

[54] **RACK MECHANISM FOR TOPLOADING DISHWASHER**

3,322,479 5/1967 Payton et al..... 312/269  
 3,195,969 7/1965 Wallen..... 312/269  
 2,508,984 5/1950 Zebronski..... 312/272.5 X

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[57] **ABSTRACT**

[21] Appl. No.: **266,264**

There is disclosed a top opening dishwasher having a lid pivoted along the rear edge thereof for selectively closing an upwardly open washing tub. A pair of upper racks are pivotally connected to the lid for movement into and out of the tub as an incident of lid closing and opening respectively. A bottom rack is mounted in the tub for vertical movement and is interconnected with the lid for raising and lowering as an incident of lid opening and closing respectively. The connection between the bottom rack and the lid is such that the bottom rack does not load the lid until the lid is partially open.

[52] **U.S. Cl.**..... 312/269, 312/272, 312/312

[51] **Int. Cl.**..... A47b 49/00, A47b 81/00

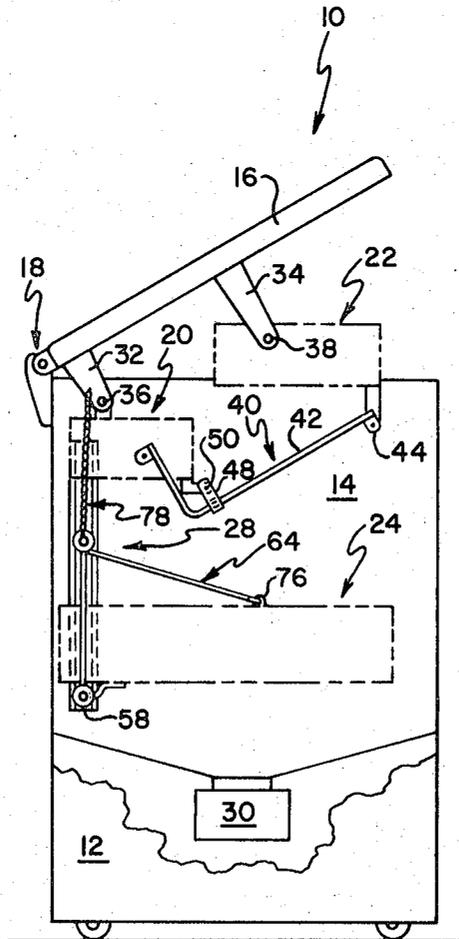
[58] **Field of Search** 312/269, 272, 272.5, 271, 273,  
 312/274, 275, 276, 312

[56] **References Cited**

**UNITED STATES PATENTS**

3,310,354	3/1967	Pattison .....	312/269
3,466,105	9/1969	Guth .....	312/274
3,325,235	6/1967	Pattison et al.....	312/269
3,390,930	7/1968	Peterson .....	312/269

