Nov. 14, 1933. H. G. DAVIS 1,934,970

IMPELLER FOR DISHWASHING MACHINES AND THE LIKE

Filed April 9, 1932 2 Sheets-Sheet 1

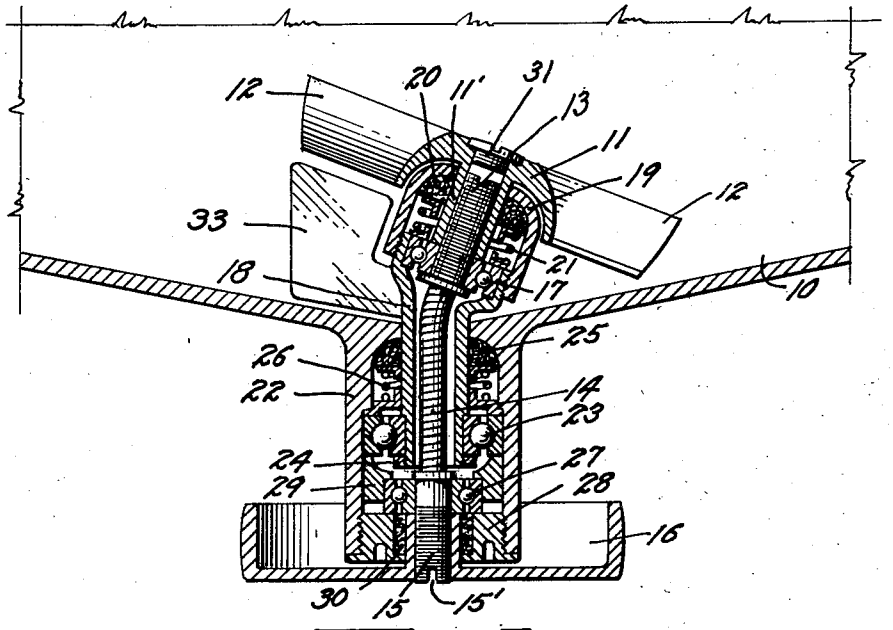


Fig 1

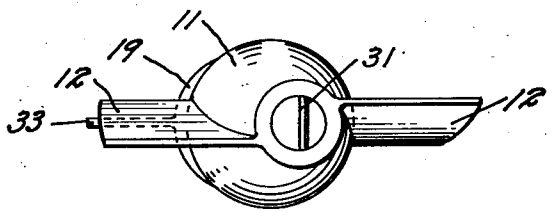


Fig 2

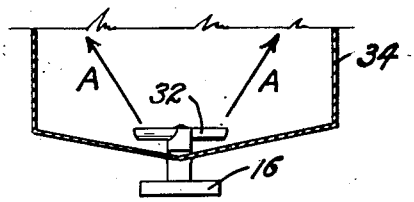


Fig 3

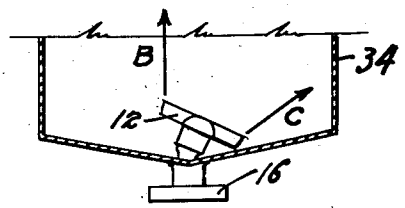


Fig 4

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IMPELLER FOR DISHWASHING MACHINES AND THE LIKE

Filed April 9, 1932 2 Sheets-Sheet 2

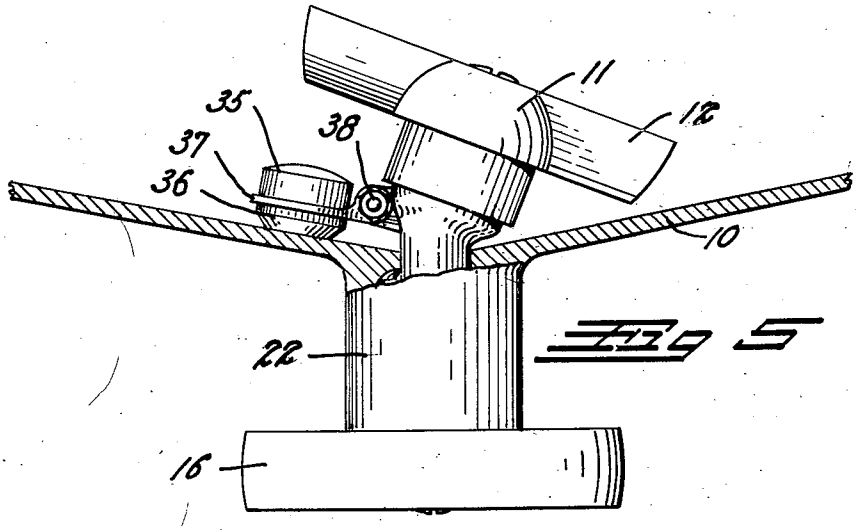


Fig 5

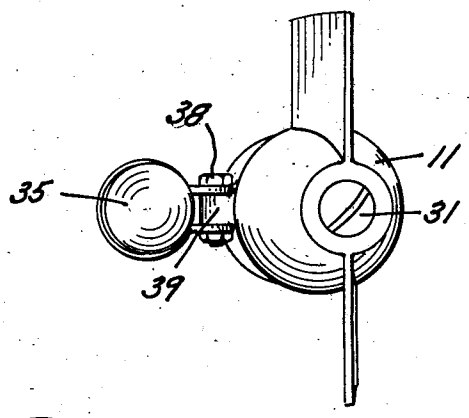


Fig 6

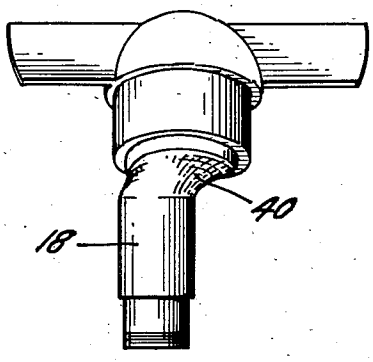


Fig 7

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1,934,970

UNITED STATES PATENT OFFICE

1,934,970

IMPELLER FOR DISHWASHING MACHINES AND THE LIKE

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Application April 9, 1932. Serial No. 604,233

8 Claims. (Cl. 259—102)

This invention relates to an impeller construction, and while more particularly designed for use in a dishwashing machine, it is of course not limited to this use, but will be found valuable wherever it is desired to have a gyrating impeller or propeller for liquids or gases.

The principal object of the invention is to provide an impeller mounting which will simultaneously rotate and gyrate the impeller.

In many dishwashing machines, impellers are mounted in the bottom of a tank or bowl to direct a flow of water upwardly through the dishes which ars usually racked above the impeller. The natural centrifugal action of an impeller, however, causes the ascending column of water to spread outwardly so that the water is impelled upwardly at a divergent angle. Owing to this natural tendency, it is difficult to cause the water to flow upwardly through the dishes with sufficient velocity to properly clean them.

Another object of the present invention is to so mount an impeller that the water at one side thereof will be propelled vertically so that it will pass effectively between the vertically racked dishes and to simultaneously gyrate or revolve the impeller in an orbit so that the vertically ascending column of water will be constantly moved to new positions.

