

[54] **RACK LEVEL ADJUSTMENT
APPARATUS IN AN APPLIANCE
CABINET**

3,560,069 2/1971 Doepke 312/351
3,402,975 9/1968 Smith 312/311
3,556,625 1/1971 Kauffman 312/312

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[21] Appl. No.: **148,839**

[57] **ABSTRACT**

The support means for a rack, such as a dish-supporting rack in a front-opening dishwasher cabinet, includes means for manually adjusting the level of the rack in accordance with the size of the items to be placed on the adjustable rack or on a rack vertically spaced therefrom. Each side of the adjustable rack is preferably adjustable between upper and lower positions, and adjustment of the rack side from an upper position to a lower one is a particularly rapid operation accomplished by manually releasing a locking means whereby the rack side will drop to its lowermost position.

[52] U.S. Cl. 312/351, 312/311, 312/312

[51] Int. Cl. A47b 51/00

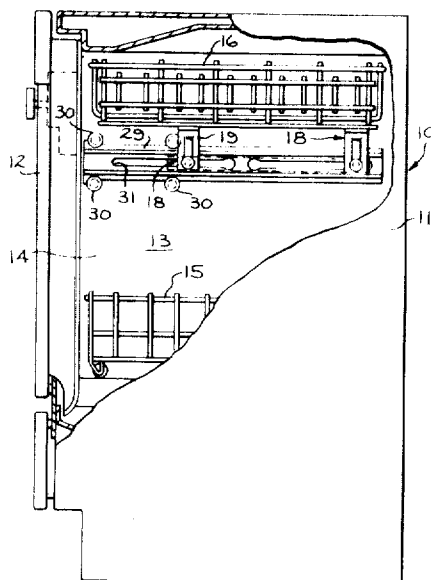
[58] Field of Search 312/351, 311, 312,
312/330; 287/3, 103 A, 54.1; 248/274;
211/162, 176; 108/146, 144

