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[54] **RACK SUPPORT ASSEMBLY IN A DISHWASHER**

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[52] **U.S. Cl.** **312/347,** 308/3.6, 312/350

[51] **Int. Cl.** **A47b 88/04**

[58] **Field of Search** ..... 312/311, 344, 347, 350, 312/351, 335, 341 NR, 346; 301/63 PW; 308/3.6

[56] **References Cited**

UNITED STATES PATENTS

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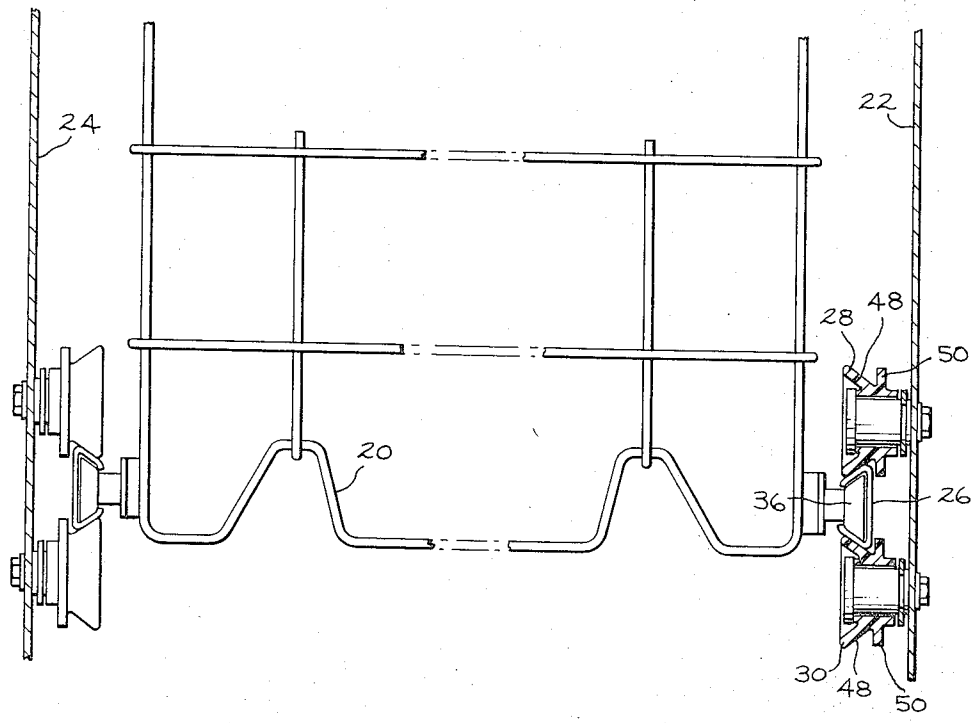
[57] **ABSTRACT**

In the front-loading type of dishwasher having a slidable support assembly for a dish rack to enable the rack to be moved in a sliding action inwardly and outwardly through the access opening of the dishwasher's chamber, a channel slide bar and rotatable means operatively associated therewith are configured whereby the tendency for the channel slide bar to twist along its length and bind with the rollers in response to a load translated thereto from the rack is substantially eliminated.

