

April 2, 1968

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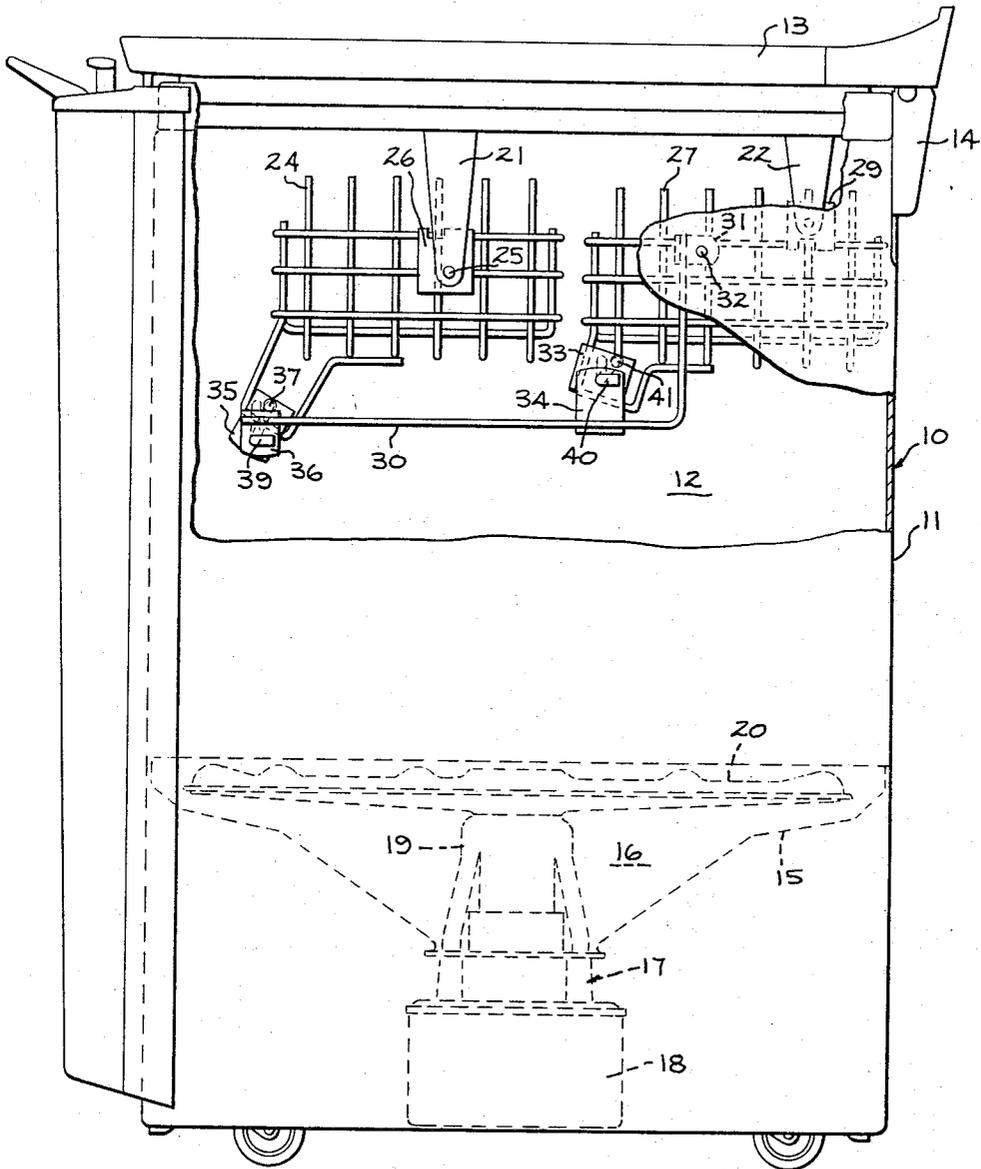
3,376,087

