United States Patent [19]

Pitstick

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[54] **RACK LEVEL ADJUSTMENT SYSTEM IN A DISHWASHER**

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[73] Assignee: **General Electric Company,** Louisville, Ky.

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[52] **U.S. Cl.** **312/351**

[51] **Int. Cl.** **A47b 88/00,** A47b 95/00

[58] **Field of Search** 312/311, 320, 351; 297/338–345; 108/144, 145; 211/176; 116/135

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[57] **ABSTRACT**

A dish supporting rack is mounted within the wash chamber of a dishwashing machine by connecting means permitting selective manual adjustment of the vertical level of the rack side. The connecting means includes a pair of spaced apart pivotal sectors, preferably formed from a durable plastic, linked to a manual control means at the front corner of the rack such that manipulation of the control means is translated to the sectors whereby the sectors pivot to vary the level of the rack side. Linkage between the control means and the sectors includes an elongated rod that may be formed as a toothed rack wherein plastic tooth sections are retained in a metal channel body portion. The manual control means has visual indicating means in combination therewith whereby the machine operator can ascertain the disposition of the rack side relative to the normal or intermediate level of adjustment.

7 Claims, 7 Drawing Figures

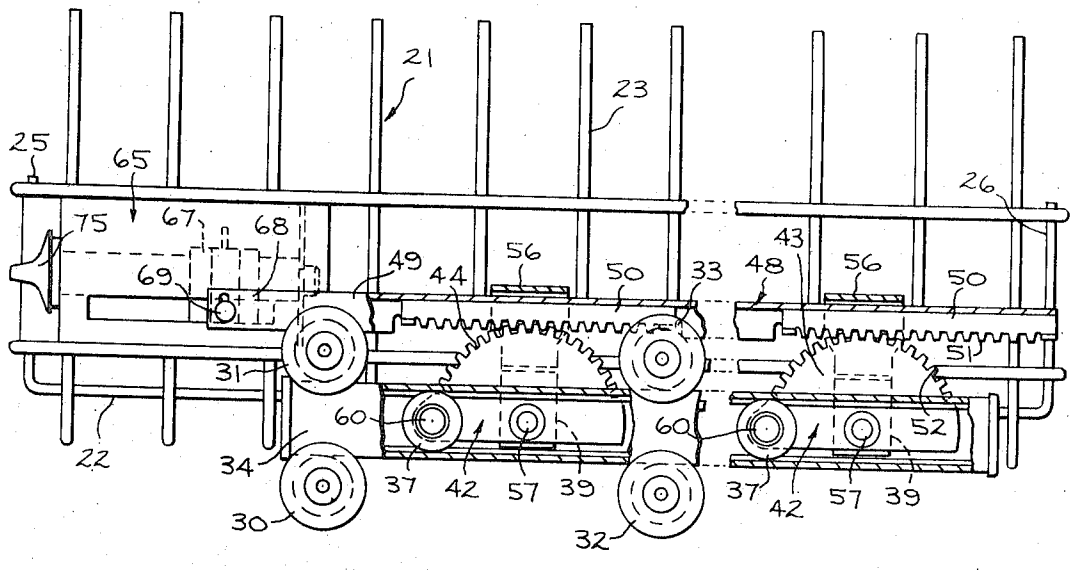
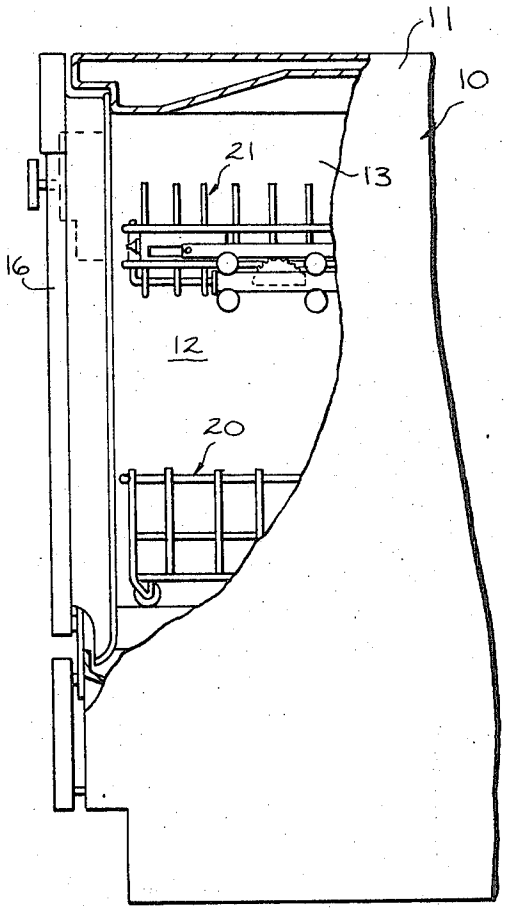