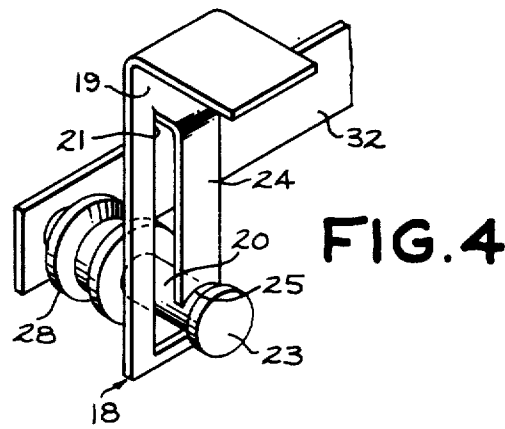
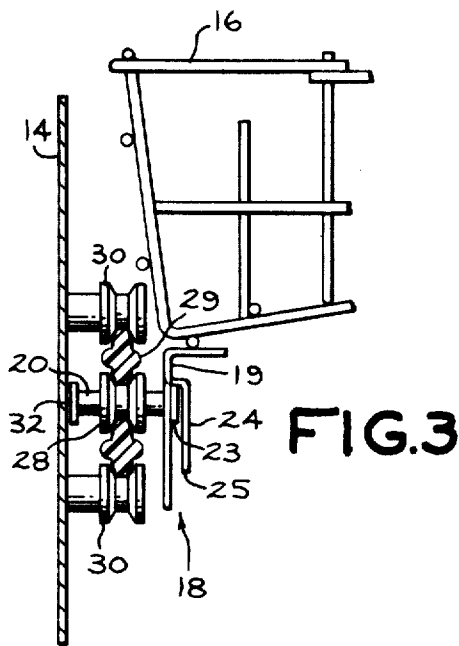
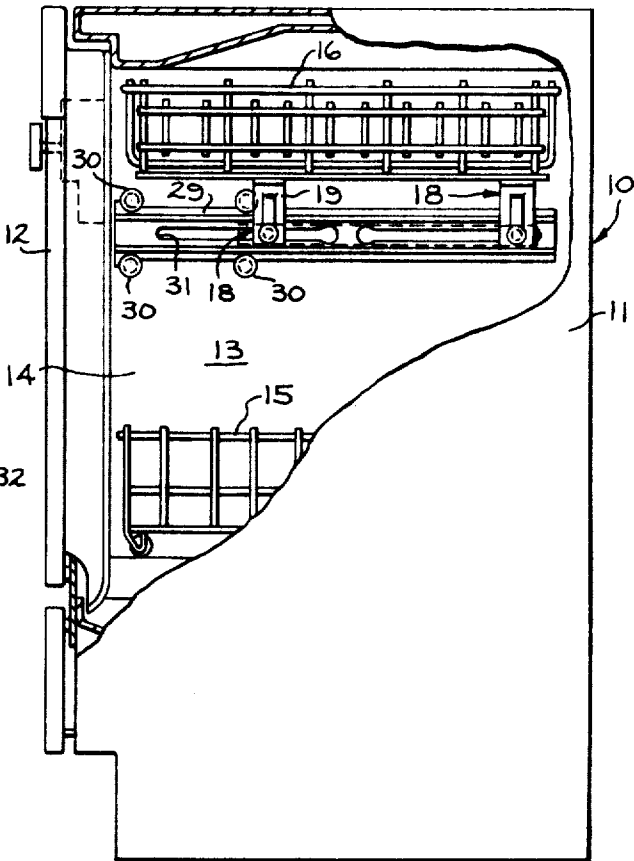
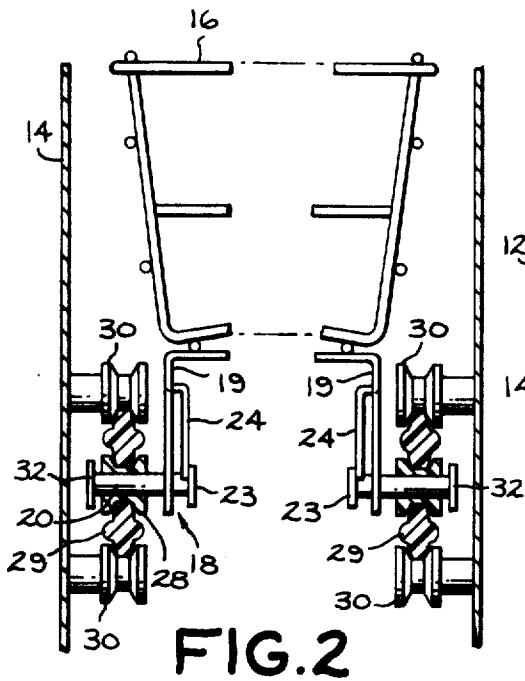
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4 Claims, 8 Drawing Figures





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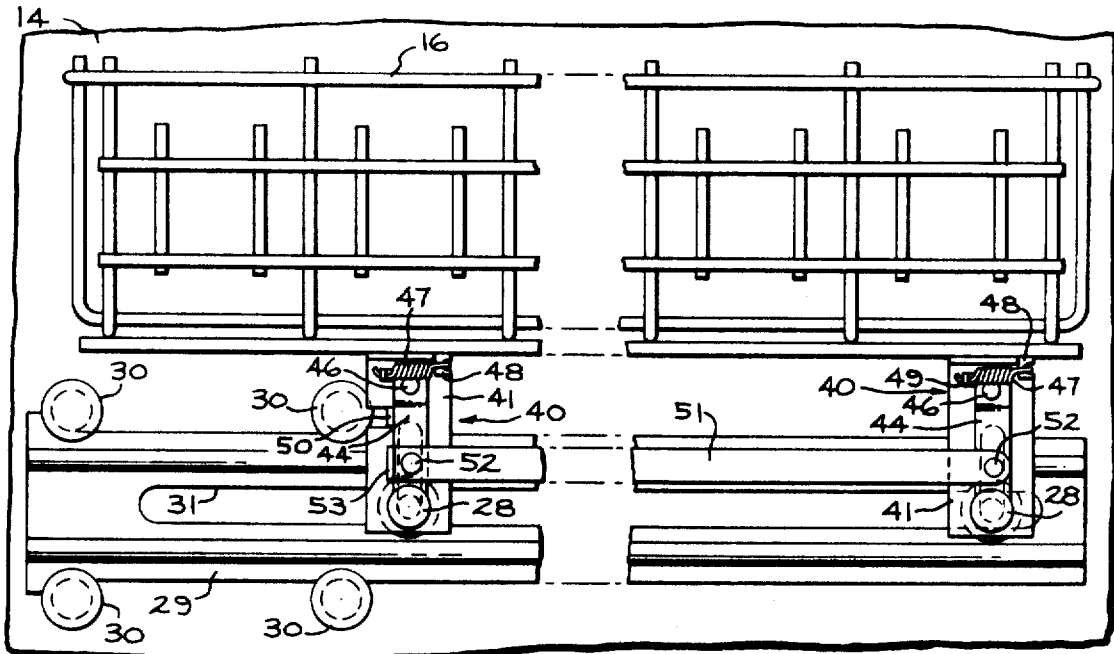


