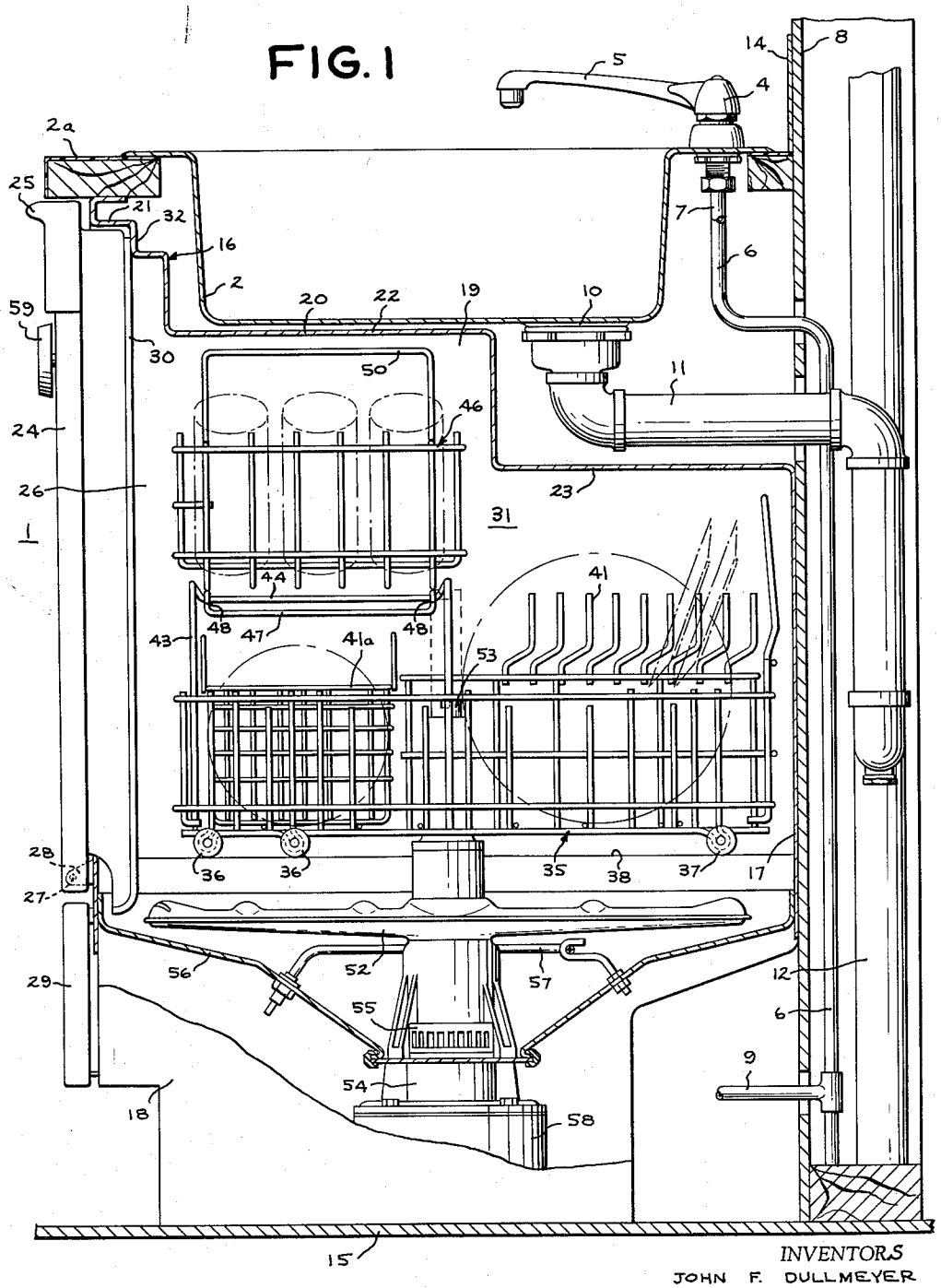
July 23, 1963 J. E. STINER ETAL 3,098,685