**10 Claims, 5 Drawing Figures**



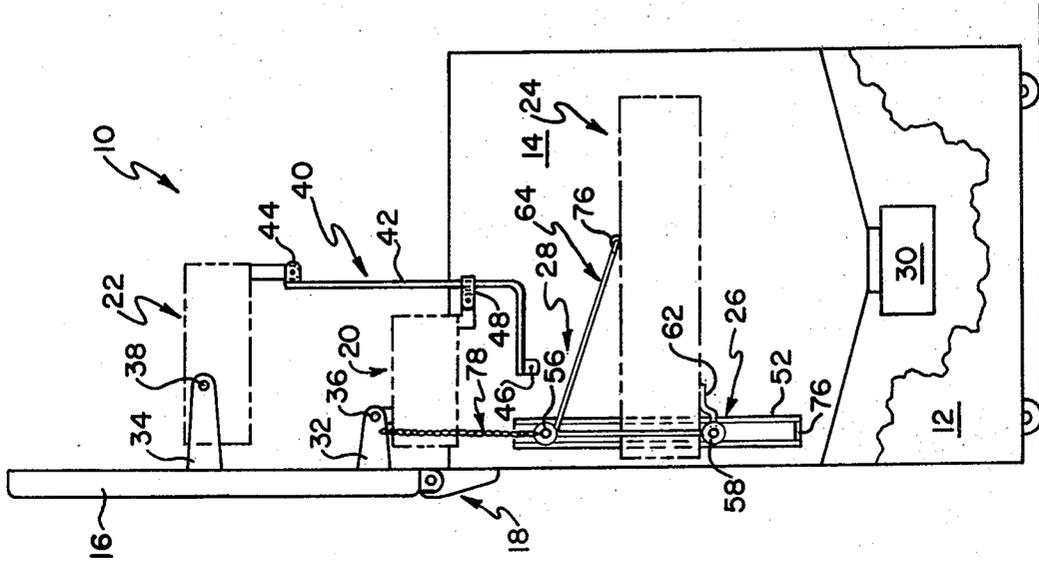


FIG. 1

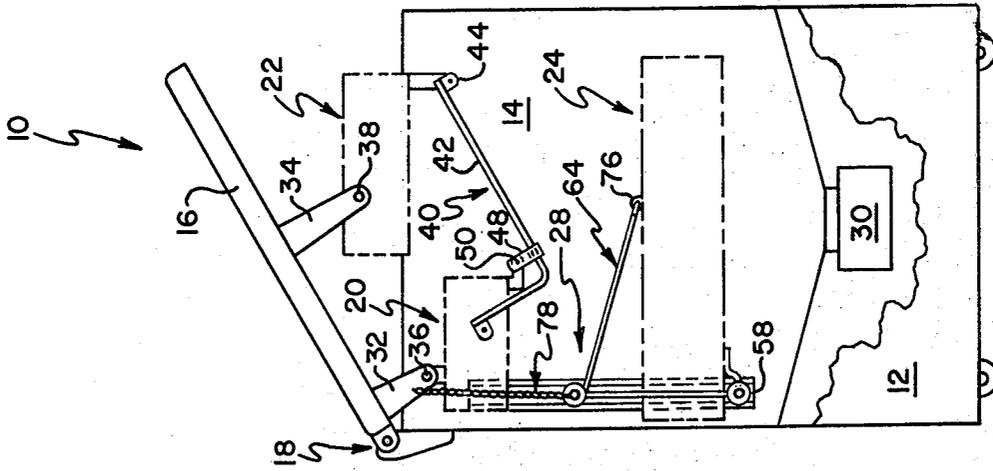


FIG. 2

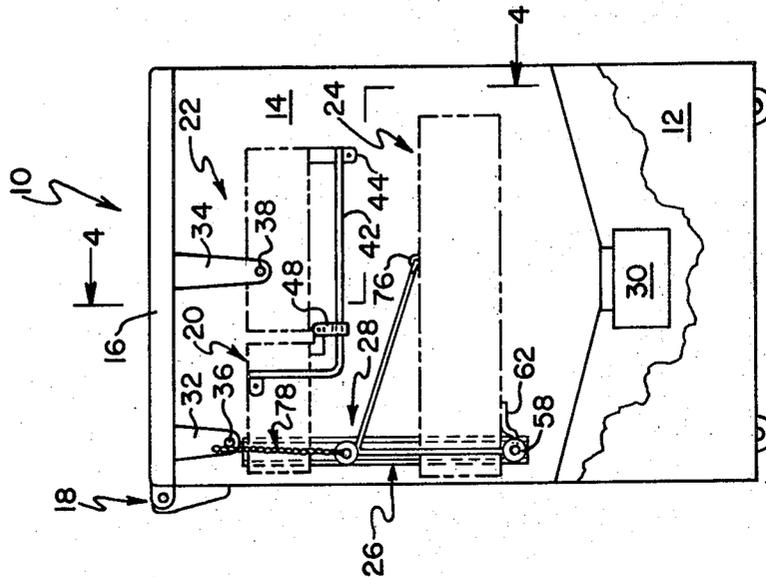


FIG. 3



## RACK MECHANISM FOR TOPLOADING DISHWASHER

### BACKGROUND OF THE INVENTION

This invention relates to top loading dishwashers provided with a dish rack arrangement interconnected with the dishwasher lid to facilitate placement and removal of dishes and utensils in the racks.