FIG. 5

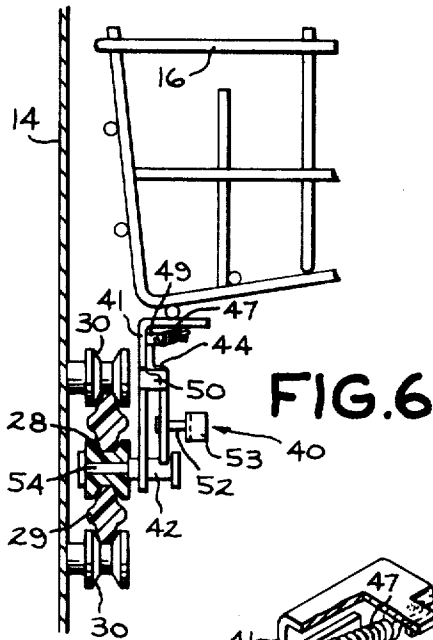


FIG. 6

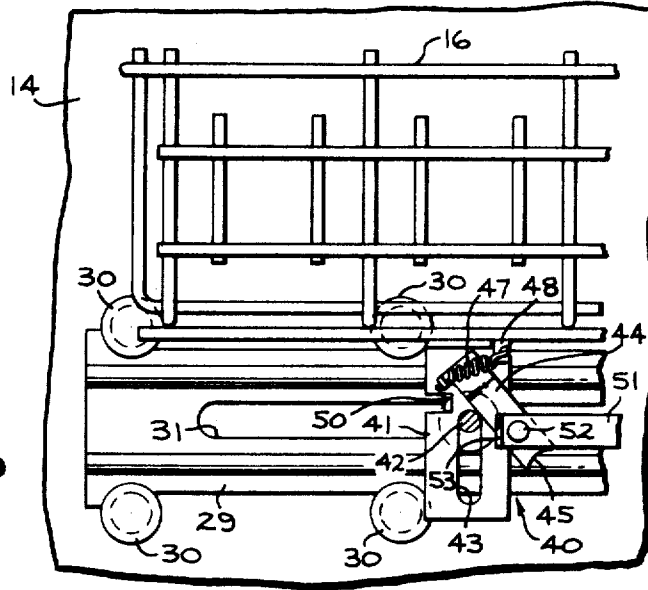


FIG. 8

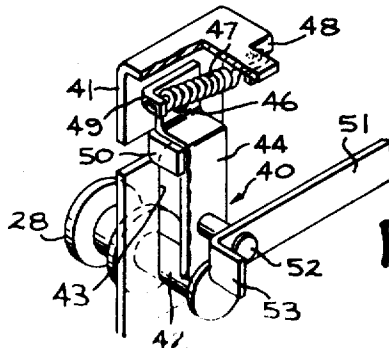


FIG. 7

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RACK LEVEL ADJUSTMENT APPARATUS IN AN APPLIANCE CABINET

BACKGROUND OF THE INVENTION

This invention relates generally to a shelf or rack supporting structure in an appliance cabinet and particularly pertains to apparatus for shifting or adjusting a rack in an appliance cabinet from one predetermined level or position to another to thereby provide more effective use of available space within the cabinet. The invention is believed particularly useful in an automatic dishwasher of the front-loading type.