COMBINED SUPPORTING RACK AND COUNTERBALANCE FOR DISHWASHER

Filed Sept. 12, 1966

2 Sheets-Sheet 1

FIG. 1



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FIG. 2

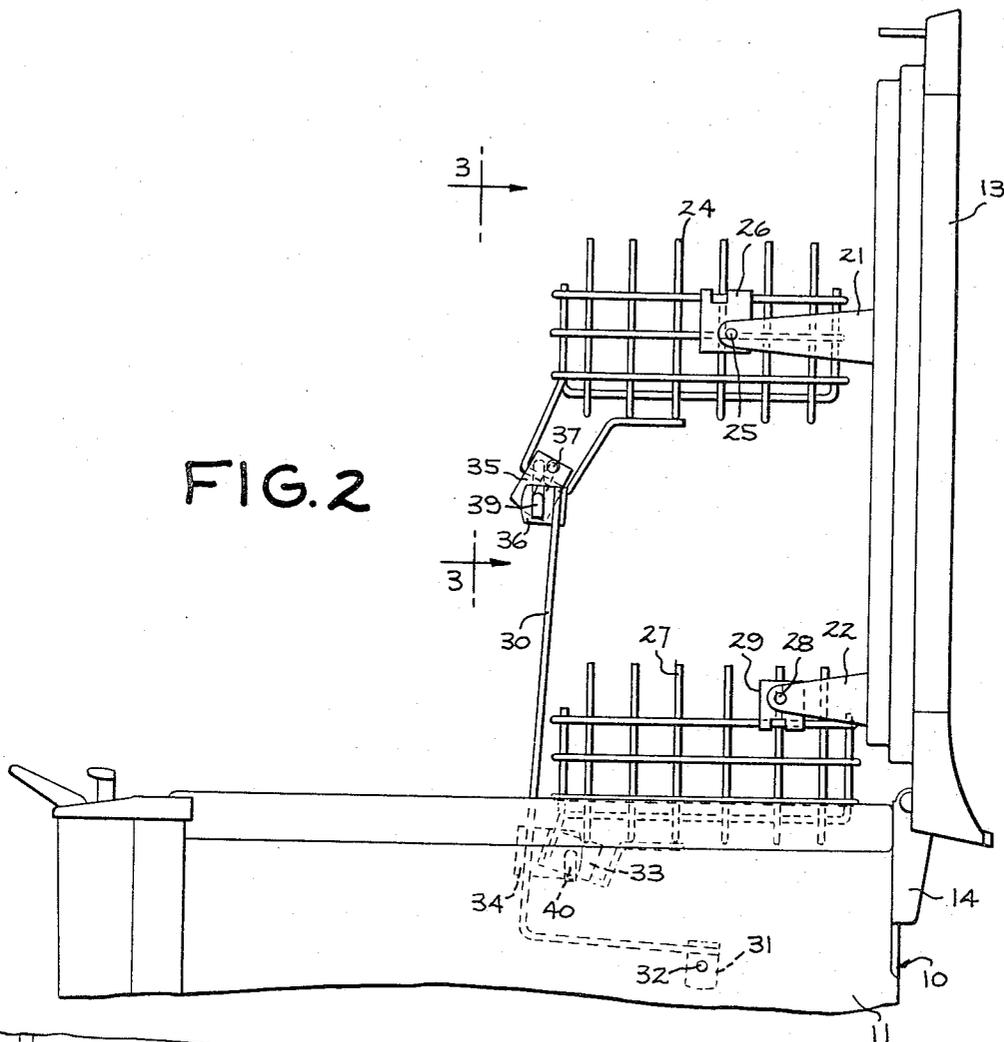
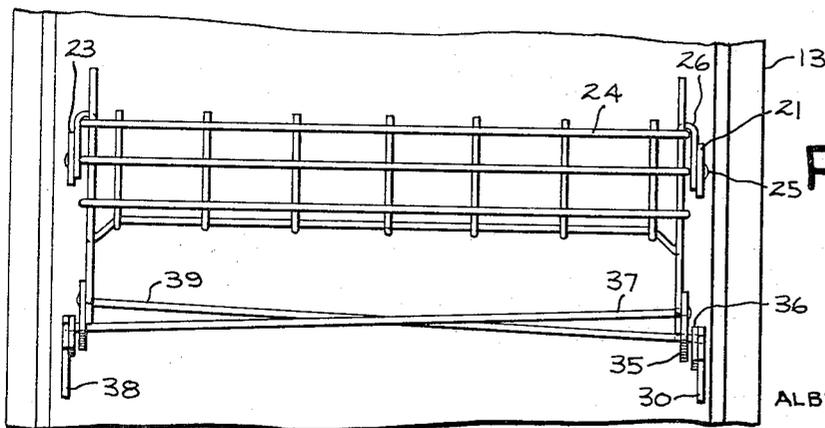