DISHWASHER HAVING CABINET AND RACK CONFIGURATION FOR USE BENEATH KITCHEN STRUCTURES SUCH AS SINKS

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FIG. 1



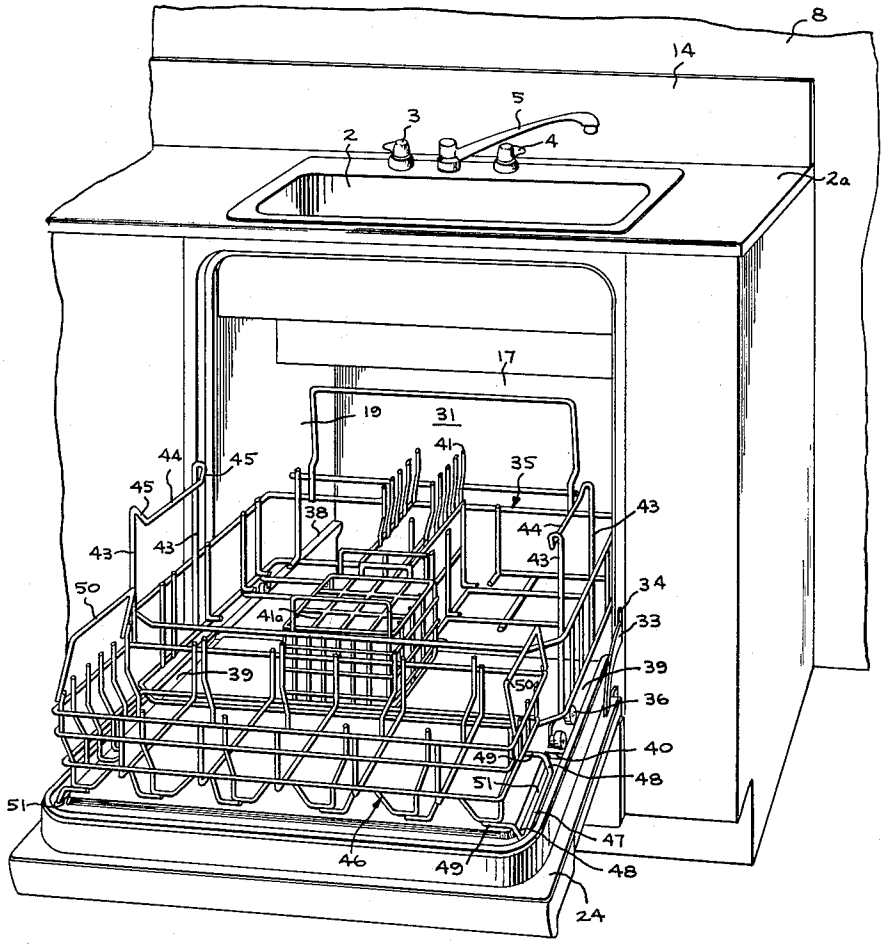
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Filed May 21, 1962 2 Sheets-Sheet 2

FIG. 2



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United States Patent Office

3,098,685

Patented July 23, 1963

3,098,685

DISHWASHER HAVING CABINET AND RACK CONFIGURATION FOR USE BENEATH KITCHEN STRUCTURES SUCH AS SINKS

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Filed May 21, 1962, Ser. No. 196,176
6 Claims. (Cl. 312—311)

The present invention relates to a dishwasher for use beneath a kitchen structure such as a sink, and more particularly to such a dishwasher which is of the "drop door" type wherein access to the dishwasher is attained through a front opening door.

It is highly desirable to provide a dishwasher which may be inserted beneath a structure such as a sink or a surface range unit in a kitchen thereby to economize space as much as possible. Accordingly, it is an object of our invention to provide such a dishwasher which utilizes the available space as efficiently as possible.