5 Claims, 3 Drawing Figures



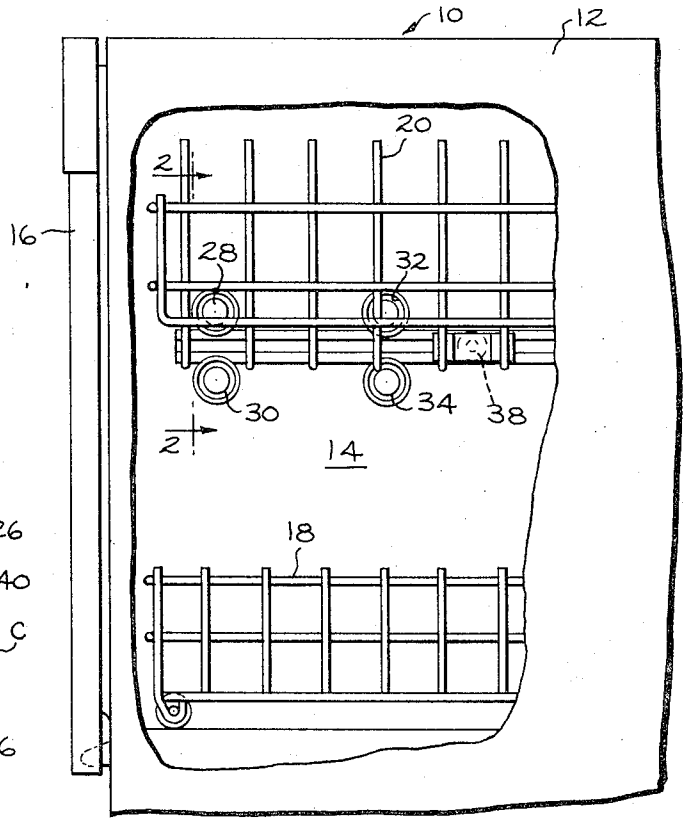
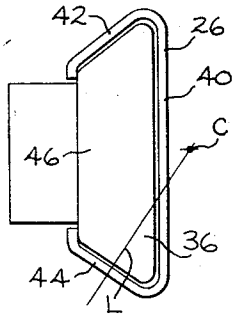


