Jan. 19, 1971 M. R. KAUFFMAN 3,556,625

RACK ASSEMBLY FOR A FRONT-OPENING DISHWASHER

Filed April 17, 1969 3 Sheets-Sheet 1

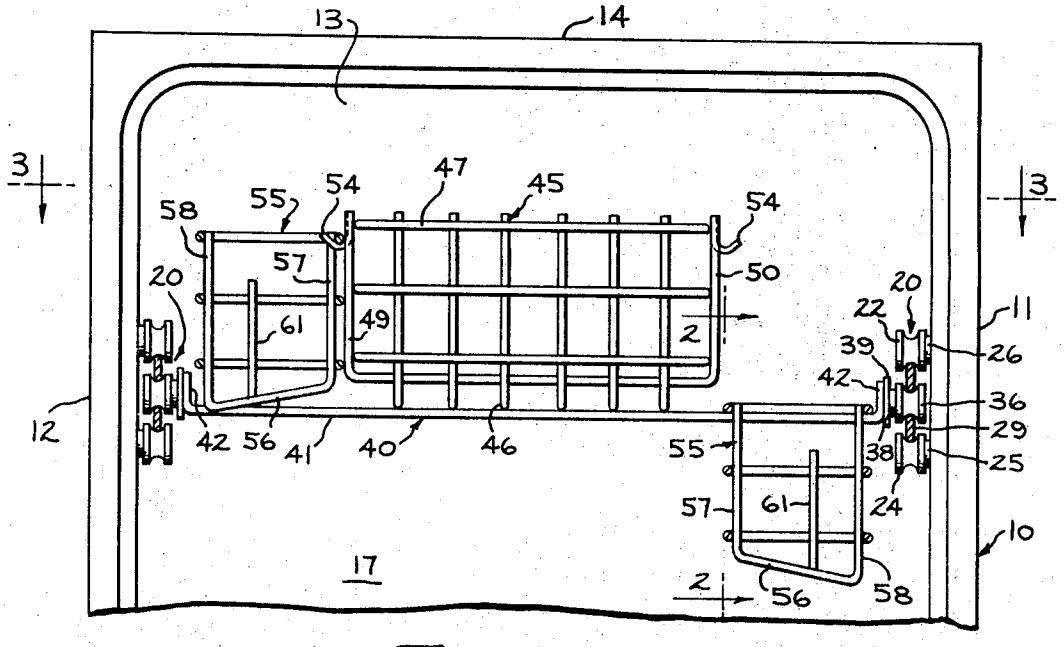


FIG. 1

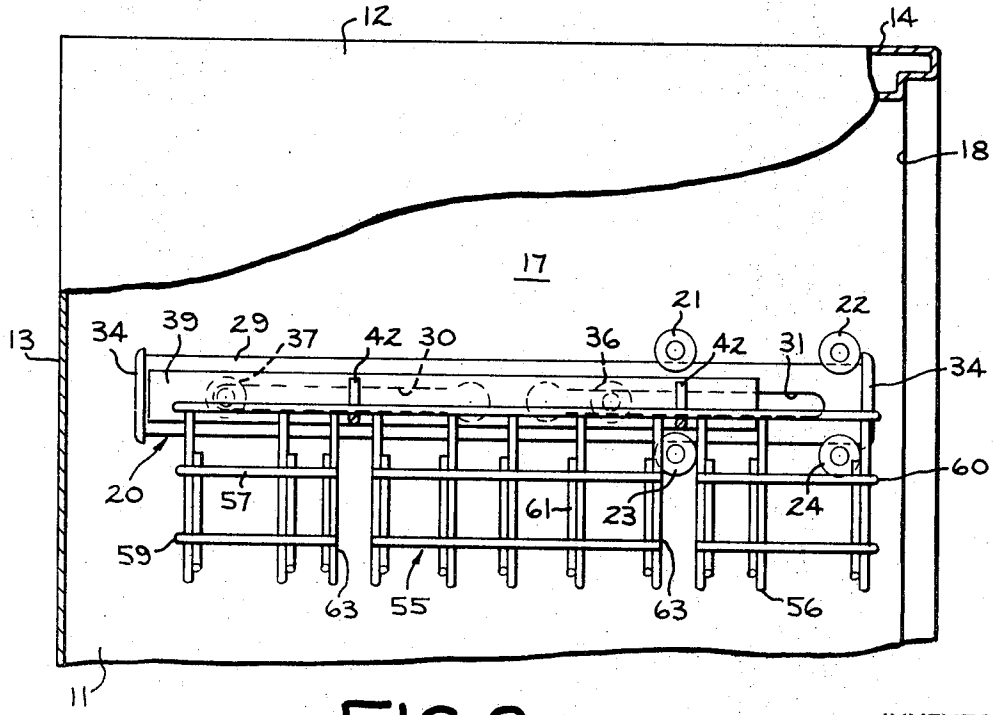


