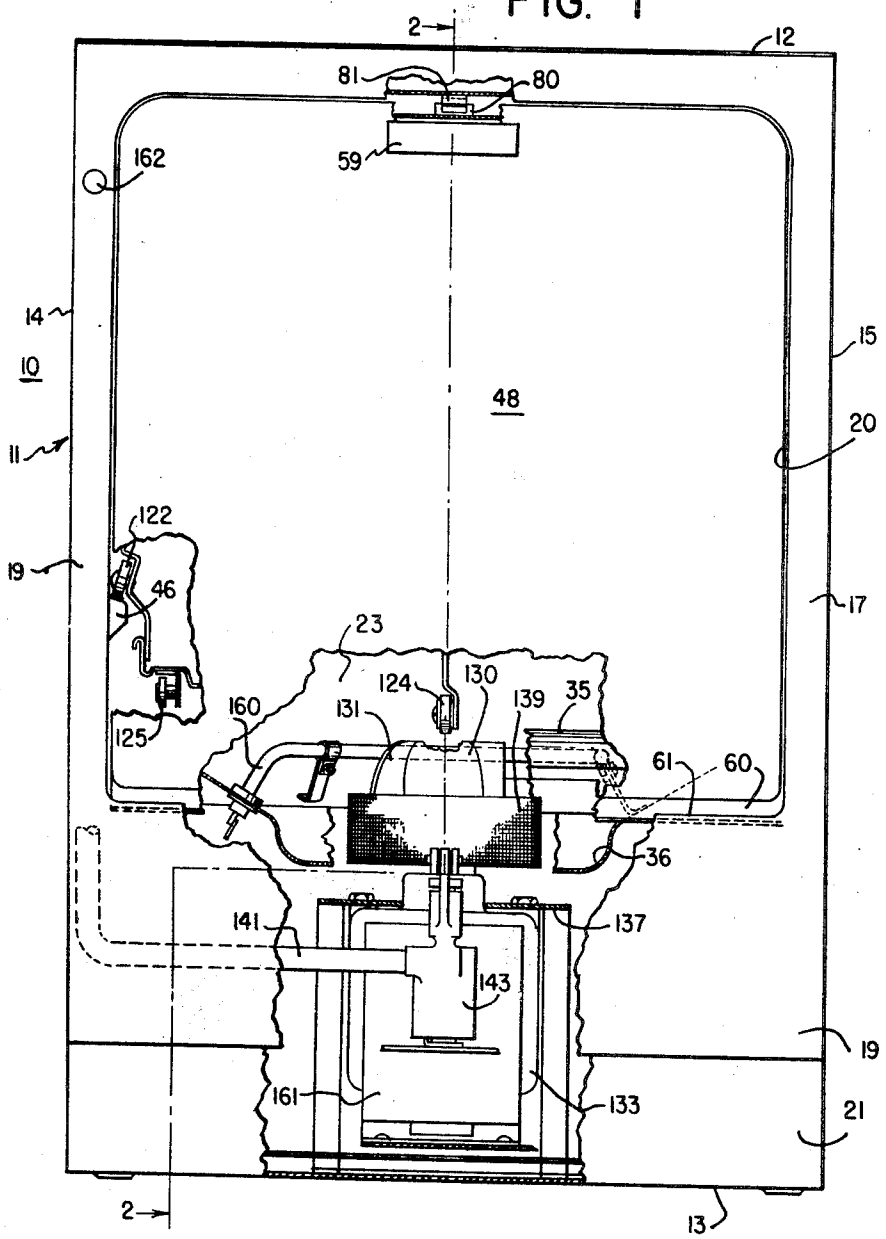
June 22, 1954 F. A. WALKER 2,681,844

WASHING APPARATUS

Original Filed Oct. 30, 1948 7 Sheets-Sheet 1

FIG. 1



INVENTOR.
Forrest A. Walker

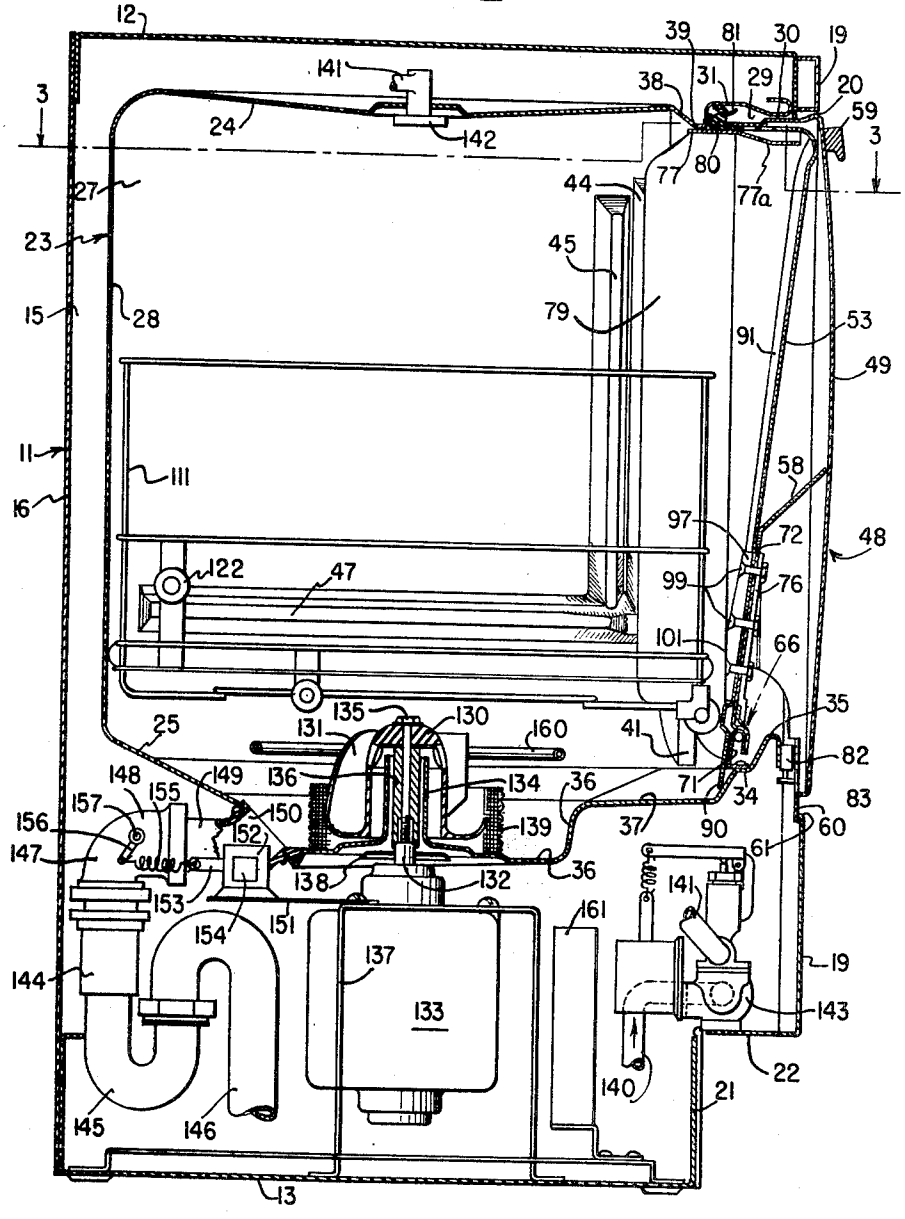
BY
Smith, Olsen & Baird
Attys.