FIG. 3



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3,376,087

COMBINED SUPPORTING RACK AND COUNTERBALANCE FOR DISHWASHER

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Filed Sept. 12, 1966, Ser. No. 578,634

9 Claims. (Cl. 312-269)

This invention relates generally to supporting racks and, more particularly, to a combined supporting rack and counterbalance for use in a dishwasher.

Important characteristics of automatic dishwashers include capacity, i.e., the number of articles which the dishwasher will contain and adequately wash, and ease of access, i.e., the ease with which articles may be inserted into and removed from the supporting racks. Recent developments have brought into the market place dishwashers having movable sectional racks to improve ease of access without sacrificing capacity. One example is the structure described and claimed in U.S. Patent No. 3,087,769, issued on Apr. 30, 1963, to L. W. Guth and assigned to the General Electric Company, assignee of the present invention. Since the access problem is especially acute in top-opening dishwashers, the structure taught by Guth has met with significant commercial success. Similarly, an improved rack system employing two movable racks in a top-opening dishwasher has met with commercial success. Such system is described and claimed in application Ser. No. 442,953, filed Mar. 26, 1965, now Patent No. 3,322,479 by D. E. Payton and W. S. Pattison, which is assigned to the assignee of the present invention.

Although such rack systems, and others involving movable rack sections, contribute greatly to ease of access without sacrifice of capacity, they do create a problem. A fully loaded rack system such as that in application Ser. No. 442,953, now Patent No. 3,322,479 may weigh in excess of fifteen pounds. When the rack system is associated with the dishwasher cover, a petite housewife is required to lift not only the fifteen pounds but also the weight of the cover as she opens the cover. Counterbalance springs may be associated with the door to assist in lifting this weight but the spring force must be transmitted to the racks through the door which usually provides an unfavorable mechanical relationship requiring the use of exceptionally strong springs. If conventional coil springs are associated directly with the racks to minimize transmission through the door, or in cases where the rack system is not moved with the cover, food soils from the articles being washed may collect in the springs creating a problem.

Accordingly, it is an object of this invention to provide a combined supporting rack and counterbalance means particularly useful with an automatic dishwasher.

Other objects will become evident as the description proceeds.

Briefly stated, in accordance with one aspect of the present invention, there is provided a structure comprising a cabinet and at least one supporting rack adapted to receive and support articles thereon. Means pivotally support the rack from the cabinet for movement relative to the cabinet. An elongated torsion bar is provided and has one end rigidly connected to the rack and the other end rigidly connected to the means supporting the rack from the cabinet. With this arrangement, the torsion bar is twisted as the rack moves downwardly, thus storing energy to be released whenever the rack is moved upwardly.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention, it is believed

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the invention will be better understood from the following description taken in connection with the accompanying drawings, in which:

FIGURE 1 is an elevational view, partially cut away to show details, of an automatic dishwasher employing the present invention;

FIGURE 2 is a fragmentary view similar to FIGURE 1 but showing the combined supporting rack and counterbalance means of the present invention in a different position; and,

FIGURE 3 is a fragmentary view taken along line 3-3 of FIGURE 2.

