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Clark

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[54] **DISHWASHING MACHINE RACK LEVEL ADJUSTMENT SYSTEM**

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

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

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

[58] **Field of Search** 312/311, 330, 351; 297/338, 345; 211/176; 108/141, 144, 145

[56] **References Cited**

UNITED STATES PATENTS

2,306,266	12/1942	Heim	108/147
2,532,342	12/1950	Sloane	108/147
2,998,290	8/1961	Sharpe	312/303
3,185,116	5/1965	Gilbert	108/147
3,316,044	4/1967	Carbary	312/306 X
3,352,431	11/1967	Smith	312/351
3,472,573	10/1969	Geiger	312/357
3,560,069	2/1971	Doepke	312/351
3,614,187	10/1971	Cuthbert	312/351
3,705,699	12/1971	Siller	116/135

FOREIGN PATENTS OR APPLICATIONS

1,909,471	6/1971	Germany	108/147

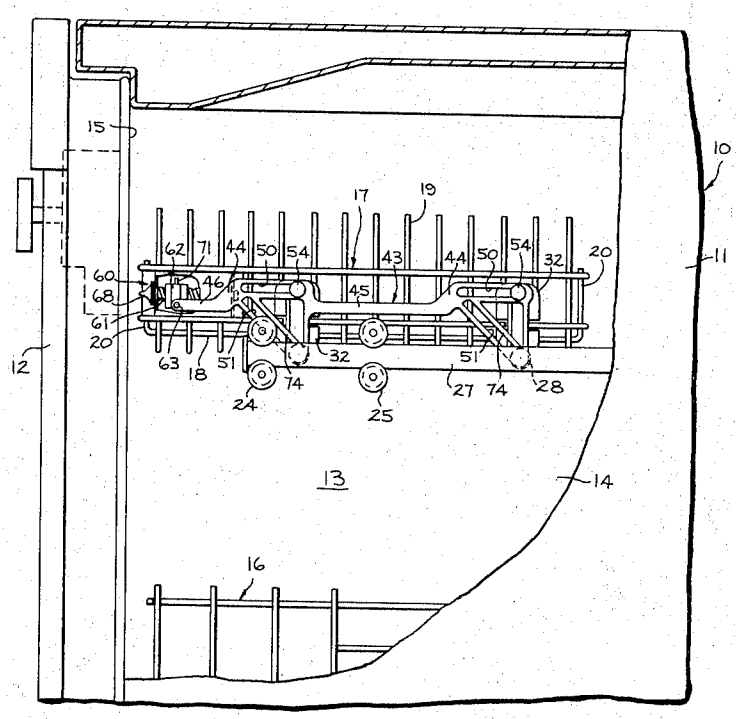
Primary Examiner—Paul H. Gilliam

Attorney, Agent, or Firm—Francis H. Boos

[57] **ABSTRACT**

A rack is supported within the wash chamber of a dishwashing machine by a connecting means permitting selective manual adjustment of the vertical level of the rack side. The connecting means includes a slidable surface portion inclined to serve as a ramp and bear on a support member whereby movement of the ramp against the support member causes vertical movement of the rack side. Manual control means on the rack is linked to the connecting means such that manipulation of the control means is translated to the slidable surface portion whereby the vertical positioning of the rack side is selectively adjusted.