June 22, 1954 F. A. WALKER 2,681,844

WASHING APPARATUS

Original Filed Oct. 30, 1948 7 Sheets-Sheet 2

FIG. 2



INVENTOR.
Forrest A. Walker

BY
Smith, Olsen & Baird
Attys

June 22, 1954 F. A. WALKER 2,681,844

WASHING APPARATUS

Original Filed Oct. 30, 1948 7 Sheets-Sheet 3

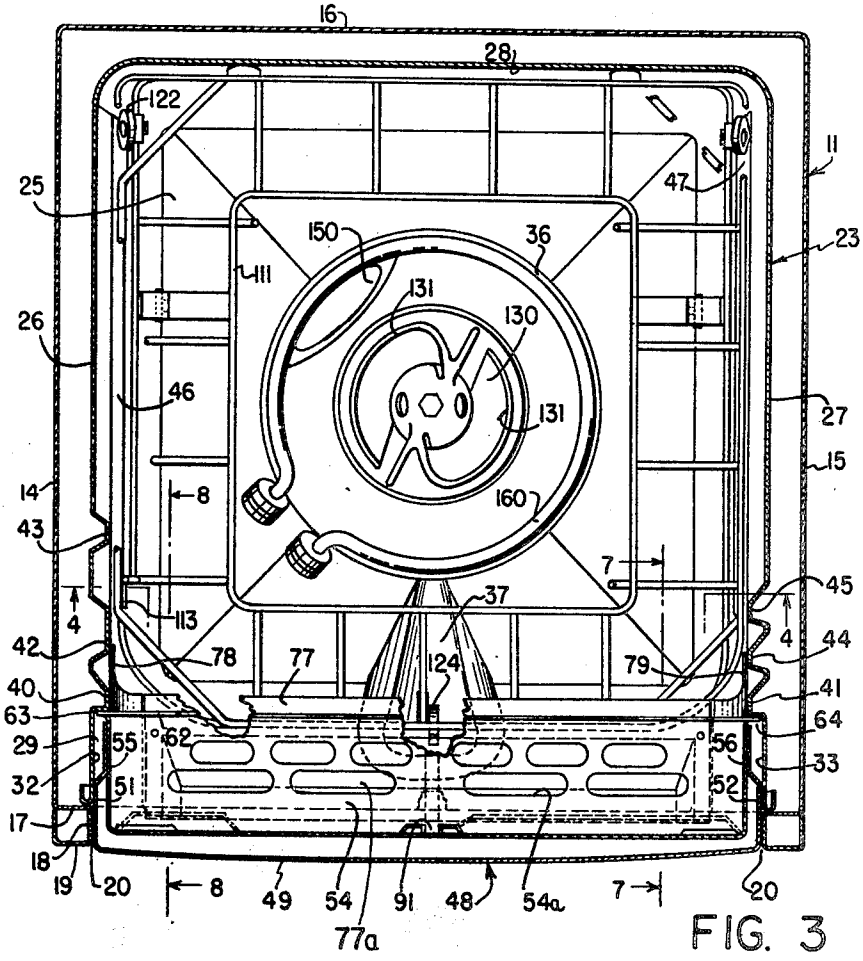


FIG. 3

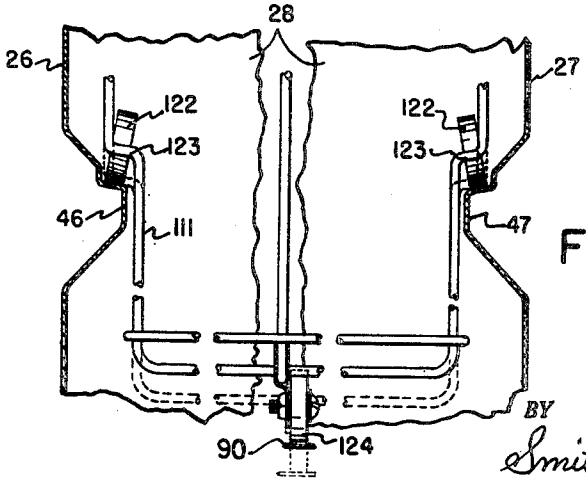


FIG. 4

INVENTOR.
Forrest A. Walker

BY
Smith, Olsen & Baird
Attys

June 22, 1954 F. A. WALKER 2,681,844

WASHING APPARATUS

Original Filed Oct. 30, 1948 7 Sheets-Sheet 4

FIG. 5

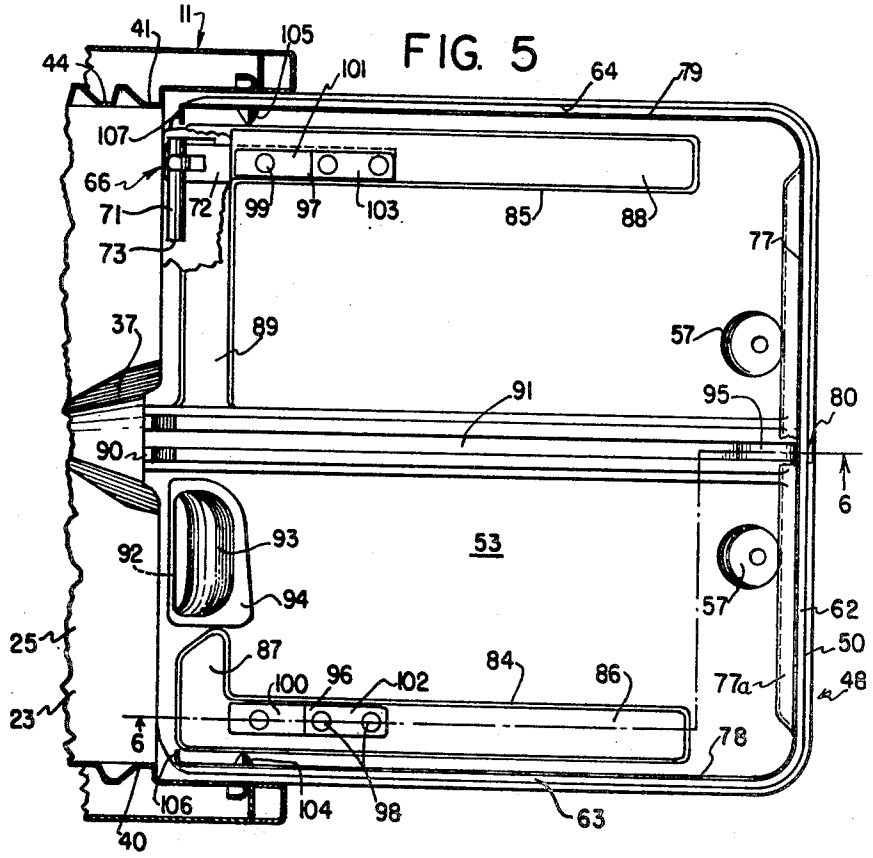
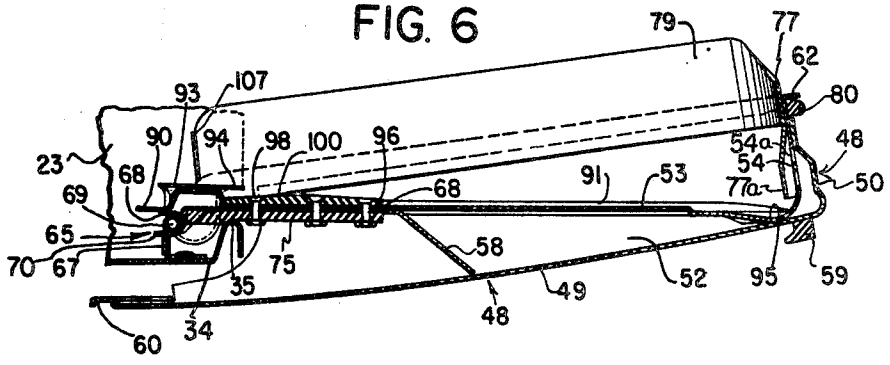


FIG. 6



INVENTOR.
Forrest A. Walker

BY
Smith, Olsen & Baird
Attys

June 22, 1954 F. A. WALKER 2,681,844

WASHING APPARATUS

Original Filed Oct. 30, 1948 7 Sheets-Sheet 5

FIG. 7

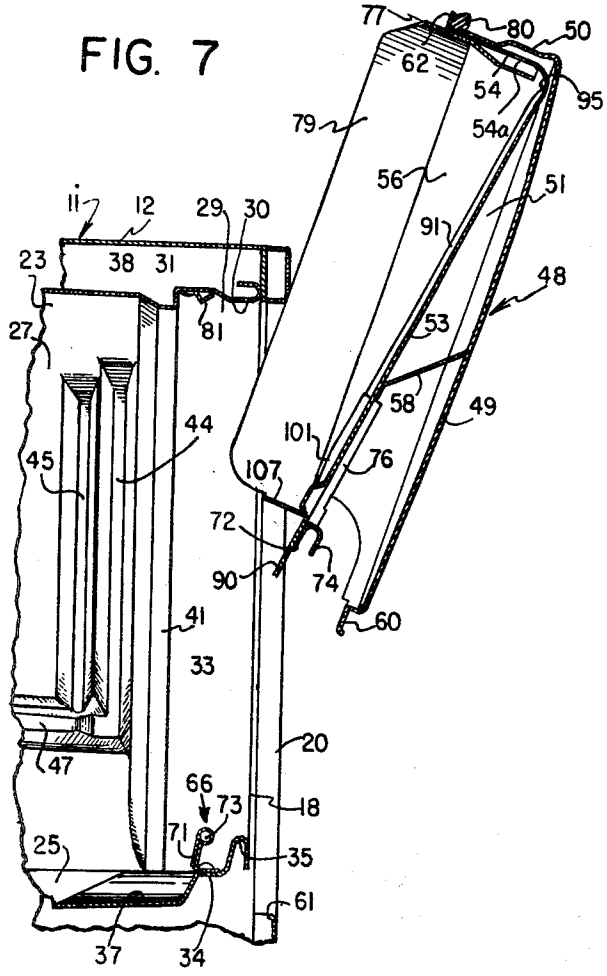
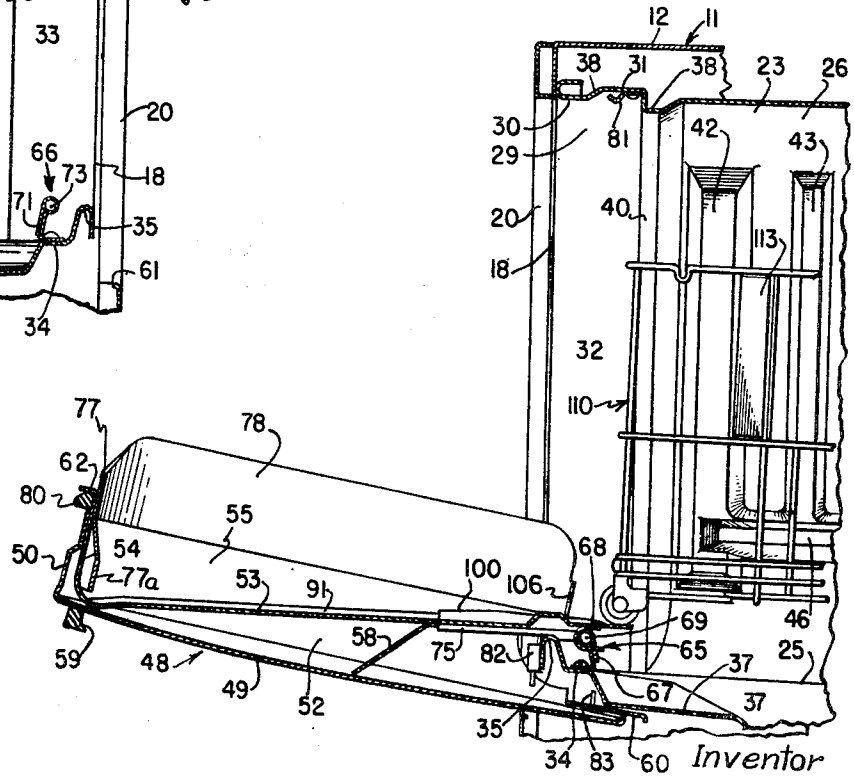


FIG. 8



Inventor
Forrest A. Walker
BY
Smith, Olsen & Baird
Attys.