FIG. 1



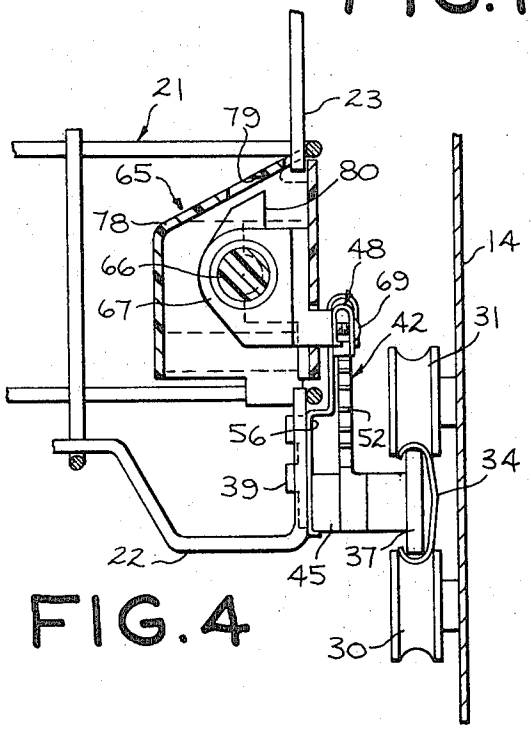


FIG. 4

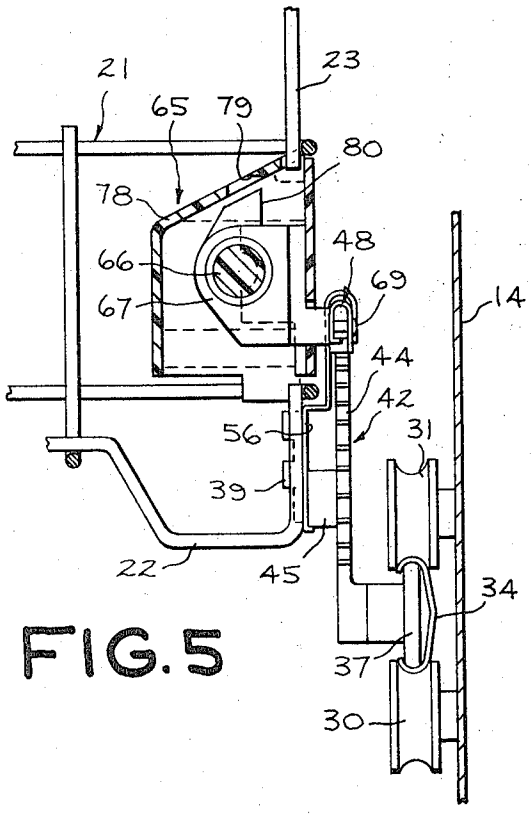


FIG. 5

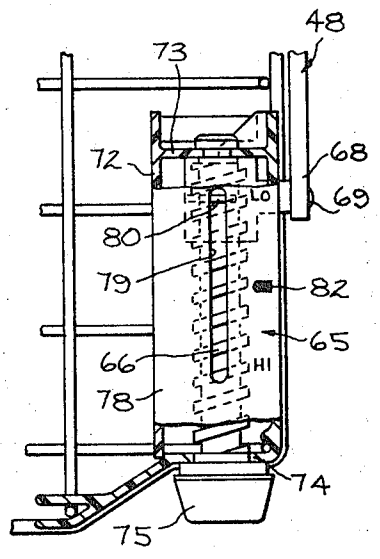


FIG. 6

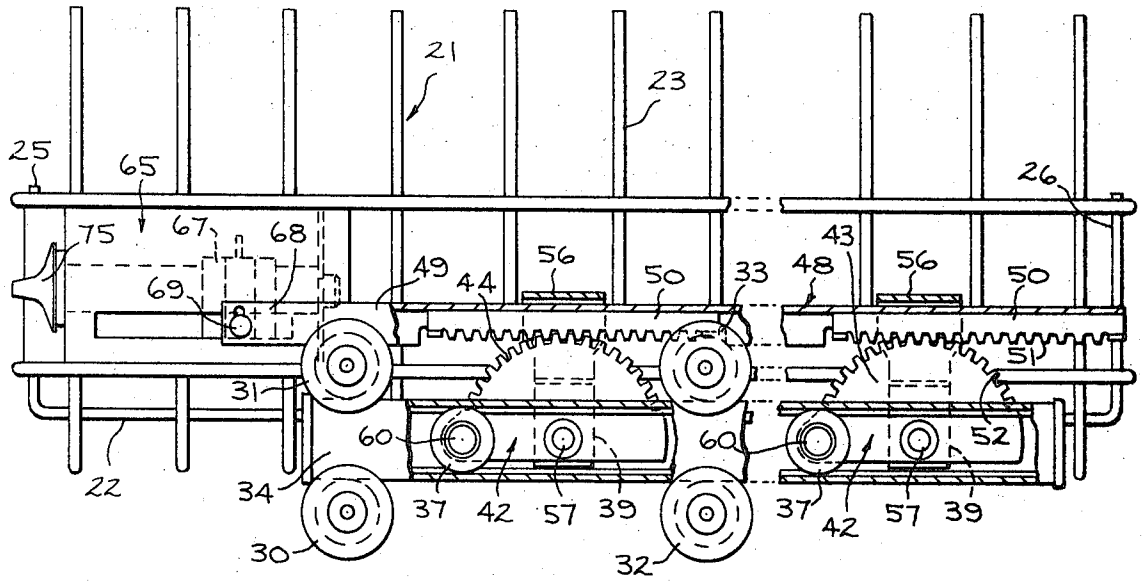

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FIG. 2

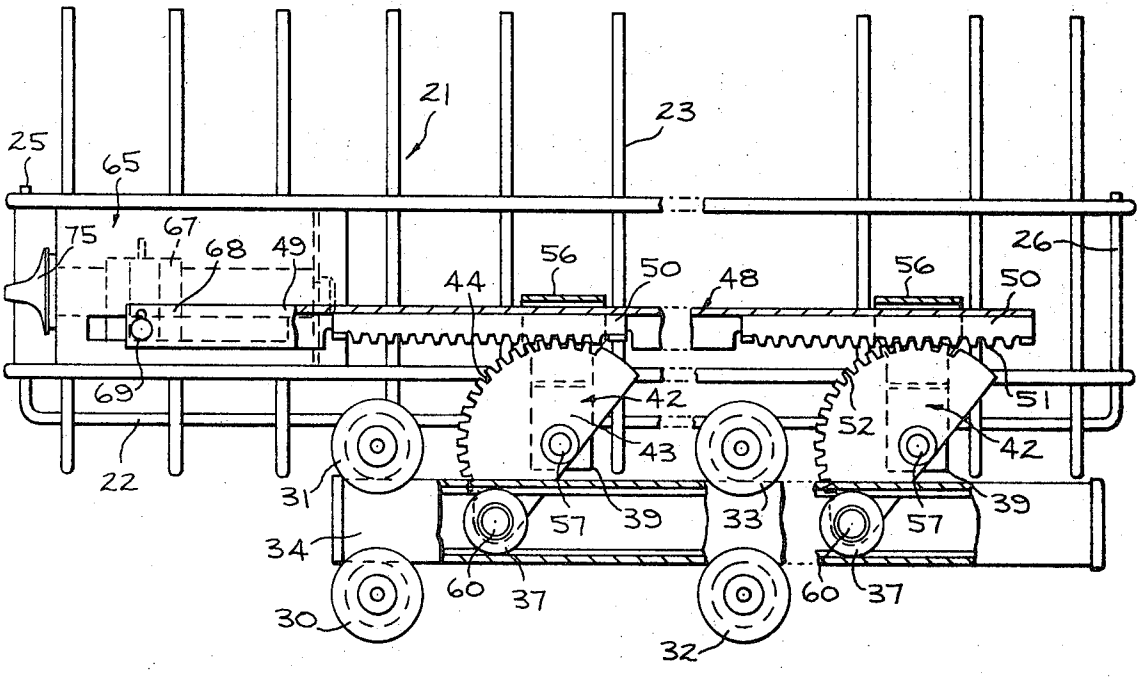

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FIG. 3

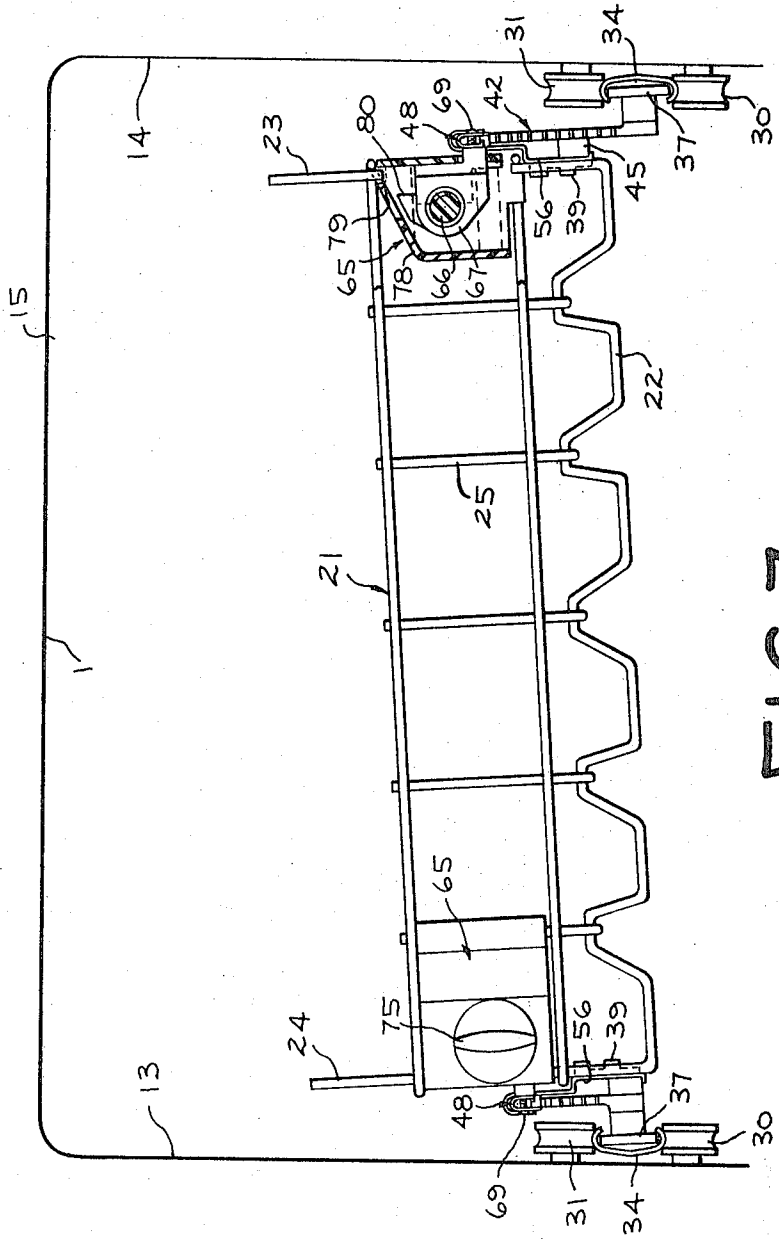

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FIG. 7

RACK LEVEL ADJUSTMENT SYSTEM IN A DISHWASHER

BACKGROUND OF THE INVENTION

This invention relates to an appliance enclosure having storage rack adjustment means therewith and specifically pertains to a dishwasher of the front loading type having means for obtaining independent adjustment of the vertical position of one or both sides of a dish supporting rack within the machine's wash chamber.

It is well known to those familiar with the manufacture of dishwashing machines that a standard width and a maximum height limitation for a dishwasher has been established in the industry. The available interior space and particularly the vertical dimension of the machine's wash chamber is thereby limited. Certain innovative approaches have therefore been proposed to maximize the use of the available space within the wash chamber. One such approach has been to provide manual adjustment of the disposition of a dish supporting rack within the wash chamber to enable accommodation of unusually large items to be stored for washing within the wash chamber.

In the standard wash chamber containing a pair of vertically spaced apart dish supporting racks it has been found advantageous to be able to re-orient the position or vertical level of one or both sides of the upper rack so that large flat utensils such as cookie sheets or pizza pans can be placed on edge in the lower rack without contacting the under surface of the upper rack. Such adjustment of the upper rack is also helpful to enable tall glasses and long-stemmed crystal to be stored in the upper rack without interference with the top of the wash chamber.