Referring now to the drawings, and initially to FIGURE 1 thereof, there is illustrated a top-opening portable dishwasher 10. Dishwasher 10 includes an outer cabinet 11 having therein a wash chamber 12. Outer cabinet 11 has four interconnected vertical side walls and an open top and bottom. The open top serves as an access opening for the admission of articles to, and removal of articles from, wash chamber 12. This access opening is provided with a closure member or door 13 pivotally secured to one wall of cabinet 11 by a plurality of hinge members 14, only one of which is visible in FIGURE 1. The lower extremity of wash chamber 12 is defined by a bottom wall 15, the periphery of which is in liquid-tight relationship to the four vertical walls of cabinet 11. Bottom wall 15 has a centrally depressed portion forming a sump 16 in which liquid will collect. Disposed within sump 16 and supported by bottom wall 15 is a motor-pump assembly 17 which includes an electrical drive motor 18 and a pump 19. Mounted for rotation at the top of pump 19 is a reaction type spray arm 20 which effectuates a wash action within wash chamber 12 by vigorously spraying wash fluid upwardly therein.

Means are provided within wash chamber 12 to support the articles or dishes to be washed in a manner whereby the wash action generated by spray arm 20 will effectuate cleansing of the articles. This means includes a lower dish-supporting rack (not shown) disposed immediately above spray arm 20 and consuming substantially the entire horizontal cross-sectional area of wash chamber 12 and an upper dish-supporting rack system which will be described in substantial detail. For the purposes of the present invention, the lower rack (not shown) may be assumed to be entirely conventional in form and of the type commonly employed in a top-opening dishwasher.

The upper rack system comprises a front bracket 21 rigidly secured to door 13 and depending down into wash chamber 12 when door 13 is closed. A rear bracket 22 is similarly rigidly secured to door 13 and depends down into wash chamber 12 when door 13 is closed. The terms "front" and "rear" described the relationship of the brackets to each other with respect to the front and rear of the dishwasher 10. Rear bracket 22 is disposed closer to hinge member 14 than is bracket 21. In the preferred form of the upper rack system, there is a pair of front brackets and a pair of rear brackets; however, the second bracket of each pair is hidden in FIGURES 1 and 2 since, in each case, the second bracket is disposed directly behind the visible bracket as viewed in those figures. However, in FIGURE 3 the second front bracket 23 is visible.

A front supporting rack 24 is pivotally carried by bracket 21 by means of a pin 25 and a clip 26. Although the precise means for pivotally mounting rack 24 to bracket 21 is not critical to the present invention, it is to be understood that the arrangement illustrated in FIGURE 1 has clip 26 secured to rack member 24 with pin 25 establishing a pivotal relationship between clip 26 and bracket 21. Similarly, a rear supporting rack 27 is pivotally carried by bracket 22 through means including a pin 28 and a clip 29.

The upper rack system further includes means to pivotally support racks 24 and 27 from cabinet 11 for movement relative to the cabinet. This means may comprise an arm 30 pivotally secured at one end to a wall of cabinet 11 by means of a clip 31 and a pin 32. Pin 32 may extend through the wall of cabinet 11 and has a pivotal relationship with clip 31 which in turn is rigidly secured to arm 30. Arm 30 is also pivotally secured to rack 27 by means of a pair of clips 33 and 34 which are pivotally interconnected. It is to be understood that clip 33 is substantially rigid with rack 27 while clip 34 is substantially rigid with arm 30. In the preferred embodiment, arm 30 extends beyond clip 34 to pivotally engage rack 24. This last-mentioned pivotal engagement is achieved by means of a pair of clips 35 and 36 which are pivotally interconnected in a manner similar to the relationship between clips 33 and 34.