FIG. 1

FIG. 3



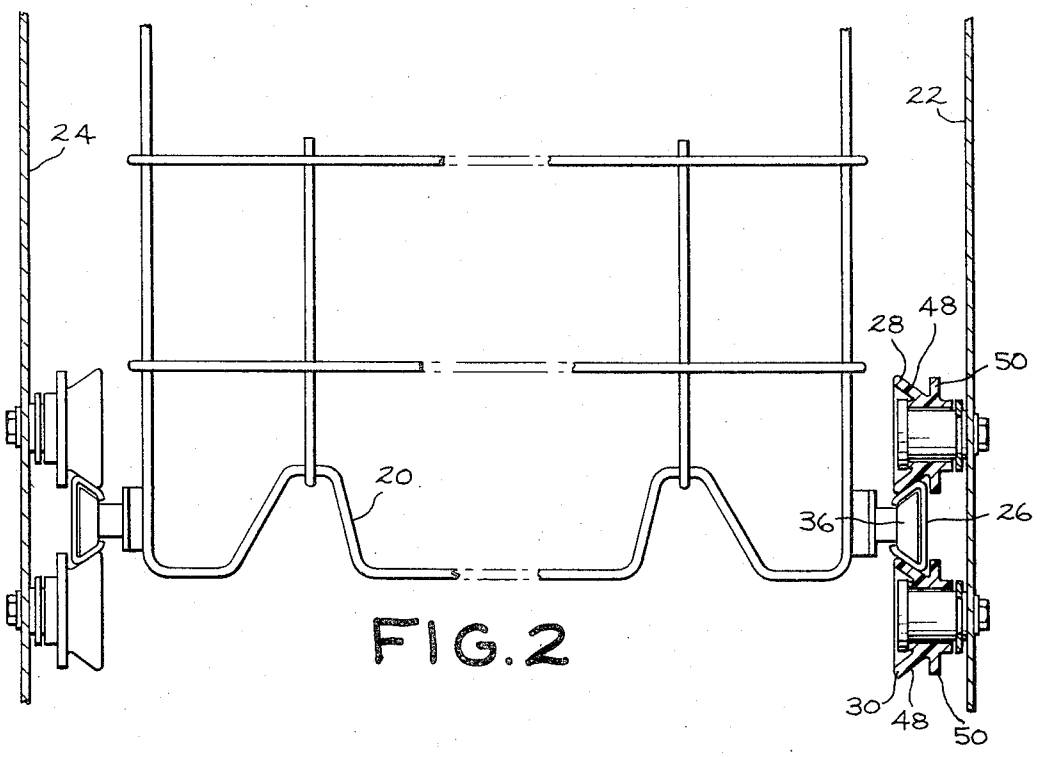


FIG. 2

RACK SUPPORT ASSEMBLY IN A DISHWASHER

BACKGROUND OF THE INVENTION

In domestic dishwashing machines of the front-opening or front-loading type it has become common for manufacturers to provide an upper dish supporting rack within the machine's wash chamber that is adapted to be slide in a horizontal direction inwardly and outwardly through the access opening. In the outward position the rack is disposed for loading of dishes therein to be washed and in the inward or retracted position the rack is fully within the wash chamber whereby the machine may be closed and placed into operation to perform its washing cycle. Such a rack is normally supported at each side thereof by a combination of rollers disposed to rotate about a horizontal axis and an elongated channel slide bar operatively associated with the rollers. More specifically, the channel slide bar is mounted between upper and lower spaced apart wall mounted rollers whereby the slide bar can slidably move on these roller supports. Additional spaced apart rollers journalled to the rack side project laterally from the rack and are captured within the channel area of the channel slide bar member and slidably track therein. The rack may then be manually drawn outwardly from its inward position in the wash chamber a limited distance wherein the rack rollers rotate and track along the length of the channel bar. When the rack has moved to where its forward roller contacts a stop at the end of the channel bar the channel bar is then urged to move forward a limited distance until a stop provided at the end thereof causes it to halt its forward movement. With the rack extending through the access opening of the machine's wash chamber in a cantilevered arrangement, the aforementioned action is reversed to slidably move the rack back to its retracted position within the wash chamber. Quite commonly, the channel slide bar is formed from sheet metal of uniform thickness and is shaped to have a cross-section C-shape wherein the lengthwise opening to the inside channel area defined by the slide bar members faces inwardly toward the rack side to receive the rack journalled rollers. Such an arrangement is shown in a patent application filed June 17, 1971, Ser. No. 154,141 now U.S. Pat. No. 3,761,153.

A major problem in the utilization of the foregoing arrangement is that a C-shaped channel slide bar formed for the purpose from relatively thin sheet metal is subject to a lengthwise twisting effect or torsional response to the load of the rack bearing on the rack rollers and translated to the channel slide bar. This twisting effect causes the channel slide bar to bind with the rollers associated therewith, particularly when the rack is fully loaded and in its outward position whereby smooth sliding movement of the loaded rack is lost.

Several approaches have been considered for preventing the aforementioned effect in a C-shaped slide bar, one of them obviously being the substitution of a heavy duty substantially thick channel slide bar member that would not be effected by the torsional force of the loaded rack. This approach has the definite disadvantage of requiring modification by substitution of material quantity or type in the channel slide bar and is preferably avoided due to the cost increase which becomes quite substantial when magnified through high production output of thousands of such machines. Another approach to reducing the binding action of the channel slide bar with its rollers is to restructure the channel slide bar to a double integral channel as shown in U.S. Pat. No. 3,472,573 that is less likely to respond to the torsional force of the loaded rack. This latter approach has a similar cost disadvantage to the first approach mentioned inasmuch as it requires the use of more material and expensive retooling to obtain the channel slide bar that is generally S-shaped is cross-section.

The present invention comprehends a comparatively inexpensive modification of the configuration of the typical C-shaped channel slide bar and the rollers operatively associated therewith to prevent binding in a dishwasher rack support means in response to load wherein the general arrangement of the support means and the material requirement therefor remains substantially unchanged.

SUMMARY OF THE INVENTION

This invention is directed to a dishwashing machine of the front-loading type having slidable support means enabling a dish supporting rack to be manually slid inwardly or outwardly through the access opening of the wash chamber of the machine and more particularly pertains to improved structure and method of making such improvements wherein the undesirable effects of binding action between components of the support means in response to rack load is prevented.

In the presently preferred embodiment of the invention a dishwashing machine is provided of the front-loading type having a wash chamber and access opening thereto. A rack for supporting dishes to be washed within the wash chamber is slidably mounted in the chamber for movement between a loading position wherein the rack extends outwardly through the access opening and a retracted position wherein the rack is disposed fully within the chamber for instigation of the machine's operational cycle. The rack has slidable support means therefor preferably including, at each side thereof, a plurality of rollers rotatably mounted on the wash chamber side wall for supporting an elongated channel slide bar for sliding movement in the direction of the bar's extension. One or more rack rollers journalled to the rack side projects outwardly laterally therefrom and is captured for tracking movement lengthwise within the channel formed by the channel slide bar. The channel slide bar is preferably formed from relatively thin gauge metal of uniform thickness. The channel slide bar has a flat planar intermediate back portion with integral upper and lower projecting flange portions which serve to encapture the rack roller projecting into the channel area of the bar.

