May 7, 1935. C. M. SNYDER ET AL 2,000,720

IMPELLER

Filed Dec. 5, 1933

Fig. 1.

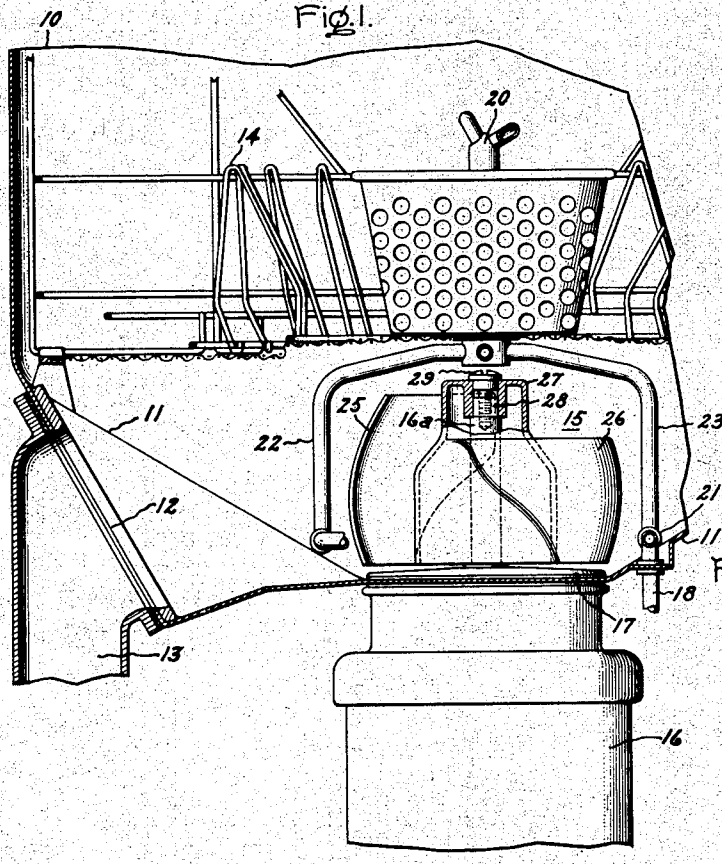


Fig. 2.

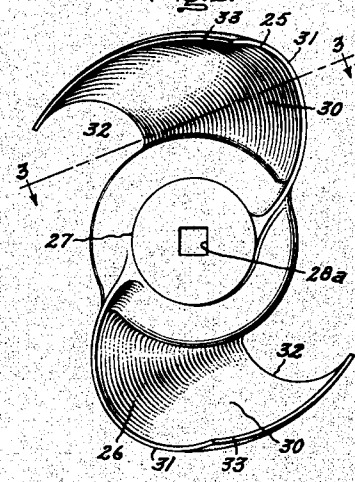


Fig. 3.

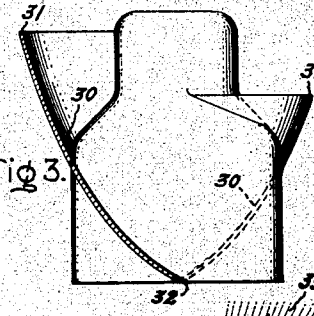


Fig. 4.

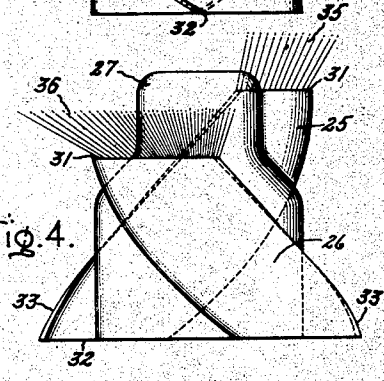


Fig. 5.

