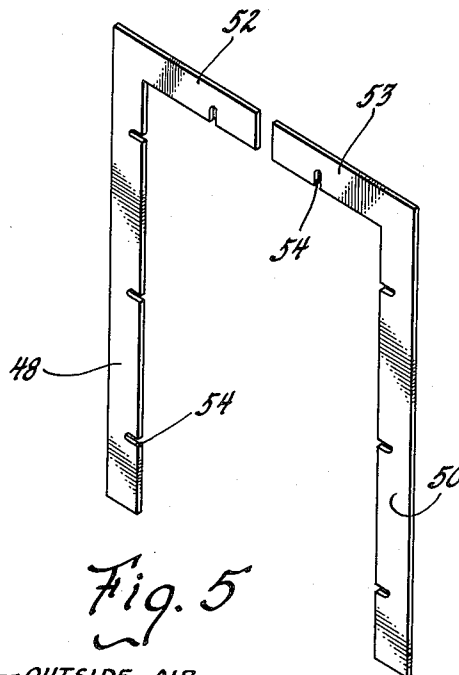
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3 Sheets-Sheet 3



OUTSIDE AIR
VAPOR
AIR-VAPOR MIXTURE

Fig. 3

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3,024,074

DOMESTIC APPLIANCE

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5 Claims. (Cl. 312-213)

This invention relates to a domestic appliance and more particularly to an improved construction for a dishwasher.

In the dishwashing art, one of the problems which arises is the exhaust and elimination of steam vapor from the dishwashing chamber. In many of the dishwashers in current vogue the venting is accomplished by opening a door, usually the dish loading door, at a particular point in the wash cycle. In this manner the vapor is exhausted to the outside at a particular point in the wash cycle and the dishes and utensils therein are permitted to dry. In other machines, such as the type for which the instant application is an improvement, the loading door is retained in a closed position throughout the washing cycle. Here, to permit the exhaust of steam or vapor from the dishwashing chamber, a continuous venting arrangement is provided through or around the dishwasher door. Thus, as steam or vapor is evolved during the washing process, the pressure within the washing chamber is increased and the vapor is forced thereby through the vent to the outside.

In both of these dishwasher types the steam or vapor vented falls upon surrounding surfaces which are relatively cool and condensation thereby occurs which causes a deterioration of the surfaces on which the condensate forms. Furthermore, the accumulation of condensate within the dishwasher, due to this venting requires that the electrical components be satisfactorily shielded from the damaging effects of the moisture.

Accordingly, it is an object of this invention to form a dishwasher door with parallel flow paths—one for outside air and the other for inside vapor.

It is also an object of this invention to provide a dishwasher door construction wherein outside air may be mixed with inside vapor to form a mixture which will not condense on the surfaces surrounding the dishwasher.

A more particular object of this invention is a dishwasher door construction having an outer panel, an inner panel, and an intermediate panel disposed therebetween to form parallel flow passageways.

It is also an object of this invention to provide a dishwasher with a door having a self-cooling arrangement whereby the need for door insulation is eliminated.

It is also an object of this invention to provide a dishwasher with a door construction suitable for housing electrical controls which, due to the condensation preventing door construction, need no special protection from the deteriorating effects of moisture.

It is also an object of this invention to provide a dishwasher adapted for under-counter installation with adjustable spacers for sealing the space between the dishwasher and the adjacent counter and cabinetry against the infiltration of moisture.

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:

FIG. 1 is a front sectional view with parts broken away of an under-counter dishwasher suitable for use with this invention.

FIG. 2 is a side sectional view taken along line 2—2 of FIG. 1 with parts broken away to show schematically the novel door construction disclosed herein.

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FIG. 3 is a fragmentary sectional view of the dishwasher door construction and venting arrangement taken along line 3—3 of FIG. 1.

FIG. 4 is a sectional view taken along line 4—4 of FIG. 1 illustrating the door sealing and spacer bracket arrangement.

FIG. 5 is a perspective view of left and right hand spacer trim elements provided by this invention.