For examples of dishwasher rack assemblies enabling manual adjustment of the vertical level of a dish supporting rack, reference should be made to the application of L. W. Guth, Ser. No. 154,141, filed June 17, 1971 and assigned to the assignee of the present invention, or to U. S. Pat. No. 3,472,573 issued to P. B. Geiger on Feb. 14, 1969.

The present invention comprehends the provision of unique structure for obtaining independent rack side level adjustment without the use of bell crank levers at the side of the rack as taught in the aforementioned disclosures of Guth and Geiger. The present invention enables varying the level of the rack side and disposing it at any selected point between predetermined high and low levels in the manner taught in the earlier Guth disclosure mentioned heretofore, as opposed to the provision of a specific limited number of available levels as taught by Geiger. It is believed the present invention provides, as compared to the earlier disclosed system of Guth, a more positive control requiring less attention to tolerances in the manufacture thereof in a form that is more acceptable in terms of structural stability, appearance, and long term trouble free operation.

SUMMARY OF THE INVENTION

In accordance with the presently preferred embodiment of the present invention, a dishwashing machine is provided with a cabinet or enclosure having a wash chamber therein accessible through a front opening door. At least two dish supporting racks are mounted within the wash chamber in a vertically spaced apart

disposition and each rack preferably has the typical configuration of wire rod elements forming a bottom, oppositely disposed side wall portions, a front wall portion and a back wall portion. Along at least one side of the upper rack, and preferably along each upper rack side, connecting means structure is provided for mounting the rack side to the wash chamber side wall adjacent thereto including a plurality of interacting components adapted to vertically adust the level of the rack side in response to manipulation of a control means by the machine's operator. The plurality of components making up the connecting means structure includes a pivotal member that may take the form of a sector gear, a linking element in the form of a rigid rod member adapted to be moved reciprocally along the rack side and translate pivotal motion to the pivotal member, and a support member having means mounting it to the chamber wall and being pivotally attached to the pivotal member at a point on the pivotal member located radially outwardly from the pivotal member's axis of rotation on the rack side. The pivotal member is adapted to pivot on the rack side about an axis generally transverse to the rack side. The pivotal member may be provided with a series of teeth along its arcuate edge portion and the rod member may be a toothed rack adapted to mesh with the teeth on the arcuate edge portion of the pivotal member so that forward or backward movement of the rod member along the rack side will be translated to the pivotal member and cause it to respectively pivot forwardly or backwardly in response to movement of the rod.

The forward end of the rod member is engaged to a manual control means mounted in an exposed accessible position. The control means preferably includes a manually rotatable portion adapted to be manually rotated clockwise or counter clockwise to impart rotative motion to a threaded shaft or worm. A nut or riding member is engaged on the worm to move axially therealong either forwardly or backwardly depending upon the direction of rotation of the worm. The forward end of the rod member is connected to the nut whereby movement of the nut is translated to the rod which in turn causes the pivotal member of the rack side to pivot. Thus, the machine's operator is able to cause the rack side to move upwardly or downwardly relative to the wash chamber wall, and the tendency of the nut to remain locked in position on the worm when manual force is removed therefrom, serves to hold the rack side in the last selected position of adjustment.

It is preferred that the worm and nut portion of the control means be journalled within a housing having an elongated slot permitting a portion of the nut to be viewed therethrough. Indicia may then be provided along the slot on the outer surface of the housing whereby the machine's operator may note the position of the nut portion relative to the indicia and thereby ascertain the relative current position of the rack side as compared to a normal intermediate rack side position.

Other aspects of the invention particularly relating to features of construction thereof will be apparent from the ensuing detailed description hereafter.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a partial side elevational view of a front loading dishwashing machine having a portion of the enclosure side wall thereof cut away to show dish sup-

porting racks within the wash chamber and connecting structure in combination with the upper rack in accordance with the present invention;

FIG. 1 is a side elevational view of the upper rack structure first shown in FIG. 1;

FIG. 3 is a view of the same rack structure shown in FIG. 2 but showing redisposition of certain elements of the invention in accordance with the operation thereof;

FIG. 4 is an enlarged fragmentary front elevational view of the corner of the upper dish supporting rack first shown in FIG. 1, having certain portions thereof cut away for the purpose of illustrating disposition of certain parts of the structure when the rack side is adjusted to an intermediate level position substantially as shown in FIGS. 1 and 2;

FIG. 5 is an enlarged fragmentary front elevational view of the corner of the upper dish supporting rack first shown in FIG. 1, having portions thereof cut away to show disposition of parts of the structure when the rack side is adjusted to a relatively high position in accordance with the disposition of structure shown in FIG. 3;