FIG. 2

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RACK ASSEMBLY FOR A FRONT-OPENING DISHWASHER

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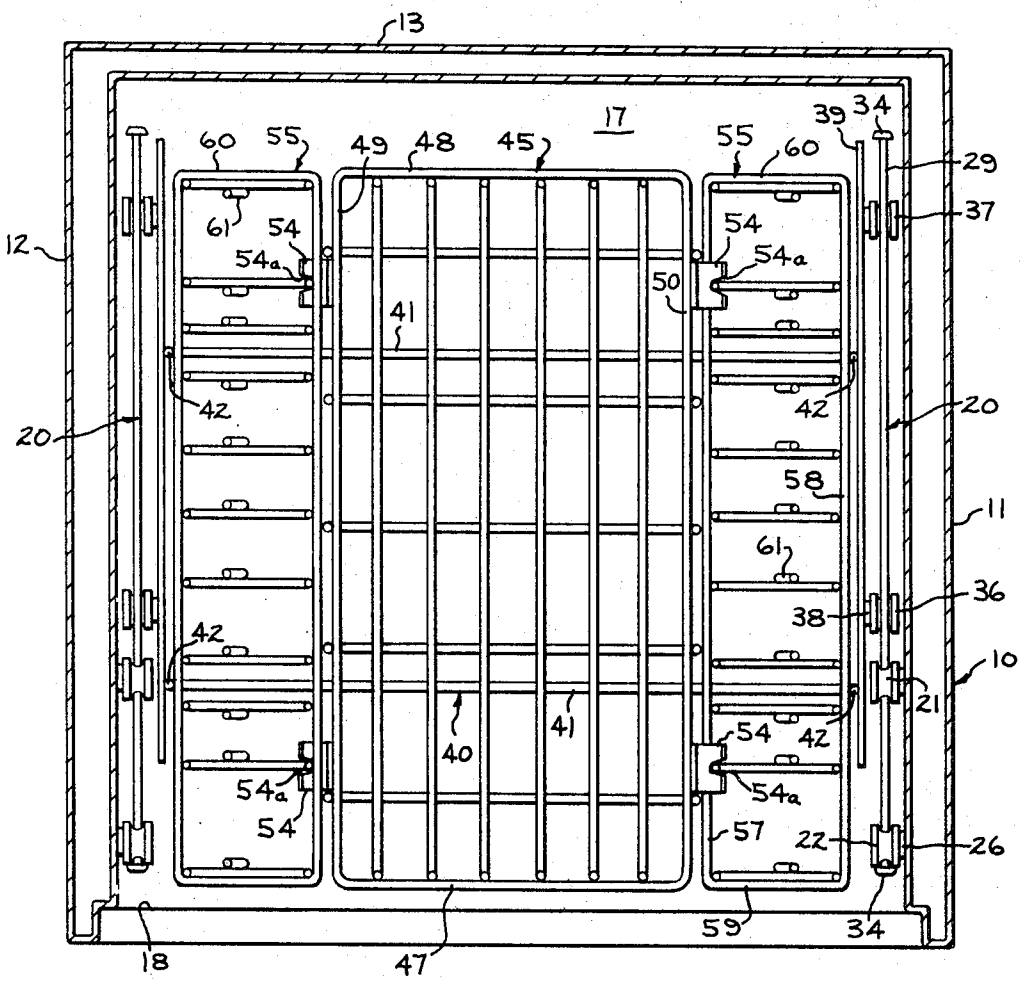