5 Claims, 5 Drawing Figures



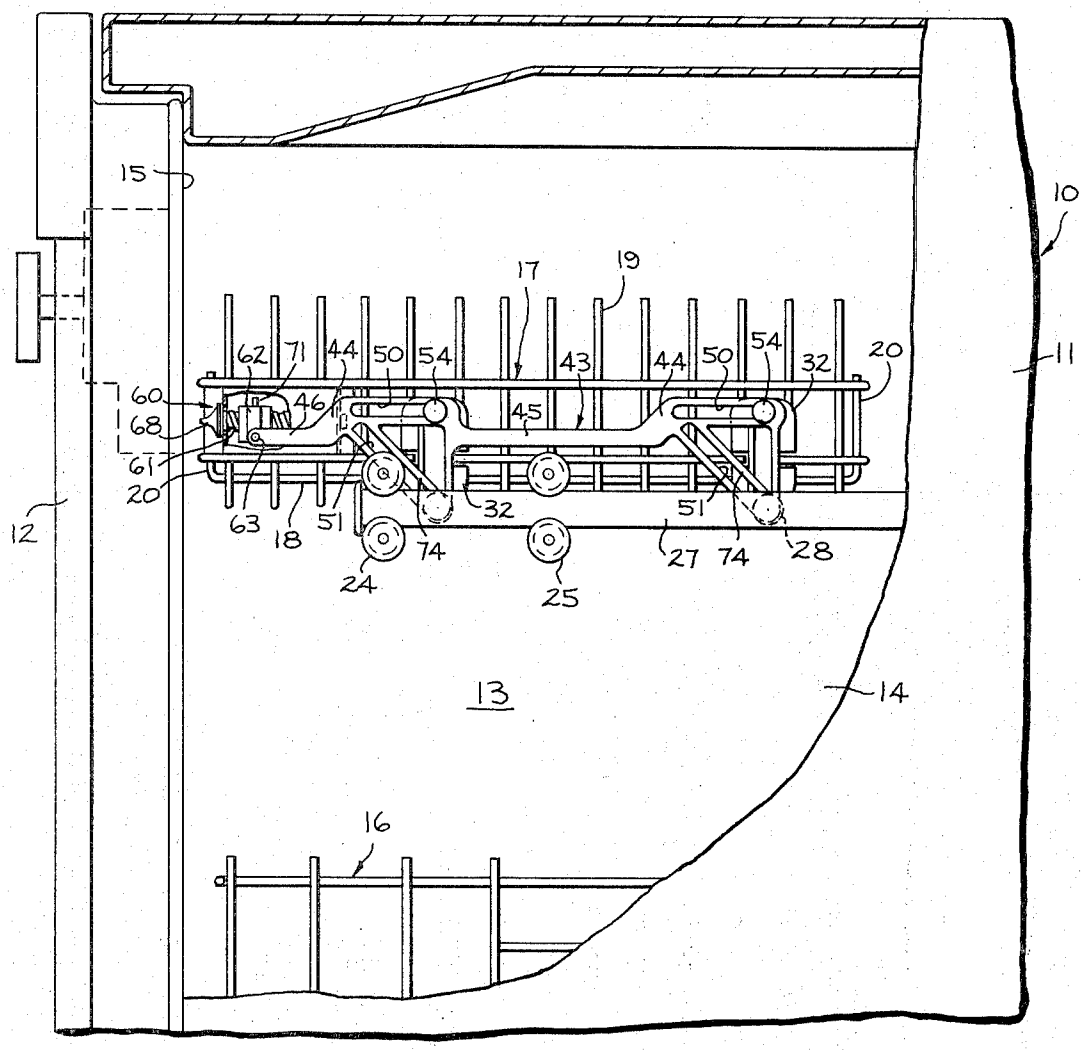

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