April 14, 1959 R. PAULY 2,881,777

IMPELLER FOR DISHWASHING MACHINE

Filed Oct. 24, 1956

Fig. 1.

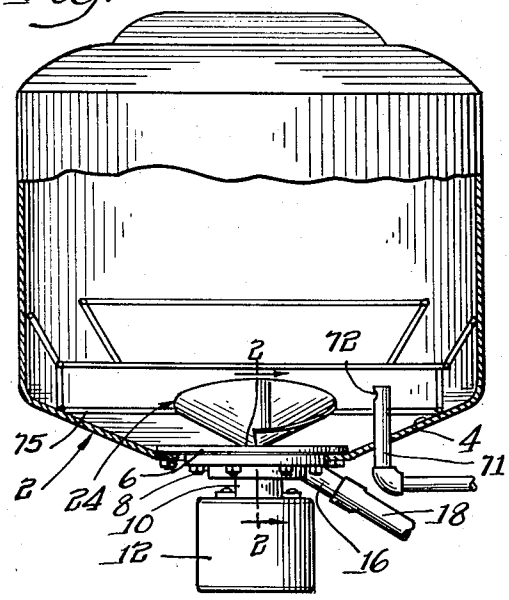


Fig. 3.

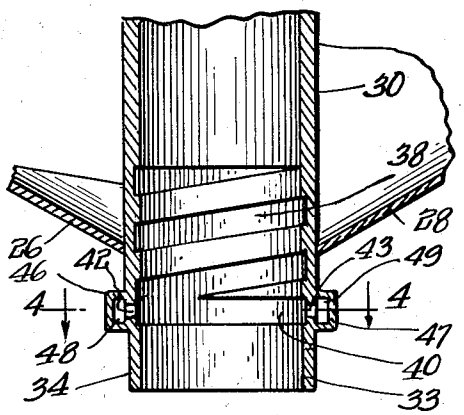


Fig. 4.

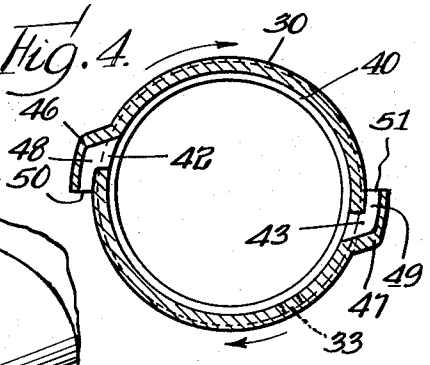
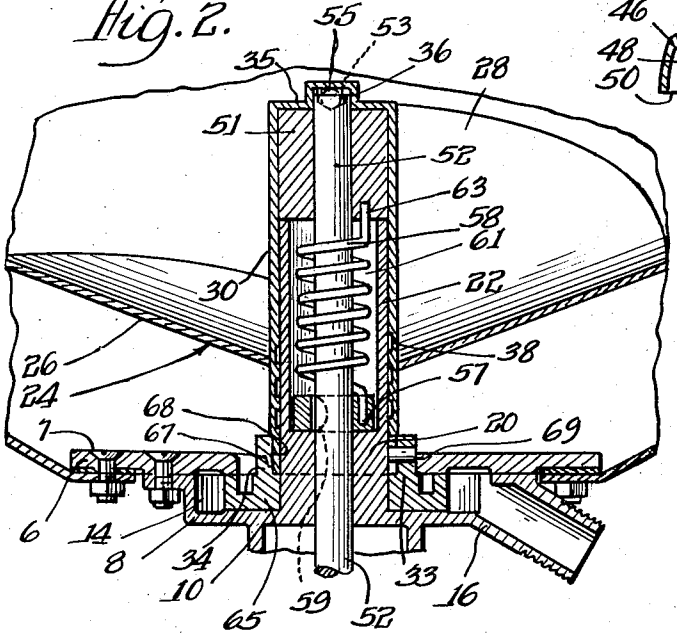


Fig. 2.



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IMPELLER FOR DISHWASHING MACHINE

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8 Claims. (Cl. 134—186)

This invention relates to dishwashing machines, and more particularly to an impeller apparatus for such machines.

In the type of dishwashing machine constructed for home use, a stationary tub is usually provided in which is supported a rack for holding dishes, silverware and the like. In most dishwashing machines of this type, an electric motor is mounted beneath the tub, the motor having a vertical shaft extending through an opening in the bottom of the tub. An open-top mounting boss extends upwardly around the latter opening and shaft and rotatably supported upon this boss is an impeller unit. The impeller unit usually includes two or more spiral blades arranged to impel water upwardly into the tub to perform the dish washing process. The impeller unit has a hollow hub which, in one form of impeller unit, telescopes over the mounting boss and is rotatably mounted thereupon. The impeller hub is closed at its top so as to form a cover for the open-top boss. Suitable means are provided for coupling the motor shaft and the impeller unit within the impeller hub. For obvious reasons, it is desirable to prevent water from leaking into the boss where the water may reach the motor shaft and the bearings thereof. Heretofore, this leakage often occurred by water seeping up between the impeller hub and the aforementioned boss and over the upper extremity of the boss.