In accordance with this invention and with reference to FIGS. 1 and 2, a dishwasher 10 having a base portion 12 is provided with a hingedly mounted door 14. The dishwasher 10 includes a dishwashing chamber 16 wherein a rotatable spray tube or impeller 18 is supported on a bracket 20 for rotation in accordance with the swirl of the water supplied to the spray tube. The dishwashing chamber 16 has a sump portion 22 formed at the bottom thereof and an electrical heating element 24 disposed immediately above and surrounding the sump 22. At a low point in the sump 22 an opening 26 leads to the inlet of a pump mechanism 28. The pump 28 is driven by a motor 30 in a manner to pump water through a conduit 32 to the spray tube 18 during the dishwashing cycle and through a conduit 34 to a remote drain in accordance with the automatic positioning of a solenoid-operated valve 36. Thus, with the valve 36 closing the drain conduit 34, water will be circulated by way of conduit 32 to the spray tube 18 from which point it is ejected over the surface of the dishes and utensils within the chamber 16. Soiled water will then fall by gravity to the bottom of the dishwashing chamber 16 and will there collect in the sump 22 for return to the pump at pump inlet 26. Suitable racks 38 and 39 are included within the dishwashing chamber 16 for supporting the dishes and utensils to be cleansed. These racks are generally supported for slidable movement outwardly from the dishwashing chamber 16 to facilitate loading and unloading thereof. Dish rack 39, for instance, is supported on rollers 41 which permit the rack to roll outwardly on a shoulder 124 of the door 14 when the door is open. For additional details on a dishwasher having the aforescribed arrangement, reference may be had to the patent to Abresch et al. 2,808,063 issued October 1, 1957.

The receptacle-like dishwashing chamber 16 may be supported a spaced distance from a floor surface by four upright channel members 40 which are joined at floor level by side channel or base support members 42. A kick plate 44 is carried by these channels to conceal the support arrangement of this free-standing dishwasher; and adjustable feet 46 are effective to correctly level the appliance during installation. In this fashion, the kick plate 44 is retained sufficiently close to the surface on which the machine is mounted to prevent any sizable object from rolling under the dishwashing equipment.

Where a dishwasher 10 is to be installed as an incremental unit in a line of commercial cabinets disposed beneath a unitary counter-top, difficulty is frequently encountered in securing a snug fit between the dishwasher and the adjoining surfaces. One of the concepts of this invention includes a novel spacer arrangement which is slidable into engagement with adjoining surfaces during installation, thereby to create a substantially dirt and moisture-proof connection about the periphery of the dishwasher.

Reference may be had to FIG. 5 wherein a perspective view is seen of a complementary pair of trim strips utilized for adjustably closing the gap between a dishwasher and adjoining cabinetry. A left-hand closure trim member or strip 48 and a right-hand closure trim member or strip 50 are formed with a right-angled top portion 52, 53 respectively. These trim strips are formed with a plurality of oversized cutouts or notches 54 to receive a bolt

70 for locking the trim strip into place after initial adjustment. The closure strips 48 and 50 are adapted to be installed beneath a dishwasher door seal shown generally at 56 in FIG. 4.

To accommodate the closure strips 48 and 50, the side walls 58 and top wall 60 of the dishwashing chamber 16 are formed with a U-shaped inturned seal and closure strip support flange 61 having a terminal portion 62 grippingly engaging the seal 56. The seal 56 is formed with a base portion 64 and a side portion 66 which terminates in a vapor seal resilient section 68. The seal portion 68 overlies the U-shaped wall flange 61 thereby retaining the seal in a fixed relationship to the side walls 58 and the top wall 60 of the washing chamber 16. In this relationship, the closure trim strips 48 and 50 are adapted to reside between the resilient seal portion 68 of the seal 56 and the U-shaped flange 61 of the walls 58 and 60. The openings or notches 54 in the closure strips 48 and 50 are sufficiently large to surround a bolt or fastening means 70 and to allow adequate adjustment both vertically and horizontally relative to the surrounding cabinetry. Thus, upon installation of an under-counter dishwasher 10, the trim or closure strip 50 may be raised into contact with the bottom surface 98 of a counter-top 72 and sidewise into contact with an adjoining cabinet 74. Likewise, the trim strip 48 may be positioned both horizontally and vertically into engagement with the bottom 98, countertop 72 and an adjoining cabinet 76. After correctly positioning the closure strips 48 and 50, the bolts 70 may be tightened to lock the strips in place. In this fashion, it should now be apparent that any dirt or moisture escaping from the dishwashing chamber 16 is substantially prevented from entering the areas behind the trim strips 48 and 50. This construction is helpful in preventing moisture damage to the cabinetry adjacent the dishwasher 10 and serves also to prevent accumulations of dirt and food which would necessarily be a hazard to the health of the occupants.