With the above-described upper rack system, the individual elements of the system will assume the relationship illustrated in FIGURE 2 as closure member 13 is pivoted from its substantially horizontal closed position to its substantially vertical open position. By comparing FIGURES 1 and 2, it can be seen that, along with the substantial displacement of rack 24 up and out of the wash chamber 12, rack member 27 also undergoes substantial displacement upwardly to provide significantly better access to the lower rear portion of wash chamber 12 for insertion of articles into, and removal of articles from, the lower rack.

As mentioned above, a fully loaded rack system, such as that just described, may weigh in excess of fifteen pounds. When the rack system is associated with the dishwasher door, as it is in the embodiment illustrated in the figures, a petite housewife may have difficulty in lifting the door as well as the loaded racks unless relatively strong counterbalance springs are provided. Heretofore, in a system such as that illustrated in the figures, coil springs are contained within hinge members 14 to counterbalance the weight of the door and the rack system. The spring force necessary to substantially relieve the housewife of the weight to be lifted, must be transmitted through the door, which results in an unfavorable lever arrangement or, in the case where coil springs are directly associated with the racks, rather than the hinge member, food soil from the articles being washed collect in the springs creating a problem.

In accordance with the present invention, a combined supporting rack and counterbalance means is provided which overcomes the aforementioned problems. There is provided an elongated torsion bar 37 having one end rigidly connected to rack 24 and the other end rigidly connected to an arm 38 which is identical in all respects to arm 30. Similarly, an elongated torsion bar 39 is provided and has one end rigidly connected to rack 24 and the other end rigidly connected to arm 30. As illustrated in FIGURES 1 and 2, the end of torsion bar 39 which is secured to arm 30, may be bent over to lay against the surface of clip 36 so that the rigid connection between clip 36 and torsion bar 39 may be conveniently effected by welding the two elements together. Similarly, torsion bar 37 has its end, which is connected to clip 35, slightly upset to provide an enlarged area which may be conveniently welded to clip 35. It is to be understood of course that the particular means for rigidly connecting the ends of the torsion bars to their respective elements is not critical to the present invention and suitable means other than welding may be employed.

If desired, instead of or in addition to torsion bars 37 and 39, elongated torsion bars 40 and 41 may be provided in association with rack 27 in a manner identical to that discussed above with regard to torsion bars 37 and 39.

A comparison of FIGURES 1 and 2 will reveal the existence of relative movement between arm 30 and each of racks 24 and 27 of approximately 90° as the com-

5 bined supporting rack and counterbalance means moves from the condition illustrated in FIGURE 1 to the condition illustrated in FIGURE 2. Thus, each of the torsion bars 37, 39, 40 and 41 is twisted 90° during movement of the racks. During assembly of the system, the torsion bars would be assembled to the rack and arms such that when the system is in the condition illustrated in FIGURE 2, the torsion bars would be substantially relaxed and, as the racks move to the condition illustrated in FIGURE 1, the torsion bars would be twisted thus storing torsional energy to be released at such time as the system moves from the condition of FIGURE 1 to the condition of FIGURE 2.

10 It should be recognized that the present invention is not necessarily limited to an arrangement wherein racks 24 and 27 are supported from door 13 but may, in fact, be utilized in an arrangement wherein racks 24 and 27 are independently supported from cabinet 11. With such arrangement, door 13 would be opened and then one or both of the movable racks would be grasped by the operator and subsequently moved to a position substantially identical with that illustrated in FIGURE 2. In such an arrangement, additional linkage would be necessary to control the tipping of baskets 24 and 27 as it is now controlled by brackets 21 and 22. Moreover, it should be recognized that, depending upon the spring constant of the individual torsion bars employed and the weight to be supported by racks 24 and 27, less than four torsion bars may be employed and it is within the spirit of the present invention to employ only a single torsion bar if such would prove sufficient to counterbalance the weight carried by racks 24 and 27.