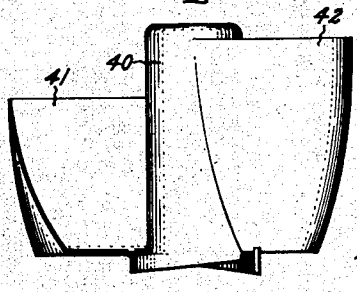
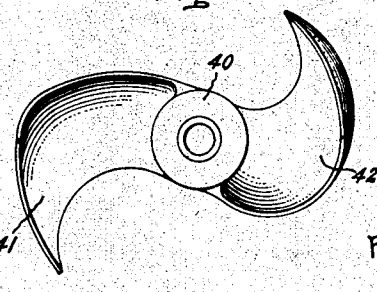


Fig. 6.



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UNITED STATES PATENT OFFICE

2,000,720

IMPELLER

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Application December 5, 1933, Serial No. 700,944

3 Claims. (Cl. 299—63)

This invention relates to impellers, more particularly to rotary fluid circulating impellers for mechanical dishwashing machines and the like, and it has for its object the provision of an improved device of this character.

In a well-known type of dishwasher, the dishes and other utensils to be washed are supported in suitable open-work trays or baskets supported in a washing vat above an impeller arranged to rotate in the lower portion of the vat. This impeller is arranged when circulated to engage a relatively small quantity of washing fluid in the lower portion of the vat so as to hurl it upwardly and circumferentially through the dish-supporting racks with sufficient force to thoroughly cleanse the dishes and utensils placed within the racks.

The impellers heretofore used in certain dishwashing machines of this character have been provided with a plurality of blades, usually two, having the same size and shape and arranged symmetrically on the impeller. It has been the practice where two blades are used to position the blades on opposite sides of the impeller in diametrically opposed relation.

It will be apparent that blades having the same size and shape and arranged symmetrically on the impeller will sweep through identically the same fluid paths, and each blade, therefore, will project the water upwardly and circumferentially through the dish racks in the same paths or trajectories, that is, each blade will cause the water to cover substantially the same rack area as does the other blade.

This invention contemplates the provision of an improved impeller provided with blades having in general the same shape and adapted generally to perform the same function, but arranged to impel the water upwardly and circumferentially through different trajectories or paths so as to spread the water over a much wider rack area than has been possible heretofore.

For a more complete understanding of this invention, reference should be had to the accompanying drawing in which Fig. 1 is a fragmentary vertical elevation, mainly in section, of a dishwashing machine provided with a fluid circulating impeller arranged in accordance with this invention; Fig. 2 is a plan view of the impeller used in the dishwashing machine of Fig. 1, taken on an enlarged scale; Fig. 3 is a sectional view taken through the line 3—3 of Fig. 2; Fig. 4 is a vertical elevation of the impeller shown in Figs. 2 and 3; Fig. 5 is an elevation of a fluid circulating impeller of modified form arranged in accordance with this invention; and Fig. 6 is a plan view of the impeller shown in Fig. 5.

Referring more particularly to Figs. 1–4 inclusive, this invention has been shown as applied to a dishwashing machine comprising an upright washing chamber or vat 10. The vat is provided with a bottom wall 11 tapering downwardly toward the central vertical axis of the vat. A drain opening 12 is provided in this bottom wall. The opening 12 communicates with a drain conduit 13. It will be understood that the drainage of fluid from the vat 10 will be controlled by means of a suitable drain valve (not shown).

Suitable removable open-work dish supporting trays or racks are provided in the lower and upper portions of the vat 10; only the lower rack 14 is shown. This lower rack and also the upper rack which cooperates with it preferably will be of the construction described and claimed in the copending application of Forrest A. Walker, Serial No. 621,042, filed July 6, 1932, and assigned to the same assignee as this invention.

In the lower portion of the vat below the lower rack is a rotary fluid circulating impeller 15 arranged to rotate on an axis substantially coaxial with the central vertical axis of the vat. The impeller is operated by means of an electric motor 16 mounted below the bottom wall of the vat and having its shaft 16a extending up into the vat through a suitable bushing 17.