The conventional non-adjustable arrangement of a dish-supporting rack in the wash chamber of a dishwasher is generally adequate for the average load of dishes. There are times, however, when it is desirable to place unusually large items within the wash chamber. Often the space between the lower and upper rack in the typical front-opening dishwasher is not sufficient to enable loading and washing of large platters or cookie sheets, etc., in the preferred on-edge position therein. Moreover, space between the upper rack and the top of the wash chamber is not adequate to permit the placing of tall glasses or long-stemmed crystal ware within the upper rack.

In U.S. Pat. No. 2,560,069, the inventor of the present invention disclosed rack adjustment means provided in combination with the slidable support means of an upper rack in a front-opening dishwasher. The assembly disclosed in the patent includes the use of spaced-apart brackets on the side of the rack. Each bracket has a curved slot provided therein which forms an arcuate-shaped trackway in the bracket. A horizontally-disposed stub shaft extends through the trackway of each bracket. The level of the upper rack is vertically adjusted by manipulating the rack to thereby reposition the trackway of each bracket relative to the associated stub shaft extending therethrough. Adjustment of the rack side from its lower position to the upper position involves first lifting the rack upwardly and then moving it a short distance in a horizontal direction to facilitate movement of the trackway of each bracket on the stub shaft associated therewith. It has been found in practice that such adjustment can be difficult for an operator to perform if the simple mechanical concept involved is not fully understood, particularly if the rack is also arranged to be manually slidable to and from the wash chamber.

In response to the aforementioned problem, an improved rack level adjustment apparatus was developed and then presented in a co-pending patent application, Ser. No. 148,839.

The invention disclosed in the co-pending application comprehends the provision of a slidable mechanism permitting adjustment of a rack side or the entire rack between upper and lower positions by a directly vertical movement rather than requiring the rack side be lifted and moved horizontally relative to its slidable support means in order to adjust the rack side from the upper to a lower position.

The present invention comprehends an improved version of the apparatus disclosed in the aforementioned application. The present invention has certain advantages thereover including being substantially less complicated to manufacture and assemble. The present invention is also comparatively simpler to operate.

SUMMARY OF THE INVENTION

In accordance with its presently preferred form, this invention comprises an appliance cabinet having oppositely-disposed side walls defining a chamber therebetween, and a load-bearing rack mounted in the chamber. An adjustable means is provided at the side of the rack that permits manual adjustment of the side between vertically-spaced predetermined positions. The adjustable means comprises at least one slidable mechanism located along the rack side and the slidable mechanism includes a first member extending from the rack side and a second member mounted to the chamber side wall. The first member is adapted to slide vertically relative to the second member such that the rack side will move from one of the vertically-spaced positions to another.

The invention further includes manually releasable locking means operatively associated with the slidable mechanism. The locking means is adapted to prevent downward movement of the first member relative to the second member when the first member is in one of the positions above the lowermost of the vertically-spaced positions. The locking means is further adapted to be manually released whereby the first member is thereafter free to move downwardly to a lower one of the positions. The locking means includes a projection on the first member that has a shoulder portion adjacent its lower end adapted to engage against the second member and thereby prevent downward movement of the first member.

BRIEF DESCRIPTION OF THE DRAWING

Features and advantages of the present invention will be apparent from the ensuing description when read in reference to the accompanying drawing wherein:

FIG. 1 is a side elevational view of a front-loading automatic dishwasher having a side wall thereof cut away and also having portions of racks within the dishwasher's chamber cut away along a vertical line to show one side of the upper rack and its adjustment means;

FIG. 2 is a fragmentary view in vertical section of the upper end of the wash chamber of the dishwasher shown in FIG. 1, illustrating the appearance of the adjustment means for a dishwasher rack wherein each side of the rack is adapted to be vertically adjustable thereby;

FIG. 3 is a view of the left-hand portion of FIG. 2 but showing components of the invention as they appear in accordance with the operation thereof;

FIG. 4 is a perspective view of a portion of the structure shown in FIG. 2, but here shown on a somewhat larger scale;

FIG. 5 is a fragmentary elevational view of structure in accordance with an alternate embodiment of the present invention;

FIG. 6 is a view taken along lines 6—6 of FIG. 5;

FIG. 7 is a perspective view of structure shown in FIG. 6, here shown on a comparatively larger scale; and FIG. 8 is an elevational view showing a portion of the structure first shown in FIG. 5, here showing components of the alternate embodiment of the invention repositioned in accordance with the operation thereof.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1 there is shown a front-loading dishwasher