More particularly, it is an object of our invention to provide such a dishwasher which is of the drop door type, and wherein a top rack is supported on a bottom rack, and is adapted to be removed from its support on the botsom rack, and then positioned on the door for loading and unloading purposes.

In one aspect of our invention we provide a dishwashing machine which is formed to be mounted beneath a kitchen structure such as a sink, for instance. The dishwasher has a housing which forms a dish chamber with an access opening in the front. A door hinged to the housing about its lower edge may be moved between a generally vertical position, in which it closes the opening, and a generally horizontal position to provide access to the chamber. The top surface of the housing is, preferably, formed with three distinct parts: a front part which is adjacent the opening and is of maximum height; an intermediate stepped down flat portion behind the front part; and a lower stepped down portion behind the intermediate part, the lower portion extending substantially to the back of the housing.

The provision of a portion of maximum height at the front of the housing permits the use of a conventional door structure, identical to that used in other installations. This permits greater economy in making the structure due to the fact that a single mass produced item—the door—may be used regardless of whether the dishwasher is to be of the conventional full size or of the special shape provided by our invention.

The first stepped down portion, that is, the intermediate part of the dishwasher, is low enough to permit the structure to be inserted beneath a conventional kitchen sink. The third and lowest step is to permit the use of the conventional drain plumbing equipment extending from the sink. By use of this stepped configuration, the dishwasher may be inserted beneath the conventionally provided kitchen sink at minimum expense for modification of the plumbing thereof. For instance, conventional plumbing fittings may be provided, either behind a wall or in a small adjacent cabinet. Also, a conventional full sized door may be used thereby permitting substantial economy.

The subject matter which we regard as our invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. Our invention, however, together with further objects and advantages thereof, may best be understood by reference to the following description taken in conjunction with the accompanying drawings.

In the drawings, FIGURE 1 is a side elevational view,

partly broken away and partly in cross section, of a dishwashing machine incorporating our invention and which is positioned beneath a kitchen sink; and

FIGURE 2 is a view in perspective of the machine of FIGURE 1, with the door thereof open to illustrate an important advantage obtained by our improved construction.

We have shown, referring to the figures of the drawings, a dishwasher generally indicated by the numeral 1 which is intended to be inserted beneath a sink 2 which is rigidly secured as best shown in FIGURE 2 in a countertop 2*a*. Conventionally, sink 2 is on the order of six inches deep and the countertop 2*a* is one and a half inches thick. The sink may be of the conventional type having a pair of faucets 3 and 4 controlling the flow of hot and cold water respectively through a spout 5 into the sink 2.

As shown in FIGURE 1, conduits 6 and 7 lead to the hot and cold water faucets respectively so that when the faucets are turned on in the usual way water of the selected temperature flows out of the spout 5. The two conduits 6 and 7 may extend back within the wall 8 of the room within which the sink is located, it being understood that such structures then generally extend to the source of water supply for the building. The hot water line 6 may include a branch 9 which extends, in the conventional manner (and therefore not shown), in liquid supply relationship to the dishwasher 1. Adjacent the back of the sink 2 is provided a drain opening 10 which is connected through a conduit 11 to a drain pipe 12 leading down in the conventional manner to a sewer or to a septic tank. In most conventional structures, a depth from the bottom of sink 2 of three or four inches is required in order to accommodate the conduit 11 leading to the drain pipe 12. It will be understood that the sink 2, together with the water and drain connections thereto, constitute a standard construction provided in many homes and very frequently built into countertop 2*a*. The countertop is frequently provided with a backsplasher portion 14 extending up against wall 8 as shown.