FIG. 1

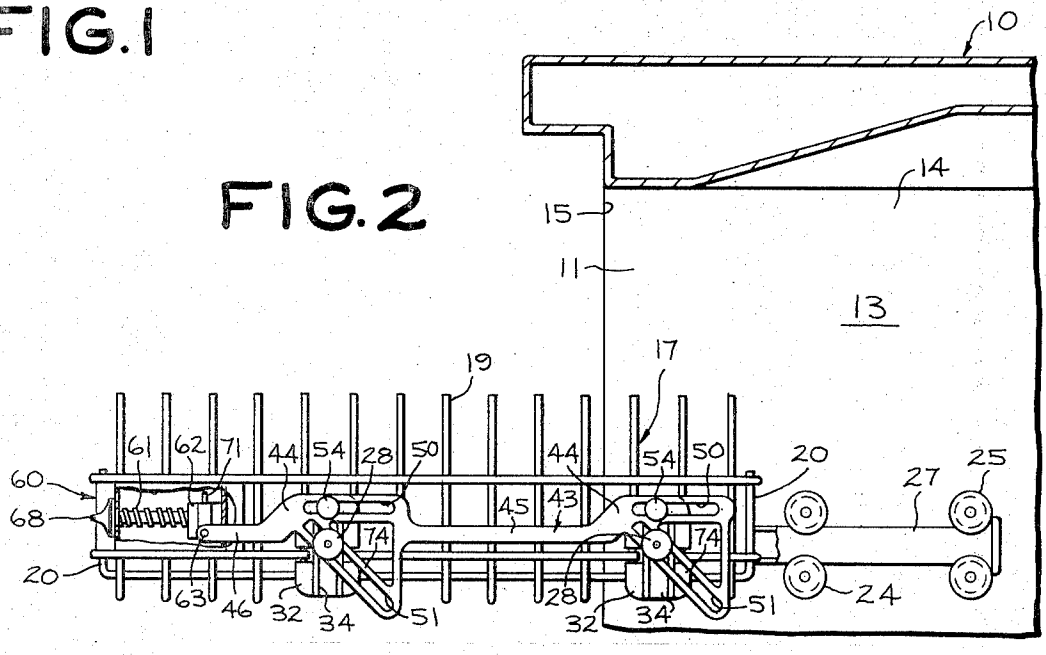
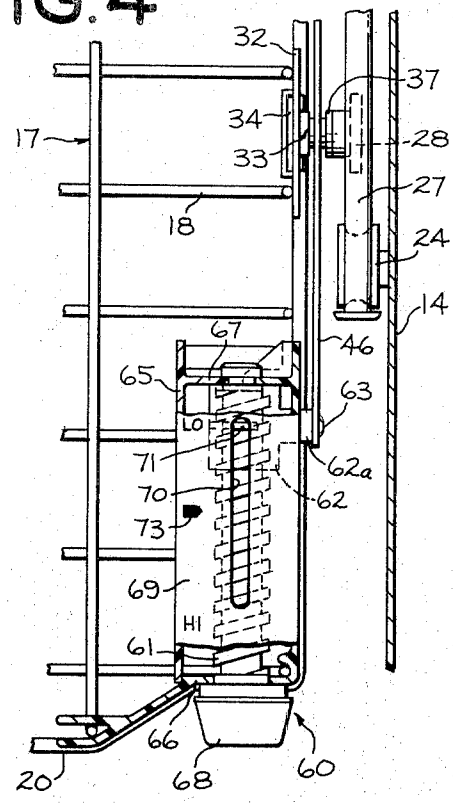