A further object of the invention resides in the specific mounting of the impeller which prevents leakage of water from the bowl into the bearings and operating parts. A still further object is to provide a method for circulating the water in the bowl of a dishwashing machine which will result in efficient scouring and cleansing of the dishes therein.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention reference is had to the accompanying drawings which form a part hereof. Like numerals refer to like parts in all views of the drawings and throughout the description.

Fig. 1 is a vertical section through the bottom of the bowl of a typical dishwashing machine illustrating the internal construction of the improved impeller.

Fig. 2 is a plan view of the impeller.

Figs. 3 and 4 are diagrammatical views illustrating the action of the present and improved impellers respectively.

Fig. 5 is a side elevation of the impeller mounting illustrating an alternate form of gyration retarder.

Fig. 6 is a plan view of the impeller of Fig. 5.

Fig. 7 illustrates an alternate, offset mounting for the impeller.

A typical dishwashing bowl is illustrated in part at 10. The improved impeller is designed to be mounted in the lowermost part of the bowl 10, as illustrated. The impeller proper may be of any suitable design. As illustrated, it comprises an inverted bell or hub 11 from which a pair of curvated blades 12 oppositely project. The hub 11 is provided with a hub sleeve 11' which is threaded onto a flanged fitting 13, secured upon the extremity of a flexible power shaft 14. The other extremity of the flexible shaft 14 terminates in a similar fitting 15 which may be threaded into a pulley wheel 16. The hub sleeve rests upon ball-bearings 17 supported in a tubular shaft 18.

A cap 19 is threaded on the top of the tubular shaft 18 to enclose suitable packing 20. The packing 20 is constantly compressed by means of a first packing spring 21 which constantly urges the packing 20 into the top of the cap 19 and around the hub sleeve 11.