The lower flange portion of the channel bar member receives the force translated through the rack roller from the rack and is disposed relative to the major body portion of the channel slide bar whereby the load resultant thereagainst is on a straight line preferably intersecting the shear center of the channel slide member. In its presently preferred form the channel slide bar upper and lower flanges thereof converge toward each other in a substantially straight line whereby a flat load bearing surface is provided on the inside surface of the lower flange portion and generally conical shaped rollers are utilized both to support the slide bar to the wash chamber side wall and to support the rack side for movement relative to the channel slide bar. In this ar-

rangement the load resultant on the lower flange portion's inside surface may be established at a point half the distance from the point of projection of the lower flange portion from the major body portion of the channel slide bar, and the inclination of the lower flange portion can be established relative to the major body portion such that a straight line corresponding to the direction of the load resultant against the lower flange portion will be directed substantially close to the shear center of the channel slide bar to thereby prevent undesirable twisting of the channel slide bar.

The method of determining the configuration of the channel slide bar disclosed herein enables improvement of the operation of the rack support means heretofore described if the lower flange member is inclined relative to the major body portion of the channel slide bar such that the resultant load point is within an angle described by a line taken perpendicular to the major body portion at the point where the lower flange portion and the major body portion converge. This limitation has the effect of moving the direction of the resultant load toward the shear center of the channel slide bar which tends to enable the channel slide bar to be appreciably more resistant to a twisting force applied thereto than previously obtainable in the conventional channel slide bar that is generally C-shaped in cross-section.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary side elevational view of a dishwashing machine cabinet having the side wall thereof cut away to reveal dish supporting racks mounted within the wash chamber of the machine;

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

FIG. 3 is an elevational view of a channel slide and roller components of the referred embodiment of the invention, shown in an enlarged scale as compared to FIG. 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows an automatic dishwashing machine **10** having a cabinet **12** that defines an interior wash chamber **14.** An access opening is provided on the front side of the cabinet **12** and is normally covered by a hinged access door **16.** Contained within the wash chamber **14** are racks **18** and **20** for supporting dishes and other utensils to be washed within the machine **10.**

The rack **20** has means therewith supporting it, at each side thereof, to oppositely disposed wash chamber side walls **22** and **24,** whereby the rack may be manually pulled outwardly from the wash chamber **14** to a loading position where it extends in a cantilevered arrangement over the open door **16.** The means enabling the rack **20** to be manually moved outwardly to its loading position and then retracted back to its operative position within the wash chamber **14** includes an elongated horizontally disposed channel slide member or slide bar **26** supported for sliding movement spaced apart between pairs of wall mounted rollers **28, 30, 32** and **34.** A pair of spaced apart rollers **36** and **38** are journalled to the side of the rack **20,** and these rollers are captured for rotation within the channel slide member **26** as shown in FIG. **2.**

As shown in FIG. **3,** the channel slide member **26** comprises an intermediate flat major body portion **40** and integral flange portions **42** and **44** that are inwardly inclined toward each other. The rack journalled roller **36** is shaped to conform to the configuration of the channel slide member **26** and particularly has a sloped annular side wall **46** that tracks against the inside surface of the flange **44.** It will be noted in FIG. **2** that the rollers **28** and **30** (and rollers **32** and **34** of FIG. **1**) are provided with a sloped annular side wall **48** to conform to the outer configuration of the slide channel member **26** which is disposed snuggly between the rollers **28** and **30** for slidably movement therebetween. Each of the wall mounted rollers, such as **28** and **30,** is also provided with an annular flange or radially outwardly projecting ridge **50** which serves as a stop to prevent the rack slide member **26** from moving down the slope of the rollers, in response to a load bearing on the rollers **36** and **38,** within the channel slide member **26.**