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FIG. 2

FIG. 4



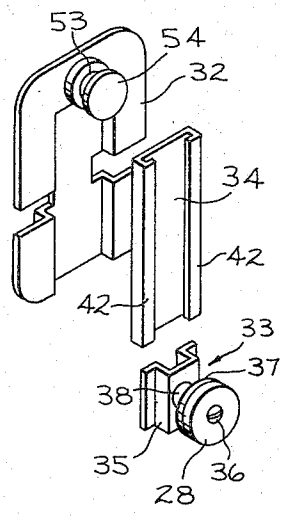
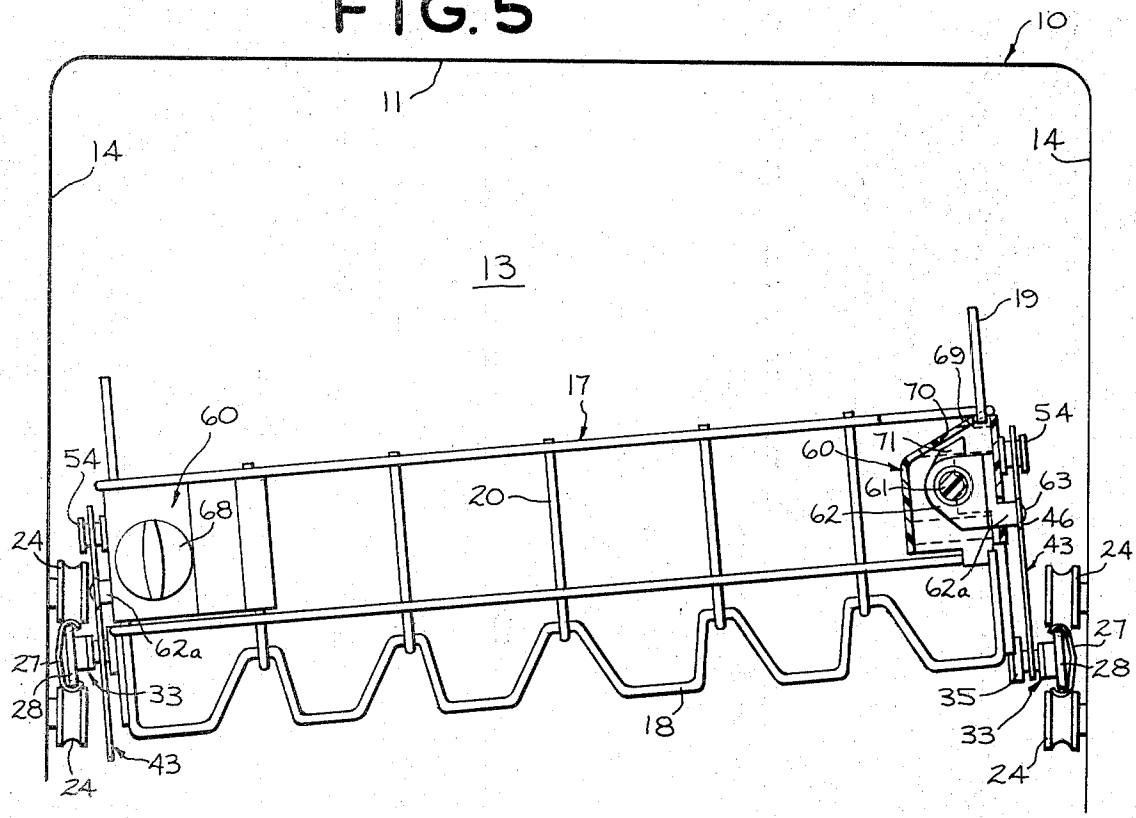


FIG. 3

FIG. 5



DISHWASHING MACHINE RACK LEVEL ADJUSTMENT SYSTEM

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 wherein means is provided for independently adjusting the vertical position of one side of a dish-supporting rack within the machine's wash chamber.

A standardized height for a dishwashing machine has been established within the industry which imposes a limit to the maximum vertical dimension of the machine's wash chamber. This limitation makes it desirable to be able to vary the vertical positioning of one or the other or both sides of a dish-supporting rack within the wash chamber of a dishwashing machine whereby items of various sizes can be more easily accommodated therein for washing. Customarily, a dishwashing machine is provided with a pair of vertically spaced apart dish-supporting racks. It has been found particularly beneficial to be able to change the level of each rack side of the upper rack whereby such items as wide cookie sheets or pizza pans can be placed, on edge, in the lower rack without binding with the upper rack. Independent vertical adjustment of the upper rack sides enables the rack to be slanted whereby one side thereof can also be disposed relatively lower in order to accommodate tall glasses and similar items to be stored along the lowered rack side without having the items contact the top of the wash chamber.