FIG. 6 is an enlarged fragmentary top plan view of the front corner of the upper dish rack first shown in FIG. 1; and

FIG. 7 is a partial front elevational view of an open dishwasher enclosure showing the wash chamber and the dishwasher rack in one position of adjustment in accordance with the operation of an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1 there is illustrated an automatic dishwashing machine **10** having an enclosure or cabinet **11** surrounding a wash chamber **12.** The wash chamber comprises oppositely disposed side walls **13** and **14** (see FIG. 7), a back wall **15,** and an access door **16** hinged to open outwardly and downwardly and thereby provide access to the wash chamber **12.** Mounted in a vertically spaced apart relation within the wash chamber **12** are a lower dish supporting rack **20** and an upper dish supporting rack **21.** The lower rack **20** is adapted to be moved outwardly over the surface of the open door **16** for loading of items to be washed therein, and the upper rack is adapted to be withdrawn outwardly to a loading position wherein it extends substantially outside the wash chamber **12** in a cantilevered arrangement.

The upper rack **21** as shown in FIGS. **1, 2, 3** and **7,** has a basket-like open framework configuration formed from wire rod elements welded in a predetermined arrangement to provide an irregular bottom **22** and oppositely disposed generally parallel and upwardly extending sides **23** and **24.** The rack **21** has front and back wall portions or ends **25** and **26** that extend upwardly from the bottom **18** and interconnect the ends of the sides **23** and **24.**

As shown, particularly in FIG. **7,** a connecting means structure is provided along each side **23** and **24** of the rack **21,** to permit the rack **21** to be slid horizontally outwardly from the wash chamber **12** to a loading position wherein the rack is cantilevered above the open door **16.** After loading, the rack **21** is manually retracted inwardly to its operative position within the wash chamber **12.** The connecting means structure at each rack side connects the rack side to the adjacent wash chamber wall and is adapted to permit the particular rack side to be manually vertically adjusted within predetermined limits.

The structure of all components of the connecting means structure is duplicated at each side of the rack **21** in a mirror image reversal of parts so that each side of the rack **21** is independently vertically adjustable. Description of the connecting means and the interaction of its various parts is hereafter primarily restricted to that as shown with respect to side **23** of the rack **21,** however, it should be realized that the description is generally applicable to the connecting means at either side of the rack.

The connecting means structure between the rack side **12** and the wash chamber wall **14** includes rollers **30, 31, 32** and **33** spaced apart in a rectangular orientation on the wash chamber wall **14** and journalled to rotate on a stud projecting laterally from the chamber wall. Each of these rollers has an annular groove whereby a slide bar or channel **34** is slidably mounted between the upper rollers **31** and **33** and the lower rollers **30** and **32.** The slide bar **34** is thus disposed substantially horizontally and parallel to the wash chamber side wall **14** and is adapted to be slid forwardly and rearwardly on the rollers. The slide bar **34** has a C-shape in cross section whereby the outer surface of the slide bar conforms to the annular groove in each of the rollers. The slide bar **34** forms an elongated internal trackway for a pair of horizontally spaced apart rack rollers **37** and **38.** The weight of the entire rack side **23** is supported on the rollers **37** and **38** such that each serves as a support member, and the rollers **37** and **38** are adapted to roll along the internal trackway formed by the slide bar **34** when the rack **21** is manually moved inwardly and outwardly through the wash chamber access opening. It should be noted that the internal trackway of the slide bar **34** is blocked by a plastic clip or other means whereby the rollers are contained in the internal trackway such that their distance of movement in tandem is limited to the length of the trackway.

The connecting means structure between the rack side **23** and the wash chamber wall **14** also includes rack mounting means permanently attached to the rack side which may be in the form of spaced apart base plates **39** (see FIG. 2 or FIG. 4). Pivotally mounted to each base plate **39,** and disposed outwardly therefrom, is a pivotal member **42** preferably comprising a sector-like body portion **43** having an arcuate edge portion **44.** The pivotal member **42** is adapted to pivot relative to the base plate **39** to which it is mounted about an axis generally transverse to the rack side, and has a collar portion **45** to maintain the body portion **43** a short distance outwardly from the base plate **39.**