Beneath sink 2, and rigidly secured on the supporting surface or floor 15 by any suitable means (not shown) is the dishwasher 1 now to be described. The dishwasher includes a housing, or cabinet, generally indicated by the numeral 16; it has a back 17, side walls 18 and 19 and an upper wall 20, all of which are stationary. The upper wall 20 includes a front portion 21 which is of maximum height relative to the floor 15, an intermediate stepped down portion 22, and a second lower stepped down portion 23 which extends back to and joins with wall 17. The intermediate portion 22 is stepped down from portion 21 so as to fit beneath the sink 2. Similarly, the lower stepped down portion 23 accommodates the drain plumbing 11 from the sink so that all the normally provided sink components may be provided without interference from the top surface of the dishwasher.

In addition, the provision of a front top surface of maximum height, as shown, permits the use of a full sized door 24 which extends up high enough so that its handle portion 25 is conveniently located just below the countertop 13. The door 24 closes the front opening 26 of the dishwasher, and is hinged on a pin 27 carried by a projection 28 extending from a stationary front base portion 29. In the closed position the door is, as shown in FIGURE 1, upright in a substantially vertical position. In this position, because the door is provided with suitable gasketing such as that shown at 30, it fits against the other stationary parts forming the dishwasher opening 26 so as to complete an enclosure or chamber 31 within which the dishes are to be washed. If so desired, an intermediate portion 32 may be provided between top

portions 21 and 22 so as to provide an upper surface against which the gasket 30 effects a sealing closure.

With the construction as described, the door section 24 is grasped by handle 25 when it is to be opened and is pivoted downwardly about the pivot pin 27 until it is substantially horizontal as shown in FIGURE 2. In order to limit the downward movement of door 24 the door is secured to suitable members 33 (only one of which is shown) at each side thereof. Members 33 extend through slots 34, and any conventional and suitable stop members may be provided in connection with these members 33 and slots 34 so as to prevent movement of members 33 through the slots 34 farther than the position shown in FIGURE 2.

A lower rack 35 extends within chamber 31 substantially from the front to the back of the chamber. Rack 35 is arranged within the dishwashing chamber 31 so that, when door 24 is moved to its open position, the rack 35 may be moved forward outwardly to the position shown in FIGURE 2. This may be effected, as shown, by the provision of supports which, in the present embodiment, consist of front rollers 36 and a back roller 37 at each side of rack 35, the rollers on each side being adapted to lie on a horizontal ridge 38; such ridges are formed in both walls 18 and 19. When door 24 is in the open position of FIGURE 2, it includes a track portion 39 at each side which forms an extension of ridge 38 so that, with the door 24 in open position, the rack 35 may be rolled forward out of chamber 31 with the front rollers 36 passing from ridge 38 onto track 39.

Preferably, a suitable stop structure 40 is provided so as to limit the extent to which the rack 35 may be moved forward out of the chamber 31. The stop is provided so that, when rack 35 reaches it, the rack is to a great extent outside the chamber 31 and thus all parts thereof are readily accessible for loading dishes. It will be understood in this connection that all the various wire segments which may be included for dish retaining purposes in the rack 35 are not necessarily shown since the precise location of such wires does not form part of our invention. However, it will readily be apparent that wire segments may be suitably arranged for receiving relatively large dishes on either side of the back of rack 35, with a number of small wire fingers 41 forming a suitable arrangement for receiving small dishes. In this connection, the front of rack 35 also constitutes a suitable position for the placement of small dishes and for the positioning of a wire silverware basket 41*a*. Extending up at each side of the front of rack 35 is a support structure 42 in the form of an inverted U having side legs 43, and a flat nexus 44 which, preferably, is connected to legs 43 by short downwardly extending parts 45.

As an important feature of our invention we provide an upper rack, generally indicated by the numeral 46, which is supported on the lower rack beneath the intermediate stepped down top portion 22. This support is effected by the provision of members each shaped as a U having a wide straight bottom portion 47 with short upwardly extending legs 48 slanting inwardly; this structure is joined to the remainder of the rack 46 by any suitable means such as, for instance, horizontally extending wire portions 49. The width of each portion 47 is such that it fits snugly between the two portions 45 on a side of the lower rack; thus, each portion 47 is supported on a horizontally extending nexus 44.