Various constructions have been taught by the prior art that provide for rack level adjustment in a dishwasher. The need for independent rack side adjustment has also been recognized as particularly beneficial in a dishwasher of the front loading type. One such assembly is disclosed in the application of L. W. Guth, U.S. Pat. Ser. No. 154,141, filed June 17, 1971, and assigned to the assignee of the present invention. The Guth assembly includes a pair of bell crank levers linked in a parallelogram arrangement at the side of the dishwasher rack as part of a means for mounting the rack side to the wash chamber wall. A manually operable rotary control means is provided adjacent the front corner of the rack and is linked to the lever arrangement to enable selective respositioning of the bell crank levers whereby the rack side is correspondingly caused to move upwardly or downwardly as desired. The bell crank lever arrangement is provided in combination with rollers and slides whereby the rack can be slidably moved to an extended position through the front access opening of the wash chamber to permit loading and unloading of the rack. The rotary control means of the Guth assembly is quite convenient to the machine operator inasmuch as it is accessible to permit operation whether the rack is in the retracted or outwardly extending position relative to the wash chamber. Further, the independent means for rack side adjustment in combination with its own rotary control means enables rapid and independent rack side adjustment whether the rack is loaded or empty.

Still another example of means for adjusting the vertical positioning of a dish-supporting rack within the wash chamber of a dishwashing machine by use of a pair of spaced apart bell crank levers at the side of the rack is disclosed in U.S. Pat. No. 3,472,573 issued to

P. B. Geiger on Feb. 14, 1969. The Geiger system includes a control lever povided on the rack side in combination with bell crank levers whereby manual selective repositioning of the control lever is translated to the bell crank levers to obtain upward or downward movement of the rack side. Assemblies such as disclosed in Guth and Geiger have obvious advantages over structures of earlier art that require complete rack removal and re-installation in order to obtain a different level for the rack.

Such rack adjusting systems as heretofore described utilize rotating or pivotal parts between the rack side and the wash chamber wall. The present invention comprehends the provision of a simplified structure for obtaining independent rack side level adjustment without the inclusion of a multiplicity of pivot points in the components that support the rack side and accomplish the adjustment function. The present invention provides an assembly enabling selective manual repositioning of the level of a rack side in a dishwashing machine that involves comparatively fewer separate parts whereby fewer problems and steps in the installation of the assembly are required. The invention is accomplished through the use of an entirely different mechanical principle as compared to that employed by the prior art examples heretofore discussed.

SUMMARY OF THE INVENTION

In accordance with the preferred embodiment of the present invention, a dishwashing machine is provided having an enclosure defining a wash chamber therein and a dish-supporting rack disposed in the chamber. The dish-supporting rack is constructed with a front end, a back end, and oppositely disposed sides, and has means along at least one side thereof connecting the side to the wall of the chamber. This connecting means includes a support member and a movable means. The support member has means mounting it to the chamber wall whereby the support member is prevented from moving vertically relative to the chamber wall even though it is preferably adapted to be freely slidable in a horizontal direction. The aforementioned movable means is slidably retained to the rack side and disposed between the rack side and the chamber wall. The movable means, preferably an elongated plate member or camming element, is adapted to be slidably moved between predetermined frontwardly and backwardly positions along the rack side. The movable means has a surface portion thereof adapted to slidably bear against the support member. The surface portion serves as an inclined runner whereby its camming movement against the support member causes the rack side to move in a generally vertical direction.

In its preferred embodiment, the connecting means of the invention comprises a pair of the support members disposed in a spaced apart arrangement along the rack side, and the movable means has two spaced apart surface portions identically inclined whereby each of the surface portions is adapted to bear against a corresponding one of the support members. The combination of the invention also includes a manual means of controlling the disposition of the movable means whereby the movable means can be selectively positioned at intermediate points between predetermined frontward and backward positions.

BRIEF DESCRIPTION OF THE DRAWINGS

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

FIG. 2 is a fragmentary side elevational view of the upper end of a dishwashing machine as shown in FIG. 1, here showing the upper rack extending outwardly from the wash chamber through the wash chamber's access opening;

FIG. 3 is an enlarged perspective view of certain components of the structure shown in FIG. 3;

FIG. 4 is a top plan view of a front corner of the upper dish rack shown in FIG. 1; and