In addition to the moisture protection gained through the adjustable closure means 48 and 50, the dishwasher 10 has been provided with a door 14 having a novel construction designed to minimize the formation of condensation from a dishwashing process. With reference generally to FIG. 2 the door 14 is formed with an outer substantially flat exterior door panel 78, an interior or inner door panel 80 and an intermediate or central baffle or support panel 82. A splash baffle 84 extends upwardly from a front portion of the sump 22 into a position between the exterior door panel 78 and the inner door panel 80 and underlying the central baffle 82. At the top of the exterior panel 78 an exhaust opening 86 provides egress from a mixing area 88 disposed between the inner panel 80 and the exterior panel 78 and overlying the central baffle 82. As generally indicated in FIG. 2, this construction thus forms parallel flow paths wherein a conduit or duct 90 provides for exhaust of humid vapor from the dishwashing chamber 16 and a passageway or duct 92 for the circulation of outside air. A space 94 between the splash baffle 84 and the lower portion of the inner door panel 80 serves as a port for the hot vapor to enter the passageway 90. Similarly, an opening 96 is formed by the spaced relationship of outer panel 78 and the splash baffle 84. Thus, with the higher temperatures of the dishwashing chamber 16 warming the vapor passage 90, a chimney effect is established which initiates a circulation of outside air through the opening 96 and upwardly in the passageway 92 to the mixing area 88. In the mixing area or chamber 88, the outside air mixes with the hot vapors entering from the passageway 90 and the mixture is vented through the opening 86 to the outside. The mixing effect within the chamber 88 sufficiently lowers the relative humidity of the exhausting gas to prevent condensation upon the surfaces surrounding the dishwasher, such as on the wood surface 98 at the bottom of counter-top 72.

For a more particular description of the dishwasher door construction believed novel in this invention, reference may be had to FIGS. 1 and 3. The dishwasher 10 is provided with a door 14 and a lower closure panel 12. A timer dial is shown generally at 100 and may be set for the desired washing cycle. On the door 14 may be located a push button 102 for initiating the wash cycle. Included also on the door 14 is a latch handle 104 which moves a bolt 106 into engagement with a keeper (not shown) at the side of the dishwashing chamber 16. The bolt 106 may carry an electrical switch 108 which automatically prevents dishwasher operation when the door 14 is in an open position. The vent openings 86 are surrounded by an escutcheon 87 which is best seen in FIG. 1 at the top of the door 14. It is, of course, understood that the openings 86 could as well run completely across the door. The cutaway section of FIG. 1 illustrates the central baffle or partition 82 as having a cutout portion 110 for receiving a water conditioning dispensing device such as 112. The dispenser 112 is selectively operated in accordance with a conventional dishwasher timing mechanism by an electrical switch 114. In previous constructions for dishwasher doors, it was necessary to shield the switches 108 and 114 from the moisture or dampness which accumulates within the dishwasher door 14 during a washing cycle. The construction here proposed, however, eliminates the need for such moisture protection as the novel construction here disclosed prevents the formation of moisture or condensation in the areas surrounding the electrical components.

The particular construction of the dishwasher door 14 will be set forth in connection with the drawing of FIG. 3. The inner door panel 80 is formed in a dishwed-out manner with a protruding insert flange 116 which projects within the dishwashing chamber 16 through an opening 118 circumscribed by the opening seal 56 and the splash baffle 84. Projecting outwardly into overlying relationship with the sealing section 68 of seal 56 is a seal flange portion 120 formed at substantially right angles to the insert flange 116 of the inner panel 80. The flange 120 terminates in an interlock portion 122 which underlies and supports a turned-over top flange 123 of the exterior door panel 78. A shoulder 124 is formed on the inner panel 80 as a support for the rollers 41 of the dish rack 39. Along the bottom section of the inner panel 80, a cut-out 126 is designed to define the opening 94 between the splash baffle 84 and the bottom of inner door panel 80.

The central baffle or passageway partition 82 is formed with side flanges 127 which are secured as at 128 to the side sections of flange 122 of the inner door panel 80 as by a welding process. Thus, the inner door panel assembly includes the inner door panel 80 and the central baffle or partition 82, a passageway 90 being formed therebetween. The central baffle or partition is formed with a top flange 130 spaced from the insert flange 116 of the inner door panel 80 to define an opening 131 therebetween from the passageway 90 to the mixing chamber 88. Similarly, at the bottommost edge of the central baffle 82, a flange 132 is spaced from an outwardly extending terminal section 134 of the splash baffle 84 to form an opening 133 therebetween.

For hinged mounting the door 14 to the dishwasher 10, the splash baffle 84 has affixed thereto a pair of hinge brackets 135. A counter balance arm 136 has a door attachment section 137 which is affixed to the inner door panel flange 122 and central baffle side flange 127 as by bolts 138. Extending from the attachment section 137 is a door pivot section 139 which is ported to receive a pin 140 carried by the hinge bracket 135.

