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M. R. KAUFFMAN ET AL

3,466,109

FRONT OPENING DISHWASHER WITH IMPROVED RACK ASSEMBLY

Filed Sept. 5, 1967

4 Sheets-Sheet 1

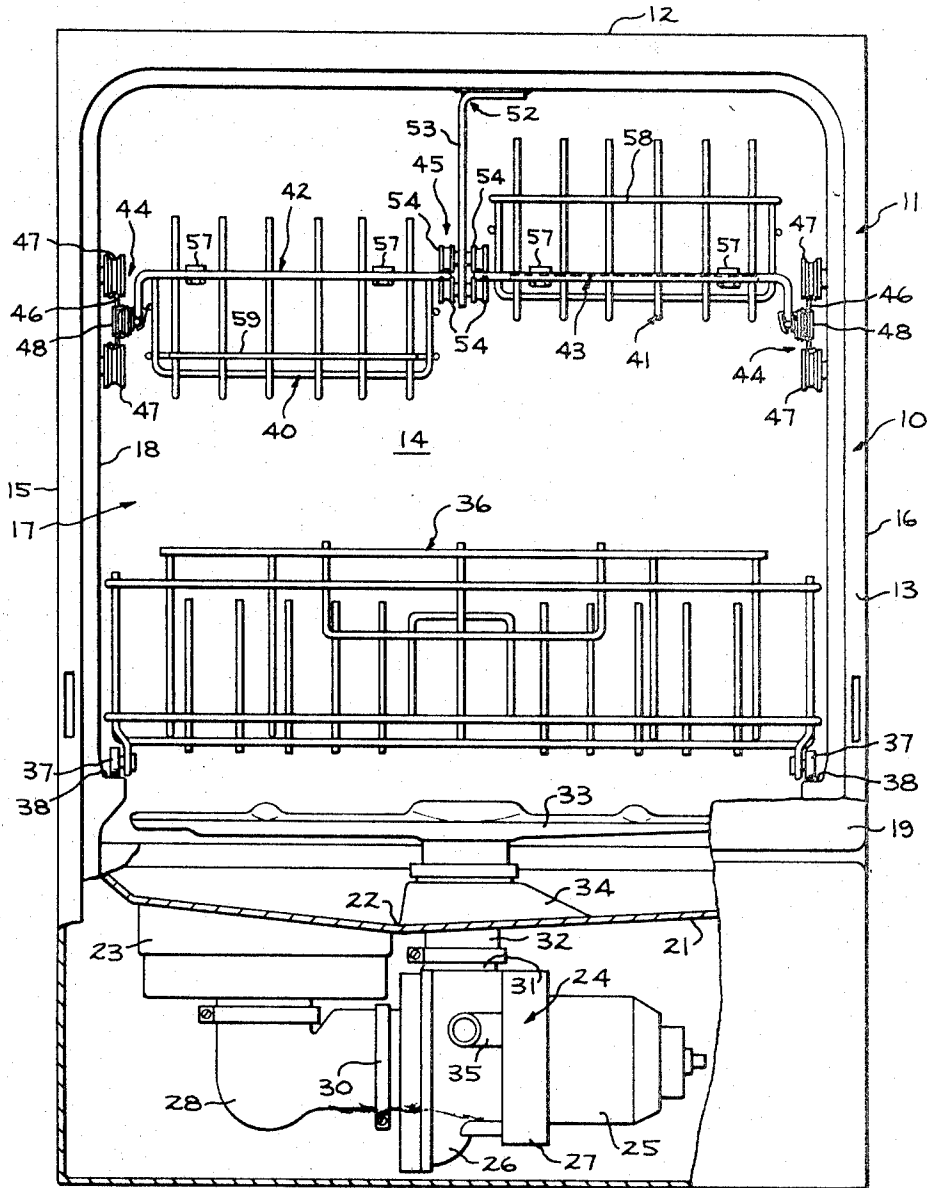


FIG. 1

INVENTORS
MELVIN R. KAUFFMAN
& WESLEY S. PATTISON
BY *Wesley S. Pattison, III*
THEIR ATTORNEY

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4 Sheets-Sheet 2

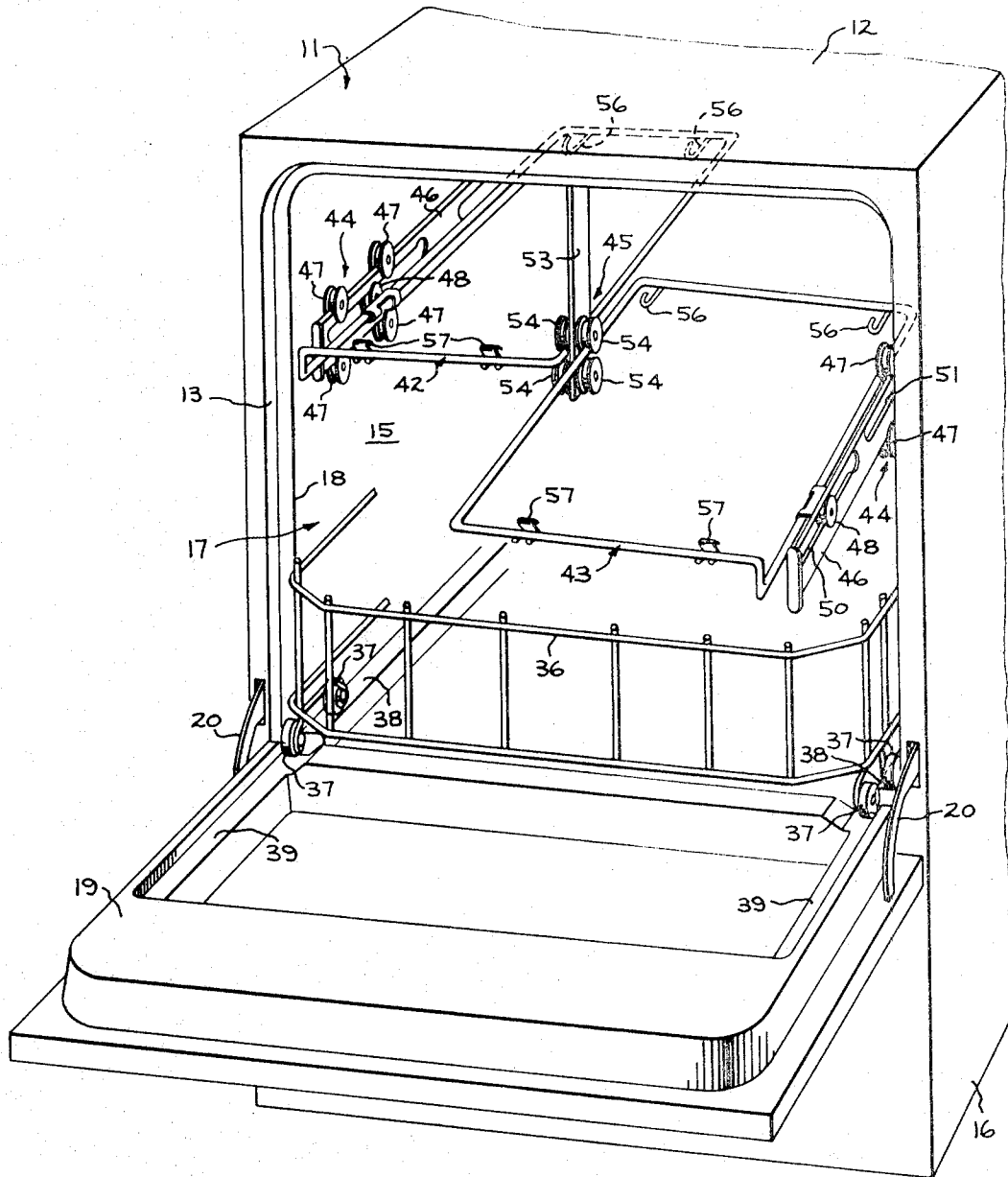


FIG.2

INVENTORS
MELVIN R. KAUFFMAN
& WESLEY S. PATTISON
BY *Harry B. Donnell, III*
THEIR ATTORNEY

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M. R. KAUFFMAN ET AL

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4 Sheets-Sheet 3

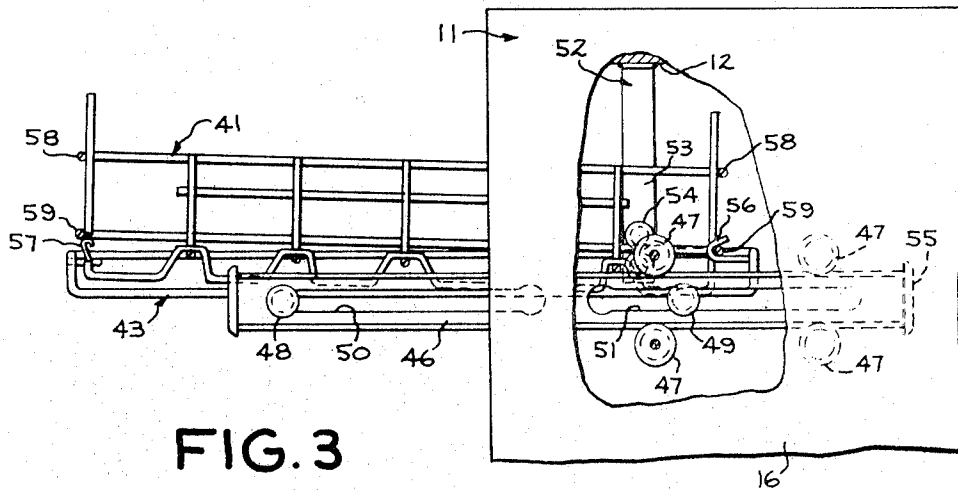


FIG. 3

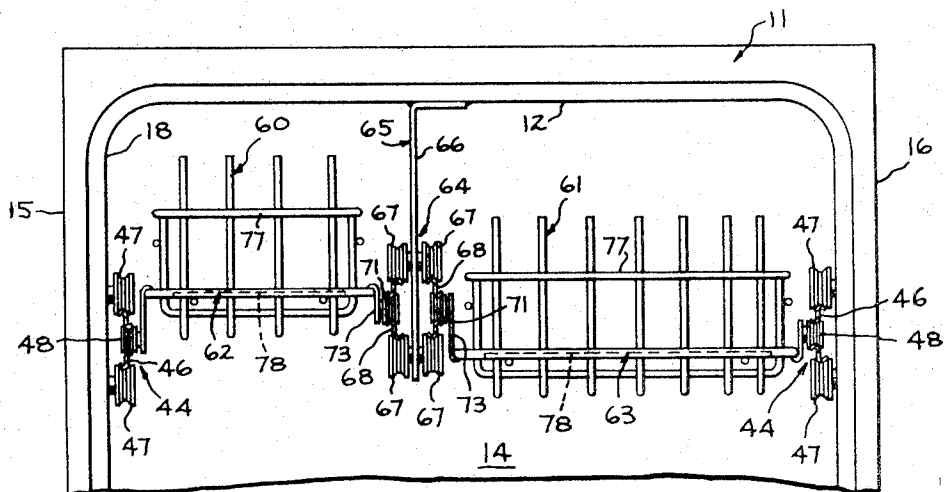


FIG. 4

INVENTORS
MELVIN R. KAUFFMAN
BY WESLEY S. PATTISON
Wesley S. Pattison, III
THEIR ATTORNEY

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4 Sheets-Sheet 4

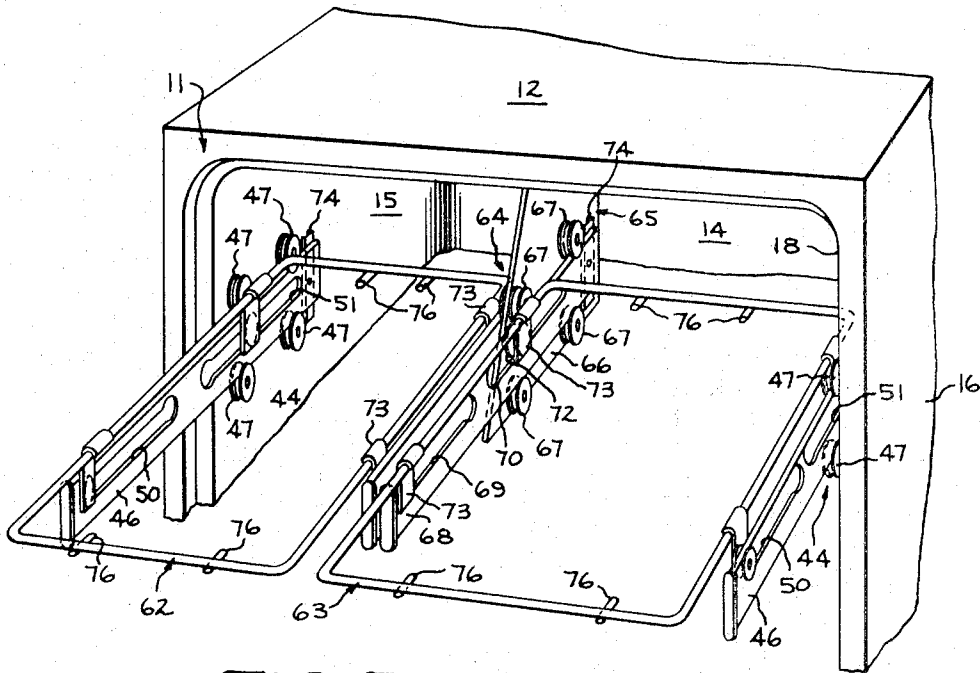


FIG. 5

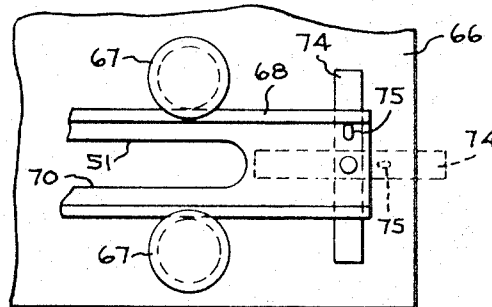


FIG. 6

INVENTORS
MELVIN R. KAUFFMAN
& WESLEY S. PATTISON
BY *Harry S. Donnell, III*
THEIR ATTORNEY

1

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3,466,109

FRONT OPENING DISHWASHER WITH IMPROVED RACK ASSEMBLY

Melvin R. Kauffman and Wesley S. Pattison, Louisville, Ky., assignors to General Electric Company, a corporation of New York

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U.S. Cl. 312-338

9 Claims

ABSTRACT OF THE DISCLOSURE