June 22, 1954 F. A. WALKER 2,681,844

WASHING APPARATUS

Original Filed Oct. 30, 1948 7 Sheets-Sheet 6

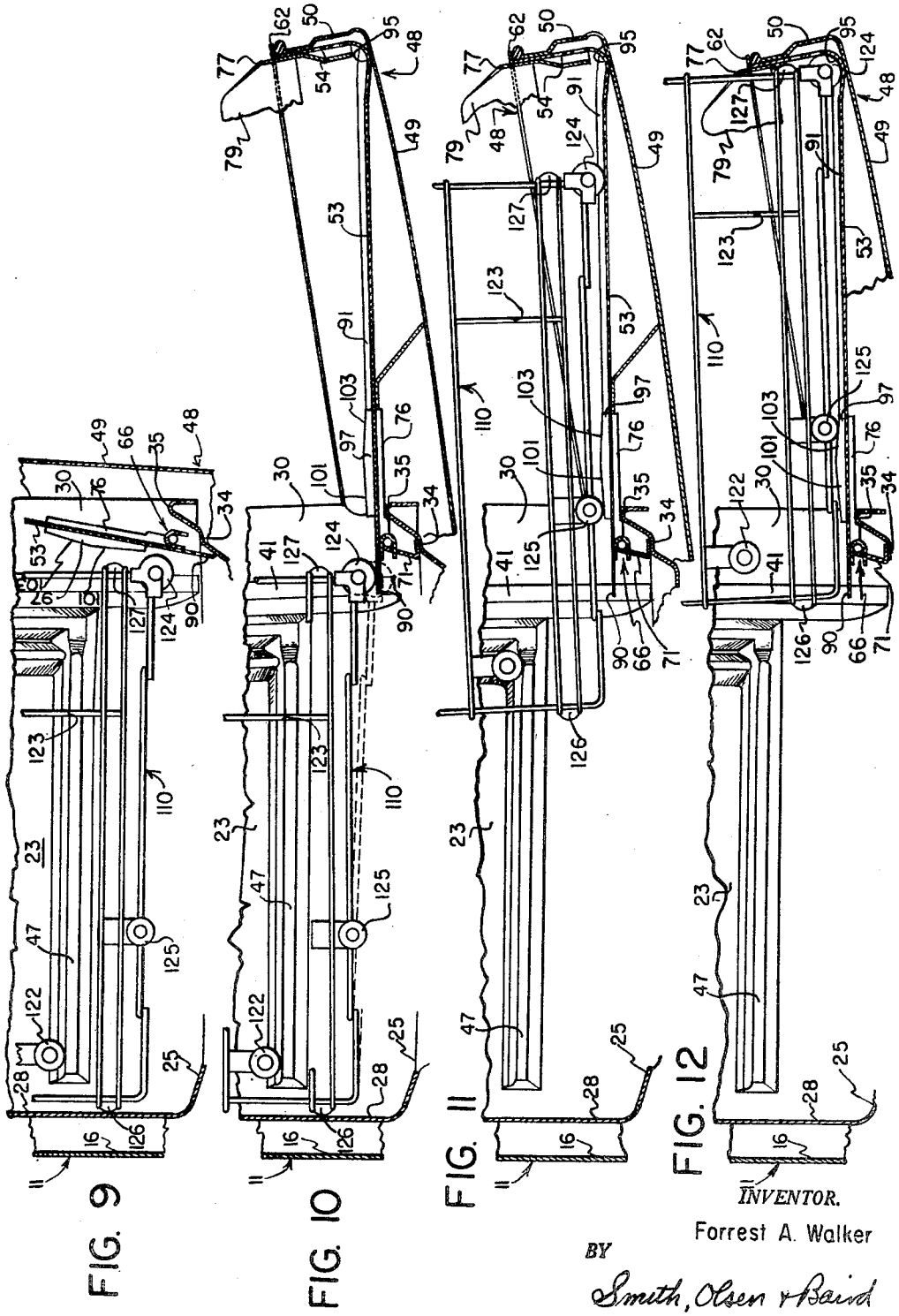


FIG. 9

FIG. 10

FIG. 11

FIG. 12

INVENTOR.
Forrest A. Walker
BY
Smith, Olsen & Baird
Attys

June 22, 1954 F. A. WALKER 2,681,844

WASHING APPARATUS

Original Filed Oct. 30, 1948 7 Sheets-Sheet 7

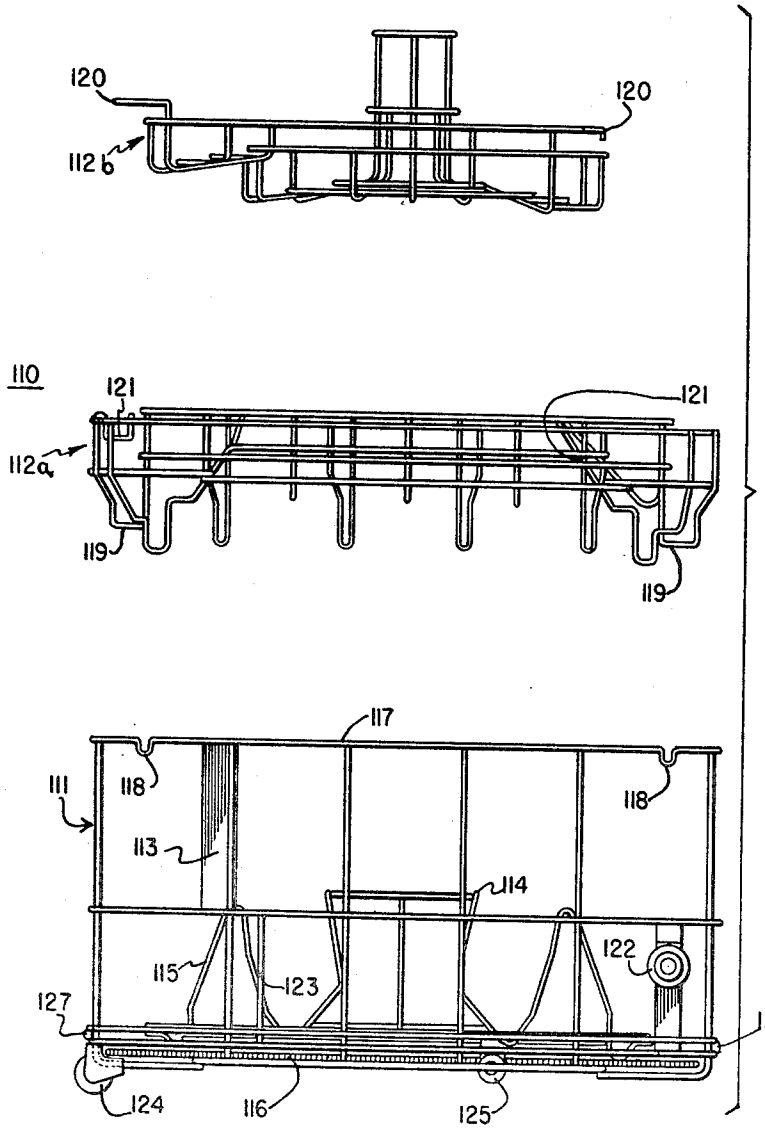


FIG. 13

INVENTOR.
Forrest A. Walker

BY
Smith, Olsen & Baird
Attys.

Patented June 22, 1954

2,681,844

UNITED STATES PATENT OFFICE

2,681,844

WASHING APPARATUS

Forrest A. Walker, Wheaton, Ill., assignor to General Electric Company, a corporation of New York

Original application October 30, 1948, Serial No. 57,488. Divided and this application July 31, 1951, Serial No. 245,401

5 Claims. (Cl. 312—311)

1

The present invention relates to dishwashing apparatus, and more particularly to improved dishwashing apparatus of the general character of that disclosed in the co-pending application of Forrest A. Walker, Serial No. 27,002, filed May 14, 1948, now Patent No. 2,620,811. This application is a division of the copending application of Forrest A. Walker, Serial No. 57,448, filed October 30, 1948, now Patent No. 2,657,697, granted November 3, 1953.

This dishwashing apparatus disclosed in the Walker application mentioned is of the timed washing cycle type that performs automatically and in predetermined sequence given steps including spraying, washing, rinsing and drying of the dishes and other utensils contained therein. This apparatus comprises a cabinet housing a vertically disposed vat including a front opening and a door for closing the opening, the door being mounted for movements between a substantially vertical closed position and a substantially horizontal open position. In this apparatus the opposite side walls of the vat carry aligned guide rails and rollers upon which a dishrack is mounted for movements through the front opening into and out of the vat over the door in its open position.

While this dishwashing apparatus is entirely satisfactory and efficient in operation, the arrangement including the guide rails and rollers carried by the side walls of the vat for mounting the dishrack for movements into and out of the vat possesses the disadvantage that the parts mentioned carried by the side walls of the vat interfere to some extent with cleaning of the interior of the vat.

Accordingly, it is the general object of the present invention to provide dishwashing apparatus including a vat of the front opening type having a door movable with respect to the front opening between a substantially vertical closed position and a substantially horizontal position and a dishrack mounted for rolling movements through the front opening into and out of the vat over the door in its open position, wherein the roller mounting arrangement comprises rollers carried by the dishrack and smooth trackways carried by the side walls of the vat and by the inner wall of the door so that the dishrack is completely removable from the apparatus permitting ready cleaning of the smooth surfaces of the interior of the vat and the door.

Another object of the invention is to provide in cabinet structure of the front opening type including an associated door and a receptacle movable through the front opening into and out of

2

the cabinet structure over the door in its open position, an improved roller mounting arrangement for the receptacle so that the receptacle is shifted from a first position supported entirely by the walls of the cabinet structure into a second position supported jointly by the walls of the cabinet structure and by the door in response to movement of the door from its closed position into its open position in order that the receptacle may then be readily rolled into a third position disposed over the door and supported entirely thereby.

Further features of the invention pertain to the particular arrangement of the elements of the dishwashing apparatus, whereby the above-outlined and additional operating features thereof are attained.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawings, in which Figure 1 is a front elevational view, partly broken away, of dishwashing apparatus embodying the present invention; Fig. 2 is a vertical sectional view of the dishwashing apparatus, taken in the direction of the arrows along the line 2—2 in Fig. 1, illustrating the construction and arrangement of the vat, the receptacle arranged within the vat and the associated front door; Fig. 3 is a horizontal sectional view, partly broken away, of the dishwashing apparatus, taken in the direction of the arrows along the line 3—3 in Fig. 2, further illustrating the construction of the vat, the receptacle arranged within the vat and the associated front door; Fig. 4 is an enlarged fragmentary vertical sectional view of the dishwashing apparatus, taken in the direction of the arrows along the line 4—4 in Fig. 3, illustrating the arrangement for mounting the receptacle within the vat and indicating the movements of the front of the receptacle in response to movements of the associated front door; Fig. 5 is an enlarged fragmentary horizontal sectional view, similar to Fig. 3, of the dishwashing apparatus, illustrating the front of the vat and the associated front door in its open position; Fig. 6 is an enlarged fragmentary vertical sectional view of the dishwashing apparatus, taken in the direction of the arrows along the line 6—6 in Fig. 5, illustrating the construction of the lower front portion of the vat and the associated front door in its open position; Fig. 7 is a fragmentary vertical sectional view of the dishwashing apparatus, taken in the direction of the arrows along the

line 7—7 in Fig. 3, illustrating the construction of the right-hand side of the front doorway into the vat and the adjacent portion of the right-hand side wall of the vat, and indicating the associated front door in its fully removed position with respect to the front doorway; Fig. 8 is a fragmentary vertical sectional view of the dishwashing apparatus, taken in the direction of the arrows along the line 8—8 in Fig. 3, illustrating the construction of the left-hand side of the front doorway into the vat and the adjacent portion of the left-hand side wall of the vat, and indicating the associated front door in its open position; Fig. 9 is a fragmentary vertical sectional view of the lower portion of the dishwashing apparatus, similar to Fig. 2, illustrating the position of the receptacle within the vat when the associated front door occupies its closed position; Fig. 10 is a fragmentary vertical sectional view of the lower portion of the dishwashing apparatus, similar to Fig. 9, illustrating the position of the receptacle within the vat when the associated front door occupies its open position; Fig. 11 is a fragmentary vertical sectional view of the lower portion of the dishwashing apparatus, similar to Figs. 9 and 10, illustrating the receptacle in its partially withdrawn position with respect to the vat and the associated front door in its open position; Fig. 12 is a fragmentary vertical sectional view of the lower portion of the dishwashing apparatus, similar to Figs. 9, 10 and 11, illustrating the receptacle in its fully withdrawn position with respect to the vat and the associated front door in its open position; and Fig. 13 is an exploded side elevational view of the receptacle of the dishwashing apparatus, illustrating the three component and detachable parts thereof.

Referring now to Figs. 1 to 3, inclusive, of the drawings, the dishwashing apparatus 10 there illustrated, and the embodying features of the present invention, is of the general character of that disclosed in the previously mentioned Walker application and comprises a cabinet 11 provided with top and bottom walls 12 and 13, opposed side walls 14 and 15, a rear wall 16 and a front wall 17 having an opening 18 formed in the upper central portion thereof. The front wall 17 carries a front panel 19 having an opening 20 formed in the upper central portion thereof, the openings 18 and 20 being arranged in substantial registry. The general outline of the panel 19 conforms to that of the front of the cabinet 11, whereby the top and sides of the panel 19 are disposed substantially flush with the top wall 12 and the respective side walls 14 and 15. The front wall 17 is rearwardly offset adjacent to the bottom wall 13 providing connecting substantially vertical and horizontal panels 21 and 22 adjacent to the lower front to the cabinet 11 in order to define a foot-receiving recess, permitting a person to work close to the front panel 19. Finally the bottom of the panel 19 is disposed substantially flush with the horizontal panel 22 lending a finished appearance to the front of the apparatus 10.

The cabinet 11 houses a substantially vertically disposed vat 23 arranged in the upper central portion thereof and secured in place in any suitable manner, not shown. The vat 23 comprises top and bottom walls 24 and 25, opposed side walls 26 and 27 and a rear wall 28, the top and bottom walls 24 and 25 and the side walls 26 and 27 terminate in a forwardly directed doorway 29 having a front opening 30 arranged in substantial registry with the front openings 18 and 20.

More particularly, the doorway 29 comprises a top flange 31 and opposed side flanges 32 and 33, while the bottom wall 25 is provided with a flange 34 terminating in an upwardly and outwardly extending ledge or lip 35 extending between the side flanges 32 and 33. The ledge 35 is directed first upwardly and outwardly and then downwardly terminating adjacent to the front opening 30 of the doorway 29, whereby the upper edge of the ledge 35 is disposed considerably above the bottom flange 34, and consequently the bottom wall 25. A substantially centrally disposed sump 36 is formed in the bottom wall 25 and communicates with a downwardly embossed depression or groove 37 formed substantially centrally in the bottom flange 34 and extending forwardly toward the central portion of the ledge 35. Further, an upstanding inverted substantially U-shaped inwardly embossed vat rib 38 is formed in the top wall 24 and the side walls 26 and 27 at the junction thereof with the top flange 31 and the side flanges 32 and 33, the vat rib 38 including an inwardly directed top portion 39 joining the top wall 24 and the top flange 31 and inwardly directed side portions or legs 40 and 41 respectively joining the side walls 26 and 27 and the side flanges 32 and 33. The ends of the legs 40 and 41 terminate just above the bottom flange 34 and well behind and below the ledge 35.