Thus, the inner door panel assembly including the inner door panel 80 and the central baffle 82 is hinged to the dishwashing chamber 16 along the splash baffle 84 and is thus hinged for pivotal movement to a horizontal open position and a vertically closed position. The jointure between the inner door panel flange 120 and the door seal

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section 68 is effective to prevent leakage of moisture or water along the sides and top of the dishwasher door 14. No seal is provided along the bottom edge of the door where the interfitting relationship of the splash baffle 84 and the inner door panel 80 prevents water from being splashed from the dishwashing chamber to the outside.

The quick and simple manner in which the inner panel assembly and the exterior panel may be joined will now be fully explained. Briefly, the top exterior panel flange 123 is hooked over the top inner panel flange 122 and the exterior panel 78 pivoted into engagement with the inner panel assembly. A bolt 142 is inserted through an opening 144 in a bottom flange 141 of the door panel 78 to securely lock the door panels into a complete door assembly.

Specifically, a pair of brackets 146 is attached to the inner baffle 82 and cooperate respectively with a pair of brackets 148 welded on the outer panel 78, the bolt 142 interlocking the two. Thus, the outer panel 78 is assembled by placing the top flange 123 thereof into overlying and hooking relationship with the flange 122 of inner panel 80 and pivoting the bottom of the outer panel 78 inwardly until the bolt 142 may be inserted through the flange opening 144 to secure the brackets 146 and 148. The bracket 146 has a leg 145 formed on an angle so that its lower edge will correctly locate bracket 148 and thus the exterior door panel 78. A tinnerman nut (not shown) is placed over the leg 145 to receive bolt 142, the angular wedge formation providing a tight rattle-free connection.

In forming the parallel flow paths, several spacers 150 are used to stabilize the outer panel 78 and overlie the top flange 130 of the baffle 82 to space the panels 78 and 82. However, this is not a solid connection or seal across the dishwasher door and outside air may flow between these spacers or supports 150.

It should be noted that the inner door panel 80 is imperforate and provides only for vapor passage from the dishwasher chamber 16 along the bottom opening 94. In the past, openings were provided along the upper portion of shoulder 124 as a means for venting the dishwashing chamber. However, occasional jets of water from the rotating spray tube 18 would be thrown through these openings into the interior of the door 14. This water would fall upon the electrical components such as switches 108, 114 within the door and subsequently on the kitchen floor surrounding the dishwasher. With the elimination of this ported inner door panel venting arrangement, these moisture problems are solved. In addition, the electrical components no longer need to be insulated from the moisture; and heat insulation, to prevent the outer door panel from overheating, is eliminated from the cavity between the inner and outer door panels. This arrangement has provided a substantial product improvement and elimination of many costly production items.

Reference may now be had to FIGS. 2 and 3, wherein the air flow relationship established by the novel construction herein disclosed is best seen. With the pump 28 operating in response to the energization of motor 30 to pump water through conduit 32 to the spray tube 18, considerable vapor and steam are released as the hot water is recirculated. This steam release increases the pressure within the dishwashing chamber 16 and these vapors flow through the opening 94 into the vapor passageway 90. By convection, these vapors rise warming the central baffle 82. This warming effect initiates a chimney effect within the outside air passageway 92 and this circulation establishes a flow of outside air which commingles with the hot vapors in the mixing chamber 88 prior to venting through opening 86 to the outside air. A portion of the vapor may pass through the opening 133 at the bottom of the central baffle 82 or the opening 110 in the central baffle 82 to effect an intermixing of outside air with inside vapor. Research has established that a satisfactory circulation of outside air exists whether or not

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the central baffle 82 is formed with the openings 110 and 133. It is the mixing effect which lowers the relative humidity of the vapor being exhausted that provides the improved condensation-free door construction. In this manner, the electrical components 108 and 114 may be left unshielded, no heat insulation need be placed between the inner door panel 80 and the outer door panel 78 and the surfaces 74, 76 and 98 surrounding the dishwasher door are left without damaging condensation as a result of the dishwashing cycle. Furthermore, the combination of this novel door construction with the closure trim strips 48 and 50 complement each other to eliminate a moisture and/or dirt problem where dishwashers are built into under-counter installations.