As shown in FIGS. **2** and **3,** an elongated rod member **48** is disposed above the spaced apart pivotal members **42.** The rod member **48** is preferably constructed as a rigid metal channel having a configuration, in cross section, of an inverted U and having spaced apart plastic bar sections or insert portion **50** clamped within the channel by means of crimps in the channel whereby each section **50** is directly above each pivotal member **42.** Each section **50** is provided with a series of teeth **51** along the under surface thereof that mesh with similar teeth **52** provided along the arcuate edge portion **44** of the pivotal member **42.** The rod member **48** is slidably retained in engagement with the pivotal members

42 by means of wraparound retainers 56. Each retainer 56 has an elongated U shape whereby one leg thereof projects vertically along each side surface of the pivotal member 42. The lower ends of the legs of the retainer 56 are fastened, by means of the pivot pin serving as the axis for the pivotal member 42, whereby the retainer 56 is held fast to the base plate 39. The rod member 48 is slidably retained within the bight portion of the retainer 56 such that the sections 50 of the rod member 48 remain in meshed engagement with the arcuate edge portion 44 of the pivotal members 42. With reference to FIG. 2, it will be seen that by this arrangement the pivotal members 42 will be caused to pivot clockwise when the rod 48 is slid rearwardly relative to the rack 21 and counter clockwise when the rod 48 is slid forwardly relative to the rack 21.

The rack rollers 37 retained in the trackway formed by the slide bar 34 are respectively journalled to one of the pivotal members 42 at a point 60 thereon. Each rack roller 37 is thereby adapted to rotate on an axis parallel to the axis about which the pivotal member 42 pivots. Each roller 37 is retained within the slide bar 34 and is thereby prevented from moving vertically, pivotal motion of the pivotal members 42, in response to sliding action imparted to the rod member 48, is translated as a force downwardly against the rollers 37. This action causes the suspended rack side to move upwardly or downwardly, depending upon the direction of pivotal rotation of the pivotal members 42.

Turning now specifically to FIG. 6, it will be seen that adjacent the front corner of the rack 21 is a control means or assembly 65 comprising a rotatably mounted threaded shaft or worm 66 having a riding member or nut 67 threadably carried thereon for movement along the worm's length in response to rotation of the worm. The rod member 48 has its forward end 68 connected laterally to the nut 67 by a screw 69 whereby longitudinal movement of the nut 67 along the worm 66 is translated to the rod member 48. The rod member 48 is thereby caused to slidably move in a direction dependent upon the direction of rotation of the worm 66. It is shown in FIG. 6 that the worm 66 is mounted in a housing 72 having end walls 73 and 74 in which opposite ends of the worm 66 are journalled for rotation on a horizontally disposed axis. A rotatable portion or knob 75 is affixed to the outer end of the worm 66 whereby the worm can be caused to rotate in either direction by manipulation of the knob 75.

The housing 72 is provided with a top cover plate portion 78 that has a narrow elongated slot 79 therethrough that extends parallel with the axis of the worm 66. The nut 67 may be provided with an upwardly projecting tooth portion 80 that follows a linear path directly beneath the slot 79 as the nut 67 moves along the length of the worm 66. By this arrangement the upper surface of the tooth portion 80 may be viewed by the operator looking downwardly and observing the slot 79. The tooth portion 80 thus serves as an indicator to inform the operator of the current vertical disposition of the rack side relative to the lowermost and uppermost adjustment positions obtainable by manipulation of the knob 75 of the control means 65.

As shown in FIG. 6, suitable indicia may be provided on the upper surface of the cover plate 78 to provide scaled indicator means that visually shows the relative disposition of the rack side. For example, an intermediate mark may be provided on the cover plate to indicate that the rack is at its normal or intermediate or halfway position of adjustment when the tooth 80 is aligned with the mark 82. The foregoing arrangement serves as a scaled indicating means that may be easily visually observed by the operator of the dishwashing machine.

Assuming now that the rack side is at the intermediate level of adjustment, the rack side may be raised or lowered quickly and conveniently. The operator of the dishwashing machine merely grasps the knob 75 and rotates it clockwise or counter clockwise depending upon whether it is desired to raise or lower the rack side. In the embodiment shown, clockwise manipulation of the knob 75 will cause the worm 66 to rotate in unison with the knob 75 whereby the nut 67 will be drawn toward the front end of the rack 21. This movement of the nut 67 causes the rod member 48 to slide longitudinally and forwardly along the rack side. It will be seen with reference to FIG. 2 that forward sliding movement of the rod member 48 will cause the pair of spaced apart pivotal members 42 to pivot in a counter clockwise direction as viewed in FIG. 2. This motion of the pivotal members 42 is translated as a lifting motion to the rack side 23 whereby the rack side is caused to move upwardly within the wash chamber 12. It is believed apparent that counter clockwise rotation of the control knob 75 by the operator of the dishwashing machine will impart a downward motion to the rack side 23. It should be noted that when the operator manipulates the knob 75 this serves, in effect, to release the binding or locking action of the nut 67 on the worm 66, and when the operator releases the knob 75, the nut again remains in locked relation to the worm whereby the rack side remains at the last selected level of adjustment.