It is known in the prior art to provide a top loading dishwasher with one or more upper racks and a lower rack, all of which are interconnected with the dishwasher lid to be raised and lowered as an incident of lid opening and closing respectively. Exemplary disclosures are found in U.S. Pat. Nos. 3,310,354; 3,325,235 and 3,390,930. In addition to these disclosures, there are other arrangements for raising and lowering only the upper racks as an incident of lid opening and closing respectively, such as found in U.S. Pat. Nos. 3,087,769 and 3,322,479.

The upper racks of this invention comprise at least one and preferably a pair of interconnected pivotally mounted racks, such as illustrated in U.S. Pat. No. 3,390,930, and a lower rack. The upper and lower racks are interconnected with the lid for movement between a loading/unloading position and a washing position as an incident of lid movement.

It is known to counterbalance the dishwasher lid, as by the use of a counterbalance spring in the hinge mechanism for the lid. If the counterbalance mechanism were designed to offset the entire weight of the lid, the upper racks, the bottom rack and a load of dishes in all racks, it will be seen that, with the racks empty, there is too much counterbalance applied to the lid. Accordingly, the counterbalance designed into the hinge is typically, in the prior art, sufficient to offset the moment of the lid, the empty upper racks and the empty lower rack. It will be apparent that when the racks are filled, the housewife must provide the force necessary to offset the moment of the load in the racks.

There are two awkward situations which occur when the housewife raises and lowers the lid of conventional toploading dishwashers which elevate and lower the loaded racks in response to lid movement. The first awkward situation occurs at the beginning of lid opening movement. The typical toploading dishwasher is about waist high or higher to the average housewife. Accordingly, the average housewife must pull upwardly on the dishwasher lid for an arc of movement of about 30° and then change her grip on the dishwasher lid to push it to its vertical or nearly vertical position. Since the weight of all the dishes remains on the dishwasher lid, there is the possibility that the dishwasher lid will slam shut while the housewife changes her grip. It will also be apparent that the housewife is at a mechanical disadvantage when pulling upwardly on the lid during its initial opening movement because she must pull upwardly thereon and because the attachment between the lower rack and the lid is at an unfavorable lever arm position.

The second awkward situation in prior art devices occurs at the end of lid closing movement. As the lid approaches its fully closed position, the lever arm position of the lower rack becomes increasingly unfavorable so that the housewife must exert an increasing force on the lid to prevent the lid from slamming shut. Since the

housewife has to change grip on the lid and then exert a substantial upward pull thereon to prevent slamming, there exists the possibility that the lid will slam shut, hopefully without catching the housewife's fingers between the lid and the front edge of the dishwasher.

It is accordingly an object of this invention to provide a toploading dishwasher having one or more upper racks pivotally mounted to the door and a lower rack interconnected to the door but independent of the upper racks which does not load the door during initial opening movement and final closing movement.

### SUMMARY OF THE INVENTION

In summary, one aspect of this invention comprises a top opening dishwasher including an upwardly opening washing tub having a lid pivoted along the rear edge thereof for selectively closing the tub, at least one upper rack and means pivotally mounting the upper rack on the lid for movement in and out of the tub, a bottom rack and means mounting the bottom rack for vertical movement in the tub from a first position adjacent the bottom thereof in supported relation with the tub to a second position elevated above the first position, and means interconnecting the lid and the bottom rack for moving the lid from the first position to the second position in response to lid opening movement including lost motion means independent of the upper rack for allowing the lid to move away from its closed position before elevating the bottom rack.

In summary, another aspect of this invention comprises a top opening dishwasher including an upwardly opening washing tub having a lid pivoted along the rear edge thereof for selectively closing the tub, at least one upper rack and means pivotally mounting the upper rack to the lid for movement in and out of the tub, a bottom rack and means mounting the bottom rack for vertical movement in the tub from a first elevated position to a second subjacent position adjacent the bottom of the tub in supported relation therewith, and means interconnecting the lid and the bottom rack for lowering the bottom rack from the first position to a second position in response to lid closing movement including lost motion means independent of the upper rack for placing the bottom rack in the second position before the lid reaches its fully closed position and for allowing the lid to continue movement toward its fully closed position.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partially broken side view of a top loading dishwasher in accordance with this invention which illustrates the lid in the closed position;

FIG. 2 is a view similar to FIG. 1 which illustrates the lid in the partially open position;

FIG. 3 is a view similar to FIGS. 1 and 2 illustrating the lid in its fully open position;