FIG. 5 is a partial front elevational view of an open dishwasher enclosure showing the wash chamber and a dishwasher rack in one position of adjustment in accordance with the operation of an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The presently preferred embodiment of the invention is illustrated in the drawing wherein FIG. 1 shows a front loading dishwashing machine **10** that includes a housing **11** having an access door **12** that is hinged at its lower end to pivot on a horizontal axis (not shown) and opens outwardly from the housing **11.** Within the housing **11** is a wash chamber **13** partially defined by the door **12** and oppositely disposed internal chamber walls **14.** The door **12** swings outwardly and downwardly away from an access opening **15,** and racks **16** and **17** are disposed in a vertically spaced apart relation within the wash chamber **13** and are adapted to be slidably withdrawn outwardly through the access opening **15** whereby each rack may be loaded or unloaded and thereafter retracted back to the operative position as shown in FIG. **1.**

Each rack **16** and **17** has a basket-like open framework configuration. The upper rack **17** includes an irregular bottom **18** and oppositely disposed generally parallel and upwardly extending sides **19.** The rack **17** has front and back ends **20** extending upwardly from the bottom **18** and interconnecting the ends of the sides **19.** Each rack **16** and **17** is preferably constructed in the typical manner, utilizing spaced apart parallel wire rod members that are welded at the points of intersection. The racks are preferably coated with a material such a polyvinyl chloride for improved appearance and durability within the wash chamber environment.

As shown in FIGS. **1, 2,** and **5,** a connecting means is provided along a side **19** of the rack **17** which, in combination with similar structure at the other side of the rack, permits the rack to be slid horizontally outwardly from the wash chamber **13** to a loading position wherein the rack **17** is cantilevered over the open door **12.** After loading, the rack **17** may be retracted inwardly to its operative position within the wash chamber **13.** The connecting means between the rack side and the chamber wall **14** is adapted to permit the rack side to be manually vertically adjusted within predetermined limits. The structure of all components of the connecting means may be duplicated at each side of the rack **17** by a mirror image reversal of parts where it is desired to have each side of the rack independently vertically adjustable.

The connecting means between the rack side **19** and the chamber wall **14** preferably includes two sets **24** and **25** of vertically spaced apart rollers. The roller sets are horizontally spaced apart and each roller is journalled to rotate on a stud projecting laterally from the chamber wall **14.** An elongated rigid slide bar or channel **27,** disposed substantially horizontally and parallel to the wall **14,** is carried between the upper and lower rollers of the sets **24** and **25.** The slide bar **27** has a C-shape in cross section and each roller in the sets **24** and **25** has a circumferential groove conforming to the outer configuration of the slide bar **27.** The slide bar **27** is adapted to slide horizontally in the roller sets **24** and **25** whereby it can be slid to extend outwardly through the access opening **15** in the disposition shown in FIG. **2.** The slide bar **27** is configured to form an elongated internal trackway for a pair of horizontally spaced apart rollers **28.** The rack side **19** of the rack **17** is supported on the rollers **28** as will be hereafter described in more detail, and the rollers **28** are adapted to roll in unison along the trackway formed by the slide bar **27** when the rack **27** is moved inwardly and outwardly through the access opening **15.** It should be noted that each end of the slide bar **27** is blocked by a plastic clip or other means whereby the rollers **28** are prevented from moving out of their engagement within the slide bar trackway.

The connecting means between the rack side **19** and the chamber wall **14** also includes support means on the rack side which may be in the form of a pair of spaced apart base plates **32** (see particularly FIG. **3**) permanently fastened to the rack side. A support member or assembly **33** is slidably mounted to each plate **32** by means of a bracket **34** that is staked in a fixed position within an accommodating recess in the base plate **32.** The support assembly **33** includes the roller **28** journalled to a slidable member **35** by means of a stud **36.** Between the roller **38** and the member **35** is a sleeve **37** having an annular groove **38.** The member **35** is configured to have oppositely disposed outwardly extending flange portions **39** which serve as rails extending into vertically extending channels formed by oppositely disposed inwardly turned flange portions **42** of the bracket **34.** By this arrangement the bracket **34** is adapted to slide vertically on the support assembly **33** whereby the rack side moves upwardly and downwardly relative to the support assembly **33.**

As shown in FIG. **2,** the connecting means structure attaching the rack side **19** to the chamber wall **14** also includes a movable means in the form of an elongated flat plate **43** having spaced apart triangular shaped widened portions **44** therealong. Between the portions **44** the plate has a horizontally extending intermediate bar portion **45.** Toward the forward end of the rack **17** the plate **43** has an end bar portion **46** that is linked to a manual control means to be hereafter described.