The worm 66 is specially threaded in its engagement with the nut 67 whereby the worm and nut serve as a locking means and the worm will not tend to rotate in response to force exerted on the nut by the weight of the loaded rack 21. Therefore, the operator, when adjusting the level of the rack side by rotating the knob 75, can release the knob when the rack side has been raised or lowered to a desired position between the uppermost and lowermost positions obtainable with the assembly shown and the level of adjustment of the rack side will remain unchanged until such time as the operator again rotates the control knob 75.

The structure of the manual control means 65 heretofore described enables the operator to ascertain at a glance the relative positioning of each of the rack sides by quick examination of the upwardly facing cover plate 78 at the forward rack corner. The provision of the manually rotatable knob outwardly on the front end of the rack is highly desirable since it enables adjustment of the rack side even when the rack is in its retracted position entirely within the wash chamber of the dishwasher.

FIG. 7 shows that each side of the rack 21 may be provided with connecting means structure between each rack side and the adjacent wash chamber side wall, and that separate manual control means enables each rack side to be vertically repositioned separately and independently of the other rack side. It should be apparent that the assembly heretofore described that affords variance of the vertical lvel of the rack side could be provided on one side of the rack only and that a more conventional rack support means could be pro-

vided at the other rack side. Such an arrangement would be limited to providing level adjustment at one rack side only, but may be considered desirable in terms of reduced cost of manufacture.

In regard to material, it is presently preferred that the embodiment described with reference to FIGS. 1–7 have as many parts as feasible formed of plastic material of a type substantially uneffected by prolonged exposure to the dishwasher wash chamber environment. It is presently contemplated that the channel portion of the rod member **48**, the retainer **56**, and various mounting pins be made from stainless steel, but that the toothed inserts **50**, the pivotal members **42**, the worm **66**, the knob **75**, the nut **67**, the housing **72**, the cover plate **78**, and the various rollers be formed from polypropylene or other similar durable composition.

It should be apparent that the present invention provides a new and improved means for adjusting one or both sides of a dish supporting rack within a dishwashing machine. While the preceding description of the various figures of the drawings sets forth the presently preferred embodiments of the invention, it is specifically not intended that the invention be limited to the particular details of construction in the examples presented. Therefore, although the invention has been described with a certain degree of particularity, it is understood that numerous changes and modifications in the details of the construction and the combination or arrangements of parts may be resorted to without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. In a front-opening dishwashing machine having a wash chamber with a dish-supporting rack disposed therein, connecting means structure along a side of the rack including means adapted to enable selective variable vertical adjustment of the level of the rack side to any level between predetermined high and low level positions, manual control means for the vertical adjustment means including a manually rotatable portion linked to the vertical adjustment means whereby rotation of the rotatable portion causes the rack side to move downwardly and counter-rotation of the rotatable portion causes the rack side to move upwardly, the improvement comprising:

scaled indicating means operatively linked to and remote from the manually rotatable portion for providing continuous visual indication of the level of the rack side relative to the high and low level positions.

2. The invention of claim **1** wherein the control means further includes a worm adapted to rotate with the rotatable portion, and a riding member adapted to move along the worm in response to the worm's rotation.

3. The invention of claim **2** wherein a portion of the riding member is disposed to be visible to the machine's operator and serves as part of the indicating means.

4. The invention of claim **1** wherein the control means is disposed at the front end of the dish supporting rack.

5. The invention of claim **1** wherein the manually rotatable portion is disposed outwardly on the front side of the rack.

6. The invention of claim **1** wherein the control means further includes a worm adapted to rotate in unison with the rotatable portion, a nut is threadably engaged on the worm, the worm and nut are mounted in a housing, the indicating means includes the housing having an elongated slot therein to enable the position of the nut to be seen through the slot.

7. The invention of claim **6** wherein the housing is located within the rack, the rotatable portion is disposed outwardly on the front side of the rack, and the slot is disposed to be visible to the operator when looking downwardly into the rack.

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