FIG. 3

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RACK ASSEMBLY FOR A FRONT-OPENING DISHWASHER

Filed April 17, 1969 3 Sheets-Sheet 3

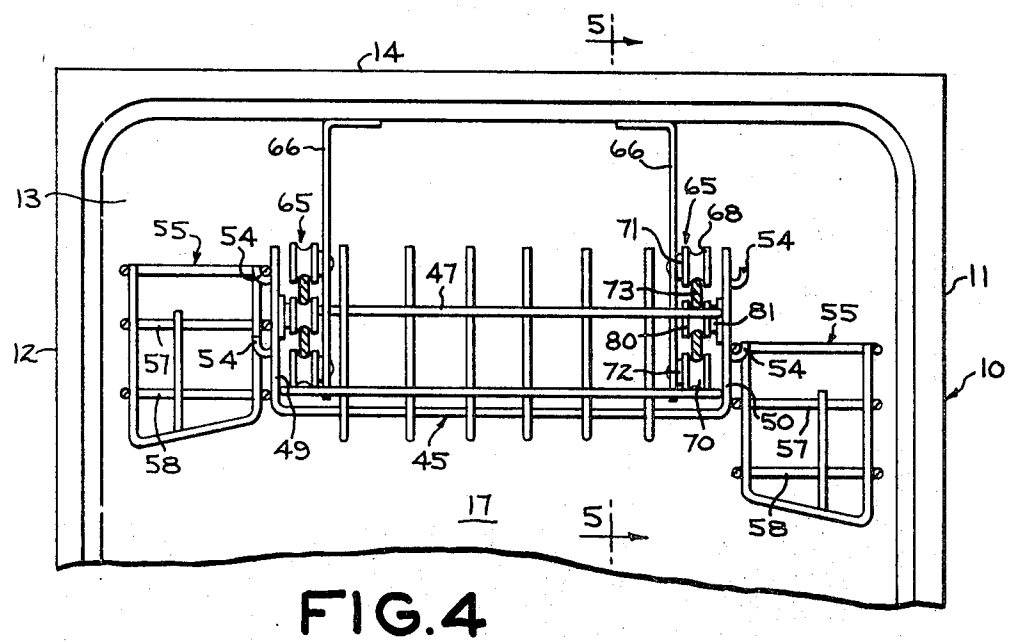


FIG.4

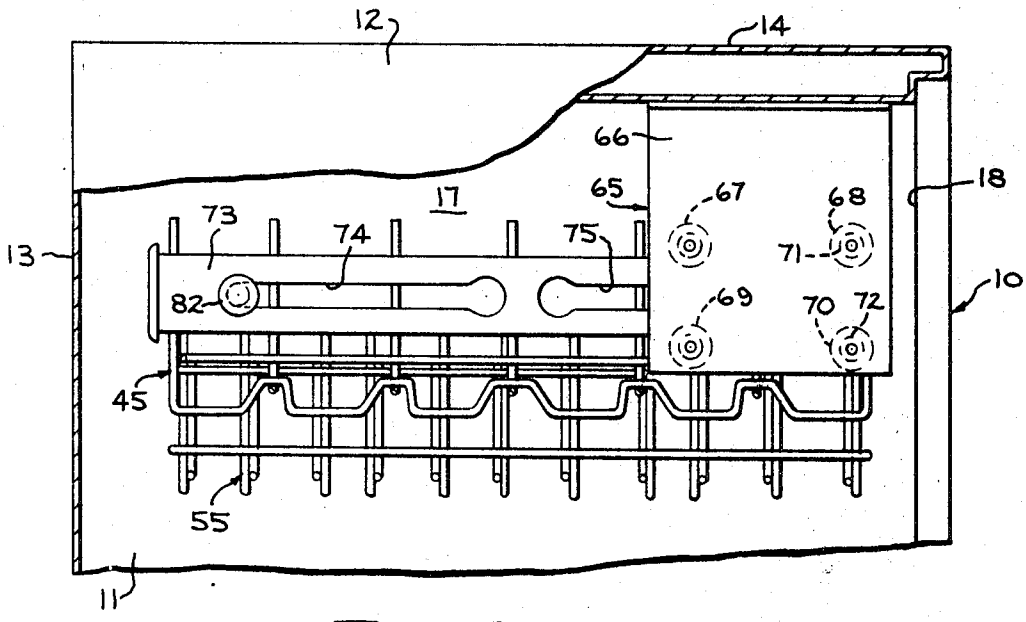


FIG.5

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RACK ASSEMBLY FOR A FRONT-OPENING DISHWASHER

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U.S. Cl. 312—301 10 Claims

ABSTRACT OF THE DISCLOSURE

An improved rack assembly in an automatic dishwasher of the type having a front access opening to an inside washing chamber and dish supporting racks which are slidably mounted to be manually pulled outwardly to an extended position through the access opening to facilitate front loading of the racks. The rack assembly for the dishwasher includes upper and lower spaced-apart open framework dish racks that are mounted for independent substantially horizontal movement with respect to the dishwasher's inside washing chamber. One of the dish racks comprises a plurality of sections including an intermediate section that is vertically fixed relative to the rack support means and vertically adjustable and removable sections or dish rack modules provided at each side of the intermediate rack section.

BACKGROUND OF THE INVENTION

This invention relates to dishwashing machines of the type having a front opening for front loading and dish supporting racks which are movable substantially horizontally through the front access opening. More particularly, the invention pertains to an improved rack assembly for a front loading dishwasher which provides more effective use of available space within the washing chamber of the machine.

It is conventional in a front loading dishwasher machine to provide a pair of vertically spaced apart racks for supporting articles to be washed within the dishwasher's washing chamber. Generally, the lower and upper racks each has a cross sectional area substantially equal to that of the horizontal cross section of the washing chamber and each is mounted to be independently slidable from its operating position within the wash chamber to a loading position where it extends horizontally outwardly from the front access opening of the machine. Generally the bottom rack is designed to receive and carry comparatively large articles for washing within the washing chamber while the top rack is positioned so that its open top is in close relation to the top wall of the dishwasher and is utilized for washing relatively small dishes and glassware. The fact that this general arrangement has been so widely adopted for use by the various manufacturers of dishwashers is evidence of its acceptance by the housewife as an advantageous means of distributing and supporting soiled tableware to be washed within a dishwasher. The conventional arrangement, however, does have certain limitations.