An improved rack assembly for a dishwasher of the type including a washing enclosure having top, bottom and side walls and an access opening through the front side wall. The rack assembly includes upper and lower open framework dish racks positionable within the enclosure in a vertically spaced relationship. The lower rack extends over substantially the entire horizontal cross-sectional area of the enclosure when positioned therein and the upper rack is split from front to rear into left and right sections which have a combined cross-sectional area approximating that of the lower rack. Support means are provided in the upper portion of the enclosure for removably mounting the upper rack sections selectively at several different elevations above the lower rack for substantially horizontal sliding movement through the access opening independently of the lower rack and of one another. The division of the upper rack into plural removable sections permits easier access to the lower rack and also allows use of practically the entire height of all or part of the washing enclosure.

BACKGROUND OF THE INVENTION

The present invention relates to dishwashing machines of the type having a front opening and racks which move substantially horizontally through that opening, and, more particularly, to an improved rack assembly which provides optimum effectiveness for such machines.

Dishwashing machines often have a washing enclosure with an access opening through the front side wall thereof. Such machines are usually provided with a door hinged at its bottom for pivotal movement from a vertical to a horizontal position to permit access to the washing enclosure. In such machines, there are generally two vertically spaced racks for receiving the articles to be washed. Each of these racks has a cross-sectional area substantially equal to that of the horizontal cross-section of the enclosure and is slidable independently of the other horizontally through the access opening to extend over the open door. It is conventional to form the bottom rack to receive larger dishes and the top rack to receive smaller dishes and glasses. While this conventional arrangement has substantial advantages, it also has the disadvantages that, when a mixed load of dishes is to be inserted into the dishwasher, the operator must move the top rack in and out continuously. This results from the fact that each time a large dish is to be inserted into the lower rack the upper rack must be moved back into the enclosure to allow access to the lower rack, while each time a glass or a small dish is to be positioned for washing, the upper rack must then be pulled back out again. Hence, it would be desirable if the upper rack could be split from front to rear into two or more sections so that the operator could gain access to the lower rack without moving the entire upper rack back into the enclosure.

It would also be desirable if the elevations of the upper rack sections could be varied to accommodate articles of different height in both the upper and lower

racks in order to more efficiently utilize available washing space within the enclosure. Furthermore, if the upper rack sections were made removable, practically the entire height of all or part of the washing enclosure could be utilized for washing very large articles.

SUMMARY OF THE INVENTION

The present invention provides an improved rack assembly in an automatic dishwasher of the type including a washing enclosure having an access opening formed in its front side wall. In one preferred form the assembly comprises: a lower rack positionable within a lower portion of the enclosure for substantially horizontal movement through the access opening; and, support means in the upper portion of the enclosure for mounting a plurality of generally side-by-side removable upper racks selectively at several elevations above the lower rack for sliding movement through the access opening independently of the lower rack and of one another. The support means preferably includes a plurality of centrally open frames, one for receiving each of the removable upper racks, and means mounting each of the frames in the enclosure for sliding movement substantially horizontally through the access opening. Each of the frames is preferably provided with elevation positioning means on its central opening which are selectively engageable with complementary means on the upper rack which is removably mounted therein. With this arrangement, the upper racks can be positioned in their respective frames at a variety of elevations relative to one another and to the lower rack or can be entirely removed from their support frames.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a front elevational view, with some of the parts broken away to illustrate details, of a dishwasher incorporating a first embodiment of the improved rack assembly of the present invention;

FIGURE 2 is a fragmentary front perspective view of the dishwasher of FIGURE 1 with the door open and the upper rack sections removed to show details of their support means;