As best shown in Figs. 3 and 8, the left-hand side wall 26 carries baffle structure that cooperates with the leg 40 of the vat rib 38 for the purpose of deflecting washing fluid on the side wall 26 away from the doorway 29 as explained more fully hereinafter. This baffle structure comprises a first upstanding inwardly embossed baffle 42 disposed rearwardly of and substantially parallel to the leg 40 of the rib 38 and a second upstanding inwardly embossed baffle 43 disposed rearwardly of and substantially parallel to the baffle 42. Similarly, as best shown in Figs. 3 and 7, the right-hand side wall 27 carries baffle structure that cooperates with the leg 41 of the vat rib 38 for the purpose of deflecting washing fluid on the side wall 27 away from the doorway 29 as explained more fully hereinafter. This baffle structure comprises a first upstanding inwardly embossed baffle 44 disposed rearwardly of and substantially parallel to the leg 41 of the rib 38 and a second upstanding inwardly embossed baffle 45 disposed rearwardly of and substantially parallel to the baffle 44. Also, two inwardly directed and substantially parallel opposed guide members 46 and 47 are respectively embossed in the side walls 26 and 27, as best shown in Figs. 3, 4, 7 and 8. The guide members 46 and 47 extend substantially horizontally, declining slightly toward the rear wall 28, and are disposed well above the bottom wall 25. More particularly, the guide member 46 extends below the baffle 43, terminates below the baffle 42 behind the leg 40 of the rib 38, and projects inwardly with respect to the leg 40. Similarly the guide member 47 extends below the baffle 45, terminates below the baffle 44 behind the leg 41 of the rib 38, and projects inwardly with respect to the leg 41. The rear ends of the guide members 46 and 47 terminate adjacent to the rear wall 28 and cooperate in supporting a receptacle or dish-rack provided in the vat 23 and described more fully hereinafter. Preferably, the component parts of the cabinet 11, as well as the panel 19, are formed of sheet steel and the exterior surfaces thereof are provided with a suitable enamel coating to lend the apparatus 10 a finished appearance. Preferably,

the vat 23 is formed of sheet steel and the interior surfaces thereof are given a suitable coating of vitreous enamel in order to prevent corrosion thereof as a result of contact with the washing fluid.

The cabinet 11 is provided with a front door 48 for closing the opening 20, that comprises, as best shown in Figs. 2, 3, 5, and 6, an outer body sheet 49 terminating in an inverted substantially U-shaped rearwardly directed marginal flange including top and opposed side portions 50, 51 and 52, and an inner body sheet 53 terminating in an inverted substantially U-shaped rearwardly directed marginal flange including top and opposed side portions 54, 55 and 56. The inner body sheet 53 is arranged in nested relation within the outer body sheet 49 and suitably secured in place so that the principal portions of body sheets 49 and 53 are arranged in upwardly approaching spaced-apart relation. More particularly the rear ends of the portions 50, 51 and 52 of the marginal flange provided on the outer body sheet 49 engage the respective rear ends of the portions 54, 55 and 56 of the marginal flange provided on the inner body sheet 53. Moreover, the inner body sheet 53 is provided with two forwardly projecting bosses 57 disposed adjacent to the top portion 54 of the marginal flange carried thereby, which bosses 57 engage the inner surface of the outer body sheet 49 adjacent to the top portion 50 of the marginal flange carried thereby. Accordingly, the upper portions of the body sheets 49 and 53 are arranged in contacting relation, while the lower edges thereof are arranged in considerably spaced-apart relation defining a wedge-shaped space therebetween. Also, two laterally extending rows of elongated openings 54*a* are formed in the top portion 54 of the marginal flange provided on the inner body sheet 53 and utilized for a purpose more fully described hereinafter. Furthermore, the inner body sheet 53 carries on the outer surface thereof an outwardly projecting bracing sheet 58 contacting the inner surface of the outer body sheet 49 in order further to retain the sheets 49 and 53 in proper spaced-apart relation. The outer body sheet 49 carries a substantially centrally disposed handle 59 adjacent to the upper edge thereof that is readily accessible from the exterior; and the lower edge of the outer body sheet 49 terminates in a rearwardly off-set laterally extending groove 60 that cooperates with an inwardly directed laterally extending edge 61 carried by the panel 19 adjacent to the bottom of the opening 20 formed therein, the groove 60 and the edge 61 cooperating to give the cabinet 11 a finished appearance when the door 48 occupies its closed position as explained more fully hereinafter. The marginal flange provided on the inner body sheet 53 terminates in an outwardly directed rim provided with top and opposed side portions 62, 63 and 64 that respectively cooperate with the corresponding portions 39, 40 and 41 of the vat rib 38 when the door 48 occupies its closed position.

The door 48 is arranged within the doorway 29 and mounted for pivotal movements with respect to the front opening 20 between a substantially vertical closed position and a substantially horizontal open position by an arrangement including two laterally spaced-apart hinge mechanisms 65 and 66 arranged in the doorway 29. More particularly, when the door 48 occupies its closed position the outer body sheet 49 is disposed in a substantially vertical position and is positioned substantially flush with the front of the panel 19, while the inner body sheet 53 is disposed in an upwardly and forwardly inclined position. On the other hand, when the door 48 occupies its open position, the inner body sheet 53 is disposed in a substantially horizontal position and the outer body sheet 49 is disposed in an upwardly and forwardly inclined position. This arrangement is very advantageous as the door 48 may be moved between its open and closed positions through an angle somewhat less than ninety degrees.

Preferably, the hinge mechanisms 65 and 66 are identical. More particularly, the left-hand hinge mechanism 65 comprises a first hinge element 67 secured to the bottom flange 34 adjacent to the left side flange 32 and rearwardly of and below the ledge 35, and a second hinge element 68 secured to the outer surface of the inner body sheet 53 adjacent to the lower left-hand side thereof. The first hinge part 67 carries a pintle 69 that cooperates with a substantially U-shaped open-ended saddle member 70 carried by the second hinge element 68. Likewise, the right-hand hinge mechanism 66 comprises a first hinge element 71 secured to the bottom flange 34 adjacent to the right side flange 33 and rearwardly of and below the ledge 35, and a second hinge part 72 secured to the outer surface of the inner body sheet 53 adjacent to the lower right-hand side thereof. The first hinge element 71 carries a pintle 73 that cooperates with a substantially U-shaped open-ended saddle member 74 carried by the second hinge element 72. The upper portion of the second hinge element 68 of the left-hand hinge mechanism 65 is covered by an outer bumper member 75; and the upper portion of the second hinge element 72 of the right-hand hinge mechanism 66 is covered by an outer bumper member 76.

The lower ends of the body sheets 49 and 53 are arranged in straddling relation with respect to the ledge 35 so that when the door 48 occupies its closed position the lower end of the inner body sheet 53 is disposed rearwardly of and below the ledge 35 and the lower end of the outer body sheet 49 is disposed forwardly of and below the ledge 35. Also when the door 48 occupies its closed position the groove 60 carried by the lower end of the outer body sheet 49 is disposed rearwardly of the edge 61 carried by the panel 19 and substantially in contacting relation therewith in order to give the front of the cabinet 11 a finished appearance. When the door 48 is pivoted into its open position the bumper members 75 and 76 of the respective hinge mechanisms 65 and 66 engage the top of the adjacent portions of the ledge 35, as clearly indicated in Figs. 6 and 8, in order to support the weight of the door 48, as well as the weight of the dish-receptacle that may be carried by the door 48 at this time, as explained more fully hereinafter. Also when the door 48 occupies its open position the groove 60 carried on the lower end of the outer body sheet 49 is swung inwardly about the pintles 69 and 73 of the respective hinge mechanisms 65 and 66 away from the cooperating edge 61 carried by the panel 19, as clearly indicated in Fig. 8.

Due to the construction of the hinge mechanisms 65 and 66 the door 48 may be completely removed from the doorway 29 when it comprises an intermediate pivoted position with respect to its open and closed positions, as illustrated in Fig. 7. More particularly, when the door 48 is moved into its intermediate position

the open-ended saddle members 70 and 74 may be lifted from the respective pintles 69 and 73 respectively incorporated in the hinge mechanisms 65 and 66. Specifically, the door 48, when it occupies its intermediate position, is lifted upwardly and outwardly in order to clear the doorway 29; which arrangement permits the complete removal of the door 48 from the doorway 29. Subsequently the door 48 may be replaced in the doorway 29 by following a substantially identical reversed procedure. This arrangement permitting complete removal of the door 48 from the doorway 29 is very advantageous as it permits ready access to the interior of the vat 23 facilitating complete and thorough cleaning thereof.

Also, the inner body sheet 53 carries an upstanding inverted substantially U-shaped inwardly directed baffle provided with top and opposed side portions 77, 78 and 79 respectively directly engaging and attached to the corresponding portions 54, 55 and 56 of the marginal flange carried by the inner body sheet 53. The top portion 77 of this baffle is provided with an inwardly depressed body 77*a* extending under the top portion 54 of the marginal flange carried by the inner body sheet 53 and covering the openings 54*a* formed therein, which arrangement is employed for a purpose subsequently described. More particularly, the top and side portions 77, 78 and 79 of this baffle project through the doorway 29 past and in cooperative relation with the respective portions 39, 40 and 41 of the vat rib 38, when the door 48 occupies its closed position. Further, when the door 48 occupies its closed position, the side portions 78 and 79 of this baffle project further rearwardly into respective cooperation with the baffles 42 and 44 carried by the respective side walls 26 and 27 of the vat 23. Also, when the door 48 occupies its closed position, the portions 50, 51 and 52 of the marginal flange carried by the outer body sheet 49 cooperate with the respective flanges 31, 32 and 33 of the doorway 29; and the portions 62, 63 and 64 of the rim disposed about the marginal flange carried by the inner body sheet 53 abut the corresponding shoulders or faces provided on the corresponding portions 39, 40 and 41 of the vat rib 38. The portions 62, 63 and 64 of the rim disposed about the marginal flange carried by the inner body sheet 53 project beyond the adjacent edges of the corresponding portions 50, 51 and 52 of the marginal flange carried by the outer body sheet 49 and are arranged in non-scraping relation with respect to the corresponding flanges 31, 32 and 33 of the doorway 29 in order to permit ready movements of the door 48 with respect to the doorway 29. Further the portions 77, 78 and 79 of the baffle secured within the marginal flange carried by the inner body sheet 53 are arranged in non-scraping relation with respect to the corresponding portions 39, 40 and 41 of the vat rib 38, and the side portions 78 and 79 of this baffle are arranged in non-scraping relation with respect to the respective baffles 42 and 44 in order further to accommodate ready movements of the door 48 with respect to the doorway 29.

In order to restrain the door 48 in its closed position an arrangement is provided that comprises a first latch element 80 disposed between the end of the portion 50 of the marginal flange carried by the outer body sheet 49 and the portion 62 of the rim provided on the marginal flange carried by the inner body sheet 53, and a second latch element 81 carried by the flange 31 within the doorway 29. The first latch element 80 may be formed of "Textolite," or the like, and is disposed substantially centrally of the top portion 50 of the marginal flange carried by the outer body sheet 49; while the second latch element 81 may take the form of a short resilient corrosion-resistant spring secured to the corresponding central portion of the flange 31 adjacent to the face of the portion 39 of the vat rib 38. When the door 48 is moved to its closed position, the latch element 80 rides under the latch element 81 and is restrained in engagement therewith by friction. In order to disengage the latch elements 80 and 81 it is only necessary to pull upon the handle 59 carried adjacent to the top of the door 48. Accordingly, the door 48 may be readily moved to its closed position and latched in place automatically by the cooperation between the latch elements 80 and 81. Likewise, the door 48 may be moved out of its closed position merely by pulling upon the handle 59 in order to disengage the latch elements 80 and 81.

Further, an electric switch or circuit controller 82 is carried by the lower left-hand front side of the ledge 35 and arranged in cooperative relation with respect to a trip element 83 carried by the inner surface of the outer body sheet 49. More particularly, when the door 48 occupies its closed position the trip element 83 engages the plunger of the switch 82 moving the switch 82 to its closed-circuit position; and when the door 48 occupies its open position the trip element 83 disengages the plunger of the switch 82 moving the switch 82 to its open-circuit position; all for a purpose more fully explained hereinafter.