The arrangement of upper and lower spaced apart racks of substantially the same cross sectional area presupposes that the housewife will always have, in a typical wash load, only that number of large articles that will not exceed the capacity limitation of the lower rack, and as few small items such as cups and glassware as may be safely distributed in the upper rack. As a practical matter, however, the housewife often has a greater number of large comparatively cumbersome items to be washed than can be conveniently stored in the lower rack of a conventional dishwasher rack arrangement and she is therefore faced with the choice of either purposefully

overcrowding items into the lower rack or withholding some of the large items from the dishwasher and washing them separately at a later time. In view of this problem it would be desirable to have a dishwasher with a rack structure that could be conveniently rearranged in accordance with the number of larger items to be washed so that rack overcrowding or the need for subsequent wash loads could be avoided.

Another problem of the conventional rack arrangement relates specifically to the washing of smaller items such as cups and glassware, etc. in the dishwasher. The fact that front loading dishwashers have slide-out racks to facilitate loading does not obviate the requirement of a number of trips between table and dishwasher by the housewife to load the machine. Though large items such as plates can be conveniently stacked and carried from the table, this is not always true for smaller items. Cups and glassware either cannot be stacked or are particularly fragile and hence require comparatively gentle handling. It would be therefore extremely convenient and advantageous for the housewife if at least part of the rack arrangement within the dishwasher could be not only slid outwardly through the access opening of the dishwasher but be manually removed and carried to the table for loading of small fragile items.

Therefore, among the objectives of this invention is the provision of a rack arrangement that will provide rack rearrangement by the housewife in accordance with the size and number of larger items to be washed in the dishwasher, in combination with the provision of a rack assembly having removable modules to permit rack loading at a point distant from the dishwasher. Other objectives of the invention will become apparent from the detailed description hereinafter.