It is accordingly one of the objects of the present invention to provide an impeller unit of the type generally described above which is so constructed that it prevents water which seeps between the impeller hub and mounting boss from reaching the upper extremity of the boss where it can reach the motor shaft. Another object of the invention is to provide an impeller unit having this feature wherein means are provided for impeling water leaking between the impeller hub and mounting boss downwardly away from the top of the boss, and a still further object of the invention is to provide means for drawing water from between the impeller hub and mounting boss at the bottom of the impeller hub. A still further object of the invention is to provide an impeller hub as just described which is of simple and inexpensive construction.

Where the impeller hub is of the type which fits over the mounting boss, the hollow hub is provided with an internal spiral groove which spirals in a direction opposite to the direction of spiral of the blades of the impeller unit. Any water which seeps into the space between the impeller hub and the mounting boss will enter the internal groove of the impeller hub and will be forced downwardly away from the top of the mounting boss due to the direction of spiral of the groove. In accordance with a further feature of the invention, means are provided for drawing water out of this spiral groove. In a preferred form of the invention, this means includes one or more hollow, peripheral extensions near the bottom of the impeller hub which extensions communicate with the bottom of the aforementioned spiral groove

through one or more lateral openings formed in the impeller hub. These hollow hub extensions have discharge openings facing in a circumferential direction opposite to the direction of rotation of the impeller unit and are preferably streamlined in shape to minimize water friction. As the impeller unit is rotated in the latter direction, regions of low pressure will be generated adjacent to the discharge openings of said hub extensions, and this will draw water out of the spiral groove within the impeller hub.

Other objects, advantages and features of the invention will become apparent upon making reference to the specification and claims to follow, and the drawings wherein:

Fig. 1 is a broken away elevational view of one type of home dishwashing machine incorporating the impeller unit of the present invention;

Fig. 2 is an enlarged vertical section through the bottom portion of the dishwashing machine shown in Fig. 1 and illustrates the construction of the impeller unit and cooperating elements of the machine;

Fig. 3 is a fragmentary enlarged vertical section through the hub of the impeller unit; and

Fig. 4 is a horizontal enlarged transverse section through the impeller hub of Fig. 3 taken along section line 4—4 thereof.

The washing machine shown in Fig. 1 is in general similar to the machine disclosed in U.S. Patent No. 1,939,630, granted December 12, 1933, to R. Pauly. This machine has been used for illustrative purposes only, it being understood that the present invention is applicable to many other types of dishwashing machines. The dishwashing machine shown in Fig. 1 has a tub **2** having a centrally, downwardly sloping bottom **4** which terminates at a central opening in which a plate **6** is secured by nuts and bolts **7**. Attached to the plate **6** is a pump housing **8** provided with a downward extension **10** which supports a motor **12**. The pump housing has a spiral channel **14**, the outlet end of which connects with an outlet **16**. A suitable water discharge conduit **18** is secured to the outlet **16** to carry water away from the tub in a manner fully explained in the aforementioned patent.

The pump housing **8**, which practically forms a closure for the bottom of the tub **2**, has an upwardly extending portion **20**, the upper portion **22** of which forms a hollow mounting boss for an impeller unit **24**.

The impeller unit **24** has a pair of blades **26** and **28** which respectively spiral in a direction such that upon clockwise rotation of the impeller unit viewed from the top thereof, water directed onto the top portions of these blades will be directed upwardly into the tub **2**. The blades are welded or otherwise secured to a generally hollow cylindrical hub **30**. The hub **30** is open at the bottom where the exterior of the hub is reduced slightly to form a neck portion **34**. A vertical slot **33** is formed in the bottom edge of the hub. The top of the hub is closed by a top wall **35** having a short cylindrical portion **36** which provides a small central recess within the hub interior. The hub interior is generally cylindrical in shape and has formed in the inner wall thereof a spiral groove **38** which spirals axially of the hub in a direction opposite to the direction of the spiral of the impeller blades **26** and **28**. The bottom of the spiral groove opens onto a cylindrical groove **40**. Lateral openings **42** and **43** are provided in the hub walls opposite the cylindrical groove **40**. Covering the lateral openings **42** and **43** are peripheral hood extensions **46** and **47** having a generally streamlined shape. The hood extensions **46** and **47** have passages **48—49** which join the lateral openings **42—43** respectively at one end. The passages **48** and **49** terminate in openings **50—51** respectively which face in the

same circumferential direction which direction is opposite to the direction in which the impeller unit is rotated, as shown most clearly in Fig. 4.