Each of the plate portions **44** is provided with a horizontally elongated slot **50** in the upper edge thereof and an elongated inclined slot **51** disposed downwardly relative to the slot **50.** Extending outwardly from the upper portion of the base plate **32** on the rack side **14** is a stud **53** provided with a radially outwardly extending head portion **54.** The stud **53** is fixedly mounted to extend outwardly from the plate **32.** The plate member **43** is adapted to slide generally in a horizontal direction

either forward or backward along the rack side with the slots **50** serving as guide means slidably retaining the plate member **43** to the studs **53.** It will be noted also with regard to FIG. **3** that each stud **36** extending outwardly from its base member **35** extends through the slot **51.** The purpose of this latter arrangement will be made clear hereafter with reference to the description of the function of the components in the connecting means between the rack side and the chamber wall which accomplish the vertical adjustment of the rack side.

Adjacent the front corner of the rack side **19** is a control means or assembly **60** comprising a rotatably mounted threaded shaft or worm **61** having a riding member or nut **62** threadably carried thereon for movement along the worm's length in response to rotation of the worm. The plate member **43** has its forwardly extended rod portion **46** connected to the nut **62** by a screw **63** whereby movement of the nut **62** along the worm **61** is translated to the plate member **43.** FIG. **4** shows that the worm **61** is mounted in a housing **65** having end walls **66** and **67.** The end walls **66** and **67** have openings in which opposite ends of the worm **61** are journalled for rotation on a horizontally disposed axis. A knob **68** is affixed to the outer end of the worm **61** whereby the worm can be caused to rotate in either direction by manipulation of the knob.

The housing **65** is provided with a top cover plate **69.** The cover plate **69** is provided with a narrow slot **70** therethrough which is elongated in a direction whereby it extends parallel with the axis of the worm **61.** The nut **62** is provided with an upwardly projecting tooth portion **71** that follows a linear path directly beneath the slot **70** as the nut **62** moves along the length of the worm **61.** The upper surface of the tooth **71** may be viewed by looking downwardly through the slot **70** and 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 **68** of the control means **60.** FIG. **4** shows that suitable indicia may be provided on the upper surface of the cover plate **69.** For example, an intermediate mark **73** may be provided on the cover plate **69** to indicate that the rack side is at its normal intermediate or halfway position of adjustment when the tooth **71** is aligned with the mark **73.**

In explaining the operation of the connecting means between the rack side and the chamber wall as heretofore described to obtain a change in the level of the rack side, it should be first pointed out that the weight of the rack side on the connecting means provides the force to obtain downward movement of the rack side. When the rack side is being adjusted downwardly, the operator, by manipulating the rotary control knob **68** is, in effect, releasing the binding action of the nut on the worm **61** by rotating the worm so that the weight of the rack causes the rack side to slide downwardly. When the rack side is being adjusted upwardly, manipulation of the knob **68** by the operator serves to offset the weight of the rack and pull the rack side upwardly in a manner to be now described.

The orientation of the component parts of the connecting means, when the rack side **19** is toward its lowermost position is shown in FIG. **2.** The level of the rack side can be changed by the operator grasping the knob **68** and rotating it such that the worm **61** is caused to rotate whereby the nut **62** moves forwardly on the worm **61** toward the knob **68.** This movement of the nut **62** is translated to the plate member **43** whereby the plate member moves in a generally horizontal direction toward the front end of the rack. The movement of the plate member **43** causes the inclined slot **51** to correspondingly move whereby a long edge or plate surface portion **74** defining the upper long side of the slot **51** bears against the support assembly **33.** Since the support assembly **33** is prevented from moving vertically because of the engagement of its roller **28** in the slide bar **27,** the latter motion causes the plate member **43** to gradually move upwardly as the inclined surface **74** slides against the support member **33.** The upward movement of the plate member **43** is translated as a force against the stud **53** staked in the plate **32.** The rack side **19,** to which the plates **32** are affixed, is thereby caused to move gradually upwardly as the plate member **43** is advanced forwardly in response to the turning of the knob **68.** Downward adjustment of the rack side is accomplished by counter-rotating the knob **68** to obtain a reversal of the action heretofore described.