As illustrated in the figures, the torsion bars may serve as connecting means to pivotally interconnect the racks 24 and 27 with the arms 30 and 38. For example, clips 35 and 36 have aligned openings through which torsion bar 39 extends. Torsion bar 39 is rigidly secured to clip 36 but clip 35 is free to pivot relative to torsion bar 39.

Thus, it can be seen that the present invention provides a combined supporting rack and counterbalance means particularly useful with an automatic dishwasher. The present invention applies the counterbalance force directly to the individual supporting rack rather than transmitting it from the hinge member through the door. This is achieved by positioning the counterbalance means within the wash chamber of the dishwasher; however, inasmuch as conventional coil springs are obviated, the collection of food particles inherent with the use of coil springs within a dishwasher wash chamber is precluded.

As will be evident from the foregoing description, certain aspects of the invention are not limited to the particular details of construction of the example illustrated, and it is contemplated that various other modifications or applications will occur to those skilled in the art. It is therefore intended that the appended claims shall cover such modifications and applications as do not depart from the true spirit and scope of the invention.

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

1. A structure comprising:

- (a) a cabinet,
- (b) at least one supporting rack adapted to receive and support articles thereon,
- (c) means pivotally supporting said rack from said cabinet for movement relative to said cabinet, and
- (d) an elongated torsion bar having one end rigidly connected to said rack and the other end rigidly connected to said means.

2. A structure comprising:

- (a) a cabinet having an access opening therein,
- (b) a closure member pivotally carried by said cabinet to close said access opening and movable between a closed position and an open position,
- (c) at least one rack carried by said closure member for movement therewith,

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- (d) means interconnecting said rack and said cabinet to control the movement of said rack as said closure member is moved, and
- (e) an elongated torsion bar having one end rigidly connected to said rack and the other end rigidly connected to said means. 5
3. The invention of claim 2 wherein said means interconnecting said rack and said cabinet comprises a first arm pivotally connected at one end to said cabinet and pivotally connected at its other end to said rack, and a second arm spaced from said first arm and pivotally connected at one end to said cabinet and pivotally connected at its other end to said rack. 10
4. The invention of claim 3 wherein said torsion bar is connected to said rack adjacent said first arm and connected at its other end to said second arm. 15
5. The invention of claim 4 further comprising a second torsion bar connected at one end to said rack adjacent said second arm and connected at its other end to said first arm. 20
6. A structure comprising:
- (a) a cabinet having an access opening therein,
- (b) a closure member pivotally carried by said cabinet to close said access opening and movable between a closed position and an open position, 25
- (c) two racks carried by said closure member for movement therewith,
- (d) means interconnecting said racks and said cabinet to control the movement of said racks as said closure member is moved, 30
- (e) a first elongated torsion bar having one end rigidly connected to one of said racks and the other end rigidly connected to said means, and
- (f) a second elongated torsion bar having one end rigidly connected to the other of said racks and the other end rigidly connected to said means. 35
7. The invention of claim 6 wherein said means interconnecting said pair of racks and said cabinet comprises a first arm pivotally connected at one end to said cabinet and pivotally connected to each of said racks, and a second arm spaced from said first arm and pivotally connected at one end to said cabinet and pivotally connected to each of said racks.
8. The invention of claim 7 wherein said other end of said first torsion bar is connected to said first arm and said other end of said second torsion bar is connected to said second arm.
9. A structure comprising:
- (a) a cabinet having an open top,
- (b) a closure member for said open top pivotal between a substantially horizontal closed position and a substantially vertical open position,
- (c) at least one rack carried by said closure member for movement therewith,
- (d) at least one arm pivotally connected at one end to said cabinet and at the other end to said rack to control the movement of said rack as said closure member is moved, and
- (e) an elongated torsion bar having one end rigidly connected to said rack and the other end rigidly connected to said arm.

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35 JAMES T. McCALL, *Primary Examiner.*