10 including a rectilinear-shaped cabinet 11. An access door 12 is hinged at its lower end to pivot on a horizontal axis and open outwardly from the cabinet 11. Within the cabinet 11 is a wash chamber 13 partially defined by the door 12 and oppositely-disposed side walls 14. Mounted within the chamber 13 are a pair of dish-supporting racks 15 and 16. Each of the racks 15 and 16 is provided with means permitting the rack to be slidably withdrawn outwardly through the chamber access opening whereby the rack may be loaded or unloaded and thereafter retracted back to the position shown in FIG. 1.

In combination with the rack 16 is an adjustable means, preferably provided at each side of the rack, that permits manual adjustment of the side between vertically-spaced positions. The adjustment means, as shown in FIGS. 1-4, includes a slidable mechanism 18. A pair of the slidable mechanisms are preferably utilized in a spaced-apart relation on the rack side. The slidable mechanism 18 has a pair of members arranged whereby one is vertically slidable with reference to the other. One of the member may be in the form of a bracket 19 that extends downwardly along the side edge of the rack 16. The other member may be in the form of a support arm or stud 20 that extends transversely and through a vertically-elongated slot 21 in the bracket 19. The slot 21 serves as a guideway and the stud 20 acts as a support arm on which the bracket may be moved directly vertically by means of its guideway sliding on the stud.

The stud 20 preferably has an intermediate shaft portion 22 and a substantially wider end portion or head 23. The bracket 19 is provided with a downwardly extending projection or tongue portion 24 spaced away from the major body portion of the bracket. The tongue portion 24 may be formed from the material removed from the bracket to provide the slot 21. The tongue portion 24 is shown as having an arcuate lower end edge or shoulder 25 for resting upon the shaft portion 22 of the stud 20.

As shown in FIGS. 2 and 3, the stud 20 also serves as an axle for a roller 28. The stud 20 is adapted to be manipulated to slide axially relative to the roller 28. This adaption will become apparent through a comparison of the disposition of the stud 20 in FIG. 2 to its disposition in FIG. 3. The roller 28 is adapted to roll in a horizontal path parallel to the dishwasher side wall 14 by means of a slide bar 29. The slide bar 29 is slidably arranged between upper and lower rollers 30. The rollers 30 are rotatably-mounted to side wall 14 of the wash chamber 13. Each of the rollers shown in the assembly has an annular intermediate groove for engaging on a portion of the slide bar 29. As shown in FIG. 1, the slide bar 29 is mounted to be slidable horizontally between two sets of the rollers 30, and the roller 28 is disposed for horizontal movement in a longitudinally extending elongated slot 31 provided in the slide bar 29. In the presently preferred form of the invention, the roller 28, the slide bar 29, and the rollers 30 serve together as means for mounting the mechanism 18, particularly the member shown in the form of the stud 20, to the side wall 14 of the chamber 13.

In an arrangement wherein a pair of the sliding mechanisms 18 are utilized in a spaced-apart relationship along a side of the rack 16, as shown in FIG. 1, the studs 20 of the mechanisms 18 are preferably interconnected by means of an elongated connecting member

or rigid bar 32. The bar 32 is most clearly shown in FIG. 4. This interconnection is not absolutely necessary to enable operation of the pair of sliding mechanisms but is a convenience and structural simplification that is preferred.

Referring again to FIG. 1, operation of the adjustment means in combination with the rack 16 may now be considered. In adjusting the rack 16 from one position to another, the door 12 of the cabinet 11 is open and the rack 16 is preferably drawn to extend outwardly to its loaded position wherein it overhangs the open door 12 in a cantilevered arrangement. Assuming then that the side of rack 16 to be adjusted is in its lowermost position, with the parts of the sliding mechanism 18 disposed as shown in FIG. 3, the rack side may be elevated to a higher position if the machine operator merely grasps the rack 16 and raises it by lifting or pulling it upwardly. This action will cause the bracket 19, as shown in FIG. 3, to slide upwardly relative to the stud 20 to the position shown in FIG. 2. Then, while holding the rack 16 in the described position, the machine operator uses the other hand to manipulate the bar 32 by pushing it inwardly whereby the studs jutting from each end thereof are slid from the position shown in FIG. 3 to that shown in FIG. 2.