The impeller 15 is arranged to engage fluid that is supplied to and allowed to accumulate in the lower portion of said vat so as to hurl it upwardly and circumferentially through the open-work racks supported above the impeller.

A suitable cleansing fluid, such as hot water, is supplied to the vat by means of a supply conduit 18 which communicates with the vat through a reaction nozzle device 20. As shown, the supply conduit 18 communicates with a ring-shaped conduit 21 resting on the bottom wall of the vat. This conduit in turn is connected with the nozzle device 20 by means of a pair of upright conduits 22 and 23 positioned on opposite sides of the impeller. This specific means for introducing the cleansing fluid to the vat forms no part of this invention, but is the subject matter of the copending application of Jesse H. Clark, Serial No. 653,243, filed January 24, 1933, and assigned to the same assignee as this invention.

The impeller 15, as previously pointed out, is provided with a plurality of blades, preferably two, having in general the same construction and each arranged to hurl the washing fluid supplied to the vat upwardly and circumferentially

through the trays. As shown, the impeller 15 comprises two blades 25 and 26 mounted upon a hub 27. The motor shaft 16a is provided with a square-shaped projection 28 which is received in a square-shaped aperture 28a provided for it in the hub. The hub is thus keyed to rotate with the shaft. The impeller is secured to the shaft by means of a suitable screw 29.

Each of the blades 25 and 26 is provided with a front fluid engaging face 30 that is curved downwardly and forwardly from its upper edge 31 to its lower edge 32 in the direction of rotation of the impeller with gradually diminishing radii, as clearly shown in Fig. 3, it being understood that the impeller will be rotated in a counterclockwise direction, as viewed in Fig. 2. Moreover, each front face 30, as shown in Fig. 2, has a transverse curvature forwardly in the direction of rotation of the impeller from the hub 27 to the outer vertical edge 33 of the face, the curvature having gradually diminishing radii from the hub to the outer face, and the radii becoming gradually shorter from the upper edge 31 to the lower edge 32 of the impeller. The impeller is thus somewhat wider at the top than it is at the bottom.

The impeller blade 26 however is somewhat shorter than is the other blade 25. As shown in Fig. 4, the height of the blade 26 is approximately equal to three-quarters of that of the blade 25. Otherwise the blade 26 has substantially identically the same shape and form as has the corresponding lower portion of the blade 25.

In the operation of the machine, when a washing fluid has been supplied to and allowed to accumulate in the lower portion of the vat and the motor 16 has been energized to rotate the impeller, the blades 25 and 26 will engage the washing fluid to deflect it upwardly from the blades. The blades by virtue of their curvature from their lower to their upper edges gradually increase the vertical deflection given the fluid as it travels up the blades. The momentum imparted to the fluid as it travels up the blades is gradually increased and becomes a maximum at the top of the blades where it slides off of the blades. At this point the fluid has considerable upward and circumferential velocity so that its trajectory up through the racks assumes roughly a conical form. The blades of course are continuously picking up the washing fluid which gravitates to the bottom of the vat and continually impelling it upwardly in the manner previously described.

However in view of the fact that the blade 26 is somewhat shorter than the blade 25, but has the same shape and form as the corresponding lower part of the blade 25, the fluid which travels up the blade 26 will not be deflected upwardly in the vertical direction to the same extent that the fluid is deflected upwardly by the blade 25. In other words, the blade 26 will not function to deflect the fluid upwardly through as great an angle as does the blade 25.

The action of the two blades is clearly illustrated in Fig. 4. In this figure, it will be observed that the fluid stream 35 that issues from the top edge 31 of the blade 25 has more nearly a vertical trajectory than has the fluid stream 36 which issues from the top 31 of the shorter blade 26. The blade 25 therefore causes the fluid to travel upwardly and circumferentially through the vat within a second body of fluid which also moves upwardly and circumferentially through the vat from the blade 26. These two masses of fluid however are not distinct bodies, but overlap considerably and of course are more or less deflected by the dishes and utensils placed within the lower rack. The two masses however do cover a considerably greater rack area than would be possible if both blades were of the same shape and size, as has been the practice heretofore.