Any sheet material section subjected to a torsional force has a shear center or center of twist, the location of which is determined by the geometry of the material cross-section. A channel slide bar configured to form an interior channel always has a shear center or point located outside the bar's major body portion at the side opposite the direction of the projection of the bar's spaced apart edge flanges. In order to increase resistance of the channel shaped member to twisting in response to a load or force against the inside surface of one of the flanges without requiring the substitution of a comparatively heavy channel member of substantially thicker or more rigid material or departing from the general channel shaped configuration, the cross-section of the channel slide member in accordance with the present invention is configured whereby any resultant load or force against the load bearing flange portion will be directed in a straight line intersecting the shear center.

By calculation it can be determined, for the preferred form of the channel slide bar as shown in FIG. **3,** that the shear center is at a point designated as point C. Therefore, the lower flange portion **44** on which the weight of the rack **18** is borne is inclined whereby the force receiving inside surface thereof is substantially perpendicular to a straight line L taken centrally through the flange portion **44** and intersecting the shear center C.

It should be emphasized that the configuration of the slide bar **26,** in accordance with the present invention, will have its resistance to twisting under load of the rack greatly improved over the more conventional C-shaped slide bar by modifying the C-shaped slide bar such that the direction of the resultant load on the lower flange portion is oriented more closely toward the shear center C. As shown in the various figures of the drawing, the angle or inclination of the inside load receiving surface of the flange portion **44** is established for the reasons given heretofore. In accordance therewith, the various rollers in the support means for the rack **20** are all provided with a conical configuration wherein each roller has the same annular slope on the side surfaces thereof, and the upper flange **42** of the channel slide bar is configured to correspond and cooperatively mate with the configuration of the rollers to operate in association therewith. The diameter of the rollers **36** and **38,** and thus the distance between the flange portion **42** and **44,** are established such that at an axial line extended from either of these rollers will pass through the shear center C of the slide bar opera-

tively associated therewith. A sliding clearance is preferably provided between each of the wall mounted rollers, (such as roller **28**) and the respective support stud on which each of these rollers and the channel slide member **26**. Allowance of such clearance tends to compensate for any tolerance in either the rack width, the tub width or the channel slide dimensions whereby the proper non-binding sliding function in moving the rack **20** outwardly from the wash chamber **14** and back to its retracted position will be retained.

I claim:

1. A dishwashing machine of the front-loading type having a wash chamber and an access opening thereto, a rack for supporting dishes to be washed slidably mounted in the chamber for movement between a loading position wherein the rack extends at least partially out through the access opening and a retracted position wherein the rack is fully within the chamber,

support means at each side of the rack including an elongated channel slide member having a substantially flat major body portion and upper and lower projecting flange portions converging toward each other whereby a load bearing surface is provided on the lower flange portion immediate said major body portion, said channel slide member further being disposed to extend generally in a horizontal orientation along the chamber side wall and slidably mounted for forward-rearward reciprocal movement in the direction of its extension,

the load bearing surface being inclined relative to the major body portion whereby a center point taken on the load bearing surface is on a line forming an acute angle with the generally vertical surface of the major body portion of the channel slide member whereby the load resultant of rack load on the lower flange portion is oriented substantially near the shear center of the channel slide member.

2. The combination of claim **1** wherein the support means includes means mounted to the wash chamber side wall for slidably supporting the channel slide member, and means on the rack side disposed to translate the load force of the rack to the lower flange portion of the slide channel member and slidably move therealong.

3. The combination of claim **2** wherein the means on the rack side comprises a plurality of spaced-apart conical rollers captively contained within the inside area of the channel slide bar for slidably tracking movement therein.

4. The combination of claim **2** wherein the means mounted to the wash chamber side wall comprises a plurality of rollers each of which has an outer surface formed complementary to the outer surface of the channel slide member to conformably register therewith.

5. The combination of claim **4** wherein each roller of the plurality has means thereon to prevent lateral movement of the channel slide bar toward the wash chamber side wall in response to rack load translated to the channel slide bar.

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