Further, the inner body sheet 53 carries two substantially L-shaped inwardly directed embosses 84 and 85 respectively disposed adjacent to the opposite sides thereof. More particularly, the emboss 84 comprises a stem 86 constituting a strengthening rib disposed substantially parallel to the portion 78 of the baffle arranged within the marginal flange carried by the inner body sheet 53 and spaced inwardly therefrom, as well as an inwardly directed leg 87 constituting a baffle positioned adjacent to the lower edge of the inner body sheet 53 and substantially parallel thereto. Likewise, the emboss 85 comprises a stem 88 constituting a strengthening rib disposed substantially parallel to the portion 79 of the baffle arranged within the marginal flange carried by the inner body sheet 53 and spaced inwardly therefrom, as well as an inwardly directed leg 89 constituting a baffle positioned adjacent to the lower edge of the inner body sheet 53 and substantially parallel thereto. Accordingly, the legs 87 and 89 are directed toward each other, while the stems 86 and 88 are disposed in substantially parallel relation with respect to each other. Also the inner body sheet 53 terminates in a downwardly projecting substantially centrally disposed tail 90 that is received within the groove 37 formed in the bottom flange 34 when the door 48 occupies its closed position; and an upstanding substantially centrally disposed trackway 91 is embossed in the inner body sheet 53, the lower end of the trackway 91 extending onto the tail 90. The leg 87 of the emboss 84 terminates short of the trackway 91, while the leg 89 of the emboss 85 joins the trackway 91. Accordingly, a space is provided between the end of the leg 87 and the trackway 91, in which space a recess 92 is provided in the inner body sheet 53. An inwardly opening detergent cup 93 is arranged in the re-

cess 92 and suitably secured in place between the inner body sheet 53 and the outer body sheet 49. Also, the detergent cup 93 is surrounded by an outwardly extending flange 94 spaced inwardly from the inner body sheet 53. Accordingly, when the door 48 occupies its closed position the bottom wall of the inwardly opening detergent cup 93 is disposed substantially in line with the pintles 69 and 73 of the respective hinge mechanism 65 and 66 and somewhat below the upper edge of the ledge 35; all for a purpose more fully explained hereinafter. The central trackway 91 terminates adjacent to the upper end thereof in a depression 95 disposed just below the portion 54 of the marginal flange carried by the inner body sheet 53 for a purpose fully explained hereinafter.

Finally the stems 86 and 88 of the respective embosses 84 and 85 carry two side trackways 96 and 97 respectively adjacent to the leg 87 and 89. The side trackway 96 is secured to the bumper member 75, to the second hinge element 68 of the hinge mechanism 65 and to the inner body sheet 53 by an arrangement including a plurality of securing devices 98, which may take the form of cooperating threaded studs and eyelets. Preferably the bumper member 75 and the side trackway 96 are formed of "Textolite," or the like, and are securely clamped together by the common securing devices 98. Likewise, the side trackway 97 is secured to the bumper member 76, to the second hinge element 72 of the hinge mechanism 66 and to the inner body sheet 53 by an arrangement including a plurality of securing devices 99, which may take the form of cooperating threaded studs and eyelets. Preferably the bumper member 76 and the side trackway 97 are formed of "Textolite," or the like, and are securely clamped together by the common securing devices 99. The side trackways 96 and 97 comprise respective rearwardly sloping surfaces 100 and 101 and respective forwardly sloping surfaces 102 and 103 when the door 48 occupies its open position; which surfaces are utilized for a purpose more fully explained hereinafter.

Finally two laterally spaced-apart and inwardly directed bosses 104 and 105 are formed in the inner body sheet 53 adjacent to the lower edge thereof. More particularly, the boss 104 is disposed between the lower side of the portion 78 of the baffle arranged within the marginal flange carried by the inner body sheet 53 and the lower side of the emboss 84 adjacent to the side trackway 96; while the boss 105 is disposed between the lower side of the portion 79 of the baffle arranged within the marginal flange carried by the inner body sheet 53 and the lower side of the emboss 85 adjacent to the side trackway 97. The extreme lower end of the portion 78 of the baffle arranged within the marginal flange carried by the inner body sheet 53 terminates in an inwardly directed lip 106 disposed below the boss 104; while the extreme lower end of the portion 79 of the baffle arranged within the marginal flange carried by the inner body sheet 53 terminates in an inwardly directed lip 107 disposed below the boss 105. More particularly, the inwardly directed lips 106 and 107 are positioned respectively adjacent to legs 87 and 89 of the respective embosses 84 and 85 and are utilized for a purpose more fully explained hereinafter.

Preferably, the sheets 49, 53 and 58 incorporated in the door 48 are formed of aluminum in order to obtain a strong light-weight construction and the exterior surfaces of the door 48 are provided with a suitable enamel coating to match that of the cabinet 11.

Further, the apparatus 10 comprises a dish and utensil supporting assembly or rack 110 including, as best shown in Fig. 13, a lower receptacle or basket 111, a detachable upper outer receptacle or basket 112*a*, and a detachable upper inner receptacle or basket 112*b*; all formed of open wire-work stainless steel construction. The lower basket 111 is substantially rectangular in plan and carries a substantially vertically disposed supplemental baffle 113 adjacent to the left-hand front side thereof and is provided with a centrally disposed structure 114 adapted to receive a removable perforated silverware receiving cup, not shown, and other structure 115 expressly adapted to receive and to support dishes in an upstanding position surrounding the structure 114. Also, the bottom of the lower basket 111 carries a reticulated screen 116 that prevents any small articles from falling therethrough into the bottom of the vat 23. The upper outer basket 112*a* and the upper inner basket 112*b* are removable together with respect to the lower basket 111. The upper outer basket 112*a* is adapted expressly to support cups and saucers while the removable inner upper basket 112*b* is adapted expressly to receive glassware. The lower basket 111 comprises an upper rim 117 provided with a plurality of spaced-apart notches 118 adapted to receive corresponding abutments 119 carried by the upper outer basket 112*a*. Finally the upper inner basket 112*b* carries structure 120 adapted to be supported by corresponding structure 121 carried by the upper outer basket 112*a*. The rack structure 110 as a whole is movable through the doorway 29 into and out of the vat 23 when the door 48 occupies its open position, by virtue of a mounting arrangement including a first pair of laterally spaced-apart rollers 122 carried by the rear of the lower basket 111 and cooperating with the respective guide members 46 and 47. Also, this mounting arrangement comprises a pair of laterally spaced-apart feet 123 carried by the front of the lower basket 111 and cooperating with the respective guide members 46 and 47, as well as a substantially centrally located front roller 124 carried by the front of the lower basket 111 and cooperating with the central trackway 91 carried by the inner body sheet 53. Finally, the mounting arrangement comprises a second pair of laterally spaced-apart rollers 125 carried by the lower rear of the lower basket 111 and respectively cooperating with the side trackways 96 and 97 carried by the inner body sheet 53.

The mounting arrangement for the rack structure 110 will best be understood by reference to Figs. 9 to 12, inclusive, of the drawings. When the rack structure 110 occupies its position within the vat 23 and the door 48 occupies its closed position, the rollers 122 respectively engage the rear ends of the guide members 46 and 47 and support the rear of the rack structure 110; while the feet 123 respectively engage the front ends of the guide members 46 and 47 and support the front of the rack structure 110, as clearly illustrated in Fig. 9. At this time when the rack structure 110 occupies its position within the vat 23 and the door 48 is moved from its closed position into its open position, the tail 90 of the inner body sheet 53 engages the front roller 124 and lifts the front of the rack structure 110, as clear-

ly illustrated in Fig. 10. More particularly, the tail 90 of the inner body sheet 53 lifting the front roller 124 lifts the front of the rack structure 110 causing the feet 123 to disengage the front ends of the respective guide members 46 and 47. Accordingly, when the rack structure 110 is arranged within the vat 23 and the door 48 occupies its closed position, a four-point support is provided for the rack structure 110; on the other hand, when the rack structure 110 is arranged within the vat 23 and the door 48 occupies its open position, a three-point support is provided for the rack structure 110. Thus at this time the rear of the rack structure 110 is supported by the pair of rollers 122 and the front of the rack structure 110 is supported by the front roller 124. Moreover, the front roller 124 is aligned with respect to the central trackway 91 carried by the inner body sheet 53.

At this time the rack structure 110 may be moved from its position within the vat 23 through the doorway 29 over the door 48 in its open position merely by pulling upon the front of the rack structure 110, the pair of rollers 122 riding upon the respective guide members 46 and 47 and the front roller 124 riding in the trackway 91. When the rack structure 110 has been moved to a partially withdrawn position with respect to the vat 23 over the front door 48 in its open position, as illustrated in Fig. 11, the second pair of rollers 125 respectively engage the side trackways 96 and 97 carried by the inner body sheet 53. More particularly, the second pair of rollers 125 respectively engage the side trackways 96 and 97 before the first pair of rollers 122 respectively disengage the guide members 46 and 47. Accordingly as the rack structure 110 is moved into its partially withdrawn position, as illustrated in Fig. 11, the mounting arrangement substitutes a five-point support for the prior three-point support for the rack structure 110.

As forward movement of the rack structure 110 is continued the second pair of rollers 125 roll up upon the respective surfaces 100 and 101 provided on the respective side trackways 96 and 97 and the first pair of rollers 122 respectively disengage the guide members 46 and 47; whereby another three-point support is substituted for the prior five-point support for the rack structure 110. As forward movement of the rack structure 110 continues the front roller 124 continues to ride in the central trackway 91 and the second pair of rollers 125 ride over onto the respective surfaces 102 and 103 carried by the respective side trackways 96 and 97. When the rack structure 110 is moved into its fully withdrawn position, as illustrated in Fig. 12, it is supported by the front roller 124 riding into the depression 95 formed in the front end of the central trackway 91 and by the second pair of rear rollers 125 engaging the respective surfaces 102 and 103 respectively carried by the side trackways 96 and 97. The fully withdrawn position of the rack structure 110, illustrated in Fig. 12, constitutes a stop position so that the rack structure 110 is retained in a steady state in its fully withdrawn position. At this time, dishes, or the like, may be appropriately loaded into or removed from the various baskets 111, 112*a* and 112*b* of the rack structure 110. Moreover, at this time the weight of the rack structure 110 and the various dishes or the like, carried thereby, is supported entirely upon the door 48. Specifically the bumper members 75 and 76 engage the associated portions of the upper edge of the ledge 35 and the hinge elements of the hinge mechanisms 65 and 66 are engaged.

At this time the upper inner basket 112*b* may be removed from the upper outer basket 112*a* or both the upper inner basket 112*b* and the upper outer basket 112*a* may be removed together from the lower basket 111. Finally the assembled rack structure 110 including the lower basket 111, together with the upper baskets 112*a* and 112*b*, may be readily removed entirely from the door 48 in its open position merely by lifting up upon the front end of the lower basket 111 and then by moving the rack structure 110 upwardly and forwardly to clear the front portion 54 of the marginal flange carried by the inner body sheet 53. In passing it is noted that the marginal flange carried by the inner body sheet 53, together with the baffle arranged within this marginal flange, constitute a retaining wall preventing accidental displacement of the lower basket 111 in its fully withdrawn support position from the door 48 in its open position. The subsequent replacement of the rack structure 110 upon the inner body sheet 53 of the door 48 is substantially identical to that described above, the above-described steps being followed in reverse order.

In order to return the rack structure 110 from its fully withdrawn position back through the doorway 29 into the vat 23, it is only necessary to push inwardly upon the front of the lower basket 111. As the rack structure 110 moves from its fully withdrawn position over the door 48 in its open position into its partially withdrawn position, as respectively illustrated in Figs. 12 and 11, the first pair of rollers 122 again respectively re-engage the front ends of the respective guide members 46 and 47. As further inward movement of the rack structure 110 is continued the second pair of rollers 125 respectively disengage the side trackways 96 and 97, as indicated in Fig. 10. After the rack structure 110 has been moved back into the vat 23 and the door 48 is again returned from its open position into its closed position the front end of the rack structure 110 is again lowered causing the front roller 124 to disengage completely the tail 90 of the inner body sheet 53 and the pair of feet 123 again to engage the front ends of the respective guide members 46 and 47, as illustrated in Fig. 9.