FIGURE 3 is a partly broken fragmentary side view of the upper portion of the dishwasher of FIGURES 1 and 2;

FIGURE 4 is a fragmentary front elevational view of the upper portion of a dishwasher incorporating a second embodiment of the rack assembly of the present invention with the door open;

FIGURE 5 is a fragmentary front perspective view of the dishwasher portion of FIGURE 4 with the upper rack sections removed to show details of their support means; and

FIGURE 6 is a fragmentary side elevational view showing details of the construction of the pivoted stops provided at the rear ends of the slides for the removable frames of the embodiment of FIGURES 4 and 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings and particularly to FIGURES 1 and 2 thereof, there is illustrated a front opening automatic dishwasher 10. The dishwasher includes an outer cabinet 11 having a top wall 12, a front wall 13, a rear wall 14 and left and right side walls 15 and 16. The aforementioned walls define therein a washing enclosure 17. The cabinet 11 has an opening 18 in its front wall 13 which serves as an access opening for the admission of articles to and removal of the articles from the washing enclosure 17. This access opening 18 is provided with a closure member or door 19 pivoted at its bottom edge by hinge means 20 to cabinet front

wall 13 adjacent the lower edge of the access opening 18. The door 19 is movable between a substantially vertical position closing the opening 18 and a substantially horizontal position opening the opening 18.

The bottom of the washing enclosure 17 is defined by a bottom wall 21 which is connected in a liquid-tight relationship to the walls 13-16. The bottom wall 21 gradually slopes to a low point 22 near the center of the dishwasher. Disposed below the low point 22 is a sump 23 which may be formed integrally in the bottom wall 21 or which may be a separate element secured to the bottom wall. Disposed below and supported by the bottom wall 21 is a motor pump assembly 24 which includes an electric motor 25, pump 26 and an electrically-operated valve 27 (shown in block). The sump 23 and the inlet of the pump 26 are interconnected by a large diameter conduit 28. The conduit 28 is secured to the sump 23 by means of a clamp 29 and to the housing of the pump 26 by means of a clamp 30. The pump 26 has a main outlet 31 communicating with a conduit 32 which in turn communicates with a reaction-type spray head 33 that is rotatably mounted atop a centrally-bored pedestal 34 formed in the bottom wall 21.

The pump 26 is also provided with an effluent discharge outlet 35 which is controlled by the valve 27 and is connected to the household sewage system by a suitable conduit means (not shown). The valve 27 includes an element within the housing of the pump 26 that is movable between two positions. In one of these positions the element closes the effluent discharge outlet 35 and opens the main outlet 31 and, in the other of these positions, closes the main outlet and opens the effluent discharge outlet. An electrical resistance heating element (not shown) may be provided in the lower portion of the washing enclosure 17 to facilitate drying of articles supported therein upon completion of the normal wash and rinse operations.

An electrically-operated fill valve (not shown) is provided to admit water to the washing enclosure 17 and an electrical sequence control means (not shown) of a well known type is provided for sequentially operating the pump valve 27 and the fill valve.

It should, of course, be understood that all the structure thus far described may be modified a great deal without seriously affecting the present invention since this structure is substantially conventional and comprises only one illustrated structure with which the present invention is compatible.

Of course, means must be provided within the washing enclosure 17 to support articles or dishes to be washed in a manner wherein the wash action generated by the spray head 33 effectuates cleansing of the articles. With a dishwasher as thus far described, it has been conventional heretofore to provide separate upper and lower racks, each of which constitute a unitary structure having horizontal dimensions substantially equal to the internal horizontal dimensions of the washing enclosure 17. With this arrangement, the lower rack is provided with rollers which allow it to be withdrawn at least partially from the washing enclosure onto the open door which, upon opening, pivots into horizontal alignment with means supporting the lower rack within the washing enclosure. It also has been conventional to provide the unitary upper rack with a slide mechanism to allow the upper rack to be withdrawn at least partially in a horizontal direction out of the washing enclosure 17. As discussed above, with this conventional arrangement it is necessary to withdraw the entire unitary upper rack so that the upper rack may be loaded; however, when the unitary upper rack is so withdrawn, it significantly interferes with the attempts of the operator to load the lower rack. It is the purpose of the present invention to provide an improved rack assembly which will allow the operator to randomly load both the upper rack and the lower rack simultaneously once the entire rack assembly has been moved into the loading position.