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

What is claimed is as follows:

1. A dishwasher door construction comprising an outer panel having a substantially flat portion and a peripheral flange at substantially right angles to said flat portion, an inner panel having a surface substantially parallel to said flat portion and a peripheral wall underlying said flange along the top and sides of said door to support said surface a spaced distance from said flat portion, a baffle interposed between said surface and said flat portion and secured to said peripheral wall, said baffle extending from a point above the bottom of said flat portion to a point below the top of said flat portion, thereby forming a plurality of substantially parallel passageways between said inner and outer panels and a mixing chamber, said outer panel formed with an opening at the bottom thereof adjacent the bottom of said baffle for the ingress of outside air to one of said passageways and said mixing chamber, said inner panel having an opening at the bottom thereof adjacent the bottom of said baffle for the ingress of humid vapor to another of said passageways and said mixing chamber, and a vent in the top of said flat portion adjacent the top of said baffle for the egress of said outside air and said humid vapor mixture.

2. A dishwasher door construction comprising an outer panel having a peripheral flange, an inner panel substantially parallel to said outer panel and having a peripheral wall underlying said flange along the top and sides of said door to support said outer panel a spaced distance from said inner panel, a baffle interposed between said panels and secured to said wall, said baffle extending from a point above the bottom of said outer panel to a point below the top of said outer panel, thereby forming a plurality of substantially parallel passageways between said inner and outer panels and a mixing chamber, said outer panel formed with an opening at the bottom thereof adjacent the bottom of said baffle for the ingress of cooling air to one of said passageways, said inner panel having an opening at the bottom thereof adjacent the bottom of said baffle for the ingress of vapor to another of said passageways, and a vent in said outer panel adjacent the top of said baffle for the egress of said cooling air and said vapor mixture from said mixing chamber.

3. A door construction for a cleaning machine comprising an outer panel having a peripheral flange, an inner panel substantially parallel to said outer panel and having a peripheral wall underlying said flange along the top of said door to support said outer panel a spaced distance from said inner panel, a baffle interposed between said panels, said baffle extending from a point above the bottom of said outer panel to a point below the top of said outer panel, thereby forming a plurality of passageways between said inner and outer panels and a mixing chamber, said outer panel formed with an opening near the bottom thereof adjacent the bottom of said baffle for the ingress of cooling air to one of said passageways, said inner panel having an opening near the bottom thereof adjacent the bottom of said baffle for the ingress of vapor

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to another of said passageways, and a vent in said outer panel above said openings and adjacent the top of said baffle for the egress of cooling air and said vapor mixture from said mixing chamber.

4. A gravity venting system for a dishwasher comprising means forming a relatively warm vapor containing washing chamber having walls defining an opening, a door for closing said opening, means interposed between said walls and said door for sealing said chamber from the relatively cool atmosphere, means substantially coextensive with the back of said door defining a first duct in said door in communication with said chamber, means substantially coextensive with the front of said door defining a second duct in said door in communication with the atmosphere, said first and second ducts extending upwardly coextensively in side by side heat exchange relationship from the bottom of said door to substantially the top of said door, and means defining a third duct in said door in communication with the upper terminus of said first and second ducts, said third duct including means forming an outlet therefrom to the atmosphere, whereby vapor rising in said first duct initiates a chimney effect of atmospheric air in said second duct and mixes with said atmospheric air in said third duct to prevent condensation.

5. A gravity venting system for a dishwasher having an electrical control comprising means forming a relatively warm vapor containing washing chamber having walls defining an opening, a door for closing said opening, means interposed between said walls and said door for sealing said chamber from the relatively cool atmosphere, means

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substantially coextensive with the back of said door defining a first duct in said door in communication with said chamber, means substantially coextensive with the front of said door defining a second duct in said door separate from said first duct and in communication with the atmosphere, said second duct enclosing said electrical control, said first and second ducts extending upwardly coextensively in side by side heat exchange relationship from the bottom of said door to substantially the top of said door, and means defining a third duct in said door in communication with the upper terminus of said first and second ducts, said third duct including means forming an outlet therefrom to the atmosphere, whereby vapor rising in said first duct initiates a chimney effect of atmospheric air in said second duct and mixes with said atmospheric air in said third duct to prevent condensation.

References Cited in the file of this patent

UNITED STATES PATENTS

1,037,073	Sonnemann	Aug. 27, 1912
1,897,192	Greenwald	Feb. 14, 1933
1,930,180	Naylor	Oct. 10, 1933
2,253,398	Reifenberg	Aug. 19, 1941
2,589,699	Johnson	Mar. 18, 1952
2,597,786	Fontaine	May 20, 1952
2,635,941	Stoddard	Apr. 21, 1953
2,706,486	Loeb	Apr. 19, 1955
2,871,082	Karig	Jan. 27, 1959