The upper rack is formed to receive additional articles to be washed, which may, for instance, include small dishes, cups, and the glasses shown in broken outline in FIGURE 1. To facilitate the handling of rack 46, it is provided with upwardly extending handles 50 at each side. When rack 35 is moved outwardly to the position shown in FIGURE 2, the rack 46 is carried forward with it so as to be entirely out from beneath portion 22. It is then a simple matter to lift the upper rack 46 up off the lower rack 35 simply by grasping the two handles 50.

As an important part of our inventive concept, we proportion the door 24 to the racks so that, even when the lower rack 35 is moved out to the position shown in FIGURE 2 so that all parts thereof are readily accessible for insertion and removal of dishes, there is still a substantial space left at the outer end of the door 24. We utilize this space for the placement of upper rack 46 as shown in FIGURE 2. Thus, the door constitutes a convenient place for the depositing of the upper rack for loading and unloading thereof. In this connection the door is preferably provided with grooves, or recesses, 51 extending along each side to the end of the door. When the top rack is laid down on the door as shown, the wire portions 47 fit within the recesses 51 so that the top rack is firmly positioned and may not readily be bumped off the door. With the top rack thus positioned on the door, it is then a simple matter to load it or unload it, then place the top rack in position on the parts 44 of rack 35, and then slide the rack 35 back into the dishwasher chamber 31 so that both racks are returned to the position shown in FIGURE 1.

As an example of the proportions which we provided in one practical embodiment of our invention, the countertop 13 is at the standard height of thirty-six inches and the door of the dishwasher has a height, or length, of twenty-three and three-eighths inches, from the bottom of the door up to the portion 21 of top surface 20. The first stepped down, or intermediate, portion 22 of top surface 20 is at a depth of six and one-fourth inches from the top of the counter, while the second or lower stepped down portion 23 is at a depth of ten and one-half inches. The distance from the front of the dishwasher chamber to the back thereof (with door 24 closed) approximates twenty-three inches. The rack 35 occupies twenty-two and one-half of these inches and the rack 46 occupies nine of these inches directly below portion 22 which is nine and one-half inches from front to back. When the lower rack 35 is moved out with the door in open position, it extends out fourteen inches onto the door, leaving the last nine and three-eighths inches for the upper rack 46.

Thus, with this relationship of the different parts, there is ample room on the door for both racks to be positioned with both being fully accessible for loading and unloading. Also, with this relationship of the parts the upper rack may be provided despite the fact that the dimensions of our dishwasher chamber are strictly limited by the assumed presence of an existing sink and drain structure.

Briefly completing the description of dishwasher 1, it may incorporate any suitable washing means such as a rotatable water ejecting member 52, together with a rotatable telescoping spraying member 53, the two members both being fed from a combination pumping and motor structure 54. The exact structure of the depicted members is fully described and illustrated in application S.N. 107,987, filed May 5, 1961, now Patent No. 3,077,200, by Lauren W. Guth, and assigned to General Electric Company, assignee of the present invention. Once water is introduced into the machine by the water introducing means (not shown) connected to conduit 9, it is taken in by the pump motor structure through suitable inlets 55, and is then ejected upwardly against the dishes with considerable force by the two water ejecting members so as to clean the dishes. This water then falls back down, and because of the sloping nature of the bottom 56 of chamber 31, flows back to the inlet 55 of the pump motor assembly 54 so as to be recirculated. The pump motor structure 54 may conventionally be of the type which, when rotated in one direction, provides the aforementioned cleaning and recirculation action, and when rotated in the opposite direction passes the water out to drain (not shown). For drying the dishes after they have been cleansed, a suitable electric heating element 57 may be provided, with the intent being that element 57 be ener-

gized at the end of the washing operation, and also during the washing operation if so desired to assist in heating water. It will be understood that the water introducing mechanism (not shown), the motor **58** of the pump motor assembly **54**, and the heating element **57** are caused to operate by a suitable sequence control mechanism (not shown) which may be located in any normally convenient place, such as for instance within the door **24**.