SUMMARY OF THE INVENTION

One form of the invention is an upper level rack construction in a dishwasher, including a horizontally disposed open framework that extends almost entirely over the cross sectional area of the washing chamber. The open framework constitutes a base for a plurality of separate racks or sections carried thereon, and slidable support means is provided at each side of the open framework for mounting it in movable relation to the opposed side walls of the washing chamber. A substantially large center rack or intermediate section that extends substantially from the front to the back of the washing chamber is attached in a fixed position on the open frame in an intermediate position with reference to the cabinet side walls. Removable vertically adjustable auxiliary racks or basket-like modules having substantially the same long dimension as the intermediate rack are provided to flank the intermediate rack on each side thereof. The auxiliary racks or modules are independently vertically adjustable with respect to the fixed intermediate rack, and are carried, in their installed position, in removable attachment to the intermediate rack so that they are horizontally slidable in unison with the intermediate rack on the supporting frame therebeneath.

In another form of the invention, an upper rack construction is provided in a front-loading washing chamber including an intermediate rack that is movably carried on slidable support means suspended from the inside surface of the top wall of the dishwasher cabinet. The long dimension of the intermediate rack is substantially equal to the distance from the back to the front of the cabinet, with allowance for space at each side of the intermediate rack for removable vertically adjustable auxiliary racks or modules. Removable or releasable attachment means is provided at each side of the intermediate rack for suspending the modules thereon in a cantilever fashion. The cross-sectional area of the intermediate rack with

the modules carried on each side thereof is substantially that of the cross-sectional area of the wash chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a front loading automatic dishwashing machine, illustrating substantially the upper half of the cabinet with the door removed and the bottom half of the cabinet cut away;

FIG. 2 is a vertical sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a horizontal sectional view taken along line 3—3 of FIG. 1;

FIG. 4 is a partial front elevational view of a front opening dishwasher, shown with the door of the cabinet removed and substantially the lower half of the cabinet cut away, illustrating a second preferred form of our invention as compared to that which is shown in FIG. 1; and

FIG. 5 is a view in vertical section taken substantially along the line 5—5 of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings and particularly to FIGS. 1, 2 and 3 thereof, there is illustrated the upper portion of a front loading dishwasher cabinet having opposite side walls **11** and **12**, a back wall **13** and a top wall **14**, defining a substantially large washing chamber **17** within the cabinet **10**. The front side of the cabinet **10** is a substantially large door that, during the machine's operation, covers a front access opening **18**. The door (not shown) is hinged at its lower edge to enable it to be opened outwardly downwardly to a horizontal orientation with respect to the cabinet **10** to allow a slidably mounted lower dish supporting rack to be slid horizontally outwardly over the open door to facilitate loading of the dishwasher (neither the door nor the lower cabinet portion with its lower rack are shown in the drawings). In the embodiment of the invention illustrated in FIGS. 1–3, the upper rack arrangement provided, as compared to the more conventional unitary upper rack structure, may be considered as comprising an intermediate rack section **45** carried on a slidably mounted open thick wire frame **40** and flanked by left and right vertically-adjustable removable auxiliary racks or rack modules or sections **55**. The racks **55** are substantially identical and, with the intermediate rack **45**, have a combined horizontal cross-sectional area approximately equal to that of the cross-sectional area of the washing chamber **17**.

As illustrated in FIG. 3, the frame **40** comprises a pair of spaced apart horizontally disposed frame members or side bars **39** interconnected by substantially rigid spaced apart cross members **41** extending between and perpendicular to the side bars **39**. Each cross member **41** has stub end portions **42** turned perpendicular to the cross member **41** to facilitate its attachment by welding to the side surface of one of the parallel side bars **39**. The frame **40** is thereby formed in a substantially rectilinear plane configuration to support the rack **45** and the modules **55** thereon.