It should be noted that each of the inclined slots **51** in the triangular shaped portion **44** of plate member **43** are elongated and disposed such that a long side thereof is defined by the oppositely facing surface portions or straight edges **74.** These surface portions **74** defining the slots **51** engage in the annular groove of the sleeve **37** of each stud **38.** Therefore, when the plate member **43** is moved generally horizontally in response to manipulation of the control means **60,** the corresponding movement of the slots **51** tend to exert an upward push against the support assemblies **33.** Since the plate member **43** cannot be moved vertically relative to the rack side but only horizontally therealong due to the plate member **43**'s guided engagement on the studs **53,** and because the support assemblies **33** are prevented from vertical movement because of the retention of the rollers **28** in the slide bar **27,** the force of the respective surface portions **74** against the annular groove **38** of the support assemblies **33** is translated to vertical motion of the rack side **19.**

The worm **61** is specially threaded in its engagement with the nut **62** 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 rack side even if the rack is fully loaded with dishes to be washed in the dishwasher. Therefore, the operator, when adjusting the level of the rack side by rotating the knob **68,** can release the knob **68** 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 **68.**

FIG. **5** shows that each side of the rack **17** may be provided with connecting means structure between the rack side and the chamber wall, and that separate manual control means may be provided for each rack side whereby each rack side may be vertically repositioned separately and independently of the other rack side. The structure of the manual control means 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

69 at each rack corner. The provision of the manually rotatable knob 68 on the front end of the rack at each corner thereof is highly desirable since it enables adjustment of each rack side even when the rack is in its retracted position entirely within the wash chamber of the dishwasher.

It should now be apparent that the present invention provides a new and improved means for adjusting one or both sides of a rack within a dishwasher through use of a relatively simplified structure wherein a plurality of pivotal parts between the rack side and the chamber wall are not required. While the preceding description of the various figures of the drawing sets forth an illustrative embodiment of the invention, it is intended that the appended claims define the subject matter 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 combinations 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 structure providing a chamber having a front opening and side walls, an article holding rack supported on each side wall, a pair of elongated track members, track support means on said walls for supporting said track members for horizontal movement between a position entirely within said chamber to a position partly outside said chamber, rack support means mounted on said rack and in engagement with said track member for allowing horizontal movement of said rack relative to said track, an adjustable rack support system comprising:

means for retaining said rack in vertically slidable engagement with said rack support means;

a guide member fixedly mounted on said rack;

a plate having a horizontal slot and an inclined cam slot, said horizontal slot slidably engaging said guide member and said inclined cam slot slidably engaging said rack support means;

manually operable control means mounted on the rack operally associated therewith for moving said plate horizontally whereby the rack is urged in a vertical direction by the action of the inclined cam slot on the rack support means.

2. The invention defined in claim 1 wherein the manually operable control means includes a riding member arranged to move horizontally relative to said rack and said plate being connected to said riding member.

3. The invention as defined in claim 2 wherein said manual control means includes a horizontally disposed rotatable member and a manual control knob on one end thereof, said knob being rotatably mounted on said rack to be accessible to the user of said dishwashing machine, said riding member being movable axially on said rotatable member during rotation of said manual control knob.

4. The invention as defined in claim 3 wherein said inclined cam slot is disposed to cause vertical upward movement of the rack when said plate is moved horizontally toward said front opening.

5. The invention as defined in claim 4 wherein said plate includes at least two horizontally disposed slots and two inclined cam slots.

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