The tubular shaft 18 projects through the bottom of the tank 10 concentrically within a tank sleeve 22 and is mounted therein on ball-bearings 23. A nut 24 is threaded on the lower extremity of the shaft 18 to hold the race of the bearing 23 in place. Leakage is prevented around the tubular shaft 18 by means of suitable packing 25 which is constantly urged into the top of the sleeve 22 and against the tubular shaft 18 by means of a second packing spring 26.

The lower extremity of the flexible shaft 14 is journalled in a ball bearing 27 which surrounds the lower fitting 15 and is held in place by means of a sealing nut 28. A separating ring 29 supports the outer race of the bearing 23 from the outer race of the bearing 27. Suitable packing 30 is positioned in the nut 28 about the hub of the pulley 16.

It will be noted that the fittings 13 and 15 are provided with screw driver slots as indicated at 15' by means of which the fittings may be held stationary while the pulley 16 or the impeller 12 is unscrewed or screwed thereon. A cap screw 31 is threaded into the impeller hub 11 to seal the upper fitting 13 from dirt and moisture.

It will be noted that the entire supporting mechanism can be quickly disassembled by simply unscrewing the pulley 16 and the nut 28. This will allow the lower bearing structure to fall from the sleeve 22. The nut 24 can then be

loosened to release the upper bearing structure and allow the removal of the tubular sleeve 18.

It is desired to call particular attention to the fact that the impeller rotates in an inclined plane. To illustrate the reason for this, we will refer to Fig. 3, in which an ordinary impeller is indicated at 32 within a suitable tank 34. It will be noted that as the impeller 32 rotates it will impel the water upwardly and outwardly as indicated by the arrows "A". This divergent angle results from the centrifugal action of the whirling column of water. In a dishwasher the dishes are usually racked vertically above the impeller. This divergent current therefore can not effectively pass upwardly between the vertical dishes, and inefficient washing is the result.

In Fig. 4 the action of the improved impeller is indicated. It will be noted that this impeller also propels the water at divergent angles but, since the impeller is mounted at an angle substantially equal to the angle of divergency, the water at one side will be propelled directly upward as indicated by the arrow "B". The water at the other side will be propelled outwardly as indicated by the arrow "C". This vertical column of water passes effectively between the racked dishes and, as the impeller is gyrated around its orbit, the vertical column will be constantly moved to a new position so as to affect an efficient cleansing of the dishes.

The gyrating of the impeller about its orbit is a natural result of the rotation of the angularly positioned blades 12. It has been found that without additional mechanism, the impeller will slowly gyrate about its vertical axis in a direction opposite to its direction of rotation causing the tubular shaft 18 to rotate in the bearings 23. This gyration is probably due to the fact that the blade 12 at one side of the impeller is further from the vertical axis than the blade at the other side, and is also in water of greater pressure so that it exerts a torque upon the tubular shaft 18. To prevent too rapid a gyration, a vane 33 may be employed. This vane is mounted directly on the tubular shaft 18 and creates a resistance to the rotation of the latter. By varying the size of this vane any desired degree of rapidity of gyration may be obtained.

Another method of retarding the gyration of the impeller is illustrated in Figs. 5 and 6. In this form weight 35 acts to press a friction brake shoe 36 against the bottom of the tank 10. The weight and the shoe are carried in a hinged member 37. The member 37 is hinged upon a hinge pin 38 passing thru a lug 39 form on the tubular shaft.

It can be readily seen that the shoe 36 will rub against the tank bottom as the propeller gyrates so as to retard the rotation thereof. The retarding action can be predetermined by weight of the weight 35.

If a more rapid gyration is desired than can be obtained from the natural re-action of the impeller, this can be accomplished by simply forming the tubular shaft 18 so that the impeller axis will be slightly offset from the axis of the tubular shaft as shown at 40, Fig. 7, so that reactance of the impeller will have a lever action about the axis of the tubular shaft so as to cause the latter to rotate.

The impeller can be driven from any desired source of power. As illustrated, it would be driven from a suitable belt around the pulley 16.

While the invention has been particularly described as applied to an impeller in a dishwashing machine, it would also be useful in fluid tanks of any nature where constant and complete agitation is desired. It is also conceivable that it would be valuable for moving a column of air, in which case the impeller would be a fan of any of the usual types. It could be mounted either in the position illustrated or inverted so as to blow downwardly.