Finally the lower basket 111 carries resilient rear bumper structure 126 and resilient front bumper structure 127 that are utilized for the purpose of preventing direct striking of the rear and the front of the lower basket 111 upon the respectively adjacent rear wall 28 and inner body sheet 53. Specifically when the rack structure 110 occupies its final position within the vat 23, it is located by engagement between the rear bumper structure 126 and the rear wall 28. On the other hand, in the event the door 48 should be moved into its closed position before the rack structure 110 has been moved into its final position within the vat 23, the front bumper structure 127 engages the inner body sheet 53 forcing the rack structure 110 into its final position within the vat 23.

The arrangement of the inclined surfaces 100 and 101 upon the respective side trackways 96 and 97 biases the rack structure 110 back into the vat 23; while the arrangement of the inclined surfaces 102 and 103 upon the respective side trackways 96 and 97 biases the rack structure 110 into its fully withdrawn position

over the door 48 in its open position. Accordingly, the trackways 96 and 97 are effective to cause return movement of the rack structure 110 back into its final position within the vat 23 when the rack structure 110 is moved in this direction; and likewise the trackways 96 and 97 are effective to cause forward movement of the rack structure 110 into its fully withdrawn position over the door 48 in its open position when the rack structure is moved in this direction.

Again referring to Figs. 1 to 3, inclusive, of the drawings the apparatus 10 further comprises an impeller 130 which is provided with blades 131 that may have any suitable shape, the important feature being that the blades are given a shape such that the washing fluid supplied to the vat 23 and allowed to accumulate in the sump 36 is thrown upwardly and outwardly in an efficient manner through the rack structure 110. The impeller 130 may be formed of any suitable material, such, for example, as "Textolite" and is mounted upon a substantially vertically disposed operating shaft 132 of an electric motor 133 arranged below the sump 36. More particularly, the sump 36 terminates in a substantially vertically disposed tube 134 through which the shaft 132 of the motor 133 projects and which is surrounded by the hub of the impeller 130. The hub of the impeller 130 may be removably secured to the upper end of the shaft 132 by an arrangement including a bolt 135 extending through an associated spacing collar 136 arranged within the tube 134 and abutting the upper end of the shaft 132, the end of the bolt 135 being threaded into a cooperating recess provided in the upper end of the shaft 132. The motor 133 is carried by suitable structure 137, that is, in turn, secured to the bottom wall 13. Finally, the shaft 132 carries a disk 138 disposed below the spacing collar 136 and the bottom of the tube 134 in order to fling from the shaft 132 any washing fluid that may escape from the vat 23 into the upper open end of the tube 134 between the hub of the impeller 130 and the wall of the tube 134. This arrangement permits ready rotation of the impeller 130 by the motor 133 and prevents the escape of any substantial amount of the washing fluid from the vat 23 through the tube 134. Also, an upstanding cylindrical reticulated screen 139 is carried by the bottom wall of the sump 36 in surrounding relation with respect to the blades 131 of the impeller 130. Accordingly, the shaft 132 of the motor 133 rotates the impeller 130 about a substantially vertical axis, the rotation of the impeller 130 being in a counterclockwise direction as viewed from the top of the vat 23.

Provided in the space in the casing 11 below the vat 23 is a suitable fluid supply pipe 140 which is adapted to be connected to a source of supply of cleansing or washing fluid, not shown, by coupling unions, or the like, not shown. For example, in the event the washing fluid is water the source of supply may be a convenient hot water tank, or the like. The washing fluid is piped from the bottom of the casing 11 upwardly between the rear wall of the casing 11 and the rear wall of the vat 23 by a flexible conduit 141 and into the top of the vat 23. Specifically, a spraying device 142 is carried by the lower surface of the top wall 24 of the vat 23 and is positioned substantially centrally of the vat 23 so that the washing fluid may be sprayed down through the rack structure 110 provided in the vat 23 and allowed to accumulate in the sump 36. Specifically, the fluid supply pipe 140 is suitably connected to an inlet valve mechanism 143 of the solenoid-dashpot type arranged to discharge into the conduit 141. The inlet valve mechanism 143 is normally biased to its closed position in order to cut off the supply of washing fluid from the fluid supply pipe 140 to the conduit 141, but is operated to its open position when the associated solenoid is energized, in order that washing fluid may be supplied from the fluid supply conduit 141 via the casing of the inlet valve mechanism 143, the conduit 141 and the spraying device 142 into the upper portion of the vat 23. Subsequently, when the solenoid of the inlet valve mechanism 143 is de-energized, the inlet valve mechanism 143 is returned slowly to its closed position cutting off the communication between the fluid supply pipe 140 and the spraying device 142. The provision of the slow closing inlet valve mechanism 143 is very advantageous in view of the fact that it eliminates water hammer in the kitchen plumbing preceding the fluid supply pipe 140. Also, a strainer, not shown, is incorporated in the casing of the inlet valve mechanism 143 in order positively to prevent foreign material in the fluid supply pipe 140 from being conducted into the fluid supply conduit 141 and thence into the spraying device 142.

Also provided in the lower portion of the casing 11 below the vat 23 is a drainpipe 144 that is connected through a suitable trap 145 to a drain connection 146. Provided in the drainpipe 144 is an elbow 147 terminating in a drain valve mechanism 148 that is suitably connected to a drain conduit 149, that, in turn, communicates through an opening 150 formed in the bottom wall 25 of the vat 23 with the bottom of the sump 36. More particularly, the drain conduit 149 may be formed of rubber, or the like, and is arranged in fluid-tight relation with the portion of the bottom wall 25 surrounding the opening 150. The drain valve mechanism 148 is normally biased to its open position in order to connect the sump 36 via the opening 150, the drain conduit 149, the casing of the drain valve mechanism 148, the elbow 147, the drainpipe 144 and the trap 145 to the drain connection 146. In order to operate the drain valve mechanism 148 there is mounted on the structure 137 a platform 151 carrying an electromagnetic device 152 which has an armature 153 that is actuated in response to energization of an associated solenoid 154. Connected to the armature 153, by a suitable spring 155, is a lever 156, which is, in turn, connected to a shaft 157 extending into the interior of the drain valve mechanism 148 and operatively connected to the valve element, not shown, thereof. Specifically the shaft 157 is normally biased by an arrangement, not shown, in order to cause the drain valve mechanism 148 to occupy its open position, as previously noted. When the solenoid 154 is energized the armature 153 of the electromagnetic device 152 is actuated so as to rotate through the spring 155 the shaft 157 in a counterclockwise direction, as viewed in Fig. 2, whereby the drain valve mechanism 148 is operated to its closed position, cutting off the communication between the sump 36 and the drain connection 146. Subsequently when the solenoid 154 of the device 152 is de-energized, the armature 153 is released, whereby the shaft 157 is rotated in the clockwise direction again operating the drain valve mechanism 148 to its open position in order

again to place the sump 36 into communication with the drain connection 146.

Mounted within the lower portion of the vat 23 above the bottom wall 25 and the sump 36 and surrounding the impeller 130 is a suitable electric heater 160 which is preferably of the sheathed resistance conductor type; which heater 160 is employed for the purpose of drying dishes after they have been washed and rinsed as explained more fully hereinafter. Also an electric control panel 161 is arranged in the lower portion of the casing 11 below the bottom wall 13. The control panel 161 supports electric apparatus, that is connected and arranged in the manner described in the previously mentioned Walker application and substantially in the manner disclosed in United States Patent No. 2,425,620, granted on August 12, 1947, to Leslie A. Kempton, for the purpose of controlling the electric motor 133, the electro-responsive inlet valve mechanism 143, the electro-responsive device 152 associated with the drain valve mechanism 148, and the electric heater 160. Specifically this electric circuit network includes a start switch, not shown, that is controlled by a push button 162 carried by the front panel 19 of the casing 11 adjacent to the upper left-hand corner thereof, as illustrated in Fig. 1, as well as the electric switch 82 of the interlock type. Also this electric control network comprises a pick-up relay, not shown, and an electromagnetic timer, not shown. The electric circuit network is so connected and arranged that when the door 48 is closed the interlock switch 82 is operated to its closed position in order to prepare the start switch, not shown. At this time when the push button 162 is operated the start switch, not shown, is closed in order to effect operation of the pick-up relay, not shown, whereby operation of the electromagnetic timer, not shown, is initiated. At this time the timer, not shown, proceeds through a timed cycle of operation of the dishwashing apparatus 10 in order to effect spraying, washing, rinsing and drying of the dishes supported by the rack structure 110 in the vat 23 and then is reset at the conclusion of the cycle, reconditioning itself for another cycle of operation. During the cycle of operation of the dishwashing apparatus 10, should the door 48 be moved from its closed position the interlock switch 82 is operated to its open position in order to govern the electric control circuit to bring about restoration of the pick-up relay, not shown, whereby the timer, not shown, is reset into its initial position.

The details of the electric control network incorporated in the dishwashing apparatus 10 have been omitted in the interest of brevity but are fully disclosed in the previously mentioned Kempton patent; however, the complete timed washing cycle of the dishwashing apparatus 10 may be understanding from the following outline.

After the dishes to be washed have been loaded into the rack structure 110 and the rack structure 110 has been moved into its normal pushed-in position in the vat 23 the door 48 is closed by the handle 56, whereupon the push button 162 is operated in order to initiate the timed washing cycle. At this time the pick-up relay, not shown, and the timer, not shown, are operated in order to initiate a first spray step. Specifically operation of the electric motor 133 is initiated and the inlet valve 143 is operated to its open position while the drain valve mechanism 148 occupies its open position. Accordingly, the impeller 130 is rotated in the counter-clockwise direction and washing fluid is supplied from the fluid supply pipe 140 to the spraying device 142. The washing fluid sprays downwardly from the spraying device 142 through the dishes supported by the rack structure 110 into the sump 36. This washing fluid passes from the sump 36 into the drain conduit 149 and thence into the drain connection 146. Some of the washing fluid in the sump 36 passes through the reticulated screen 139 and may be caught and flung upwardly and outwardly through the dishes supported by the rack structure 110 by the blades 131 of the impeller 130 at this time, although this action is not considerable since the drain valve mechanism 148 occupies its open position. This first spray step is carried out through a time interval of approximately 30 seconds under the control of the timer, not shown.

The timer, not shown, then initiates a first washing step and specifically the electromagnetic device 152 is operated in order to close the drain valve mechanism 148 while the inlet valve mechanism 143 occupies its open position and the electric motor 133 is running. At this time the washing fluid sprayed through the dishes supported by the rack structure 110 from the spraying device 142 accumulates in the sump 36 since the drain valve mechanism 148 occupies its closed position. The washing fluid accumulating in the sump 36 of the vat 23 passes through the reticulated screen 139 and is caught by the blades 131 of the impeller 130 and is flung upwardly and outwardly through the rack structure 110 and the dishes supported thereby against the walls of the vat 23 and the door 48 and again returns to the sump 36. The supply of washing fluid from the spraying device 142 continues until a predetermined quantity of washing fluid accumulates in the sump 36 imposing a predetermined load upon the impeller 130 and consequently upon the electric motor 133. The electric circuit network is responsive to this increased load imposed upon the electric motor 133 and operates in order to de-energize the solenoid of the inlet valve mechanism 143, whereby the inlet valve mechanism 143 is operated to its closed position to shut off the supply of washing fluid from the fluid supply pipe 140 to the spraying device 142. Also the electric circuit network comprises an arrangement for de-energizing the solenoid of the inlet valve mechanism 143 in order to shut off the supply of washing fluid from the fluid supply pipe 140 to the spraying device 142, after an elapsed time of forty-five seconds, in the event this operation has not already been effected by the previously mentioned arrangement responsive to the increased load upon the electric motor 133. After a predetermined quantity of washing fluid has accumulated in the sump 36 a given charge of detergent is introduced into the washing fluid in order that the first washing cycle may be effective to remove grease and other foreign materials from the dishes supported by the rack structure 110, the arrangement for introducing the detergent into the washing fluid accumulated in the sump 36 during the first washing step being described more fully hereinafter. Preferably, the detergent mentioned is of the type sold under the trade name "Calgonite," that comprises about forty per cent sodium hexametaphosphate and sixty per cent sodium metasilicate. This first washing step is carried out through a time interval of approximately five minutes under the control of the timer, not shown, whereupon the timer operates to effect the release of the electromagnetic devices 152, whereby the drain valve mecha-

nism 148 is operated to its open position while the inlet valve mechanism 143 occupies its closed position and the electric motor 133 is running. The washing fluid accumulated in sump 36 is then drained into the drain conduit 146, which takes place in not more than forty-five seconds. The timer, not shown, then operates at the conclusion of forty-five seconds in order again to effect operation of the inlet valve mechanism 143 to its open position while the drain valve mechanism 148 occupies its open position and the electric motor 133 is running, thereby to initiate a second spray step.