The improved rack assembly of the present invention includes a conventional unitary lower rack 36 having a horizontal cross-sectional area substantially equal to that of the washing enclosure 17. The lower rack 36 is provided with rollers 37 on its lower left and right edges. When the lower rack 36 is positioned within the washing enclosure 17, the rollers 37 rest upon horizontal surfaces 38 formed on the interior of the cabinet left and right side walls 15 and 16, respectively. The surfaces 38 can be formed of suitable pieces of sheet metal, suitably shaped and secured to the respective side walls 15 and 16. The surfaces 38 extend from the cabinet rear wall 14 and terminate adjacent the access opening 18 in the front cabinet wall 13. As best shown in FIGURE 2, the door 19 is provided with surfaces or tracks 39 which, when the door is pivoted to its open position, are in horizontal alignment with the surfaces 38 within the washing enclosure 17 to permit the lower rack 36 to be rolled or slid onto the door 19.

In the embodiment of the present invention illustrated in FIGURES 1-3, the upper rack is split from front to rear along the center of the washing enclosure 17 and includes a left rack section 40 and a right rack section 41. The upper rack sections 40 and 41 are substantially identical and comprise substantially rectangular open framework racks or baskets, which have a combined horizontal cross-sectional area approximately equal to that of the lower rack 36.

The upper rack sections 40 and 41 are supported for substantially horizontal sliding movement through the access opening 18 independently of one another and the lower rack 36 by support means mounted within the upper portion of the washing enclosure 17.

As illustrated in FIGURES 2 and 3, the support means for the upper rack sections 40 and 41 include centrally open, left and right, thick wire frames 42 and 43 and means for slidably mounting the frames 42 and 43 in the upper portion of the washing enclosure 17. The left and right upper rack sections 40 and 41 are respectively removably mounted in the central opening in the left and right frames 42 and 43, which are in turn each mounted for substantially horizontal sliding movement through the access opening 18 on slide means which are mounted within the enclosure 17.

Each of the frames 42 and 43 is substantially rectangular and has an outer edge adjacent one of the enclosure side walls 15, 16 and an inner edge adjacent the split between the rack sections 40 and 41. The slide means include outer slide means 44 for mounting the outer edge of each of the frames 42 and 43 and inner slide means 45 for mounting the inner edge of each of the frames 42 and 43.

The outer edge of each of the frames 42 and 43 is mounted to the washing enclosure by the outer slide means 44, which are similar to those described in detail in U.S. Patent No. 3,096,125, issued July 2, 1963 to Norman L. Kendt, and assigned to the General Electric Company, assignee of the present invention. The outer slide means 44 basically include an outer slide 46 supported by four rollers 47 which are rotatably journaled on the interior of each of the left and right side walls 15, 16 of the cabinet 11. A front roller 48 and a rear roller 49 are rotatably journaled on the outer edge of each of the frames 42 and 43 and extend outwardly therefrom to cooperate with elongate slots 50 and 51, respectively, in the slide 46.

The inner edge of each of the frames 42 and 43 is mounted within the upper portion of the washing enclosure 17 by the inner slide means 45. The inner slide means includes a bracket 52 which is fastened by suitable means, such as welds, to the interior of the cabinet upper wall 12 adjacent the front center of the access opening 18. The bracket 52 has a vertically dependent portion 53 which rotatably journals two rollers 54 on each of its left and right faces. The rollers 54 on the

left face of the bracket portion 53 receive the right or inner edge to the left frame 42 while the rollers 54 on the right face of the bracket portion 53 receive the left or inner edge of the right frame 43.

With this arrangement, each of the frames 42 and 43 can move relative to its outer slide 46 and its slide 46 can move relative to its cabinet side wall 15 or 16, whereby each of frames 42 and 43 can be moved rearwardly into the washing enclosure to an extent whereby the forwardmost edge of the frame 42 or 43 is well within the washing enclosure 17. As best illustrated in FIGURE 3, complete removal of the frames 42 and 43 from the washing enclosure 17 is prevented by a stop 55 which is rigidly fastened to the rear end of each of the slides 46.

As previously noted, each of the left and right upper rack sections 40 and 41 is respectively removably mounted in the central opening in the left and right frames 42 and 43. In accordance with the present invention, means are provided for selectively positioning the rack sections 40 and 41 at various elevations relative to one another and to the lower rack 36. This elevation selection is made possible by the provision of complementary elevation positioning means on the rack sections 40 and 41 and their respective frames 42 and 43. In the embodiment illustrated in FIGURES 1-3, these elevation positioning means include a pair of upwardly and rearwardly opening hooks 56 formed on the inner perimeter of the rear edge of each of the frames 42 and 43 and a pair of upwardly opening resilient clips 57 mounted on the inner perimeter of the front edge of each of the frames 42 and 43. As best illustrated in FIGURE 3, each of the open framework upper rack sections 40 and 41 is provided with vertically spaced horizontal rods 58 and 59, respectively adjacent the top and bottom of its front and rear ends, which are selectively engageable in the hooks 56 and clips 57. If it is desired to position one of the upper rack sections 40 or 41 at a higher elevation within the washing enclosure 17 (note the right upper rack section 41 in FIGURES 1 and 3) its bottom rods 59 are engaged in the complementary hooks 56 and clips 57 of its frame, when the rack section is mounted within the frame central opening. Alternatively, for positioning at a lower elevation (note the left upper rack section 40 in FIGURE 1), its upper rods 58 are so engaged.