FIG. 4 is an enlarged cross sectional view of this invention as taken along line 4-4 of FIG. 1 as viewed in the direction indicated by the arrows;

FIG. 5 is a view illustrating the mounting and supporting mechanism of the bottom rack.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1-3, there is illustrated a top loading dishwasher 10 of this invention comprising, as major components, an outer shell 12 which is typically

rectangular in horizontal cross section, an inner shell 14 which is also typically of rectangular horizontal cross section and a lid 16 mounted by hinge means 18 for movement between open and closed positions. The dishwasher 10 also comprises a pair of upper racks 20, 22 pivotally mounted to the lid 16, a bottom or lower rack 24, means 26 mounting the bottom rack 24 for vertical movement and means 28 interconnecting the lid 16 and the bottom rack 24 for raising and lowering the bottom rack 24 in response to opening and closing of the lid 16.

It is apparent that many conventional features of the dishwasher 10 are omitted and that other components not directly related to this invention is shown merely by way of example. For example, the bottom of the inner shell 14 is illustrated as draining into a pump-motor 30 which is arranged to deliver water into a spray device (not shown) for spraying dishes loaded in the racks 20, 22, 24. It will be seen that the dishwasher 10 is of the type comprising an upwardly opening washing tub having the lid 16 pivoted along the rear edge thereof for selectively opening and closing the tub.

The hinge means 18 conveniently includes a counterbalance device of any suitable type, such as disclosed in U.S. Pat. No. 3,001,227. The magnitude of the counterbalance afforded by the hinge means 18 is preferably such to offset the moment of the lid 16 and the moment of the empty racks 20, 22. As will become more fully apparent hereinafter, the interconnecting means 28 is such that the weight of the lower rack 22 is not transferred to the lid 16 during opening movement thereof until the lid 16 assumes the position illustrated in FIG. 2. Accordingly, movement of the lid 16 from the fully closed position of FIG. 1 requires a moment applied by the housewife sufficient only to offset the moment of the load in the upper racks 20, 22. Since the housewife has a substantially longer lever arm than the load of the dishes in the upper racks 20, 22, it will be evident that the force applied by the housewife is relatively modest. It will also be evident that, as the lid 16 proceeds through its opening movement, the effective lever arm of the load in the racks 20, 22 decreases thereby requiring less force to be applied by the housewife to offset the same. As the lid 16 continues opening movement from the partially open position of FIG. 2 wherein the lid 16 is about 30° from the horizontal, the interconnecting means 28 picks up the lower rack 24 and elevates the same during continued opening movement.

During closing movement of the lid 16, the weight of the bottom rack 24 is carried by the lid 16 as the lid 16 moves from the fully open position of FIG. 3 to the partially open position of FIG. 2. It will be evident that the effective lever arms of the loads in the upper racks 20, 22 and the effective lever arm of the lower rack 24 becomes increasingly unfavorable to the housewife. As the lid 16 reaches the position of FIG. 2, however, the load of the lower rack 24 is transferred to the dishwasher body. Accordingly, the housewife need only counterbalance the loads in the upper racks 20, 22 during continued closing movement from the position shown in FIG. 2.

The upper racks 20, 22 may be of any suitable type such as plastic or plastic coated wire. The racks 20, 22 pivotally mounted to the lid 16 by a pair of brackets 32, 34 rigid with the lid 16 and a pair of pins 36, 38 respectively. It is thus apparent that the racks 20, 22 move simultaneously with the lid 16 at the beginning of

lid opening movement. Stabilizing means 40 interconnect the upper racks 20, 22 and maintain the same in a generally vertical position throughout the range of movement of the lid 16. The stabilizing means 40 includes a generally L-shaped stabilizing link 42 secured by a pivotal connection 44 to the forward upper rack 22 and secured by a pivotal connection 46 to the inner shell 14. A bracket 48 captivates an intermediate portion of the link 42 and is secured to the rear upper rack 20 by a suitable pivotal connection 50. The stabilizing means 40 is quite similar to that disclosed in U.S. Pat. No. 3,390,930 to which reference is made for a more complete understanding thereof.