While a specific form of the improvement has been described and illustrated herein, it is desired to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:—

1. Means for mounting an impeller in the bottom of a liquid containing tank comprising: a fixed sleeve extending from said bottom; a rotatable tubular shaft bent laterally at its upper end extending through said bottom within said sleeve; bearings within said sleeve for said tubular shaft; a flexible shaft extending downwardly through said tubular shaft; a bearing for said flexible shaft within said tubular shaft, means for preventing leakage from said tank into said fixed sleeve; and an impeller mounted on the upper extremity of said flexible shaft.

2. Means for mounting an impeller in the bottom of a liquid containing tank comprising: a fixed sleeve extending downwardly from said bottom; a rotatable tubular shaft extending through said bottom within said sleeve; bearings within said sleeve for said tubular shaft; a flexible shaft extending downwardly through said tubular shaft; a bearing for said flexible shaft within said tubular shaft; and an impeller mounted on the upper extremity of said flexible shaft; the bearing for said flexible shaft being obliquely mounted with respect to the axis of said sleeve so that said impeller will rotate in an oblique plane.

3. Means for mounting an impeller in the bottom of a liquid containing tank comprising: a fixed sleeve extending downwardly from said bottom; a rotatable tubular shaft extending through said bottom within said sleeve; bearings within said sleeve for said tubular shaft; a flexible shaft extending downwardly through said tubular shaft; a bearing for one extremity of said flexible shaft within said tubular shaft; an impeller mounted on the upper extremity of said flexible shaft, the bearing for said flexible shaft being obliquely mounted with respect to the bearings for said tubular shaft so that said impeller will rotate in an oblique plane; a bearing in said sleeve for the other extremity of said flexible shaft, said latter bearing being parallelly mounted with respect to the bearings for said tubular shaft and means for rotating said flexible shaft.

4. An impeller mounting comprising: a rotatably mounted bearing member; an angularly bent, flexible power shaft supporter by said bearing member; an impeller carried by said power shaft so as to rotate in a plane at an angle to the plane of rotation of said bearing member; means for rotating said power shaft; said bearing member being free to rotate simultaneously with said power shaft; and brake means for retarding the rotation of said bearing member to a slower speed than said power shaft.

5. Means for mounting an impeller on the bottom of a tank comprising:—a rotatable bearing shaft passing through the bottom of said tank;

a first horizontal tubular bearing on the exterior of said tank for maintaining said bearing shaft vertical; a flexible shaft passing through said bearing shaft; a second horizontal bearing on the exterior of said tank for maintaining the lower extremity of said flexible shaft vertical within said bearing shaft; an inclined bearing in the upper extremity of said bearing shaft within said tank acting to bend the upper extremity of the flexible shaft at an angle to the lower extremity thereof; an impeller mounted within said tank on the angularly bent upper extremity of said flexible shaft so as to rotate in an inclined plane; and means adjacent the lower extremity of said flexible shaft for imparting rotation to the latter.

6. Means for mounting an impeller on the bottom of a tank comprising:—a rotatable bearing shaft passing through the bottom of said tank; a first horizontal tubular bearing on the exterior of said tank for maintaining said bearing shaft vertical; a flexible shaft passing through said bearing shaft; a second horizontal bearing on the exterior of said tank for maintaining the lower extremity of said flexible shaft vertical within said bearing shaft; an inclined bearing in the upper extremity of said bearing shaft within said tank acting to bend the upper extremity of the flexible shaft at an angle to the lower extremity thereof; an impeller mounted within said tank on the angularly bent upper extremity of said flexible shaft so as to rotate in an inclined plane; means on the exterior of said tank adjacent the lower extremity of said flexible shaft for imparting rotation to the latter; a first sealing means for sealing said tank about said bearing shaft; and a second sealing means for sealing said bearing shaft about said flexible shaft.

7. A method of circulating the water in the tank of a dishwashing machine comprising projecting an unconfined conical column of water outwardly and upwardly from a point in the bottom of said tank toward the surface of the water in said tank, said conical column being inclined so that the water on one side is rising substantially vertically; thence gyrating said conical column about a substantially vertical axis in said tank and allowing the water to return by gravity to said point for reprojection.

8. A method of circulating the water in the tank of a dishwashing machine comprising: projecting a flaring, ascending, conical column of water from the bottom of said tank, said conical column being inclined so that on its innermost portion the water is rising substantially vertically and on its outermost portion is moving substantially horizontally; thence swinging said column relatively slowly about a substantially vertical axis so that said vertically moving and horizontally moving portions successively assume new positions in said tank and allowing the water from said column to return by gravity to said bottom for reprojection.

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