FIGURES 4 and 5 illustrate another embodiment of the present invention which provides upper rack sections 60 and 61 of unequal size and permits complete removal from the washing enclosure 17 of both of the similarly unequally-sized left and right frames 62 and 63 which support the unequal upper rack sections 60 and 61. In this second embodiment, the upper rack is split from front to rear of the washing enclosure 17 in such a manner that its left rack section 60 covers approximately two-fifths and its right rack section 61 covers approximately three-fifths of the left-to-right horizontal dimension of the washing enclosure 17.

The left and right sections 60 and 61 are respectively removably mounted in the central opening in the heavy wire left and right frames 62 and 63, which are in turn each mounted for substantially horizontal sliding movement through the access opening 18 on modified slide means that are mounted within the enclosure 17. Each of the frames 62 and 63 is substantially rectangular and has an outer edge adjacent one of the cabinet side walls 15, 16 and an inner edge adjacent the split between the rack sections 60 and 61. The modified slide means for this second embodiment includes outer slide means substantially identical to slide means 44 provided in the first embodiment illustrated in FIGURES 1-3 and modified inner slide means 64 for the inner edge of each of the frames 62 and 63.

The modified inner slide means 64 include a bracket 65 which is fastened by suitable means, such as welds, to the interior of the cabinet top wall 12 adjacent the front

of the access opening 18 at a point located approximately two-fifths of the distance from the left 15 to the right side wall 16 of the cabinet 11. The bracket 65 has a vertical dependent portion 66 which rotatably journals four rollers 67 on each of its left and right faces. The rollers 67 on the faces of the bracket portion 66 receive an inner slide 68 which is similar to the outer slide 46 and is provided with elongated slots 69 and 70. The slots 69 and 70 respectively receive a front roller 71 and a rear roller 72 which are each rotatably journaled on a tab 73 that extends vertically from the inner edge of each of the frames 62 and 63.

As shown in detail in FIGURE 6, the rear end of each of the outer and inner slides 46 and 68 of the second embodiment is provided with a pivoted stop 74 which is normally retained in a vertical position by detent means 75 formed on it and the slide so that it can engage the rear ends of the rollers 47 and 67 and prevent removal of the slide from the washing enclosure 17. However, when it is desired to completely remove the frames 62 or 63 from the washing enclosure 17, the stops 74 are forced free from their detent means 75 and pivoted to a horizontal position to allow movement of the slides 46 and 68 through the rollers 47 and 67.

The second embodiment illustrated in FIGURES 4-6 includes two means for selectively positioning its rack sections 60 and 61 at various elevations relative to one another in the lower rack 36.

The first of these elevation positioning means are somewhat similar to those provided in the first embodiment shown in FIGURES 1-3, and include a pair of transversely-spaced horizontal studs 76 projecting into the central opening from the front and rear edges of each of the frames 62 and 63. Each of the open framework upper rack sections 60 and 61 is provided with vertically-spaced horizontal rods 77 and 78 which are respectively located adjacent the top and bottom of the front and rear ends of each of the rack sections 60 and 61 and are selectively engageable with the studs 76. If it is desired to position one of the upper rack sections 60 or 61 at a higher elevation within the washing enclosure 17, its bottom rods 78 are engaged with the complementary studs 76 on its frame when the rack section is mounted within the central opening thereof. Alternatively, if it is desired to position one of the rack sections 60 or 61 at a lower elevation, its upper rods 77 are so engaged.

The second elevation positioning means are provided by the removable frames 62 and 63. As illustrated in FIGURES 4 and 5, the removable frames 62 and 63 are vertically offset from the horizontal axes of their rollers 48, 49 and 71, 72 which are received within the slots 50, 51 and 69, 70 in their outer 46 and inner slides 68 by the tabs 73. Consequently, the removable frames 62 and 63 can be positioned either above or below the axes of these rollers 48, 49 and 71, 72 depending upon the direction in which their tabs 73 extend when their slides 46 and 68 are inserted into the side wall 47 and bracket rollers 67. As shown in FIGURE 4, the left frame 62 has been inserted with its tabs 73 extending downward and is located above the axes of its slide-received rollers 48, 49 and 71, 72, while the right rack 63 has been inserted with its tabs 73 extending upward and is located below the axes of its slide-received rollers and below the left rack frame 62. As shown in FIGURE 5, both removable rack frames 62 and 63 have been inserted with their tabs 73 extending upward and both are located at the same elevation.