Washing fluid is again supplied from the fluid supply pipe 140 to the spraying device 142, whereby the dishes supported by the rack structure 110 are again sprayed, and the washing fluid in the sump 36 passing through the drain valve mechanism 148 into the drain connection 146. This second spray step is carried out under the control of the timer, not shown, through a time interval of approximately ten seconds, whereupon the timer again operates the electromagnetic device 152 in order to effect closure of the drain valve mechanism 148 and the consequent initiation of a second washing step.

The second washing step proceeds in the manner of the first washing step described above, whereby the inlet valve mechanism is operated to its closed position depending upon the load upon the electric motor 133 or at the conclusion of forty-five seconds. The second washing step continues for a timed interval of five minutes under the control of the timer, not shown, whereupon the electromagnetic device 152 is again released in order to open the drain valve mechanism 148 while the inlet valve mechanism 143 occupies its closed position and the electric motor 133 is running. The washing fluid accumulated in the sump 36 is then drained into the drain connection 146; and after forty-five seconds the timer, not shown, again operates to effect operation of the inlet valve mechanism 143 to its open position while the drain valve mechanism 148 occupies its open position and the electric motor 133 is running, thereby to initiate a third spray step. The washing fluid supplied from the fluid supply conduit 140 to the spraying device 142 sprays through the dishes supported by the rack structure 110 and is drained from the sump 36 into the drain connection 146. This spray step continues throughout a timed interval of ten seconds under the control of the timer, not shown, whereupon operation of the electromagnetic device 152 is effected in order to effect closure of the drain valve mechanism 148, thereby initiating a first rinse step.

Washing fluid is sprayed from the spraying device 142 into the vat 23 and accumulates in the sump 36; and thereafter the inlet valve mechanism 143 is operated to its closed position depending upon the load upon the electric motor 133 or upon the elapsed time interval of forty-five seconds, as previously explained. This rinse step continues through a time interval of one minute, whereupon the timer, not shown, releases the electromagnetic device 152 to cause the drain valve 148 to be operated to its open position. The washing fluid accumulated in the sump 36 is then drained through the drain valve 148 into the drain connection 146.

At the conclusion of forty-five seconds the timer, not shown, again operates the inlet valve mechanism 143 to its open position in order to initiate another spray step in the manner previously explained. After ten seconds the timer, not shown, operates the electromagnetic device 152 in order to effect operation of the drain valve mechanism 148 to its closed position, whereby washing fluid is again accumulated in the sump 36 initiating a second rinse step. Subsequently the inlet valve mechanism 143 is operated to its closed position depending upon the load upon the electric motor 133 or at the expiration of forty-five seconds, as previously explained. This second rinse step continues through a time interval of one minute and thereafter the timer, not shown, releases the electromagnetic device 152 in order to cause the drain valve mechanism 148 to be operated to its open position. The washing fluid accumulated in the sump 36 is then drained through the drain valve mechanism 148 into the drain connection 146.

After the expiration of forty-five seconds the timer, not shown, operates to supply heating current to the heater 160 while the inlet valve mechanism 143 occupies its closed position and the drain valve mechanism 148 occupies its open position. At this time operation of the electric motor 133 is continued and when the heater 160 is heated the air circulated in the vat 23 by the blades 131 of the impeller 130 passes over the heater 160 and is directed into contact with the dishes supported by the rack structure 110. This initial drying step is continued for twenty minutes under the control of the timer, not shown, with the electric heater 160 being supplied with current and the electric motor 133 running. After the expiration of twenty minutes the timer, not shown, opens the circuit to the electric motor 133, while retaining closed the circuit for supplied heating current to the heater 160. Accordingly, the motor 133 stops and operation of the impeller 130 is arrested. Drying of the dishes supported by the rack structure 110 continues after operation of the impeller 130 has been arrested for additional ten minutes under the control of the timer, not shown. After the expiration of this additional ten minutes the timer, not shown, interrupts the supply of heating current to the electric heater 160, and releases the pick-up relay, not shown. The timer, not shown, has completed the timed cycle and is returned to its initial position resetting the circuit network for another timed cycle of operation of the dishwashing apparatus 10.

During the operation of dishwashing apparatus 10 through the timed cycle above described the door 48 must be retained in its closed position as previously explained. Also during the various wash and rinse steps when considerable washing fluid is accumulated in the sump 36 it is pointed out that the reticulated screen 139 prevents large particles of foreign matter such, for example, as lettuce leaves, or the like, accumulating in the sump 36 from being caught in the blades 131 of the impeller 130 and again flung upwardly and outwardly thereby into the rack structure 110 and the dishes supported thereby. Finally, at the conclusion of the timed cycle the dishes supported by the rack structure 110 have not only been thoroughly washed and rinsed but they have also been dried. At this time the door 48 may be moved from its closed position to its open position and the rack structure 110 may be moved from its fully pushed-in position to its fully withdrawn position and the dishes removed therefrom and replaced in a kitchen cabinet or the like if desired.

In the operation of the dishwashing apparatus after the dishes have been loaded into the rack

structure 110 and the rack structure 110 has been moved into its fully pushed-in position in the vat 23, a predetermined quantity or charge of detergent is placed in the detergent cup 93 and the door 48 is moved from its open position to its closed position by the handle 59. Even though the door 48 is moved rather rapidly into its closed position no substantial quantity of the charge of detergent placed in the detergent cup 93 is jarred out of the pocket therein into the vat 23 since the pocket formed in the detergent cup 93 has considerable depth and the bottom wall thereof occupies a substantially horizontal position at this time.

At this time the timed cycle of operation of the dishwashing apparatus 10 is initiated by operating the push button 162 in the manner previously explained, whereby the first spray step is initiated. More particularly, washing fluid is sprayed from the spraying device 142 downwardly through the dishes supported by the rack structure 110 arranged in the vat 23 while the drain valve mechanism 143 occupies its open position and the electric motor 133 is running. Accordingly, some of the washing fluid from the spraying device 142 strikes the inner body sheet 53 of the door 48 and some of the washing fluid may be flung up from the sump 36 by the blades 131 of the impeller 130 upon the inner body sheet 53; however, this washing fluid runs down the inner body sheet 53 and is deflected from the pocket opening in the detergent cup 93. Specifically, the surrounding flange 94 carried by the detergent cup 93 in spaced relation to the inner body sheet 53 prevents the entry of the washing fluid into the pocket of the detergent cup 93. Thus during the spray step of the timing cycle no substantial quantity of washing fluid enters the pocket of the detergent cup 93, whereby the charge of detergent placed in the pocket of the detergent cup 93 remains therein substantially undisturbed during the first spray step.

Subsequently, at the beginning of the first washing step when the drain valve mechanism 143 is operated to its closed position washing fluid begins to accumulate in the sump 36 and is recirculated through the rack structure 110 and the supported dishes by the blades 131 of the impeller 130. As the quantity of washing fluid accumulating in the sump 36 increases the level thereof rises with respect to the top of the ledge 35 and with respect to the pocket formed in the detergent cup 93 and disposed just above the ledge 35. Before the inlet valve mechanism 143 is operated to its closed position a sufficient quantity of washing fluid has accumulated in the sump 36 in order to raise the level thereof up toward the pocket formed in the detergent cup 93, since the impeller 130 is operating at this time. Subsequently, the inlet valve mechanism 143 is operated to its closed position while the level of the washing fluid accumulating in the sump 36 is well below the top of the ledge 35, and the first washing step continues as previously explained.

When the level of the washing fluid accumulating in the sump 36 is raised a predetermined amount up toward the pocket formed in the detergent cup 93 during the initial part of the first washing step, the washing fluid is washed into the pocket formed in the detergent cup 93. This action is obtained in the dishwashing apparatus 10 by virtue of the fact that the impeller 130 is rotated in the counter-clockwise direction as viewed from the top of the vat 23, whereby the washing fluid is recirculated from the sump 36 into the pocket of the detergent cup 93 and thence out of the pocket of the detergent cup 93 back into the vat 23 and thence into the sump 36. This recirculation of the washing fluid into the pocket formed in the detergent cup 93 positively insures that all of the charge of detergent contained in the pocket of the detergent cup 93 is washed out and introduced into the quantity of washing fluid contained in the sump 36. Of course, the detergent is placed in solution and the solution is flung upwardly and outwardly by the blades 131 of the impeller 130 through the rack structure 110 and the supported dishes in order to obtain the washing action upon the dishes in the manner previously explained.

The arrangement described is very advantageous in view of the fact that the charge of detergent placed in the pocket of the detergent cup 93 is automatically introduced into the quantity of washing fluid contained in the vat during the initial portion of the first washing step merely by the normal operation of the impeller 130; and, accordingly, requires no externally operated detergent cup mechanism to obtain introduction of the detergent at the required point, in the first washing step. Moreover, the previously described deflector or baffle arrangement carried by the inner body sheet 53 and by the detergent cup 93 positively prevents any substantial quantity of washing fluid from entering the pocket of the detergent cup 93 during the preceding first spray step.

Again considering the operation of the dishwashing apparatus 10, the door 48 occupies its closed position during the entire timed washing cycle, whereby the side door baffles 78 and 79 are disposed in respective cooperating relation with the side wall baffles 42 and 44 in order to limit the quantity of washing fluid entering between the cooperating baffles either from the spray device 142 or from the blades 131 of the impeller 130. Also, at this time the supplemental baffle 113 carried by the lower basket 111 is so related with respect to the cooperating baffles 78 and 42 that the upwardly directed washing fluid from the blades 131 of the impeller 130 is deflected from entering between the cooperating baffles 78 and 42. This arrangement including the supplemental baffle 113 disposed on the left-hand side of the rack structure 110 is very advantageous since the impeller 130 rotating in the counterclockwise direction has a tendency to throw more washing fluid between the cooperating baffles 78 and 42 than between the cooperating baffles 79 and 44. However, it will be understood that even though the supplemental baffle 113 is omitted from the rack structure 110, there will be no substantial entry of washing fluid between the cooperating baffles 42 and 78 due to their position and arrangement. Also, the two side wall baffles 43 and 45 disposed respectively rearwardly of the cooperating side wall baffles 42 and 44 deflect washing fluid on the respective side walls 26 and 27 from between the cooperating baffles 78 and 42 and the cooperating baffles 79 and 44, respectively. Thus the baffle arrangement described limits the quantity of washing fluid entering between the legs 40 and 41 of the vat rib 38 and the cooperating door baffle disposed within the marginal flange carried by the inner body sheet 53 of the door 48. Moreover, most of the washing fluid that passes between the cooperating baffles 42, 78 and 44, 79 loses its horizontal component and falls down-

wardly before it reaches the portions 40 and 41 of the vat rib 38.