It should be noted that the slot 21 in the bracket 19 is made to extend downwardly far enough that when the stud 20 is in contact against the lower end of the bracket defining the extreme lower end of slot 21, the head 23 of the stud 20 will slide easily, in a lateral direction, beneath and past the shoulder 25 of the tongue portion 24. Then, by halting the lifting force on the rack side, the rack side and the bracket 19 will drop a slight distance downwardly whereby the shoulder 25 will rest against the stud 20 such that the rack side is thereby held in the upper most position. The weight of the rack itself is sufficient to maintain the shoulder 25 against the stud 20 and, because the diameter of the head portion 23 is greater than the intermediate portion of the stud 20, the stud 20 is prevented from being inadvertently slid axially relative to the shoulder 25. Changing the level of the rack side from the uppermost position shown in FIG. 2 to that shown in FIG. 3 requires a reversal of the manual operational steps described heretofore. This involves lifting the rack 16 slightly upwardly such that the undersurface of the stud 20 is contacted by the lower portion of the bracket 19 whereby shoulder 25 of the tongue portion 24 is moved above the horizontal plane wherein the highest peripheral edge of the stud head 23 resides. The operator, while holding the rack side in the aforescribed position, then grasps the bar 32 and pulls it from the position shown in FIG. 2 to that shown in FIG. 3 whereby each stud head 23 moves laterally and comes to rest in contact with the body of its associated bracket 19. The operator may then manually lower the rack side to the lowermost position, as shown in FIG. 3.

In an arrangement wherein each side of the rack 16 is provided with at least two spaced-apart sliding mechanisms 18, as shown in FIG. 2, each side of the rack may be separately raised or lowered, as heretofore described, in the same general manner.

In FIGS. 5-8 there is shown an alternative embodiment of the present invention which may be considered as a modification or improvement of the structure shown in FIGS. 1-4. As was true with reference to FIG. 1, FIG. 5 also shows a slide bar 29 disposed at the side

of the rack and supported for horizontal movement between sets of rollers 30. The rollers 30 are rotatably attached to the side wall 14 of the wash chamber 13. A pair of spaced-apart sliding mechanisms 40 are provided for adjusting the side of the rack 16 between upper and lower levels or positions. Each sliding mechanism 40 comprises a bracket 41 adapted to be vertically movable relative to a stud 42. Each bracket 41 is provided with a vertically-elongated slot 43 through which the stud 42 extends.

The bracket 41 has a pivotal member in the form of a projection or tongue portion 44 having an arcuate lower end shoulder portion 45. The tongue portion 44 is mounted to the bracket 41 by means of a pivot pin 46. A coil spring 47 serves as means for urging the tongue portion 44 to pivot to a vertical disposition as shown in FIGS. 5, 6, and 7. The spring 47 is connected between a tab 48 on the upper end of the bracket 41 and a tab 49 protruding at the upper end of the tongue portion 44. The bracket 41 also has an integral intermediate portion or tab 50 for stopping pivotal motion of the tongue portion 44 at the vertical orientation as shown in FIG. 7.

The sliding mechanisms 40 as shown in FIG. 5, are interconnected by linkage in the form of an elongated member or control bar 51 extending between the respective tongues 44 whereby pivotal motion of one tongue portion 44 is translated to its counterpart member of the other sliding mechanism so that they may be moved in unison. The control bar 51 is pivotally fastened to each tongue portion 44 by means of an elongated stud 52. A tab 53 integral to the control bar 51 projects laterally from the end thereof to provide a means of grasping the end of the control bar 51 with the fingers.

Whereas in the first embodiment described in FIGS. 1-4, the stud extending from the roller 28 was axially movable relative thereto, in this embodiment of the invention the stud 42 is provided with a slim intermediate portion 54 that extends within the roller 28 such that the stud portion 54 is flanked at either end by a wider stud portion extending radially outwardly relative to the roller's side surface. The stud 42 is thus prevented from moving axially in a horizontal direction relative to the roller 28. In this embodiment of the invention, adjustment of the sliding mechanism 40 to vertically move the bracket 41 downwardly relative to the stud 42 is accomplished by pivoting the tongue portion 44 about the horizontal axis of the pivot pin 46.