The fluid distribution may be changed by varying the relative heights of the blades 25 and 26, and also by varying somewhat the transverse curvatures of the blades.

For example, in Figs. 5 and 6 is shown a form of this invention where the shorter blade has a transverse curvature somewhat greater than has the taller blade. As shown in these figures, the impeller of this form of this invention comprises a hub 40 carrying two blades 41 and 42 arranged symmetrically on the hub. The blade 41, as shown, is somewhat shorter than the blade 42. These two blades have in general the same shape and formation as have the blades 25 and 26 of Figs. 1 to 4. In this case however the transverse radii of the short blade 41 are somewhat greater than the corresponding transverse radii of the blade 42. This curvature is clearly shown in the plan view of the impeller shown in Fig. 6. By reason of this arrangement the shorter blade 41 spreads the fluid over a wider path than does the corresponding shorter blade 26 of Figs. 1–4. The taller blade 42, as before, functions to hurl the fluid more directly upward in the vat.

The shorter blade 41 picks up a little more fluid than does the taller blade 42, but releases it more quickly, while the taller blade holds a slightly less amount of water for a somewhat greater period of time. This action tends to maintain a balanced load on the impeller.

As a matter of fact, in either form of the invention there is practically no increased vibration in a dishwashing machine when using the impellers arranged in accordance with this invention.

While we have shown particular embodiments of our invention, it will be understood of course that we do not wish to be limited thereto since many modifications may be made, and we therefore contemplate by the appended claims to cover any such modifications as 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. In a dishwashing machine provided with a vat and a dish-supporting rack within said vat, a rotary fluid circulating impeller adapted to be operated within said vat below said rack comprising a hub, a pair of blades on said hub, each having a fluid engaging face curving downwardly and forwardly from its upper to its lower edge in the direction of rotation of the impeller with gradually diminishing radii so that each blade when it engages washing fluid in said vat deflects said fluid upwardly within said vat, the blades gradually increasing the vertical deflection of said fluid as the fluid flows up the blades, the lower edges of said fluid engaging faces lying in substantially the same plane and the upper edge of the fluid engaging face of one of said blades being materially below the upper edge of the other so that fluid is deflected upwardly by said one blade through a smaller vertical angle than the fluid deflected by the other blade.

2. In a dishwashing machine provided with a vat and a dish-supporting rack within said vat,

a rotary fluid circulating impeller adapted to be operated within said vat below said rack comprising a hub and a pair of blades symmetrically positioned on said hub, each blade having a fluid engaging face curving downwardly and forwardly from its upper to its lower edge in the direction of rotation of said impeller with gradually diminishing radii and curving forwardly from said hub to its outer vertical edge in the direction of rotation of said impeller with gradually diminishing radii, the latter radii becoming gradually smaller from the upper to the lower edge of said blade, said upper and lower edges lying in parallel planes substantially perpendicular to the axis of rotation of said impeller and the plane containing the upper edge of one of said blades being materially higher than the corresponding plane of the other blade so as to deflect fluid upwardly through a vertical angle materially in excess of that of the fluid deflected by said other blade.

3. In a dishwashing machine, a fluid circulating impeller comprising a plurality of symmetrically positioned blades, each blade having a fluid engaging face curving downwardly and forwardly from its upper to its lower edge in the direction of rotation of said impeller with gradually diminishing radii, and each having a fluid engaging face curving forwardly in the direction of rotation of said impeller from a point adjacent the axis of rotation of said impeller to the outer vertical edge of said blade, the last-mentioned radii of curvature of one of said blades being somewhat greater than the corresponding radii of curvature of the other blade, the lower edges of said blades lying in a common plane substantially perpendicular to the axis of rotation of said impeller, and the upper edges of said blades lying in planes substantially perpendicular to said axis of rotation, the plane of the upper edge of said one blade having the greater radii of curvature being materially below the plane of the upper edge of said other blade.

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