Further the portions 77, 78 and 79 of the door baffle respectively cooperate with the portions 39, 40 and 41 of the vat rib 38 in order further to limit the amount of washing fluid entering into the doorway 29. Moreover, the portions 62, 63 and 64 of the rim disposed on the marginal flange carried by the inner body sheet 53 of the door 43 respectively engaging the forwardly directed shoulders or faces provided on the respective portions 39, 40 and 41 of the vat rib 38 further to limit the amount of washing fluid entering into the doorway 29.

By virtue of this related structure described above very little washing fluid enters the doorway 29 when the door 43 occupies its closed position; and, the portions 50, 51 and 52 of the marginal flange carried by the outer body sheet 49 of the door 43 respectively cooperate with the top and side flanges 31, 32 and 33 in order positively to prevent any of the washing fluid from escaping from the doorway 29 through the front opening 30 and thence through the front opening 20 provided in the panel 19. The washing fluid entering the doorway 29 between the top flange 31 and the top portion 50 of the marginal flange carried by the outer body sheet 49 flows laterally across the top portion 50 of this marginal flange and thence downwardly along the side portions 51 and 52 of this marginal flange onto the bottom flange 34 rearwardly of the ledge 35 and ultimately back into the sump 36. The washing fluid entering the doorway 29 between the side portion 51 of the marginal flange carried by the outer body sheet 49 and the side flange 32 falls downwardly onto the bottom flange 34 rearwardly of the ledge 35 and is drained back into the sump 36; and, likewise, the washing fluid entering the doorway 29 between the side portion 52 of the marginal flange carried by the outer body sheet 49 and the side flange 33 falls downwardly onto the bottom flange 34 rearwardly of the ledge 35 and is drained back into the sump 36.

Also during the operation of the washing apparatus 10 the washing fluid that strikes the rear surface of the inner body sheet 53 flows downwardly therealong and back onto the bottom flange 34 and thence back into the sump 36. Some of this washing fluid travels down the rear surface of the inner body sheet 53 between the stem 86 of the emboss 84 and the central trackway 91 and cascades over the leg 87 and around the body of the detergent cup 93 onto the bottom flange 34; while other of this washing fluid travels down the rear surface of the inner body sheet 53 between the stem 88 of the emboss 85 and the central trackway 91 and cascades over the leg 89 onto the bottom flange 34. Still other of this washing fluid travels down the rear surface of the inner body sheet 53 between the stem 86 of the emboss 84 and the side portion 78 of the baffle carried by the marginal flange of the inner body sheet 53 and is directed outwardly by the boss 104 onto and beyond the leg 87; and, likewise, still other of this washing fluid travels down the rear surface of the inner body sheet 53 between the stem 88 of the emboss 85 and the side portion 79 of the baffle carried by the marginal flange of the inner body sheet 53 and is directed outwardly by the boss 105 onto and beyond the leg 89. Finally washing fluid travelling down the inner surface of the side portion 78 of the baffle carried by the marginal flange of the inner body sheet 53 is directed inwardly by the lip 106 out of the corner and over the leg 87; and, likewise, washing fluid travelling down the inner surface of the side portion 79 of the baffle carried by the marginal flange of the inner body sheet 53 is directed inwardly by the lip 107 out of the corner and over the leg 89.

Finally, during the operation of the washing apparatus 10, the interior of the vat 23 is vented to the exterior through the doorway 29 around the door 43 in its closed position; and, further, the interior of the vat 23 is vented directly through the openings 54*a* formed in the top portion 54 of the marginal flange carried by the inner body sheet 53 into the space between the inner body sheet 53 and the outer body sheet 49 and thence into the space below the vat 23 in the cabinet 11. The rearwardly depressed body 77*a* of the top portion of the baffle carried by the inner body sheet 53 extending under the top portion 54 of the marginal flange carried by the inner body sheet 53 covers the openings 54*a* formed therein and prevents washing fluid from being splashed from the interior of the vat 23 through the openings 54*a* while accommodating ventilation as described above. Any condensate accumulating between the upper portions of the inner body sheet 53 and the outer body sheet 49 flows downwardly and is caught by the bracing sheet 58 and conducted laterally and then downwardly along the outer surface of the inner body sheet 53 onto the bottom flange 34 just rearwardly of the ledge 35, which condensate then flows laterally inwardly into the depression 37 and below the tail 90 provided on the inner body sheet 53 back into the sump 36. Also vaporized washing fluid arising from the bottom flange 34 just rearwardly of the ledge 35 tends to condense on the bracing sheet 58 and then to run back on the outer surface thereof onto the bottom flange 34 just rearwardly of the ledge 35.

Accordingly, it will be understood that the door 43 is of the gasketless type providing open ventilation of the interior of the vat 23 during operation of the washing apparatus 10, and preventing the escape of the washing fluid from the vat 23 through the front opening 30 of the doorway 29 about the door 43 when the door 43 occupies its closed position by virtue of the baffling arrangement incorporated in the washing apparatus 10 and carried by the vat 23, by the door 43 and by the rack structure 110. This arrangement is very advantageous in view of the fact that no special ventilating structure need be incorporated in the door 43; and, since no sealing gasket is employed in order to prevent the escape of washing fluid from the opening 30 of the doorway 29, no maintenance or repairs are required in this connection during the life of the washing apparatus 10.

In view of the foregoing it is apparent that there has been provided washing apparatus of the front opening type incorporating an improved arrangement for preventing the escape of washing fluid from the vat even though the associated door is of the gasketless type and for providing open ventilation of the interior of the vat about the door in its closed position. Also, the washing apparatus incorporates an improved arrangement for mounting the dish-supporting rack structure for movements through the front opening into and out of the vat over the front door in its open position.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In combination, cabinet structure including a pair of oppositely disposed side walls defining a chamber having a front opening, a door associated with said front opening and mounted for movements with respect thereto between a substantially vertical closed position and a substantially horizontal open position, said door being provided with an inner wall, a receptacle adapted to be moved through said front opening into and out of said chamber over said inner wall when said door occupies its open position, both the lower rear and the lower front of said receptacle being supported entirely by said side walls when said receptacle is in said chamber and said door occupies its closed position, and an element carried by the lower front of said receptacle and engaged by the lower portion of said door incident to movement thereof from its closed position into its open position to shift the support of the lower front of said receptacle from said side walls to said inner wall and disengaged by the lower portion of said door incident to movement thereof from its open position back into its closed position to shift the support of the lower front of said receptacle from said inner wall back to said side walls.

2. In combination, cabinet structure including a pair of oppositely disposed side walls defining a chamber having a front opening, a pair of guide elements respectively carried by said side walls, a door associated with said front opening and mounted for movements with respect thereto between a substantially vertical closed position and a substantially horizontal open position, said door being provided with an inner wall, a receptacle adapted to be moved through said front opening into and out of said chamber over said inner wall when said door occupies its open position, a first pair of supports carried by the lower rear of said receptacle and respectively engaging the rear ends of said pair of guide elements, a second pair of supports carried by the lower front of said receptacle and respectively cooperating with the front ends of said pair of guide elements, and a fifth support carried by the lower front of said receptacle and cooperating with the lower portion of said inner wall, the lower portion of said inner wall engaging said fifth support and lifting said second pair of supports from respective engagement with the front ends of said pair of guide elements when said door is moved into its open position in order to provide a three-point support for said receptacle, the lower portion of said inner wall disengaging said fifth support and lowering said second pair of supports into respective engagement with the front ends of said pair of guide elements when said door is moved into its closed position in order to provide a four-point support for said receptacle.

3. In combination, cabinet structure including a pair of oppositely disposed side walls defining a chamber having a front opening, a pair of guide elements respectively carried by said side walls, a door associated with said front opening and mounted for movements with respect thereto between a substantially vertical closed position and a substantially horizontal open position, said door being provided with an inner wall carrying a trackway, a receptacle adapted to be moved through said front opening into and out of said chamber over said inner wall when said door occupies its open position, a pair of rollers carried by the lower rear of said receptacle and respectively engaging the rear ends of said pair of guide elements, a pair of feet carried by the lower front of said receptacle and respectively cooperating with the front ends of said pair of guide elements, and a third roller carried by the lower front of said receptacle and cooperating with said trackway, the lower portion of said trackway engaging said third roller and lifting said pair of feet from respective engagement with the front ends of said pair of guide elements when said door is moved into its open position, the lower portion of said trackway disengaging said third roller and lowering said pair of feet into respective engagement with the front ends of said pair of guide elements when said door is moved into its closed position, said pair of rollers engaging said pair of guide elements and said third roller engaging said trackway guiding the movements of said receptacle through said front opening into and out of said chamber over said inner wall when said door occupies its open position.

4. In combination, cabinet structure including a pair of oppositely disposed side walls defining a chamber having a front opening, a pair of guide elements respectively carried by said side walls, a door associated with said front opening and mounted for movements with respect thereto between a substantially vertical closed position and a substantially horizontal open position, said door being provided with an inner wall, a receptacle adapted to be moved through said front opening into and out of said chamber over said inner wall when said door occupies its open position, first and second pairs of rollers carried by the lower rear sides of said receptacle, a pair of feet carried by the lower front sides of said receptacle, and another roller carried by the lower front center of said receptacle, said first pair of rollers respectively engaging the rear ends of said pair of guide elements and said pair of feet respectively engaging the front ends of said guide elements when said receptacle is supported in said chamber and said door is closed, said first pair of rollers respectively engaging said pair of guide elements and said other roller engaging said inner wall when said receptacle is supported in said chamber and said door is open, movement of said door between its closed position and its open position effecting said engagement by said inner wall of said other roller and disengagement by said pair of feet of the front ends of said guide elements, movement of said door between its open position and its closed position effecting disengagement by said inner wall of said other roller and said engagement by said pair of feet of the front ends of said guide elements, said second pair of rollers engaging the lower end of said inner wall and said other roller engaging the upper end of said inner wall when said receptacle is supported over said inner wall with said door in its open position.

5. In combination, cabinet structure including a pair of oppositely disposed side walls defining a chamber having a front opening, a pair of guide elements respectively carried by said side walls, a door associated with said front opening and mounted for movements with respect thereto between a substantially vertical closed position and

a substantially horizontal open position, said door being provided with an inner wall, a receptacle adapted to be moved through said front opening into and out of said chamber over said inner wall when said door occupies its open position, means including a first pair of rollers carried by the lower rear of said receptacle and respectively engaging the rear ends of said pair of guide elements and a pair of feet carried by the lower front of said receptacle and respectively engaging the front ends of said pair of guide elements for supporting said receptacle within said chamber when said door occupies its closed position, means including said first pair of rollers respectively engaging said pair of guide elements and another roller carried by the lower front center of said receptacle and engaging said inner wall for supporting said receptacle within said chamber when said door occupies its open position, said first pair of rollers respectively engaging said pair of guide elements and said other roller engaging said inner wall accommodating rolling movement of said receptacle from within said chamber to a partially withdrawn position over said inner wall with said door in its open position, and means including said first pair of rollers respectively engaging said pair of guide elements and a second

pair of rollers carried by the lower rear of said receptacle and engaging said inner wall and said other roller engaging said inner wall for supporting said receptacle in said partially withdrawn position over said inner wall with said door in its open position, said other roller and said second pair of rollers all engaging said inner wall accommodating rolling movement of said receptacle from said partially withdrawn position into a fully withdrawn position over said inner wall with said door in its open position and supporting said receptacle in said fully withdrawn position.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
851,711	Tory	Apr. 30, 1907
1,144,882	Whitaker	June 29, 1915
1,209,962	Heath	Dec. 26, 1916
1,417,162	Gagen	May 23, 1922
1,621,387	Warren	Mar. 15, 1927
1,946,181	Stoddard	Feb. 6, 1934
2,290,653	Stoddard	July 21, 1942
2,342,298	Pearson	Feb. 22, 1944