The bottom rack 24 may also be of any suitable type such as plastic or plastic coated wire. The mounting means 26 is illustrated as comprising a pair of generally C-shaped channels 52 secured to the inner shell 14 in any suitable manner, as by the use of threaded connections 54. The channels 52 each receive an upper and lower roller 56, 58. The lower roller 58 is best illustrated in FIG. 5 and carries an axially extending arm 60 receiving a pin 62 constituting a bottom support for the rack 24. The pin 62 is conveniently rigid with the rack 24 and passes through an appropriately sized opening in the arm 60. A brace 64 interconnects the upper and lower rollers 56, 58 and the rack 24. The brace 64 conveniently comprises a plastic coated wire 66 wrapped substantially around the arm 60 and maintained in position by suitable keepers 68. The wire 66 makes an approximate 320° bend around a projection 70 (FIG. 4) extending from the upper roller 56. Suitable keepers 72 maintain the position of the wire 66 on the projection 70. The forward end of the wire 66 loops through a suitable eyelet 74 adjacent the top of the rack 24 as shown best in FIGS. 1-3. It will accordingly be seen that the mounting means 26 guides the rack 24 for vertical movement in the washing tub of the dishwasher 10. In the lowermost position of the rack 24, as illustrated in FIGS. 1 and 2, the rack 24 is supported by the washing tub in any suitable manner, as by an abutment 76 in the bottom of the channel 52.

As mentioned previously, the innerconnecting means 28 transmits opening and closing movement of the lid 16 into vertical movement of the rack 24. The interconnecting means 28 comprises lost motion means 78 which allows the lid 16 to move from the fully closed position of FIG. 1 to the partially open position of FIG. 2 before picking up the lower rack 24. The lost motion means 78 also has an important function during lid closing movement in that it allows placement of the bottom rack 24 in its lowermost position in supported relation with the washing tub before the lid 16 reaches its fully closed position. The lost motion means 78 also allows continued closing movement of the lid 16 toward the position of FIG. 1. This provides an important operating feature since the force that must be applied to the lid 16 during closing movement decreases substantially when the bottom rack 24 is placed in supported relation to the washing tub. Since the counterbalance mechanism in the hinge means 18 substantially counterbalances the weight of the lid 16 in the empty upper racks 20, 22, the housewife need only apply a force to the lid 16 sufficient to counterbalance the moment of the dishes in the upper racks 20, 22. Accordingly, the possibility of the lid 16 slamming shut and catching the housewife's fingers between the lid 16 in

the frame of the dishwasher 10 is substantially minimized.

It is also preferred that the lost motion mechanism 78 does not impose a substantial moment on the upper racks 20, 22. If the lost motion means 78 were connected to a point at the forward end of the upper rack 20, for example, there might be a substantial moment imposed on the upper rack 20 as the lid 16 passed the position of FIG. 2. This would result in an undesirable force being exerted against the upper racks 20, 22 in a generally clockwise direction when the lower rack 24 is picked up. Accordingly, the lost motion means 78 is preferably interconnected with the lid at locations imposing no substantial moment on the upper racks 20, 22.

To these ends, the lost motion means 78 may be connected between the bracket 32 and the upper roller 56. It will be seen that no substantial moment is imposed on the upper racks 20, 22 by this arrangement. Thus, the movement of the upper racks 20, 22 as controlled by the stabilizing means 40 will be relatively smooth. In addition, in the dishwasher 10, there is only one stabilizing link 42 provided whereas, if the lost motion means 78 imparted a substantial moment to the upper racks 20, 22 there would probably be required a second stabilizing link 42.

The lost motion means 78 comprises a chain 80 which is of a length greater than the distance between its attachments to the bracket 32 and the roller 56 in the closed position of FIG. 1. The attachment between the chain 80 and the roller 56 is conveniently through an arm 82 which resides axially of the roller 56 as shown best in FIG. 4. The lost motion means 78 may also comprise a resilient member 84 intertwined with the lengths of the chain 80 and connected at opposite ends thereof to collapse the chain links when not in tension to avoid interference between the chain 80 and the upper rack 20, for example. An important feature of the lost motion means 78 is that the bracket 32, which is necessary to the mounting of the upper rack 20 and already existing, is used as a connection to the lid 16. Also of considerable importance is that the connection between the lost motion means 78 and the bracket 32 is spaced between the pivot pin 36 and the lid 16. This creates a rather short lever arm for the bottom rack 24 and consequently affords a substantially greater mechanical advantage to the housewife than if the lower rack 24 were connected to the upper rack 22.