The frame **40** is supported along each side thereof by a slidable support means or roller assembly **20** that provide the means by which the frame **40**, with the intermediate rack **45** and the side modules **55** carried thereon, to be manually slid outwardly to extend through the access opening **18** of the cabinet **10** to facilitate loading of small tableware articles for washing. The roller assemblies **20** are positioned on the inside surface of opposite side walls **11** and **12** of the cabinet **10** and are substantially identical, with one being in reverse orientation to the other.

As illustrated in FIG. 2, each roller assembly **20** includes a pair of spaced apart upper rollers **21** and **22** and spaced apart lower rollers **23** and **24**, each rotatably mounted by means of a stub shaft (such as stub shafts **25** and **26** shown in FIG. 1) to the inside surface of the cabinet side wall. The rollers **21**, **22**, **23** and **24** are grouped on the side wall **11** toward the front of the

cabinet **10** in a formation as though each roller was the corner of a rectangle, and the upper rollers **21** and **22** are spaced from the lower rollers **23** and **24** such that a longitudinally elongated slide bar **29** may be positioned and carried by means of annular roller grooves, between the upper and lower rollers. The slide bar **29** is thereby mounted so as to be slidable outwardly in a horizontal plane to extend through the access opening **18** of the cabinet **10**, and the aforementioned rollers are positioned such that when the slide bar **29** is in its extreme inward or outward position with respect to the washing chamber **17**, it is held in cantilever suspension by the roller assemblies **20**.

Slide bar **29** is provided with forward and rearward longitudinal openings or slots **30** and **31** along the length thereof. The slots **30** and **31** are positioned in horizontal alignment with respect to each other for the purpose of receiving and acting as horizontal trackways for spaced apart frame rollers **36** and **37**. Each of the frame rollers **36** and **37** is rotatably mounted on the outside surface of one of the side bars **39** of the frame **40**, by means of a stub shaft or roller axle (such as shaft **38** shown in FIG. 1) on which the roller is journalled. It should be noted that the slide bar **29** of the roller assembly **20** is provided at each end thereof, with a traversely widened end portion **34** which will act as a stop means to prevent the slide bar from being slid in either direction beyond its slidable attachment with its associated group of wall mounted rollers **21**, **22**, **23** and **24**.

Referring now to FIGS. 1 and 3, the intermediate rack **45** is constructed of heavy wire or rod-like members placed and joined by means of welds to assume a rigid web-like basket including a horizontal rack floor portion **46**, a vertically disposed front fence and rear fence portions **47** and **48**, and left and right side fence portions **49** and **50**. The floor portion **46** of the intermediate rack **45** is joined to the cross members **41** of the frame **40** by welds at the points where the rod-like members of the floor portion **46** cross and abut on the cross members **41**. The intermediate rack **45** is thus vertically fixed by its attachment to the frame **40**. Means are provided on the side fence portions **49** and **50** for cantilever suspension of one of the rack modules **55** on each side of the intermediate rack **45**. For the latter purpose, as illustrated in FIGS. 1 and 3, small trough-like hooked members **54** are attached by means of welds at spaced apart locations along the top edge of the outer side of the side fence portions **49** and **50** of the intermediate rack **45**.

Each of the left hand and right hand sections or rack modules **55** has an open top side and is preferably constructed of substantially heavy wire or rod-like members in a welded rigid web-like frame work with a sloped bottom portion **56**, substantially long opposite side fence portions **57** and **58**, and forward and rearward end fence portions **59** and **60**. The inside area of each module **55** may be provided with vertically projecting spaced apart "spikes" **61** for partitioning the module lengthwise or for facilitating the placing of inverted glassware or similar items thereover.

The lefthand module **55** illustrated in FIG. 1 is in its intermediate vertical position, having the top horizontal rail of side fence **57** engaged in hooks **54** of the intermediate rack **45**, with the lowermost rail of side fence **57** of the module **55** pressing against the lower part of side fence **49** of rack **45**.

As illustrated in FIG. 2, sections of the horizontal intermediate side rails of module side fences **57** and **58** are cut away on both sides of the module **55** to provide openings **63** whereby the module **55** may be removed entirely from its attachment to the hooks **54** of the rack **45** and allowed to drop downwardly to rest with its side top rails resting on the spaced apart cross members **41** of the frame **40**.