The sequence control mechanism controls the components so as to provide, in sequence, introduction of water, ejection of water through the members **52** and **53** into the chamber **31** for a period of time, and draining of the water to provide a first rinse; this is followed by as many rinses as desired, a washing operation, and then further rinses. The operation is terminated by a heating step in which element **57** is energized in order to dry the dishes. It will be understood that the initiation of the cycle may be provided by a suitable manually controlled member **59** which is normally connected to the sequence control mechanism and extends from the front of the machine so as to be readily accessible. Through the member **59**, the sequence control mechanism may be preset to any desired position in which a sequence of operation is initiated, with the remainder of the cycle then proceeding automatically and the sequence control mechanism turning off the machine at the end of the operation.

It will be seen from the foregoing that, by our invention, we provide a structure which, through its stepped top housing configuration, may readily be inserted for use beneath a sink or similar structure in a kitchen so as to utilize the space therebeneath to maximum advantage. It will further be seen that we provide a cooperative relationship between the lower rack, the upper rack, and the bottom hinged door of our machine which provides substantial and important advantages in the use of the structure and in making maximum use of the space available.

While we have shown and described a particular embodiment of our invention, we do not desire the invention to be limited to the precise construction disclosed, and we intend by the appended claims to cover all modifications which fall within the true spirit and scope of our invention.

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

1. For use beneath a kitchen structure such as a sink, a dishwasher comprising: a housing having a dish chamber therein and an access opening formed at the front thereof, said housing having a top surface formed with a portion of maximum height at the front thereof adjacent said opening, an intermediate stepped-down generally flat portion behind said front portion, and a lower stepped-down generally flat portion behind said intermediate portion, said lower portion extending substantially to the back of said housing; and a door pivotally connected adjacent its lower edge to said housing for movement between a generally vertical closed position wherein it closes said opening beneath said portion of maximum height of said top surface and a generally horizontal open position.

2. The apparatus defined in claim 1 wherein a bottom rack is positioned within said chamber extending substantially from the front to the back thereof, and a top rack is positioned above said bottom rack, said top rack being formed to extend only beneath said intermediate portion of the top surface of the housing.

3. The apparatus defined in claim 2 wherein said bottom rack is mounted for sliding movement out onto said door when said door is in its open position, and said top rack is supported on said bottom rack to be carried therewith.

4. The apparatus defined in claim 2 wherein said bottom rack is mounted for sliding movement out onto said door when said door is in its open position, and said top rack is removable, said door being proportioned to said racks so that when said bottom rack is substantially out on said door and is fully accessible to an operator a sufficient length of said door remains to the top edge thereof to receive said top rack.

5. For use beneath a kitchen structure such as a sink, a dishwasher comprising: a housing having a dish chamber therein and an access opening formed at the front thereof, said housing having a top surface formed with a first higher portion at the front thereof and a lower stepped down portion at the back thereof, said lower portion extending substantially to the back of said housing; a door pivotally connected adjacent its lower edge to said housing for movement between a generally vertical closed position wherein it closes said opening and a generally horizontal open position; a bottom rack having supports on each side thereof, said dish chamber having substantially horizontal tracks formed at each side thereof in supporting relation to said supports, said supports being formed to move on said tracks thereby to permit motion of said bottom rack along said tracks, said door forming an extension of said tracks when in its horizontal open position whereby said bottom rack may move out partly onto said door; and a top rack supported on said bottom rack beneath said higher portion of said housing; said door being proportioned to said bottom and top racks so that, when said bottom rack is substantially out on said door and is fully accessible to an operator, a sufficient length of said door remains to the top edge thereof to receive said top rack.

6. The apparatus defined in claim 5 wherein said door has recesses formed therein to receive the base of said top rack thereby to provide a stabilizing effect for said top rack.

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