Assuming that the side of the rack 16 is set at its uppermost position as shown in FIGS. 5-7, adjusting the rack side to a lower position is quite easily accomplished, whether the rack is disposed within the wash chamber in its operating position or is extending outwardly at its loading position. The operator need merely grasp the rack with one hand to stabilize it and prevent it from sliding horizontally while the other hand is used to grasp the tab 53 of the bar 51. Pressing rearwardly against the tab 53 whereby the bar 51 is caused to move in the general direction of its extension, that is, toward the back side of the wash chamber, will cause the respective tongue portions 44 to pivot from the position shown in FIG. 7 to the position shown in FIG. 8 whereby the shoulder portions 45 move off of the associated respective studs 42. This releases the respective brackets 41 to slide downwardly on the studs 42 to the position shown in FIG. 8. In accomplishing

this lowering operation of the rack side, the operator may find it beneficial to exert a slight lifting force against the rack side whereby the shoulder portion 45 will slide more easily away from its engagement on the stud 42. However, this is not believed generally necessary when lowering the rack since the weight of the rack pressing the shoulder portion 45 against the stud 42 is quite easily offset when manual force is exerted against the tab 53.

Raising the side of the rack 16 from the lowermost position shown in FIG. 8 back to its uppermost position is accomplished simply by grasping the rack side and lifting it directly upwardly. Then, when each bracket 41 moves upwardly such that the stud 42 contacts against the lower end portion of the bracket 41 defining the end of the slot 43, the spring 47 urges the tongue portion 44 to pivotally return to its vertical orientation whereby the shoulder portion 45 moves over the stud 42 and thereafter acts as a manually releasable means of locking the rack side in its uppermost position. The control bar 51, with its tab 53, serve as means for releasing the locking means. The tab 53 is located such that it is easily accessible to the machine operator whereby the rack side may be selectively released to drop to the lower position when the rack is disposed within the wash chamber in the operative rack position or when the rack is disposed through the access opening for loading.

From the preceding description it should now be apparent that the present invention provides apparatus including vertically slidable mechanism in combination with a rack in an appliance cabinet that is relatively inexpensive to manufacture. The apparatus is easily operated whereby the level of the rack side may be adjusted in accordance with the size of items to be stored within the cabinet.

It is intended that the appended claims define the subject matter of the invention and it is specifically not intended that the invention be limited to particular details of construction in the examples described and illustrated. Therefore, although the invention has been described with a certain degree of particularity, it is understood that numerous changes or modifications in the details of the construction and the combination or arrangement of parts may be resorted to without departing from the spirit and scope of the invention as set forth in the appended claims.

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

1. In a front-loading dishwashing machine cabinet having oppositely-disposed side walls defining a wash chamber therebetween, a rack mounted generally in the upper end of the chamber for supporting dishes to be washed, the rack being adapted to be slidable horizontally between an operative position where it is disposed fully within the wash chamber and a position where it extends outwardly from the chamber for loading, an adjustable means on a side of the rack permitting manual adjustment of the side between vertically-spaced positions, the adjustable means comprising:

- a. a plurality of rigid brackets located in spaced-apart relation along the side of the rack,
- b. each of the brackets having a straight generally vertically-extending elongated slot provided therein,
- c. a support arm extending substantially laterally with respect to the rack and through the slot whereby

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the rack side may be moved vertically such that the slot moves relative to the support arm extending therethrough,

- d. the rack side being adapted to be moved directly upwardly by a manual lifting action to an upper position wherein the support arm is adjacent the lower end of the slot, and
 - e. manually releasable locking means for holding the lower end of the slot adjacent the support arm whereby the rack side is held in a position above the lowermost of the vertically-spaced positions.
2. The invention of claim 1 including means for releasing said locking means being accessible for manual

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operation when the rack is disposed in the operative position.

3. The invention of claim 1 wherein the adjustable means is provided on each side of the rack whereby each side may be manually adjusted independent of the other rack side.

4. The invention of claim 1 wherein said manually releasable locking means includes a pivotal member on each of the brackets, and each pivotal member has a shoulder portion for engaging the support arm extending through the bracket slot.

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