Referring to FIGS. 1–3 of the drawing, either of the modules **55** may be, by the construction shown, selectively adjusted in its vertical position with respect to the inter-

mediate rack **45** from a low position as illustrated by the position of the righthand module **55** in FIG. 1 to a position wherein the top of the module **55** would be substantially above the top of the intermediate rack **45**. The latter position, of course, would be accomplished by raising the module **55** upwardly and engaging an intermediate rail of side fence **57** of the module **55** in the spaced apart hooks **54** on one side of the intermediate rack **45**, and this would result in having the horizontal lower side rail **58** resting against the outer side of the side fence **49** of rack **45** at a point near the vertical midpoint of the side fence **49**. Also, either of the modules **55** illustrated in FIG. 1 may be completely removed from the cabinet **10** to facilitate loading at a location distant from the dishwasher.

In FIGS. 4 and 5, which illustrate another embodiment of this invention, like numerals are utilized to designate like components of a dishwasher where such components are substantially the same as those shown in FIGS. 1, 2 and 3. Therefore, illustrated in FIGS. 4 and 5 is a dishwasher having a cabinet **10** comprised of side walls **11** and **12**, a top wall **14**, and a back wall **13** defining a wash chamber **17** with a front access opening **18**. In this embodiment, the rack arrangement situated in the upper area of the wash chamber **17** broadly comprises a middle or intermediate rack **45** with side rack sections or modules **55** hanging in cantilever suspension to each of the rack side fence portions **49** and **50**. The intermediate rack **45** and its suspended modules **55** are constructed substantially as those illustrated in FIGS. 1–3 but in this embodiment the intermediate rack **45** is supported, for its horizontal sliding action with respect to the wash chamber **17**, by means of suspended slidable support means or roller assemblies **65** attached to the inside surface of the side fences **49** and **50** of the intermediate rack **45**.

As illustrated in FIGS. 4 and 5, each slidable support means or roller assembly **65** includes a rigid hanger plate **66** anchored by its upper end to the inside surface of the cabinet's top wall **14** and protruding vertically downwardly into the washing chamber to provide a vertically disposed base on which is mounted a group of rollers, including upper rollers **67**, **68** and lower rollers **69** and **70**, each of which is rotatably mounted on a stub shaft (such as stub shafts **71** and **82** in FIG. 4). Each roller assembly **65** also includes a longitudinally elongated slide bar **73** that is slidably supported between the pair of upper rollers **67** and **68** and the pair of lower rollers **69** and **70**. Each slide bar **73** is provided with rearward and forward slots **74** and **75** which serve as respective trackways for rack mounted rollers, such as rollers **80** and **82**. Each of the rack mounted rollers is rotatably mounted on a stub shaft or roller axle, such as shaft **81**, FIG. 4, that is fixedly attached to the inside surface of a side wall fence of the rack **45**.

In this second embodiment of the invention, the means of supporting the modules **55** to each side of the rack **45** is modified to the extent that additional hooks **54** are provided in a vertically spaced apart relation as compared to the hooks **54** illustrated with reference to the first embodiment of the invention shown in FIGS. 1–3. Such a hook arrangement as illustrated in FIG. 4 permits each module **55** on the side of the rack **45** to be repositioned downwardly relative to the rack **45** so that space is gained above the module whereby larger items to be washed may extend upwardly from and above the module without impinging against the inner surface of the cabinet upper wall **14**.

In comparing the two presently preferred embodiments shown in the drawings (comparing FIG. 1 with FIG. 4) it will be noted that the suspended roller arrangement illustrated in FIG. 4 not only requires fewer parts for its construction but makes available two side areas that are unobstructed between the intermediate rack **45** and the chamber side walls when both the modules **55** are removed entirely from within the cabinet **10**. Thus, large and cumbersome items can be conveniently stored along the inside side walls of the lower level rack (not shown) and be permitted to extend upwardly into the area vacated by removal of the modules **55** on each side of the rack **45** without interference of horizontal rack support members.