The criteria that the bottom rack 24 not impose a substantial moment on the upper rack 20 may be resolved by securing the chain 80 to the upper rack 20 at a location substantially immediately below the pivot pin 36. This has its disadvantages since the effective lever arm of the lower rack is increased and the mechanical advantage of the housewife is accordingly reduced.

I claim:

1. A top opening dishwasher comprising  
 an upwardly opening washing tub having a lid pivoted along the rear edge thereof for selectively closing the tub;  
 an upper rack and means pivotally mounting the upper rack on the lid adjacent the rear thereof for simultaneous movement therewith;  
 means for maintaining the upper rack generally horizontal throughout the range of movement of the lid;

a bottom rack and means mounting the bottom rack for vertical movement in the tub from a first position adjacent the bottom thereof in supported relation with the tub to a second position elevated above the first position; and

means interconnecting the lid and the bottom rack for moving the bottom rack from the first position to the second position in response to lid opening movement including lost motion means interconnecting the lid and the bottom rack at locations imposing no substantial moment on the upper rack for allowing the lid to move away from its closed position before elevating the bottom rack, the lost motion means including an elongate collapsible element.

2. The dishwasher of claim 1 wherein the upper rack extends from adjacent the rear of the lid to a location intermediate the washing tub.

3. The dishwasher of claim 2 further comprising a second upper rack positioned forwardly of the first mentioned upper rack and means pivotally mounting the second upper rack on the lid and wherein the maintaining means comprises a link interconnecting the first and second racks for maintaining the same generally horizontal.

4. The dishwasher of claim 1 wherein the elongate collapsible element comprises a chain.

5. A top opening dishwasher comprising  
 an upwardly opening washing tub having a lid pivotally mounted about an axis adjacent the rear edge thereof for selectively closing the tub;

an upper rack and means pivotally mounting the upper rack on the lid including a bracket rigid with the lid and projecting away therefrom and means pivotally mounting the upper rack to the bracket for movement about an axis;

a bottom rack and means mounting the bottom rack for vertical movement in the tub between the first position adjacent the bottom thereof in supported relation with the tub and a second position elevated above the first position; and

means interconnecting the lid and the bottom rack for moving the rack between the first and second positions in response to movement of the lid between fully open and fully closed positions including lost motion means interconnecting the lid and the bottom rack for allowing the lid to move relative to the tub adjacent the fully closed position thereof without bearing the load of the bottom rack, the lost motion means comprising a lever arm rigid with the lid and a lost motion connection secured to the bottom rack and secured to the lever arm at a distance less than the distance between the lid axis and the upper rack axis.

6. The dishwasher of claim 5 wherein the lost motion connection comprises a chain.

7. The dishwasher of claim 5 wherein the lever arm comprises the upper rack bracket.

8. A top opening dishwasher comprising  
 an upwardly opening washing tub having a lid pivoted along the rear edge thereof for movement sequentially between an open, an intermediate and a closed position;

an upper rack and means movably mounting the upper rack on the lid adjacent the rear thereof for simultaneous movement therewith;

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means for maintaining the upper rack generally horizontal throughout the range of movement of the lid;

a bottom rack and means mounting the bottom rack for vertical movement in the tub from a first position adjacent the bottom thereof in supported relation with the tub to a second position elevated above the first position; and

means for raising the bottom rack from the first position to the second position in response to lid opening movement between the intermediate and open lid positions and for lowering the bottom rack from the second position to the first position in response to lid closing movement between the open and intermediate lid positions, the raising and lowering means including

means independent of the maintaining means interconnecting the lid and the bottom rack at locations

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imposing no substantial moment on the upper rack for suspending the bottom rack from the lid between and including the open and intermediate lid positions, the suspending means incorporating a lost motion device allowing the lid to move from the closed position to the intermediate position before raising the bottom rack away from the first position thereof and allowing the lid to move from the intermediate position to the closed position without the load of the bottom rack.

9. The dishwasher of claim 8 wherein the lost motion device comprises an elongate element having a length greater than the distance between the attachments thereof to the suspending means when the lid is in the closed position.

10. The dishwasher of claim 9 wherein the elongate element comprises a chain.

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