As will be evident from the foregoing description, certain aspects of the invention are not limited to the particular details of construction of the examples illustrated, and it is contemplated that various other modifications or applications will occur to those skilled in the art.

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

1. In an automatic dishwasher of the type including a

washing enclosure having top, bottom and side walls and an access opening in one of the side walls, an improved rack assembly for supporting articles to be washed positioned within the enclosure, comprising:

- (a) a lower rack positionable within a lower portion of the enclosure for substantially horizontal movement through the access opening; and
 - (b) support means in the enclosure for supporting a plurality of generally side-by-side removable upper racks selectively at different elevations above said lower rack for substantially horizontal sliding movement through the access opening independently of said lower rack and one another;
 - (c) said support means including a plurality of centrally open frames, one for receiving each of said upper rack, and mounting means for mounting each of said frames in said enclosure for independent sliding movement through said access opening.
2. In an automatic dishwasher of the type including a washing enclosure having top, bottom and side walls and an access opening in one of the side walls, an improved rack assembly for supporting articles to be washed positioned within the enclosure, comprising:
- (a) a lower rack positionable within the lower portion of the enclosure for substantially horizontal movement through the access opening;
 - (b) an upper rack positionable within the upper portion of the enclosure vertically spaced from said lower rack;
 - (c) said upper rack including a left section and a right section;
 - (d) support means in the enclosure for supporting each of said upper rack sections for substantially horizontal sliding movement through the access opening independently of one another and of the lower rack; and
 - (e) selectively engageable complementary elevation positioning means on at least one of said upper rack sections and its support means for varying the elevation of said one of said rack sections relative to the other of said rack sections and said lower rack.
3. In an automatic dishwasher of the type including a washing enclosure having top, bottom and side walls and an access opening in one of the side walls, an improved rack assembly for supporting articles to be washed positioned within the enclosure, comprising:
- (a) a left rack section;
 - (b) a right rack section;
 - (c) support means in the enclosure for supporting each of said rack sections for substantially horizontal sliding movement through the access opening independently of one another; and
 - (d) selectively engageable complementary elevation positioning means on at least one of said rack sections and its support means for varying the elevation of said one of said rack sections relative to the other of said rack sections.
4. In an automatic dishwasher of the type including a washing enclosure having top, bottom and side walls and an access opening in one of the side walls, an improved rack assembly for supporting articles to be washed positioned within the enclosure, comprising:
- (a) a left rack section;
 - (b) a right rack section; and
 - (c) support means in the enclosure for supporting each

of said rack sections for substantially horizontal sliding movement through the access opening independently of one another;

- (d) said support means for said sections including a support member mounted on the top wall of the enclosure.
5. In an automatic dishwasher of the type including a washing enclosure having top, bottom and side walls and an access opening in one of said side walls, an improved rack assembly for supporting articles to be washed positioned within the enclosure, comprising:
- (a) a lower rack positionable within a lower portion of the enclosure for substantially horizontal movement through the access opening;
 - (b) said lower rack having a cross-sectional area which consumes substantially the entire horizontal cross-sectional area of the enclosure when positioned therein;
 - (c) support means in the enclosure for supporting a plurality of generally side-by-side upper racks above said lower rack for substantially horizontal movement through the access opening independently of said lower rack and one another;
 - (d) said support means including a plurality of centrally open frames, at least one for receiving each of said upper racks; and
 - (e) mounting means for mounting each of said frames in said enclosure for independent sliding movement through the access opening.
6. The invention of claim 1, wherein:
- (a) each of said frames is provided with elevation positioning means selectively engageable with complementary means on the rack received therein.
7. The invention of claim 1, wherein:
- (a) said open frames comprise a pair; and
 - (b) said mounting means for mounting each of said frames in the enclosure includes
 - (i) first slide means mounted on one of the enclosure side walls, and
 - (ii) second slide means mounted on the enclosure top wall.
8. The invention of claim 1, wherein:
- (a) at least one of said frames is removable from its mounting means, whereby it can be completely removed from the dishwasher.
9. The invention of claim 1, wherein:
- (a) at least one of said frames is mountable in its mounting means in at least two different positions whereby its elevation within the enclosure can be varied.

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JAMES T. McCALL, Primary Examiner

U.S. Cl. X.R.

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