In either of the two embodiments shown in the drawings, it may be found desirable on each of the hooks **54** on the side fences **49** and **50** of the intermediate rack **45**, to provide a notch **54***a* to receive a vertical side rail portion of the side fence **57** of the module **55**, so that replacement and realignment of the module **55** in its proper position with respect to the intermediate basket **45** would be simplified. Inasmuch as the housewife-operator is likely, when desiring to slide the upper rack assembly outward through the cabinet access opening, to grasp the outer end of either of the modules **55** and pull outwardly, the provision of a notch **54***a* in each hook **54**, to engage a vertical rail portion of the module **55**, also assures that the entire upper rack assembly will slide smoothly outwardly as a unit.

This invention, in its broader aspects, would also be applicable for use in a top-opening dishwasher of the type wherein dish supporting racks are suspended for vertical movement in unison with the opening and closing of the top access door or cabinet cover. For example, the concept of removable, vertically adjustable side rack modules depended to an intermediate rack may be adapted for use with a rack assembly similar to the assembly described in U.S. Pat. No. 3,087,769, issued to Lauren W. Guth, on Apr. 30, 1963, and assigned to the General Electric Company, the assignee of the present invention. Guth's swinging rack section, which is pivoted to the cover of the dishwasher whereby the rack will rise out of the machine as the cover is opened, could be constructed as an intermediate rack section of a size allowing space on either side or at its front edge for provision of a removable module that is in dependent attachment to the rack section and vertically adjustable thereto.

As will be evident from the claims appended hereto, it is not intended that the invention be limited to the embodiments described heretofore or to the particular details of construction of the examples illustrated in the accompanying drawings.

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

1. In a front loading dishwasher of the type having a washing chamber and an access opening therefor, dish supporting racks mounted for limited movement from the washing chamber and outward, for loading and unloading, through the chamber's access opening, an improved rack assembly, comprising:

(a) an intermediate upper rack located in the upper portion of the washing chamber and extending substantially the entire distance from the front to the back of the washing chamber,

(b) auxiliary upper racks disposed one to either side of said intermediate rack and the area occupied by all of upper racks is substantially equal to the horizontal cross sectional area of the washing chamber.

(c) slidable support means for all of said racks permitting substantially horizontal movement of said racks as a unit through the access opening,

(d) said intermediate rack being in fixed attachment on said support means, and

(e) adjustable attachment means permitting selective vertical repositioning of said auxiliary racks relative to said intermediate rack.

2. The combination set forth in claim **1**, wherein said slidable support means is mounted to the washing chamber side walls.

3. The combination set forth in claim **2**, wherein said slidable support means includes an open frame disposed generally horizontally in the washing chamber, and said intermediate rack is fixedly attached thereto.

4. The combination set forth in claim **1**, wherein said slidable support means is mounted to the washing chamber top wall.

5. The combination set forth in claim 1, further comprising means for realigning each of said auxiliary racks in the same vertical plane with respect to said intermediate rack when either of said auxiliary racks is removed entirely from the dishwasher and then replaced for use in the washing chamber.

6. The combination set forth in claim 1, wherein said adjustable attachment means comprises means for removably attaching each of said auxiliary racks to the side wall of said intermediate rack.

7. The combination set forth in claim 6 wherein said adjustable attachment means is a plurality of hooks integral to the side wall of said intermediate rack for suspending each of said auxiliary racks thereto in cantilever suspension.

8. In a dishwasher of the type including a cabinet having top, bottom, and side walls, and an access opening in one of the walls leading to a washing chamber, an improved rack assembly for supporting articles to be washed in the washing chamber, comprising:

(a) at least one dish supporting rack, support means provided in the washing chamber for said supporting rack and for limited movement through the access opening,

(b) said rack being split into a plurality of sections,

(c) a first of said rack sections being vertically fixed relative to said support means, and

(d) at least a second of said rack sections being vertically adjustable relative to said support means.

9. The combination set forth in claim 8, wherein said rack is split from front to rear into said plurality of said rack sections.

10. The combination set forth in claim 8, wherein:

(a) said rack is split into three sections including a left section, a center section, and a right section,

(b) said center section is said first section that is vertically fixed relative to said support means, and

(c) said left and right sections are vertically adjustable relative to said support means.

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312—312, 341