Secured within the upper end of the impeller hub **30** is a cylindrical member **51** having a central bore which receives the vertical shaft **52** of the motor **12**, the shaft passing upwardly through a bore in the base of the mounting boss **20**. The motor shaft extends into the reduced upper end of the impeller hub and the latter fits loosely over the motor shaft. The end of the shaft may be provided with a recess **53** having a ball bearing **55** therein which engages the top of the impeller hub to enable the hub to rotate freely upon the shaft.

Shaft **52** has a collar **57** secured thereto by a key **59**. A helical spring **58** surrounds the shaft **52** within the hollow extension **22** of the boss **20**, one end of the spring extending into a hole in the collar **57** and the other end of the spring extending into a hole in the cylindrical member **51** fixed to the impeller hub. Thus, rotation of the motor shaft **52** will produce rotation of the impeller hub through the yieldable connection of the helical spring **61**.

Within the pump housing is a rotatable member **65** having an upwardly extending collar **67** which fits around the base of the mounting boss. The collar **67** has an internal recess **68** in the upper portion thereof which provides a space between the base of the mounting boss and the collar **67** for receiving the reduced neck portion **34** of the impeller hub. The slot **33** in the neck portion of the impeller hub fits over a pin **69** carried by the collar **67** so as to rotatably connect the impeller hub with the collar **67**. The collar **67** forms part of the movable portion of the pump mechanism which draws water from the bottom of the tub **2** as the impeller unit is rotated.

A water inlet pipe **71** extends upwardly through the bottom of the tub **2** and has a nozzle opening **72** which directs water against the impeller blades **26** and **28** which impel the water upwardly into the tub **2**. A rack **75** is supported above the impeller unit and supports the various dishes, silverware, etc. to be washed. The rack is of an open mesh or wire construction so that water directed upwardly by the impeller unit will reach the dishes, silverware, etc. supported in the rack.

Some water in the bottom of the tub will gain entrance to the space between the mounting boss **22** and the impeller hub **30** following a path beginning at the interface between the neck portion **34** of the impeller hub and the pump collar **67** and extending upwardly between the mounting boss and impeller hub. As water reaches the spiral groove **38**, the rotation of the impeller hub in a clockwise direction together with the direction of spiral of the impeller hub spiral groove **38** will prevent the water from rising above the spiral groove **38** where it can gain entry into the interior of the mounting boss **20**.

Due to the hood extensions **46** and **47**, regions of reduced pressure are provided at the discharge openings **50** and **51** thereof. Since the passages **48—49** therein are connected to the spiral groove **38** through the cylindrical recess **40** within the impeller hub, any water reaching the space between the mounting boss and impeller hub will be sucked into the passages **48—49** of the hood extensions **46** and **47** and will be discharged through the discharge openings **50—51** thereof.

It should be understood that many different types of dishwashing machine constructions are adaptable for use with the impeller construction of the present invention. Furthermore, numerous variations may be made of the preferred form of impeller construction above described without departing from the spirit of the broader aspects of the invention.

It is claimed as new and desired to be protected by Letters Patent of the United States:

1. In a dishwashing machine having a chamber for washing dishes, means for supplying water to the chamber, an imperforate, hollow, open-ended boss in said chamber, a drive shaft extending into the inner end of said hollow boss, the latter forming a water-tight enclosure for the shaft except for the outer end thereof which is open, an impeller unit within said dishwashing chamber for impelling water in said chamber against the dishes therein, said impeller unit having a hub, said impeller hub and boss being in close mutual telescoping relation, the impeller unit covering the open outer end of said boss and being rotatable with respect to said boss, and means for inhibiting leakage of water into the outer end of said boss from between the boss and the impeller hub comprising a spiral groove formed on the surface of said impeller hub confronting said boss, said groove spiraling in a direction which will inhibit entry of water into said boss.

2. In a dishwashing machine having a chamber for washing dishes, means for supplying water to the chamber, an imperforate, hollow, open-ended boss in said chamber, a drive shaft extending into the inner end of said hollow boss, the latter forming a water-tight enclosure for the shaft except for the outer end thereof which is open, an impeller unit within said dishwashing chamber for impelling water in said chamber against the dishes therein, said impeller unit having a hub, said impeller hub and boss being in close mutual telescoping relation, the impeller unit covering the open outer end of said boss and being rotatable with respect to said boss, and means for inhibiting leakage of water into the outer end of said boss from between the boss and the impeller hub comprising a spiral groove formed on the surface of said impeller hub confronting said boss, said groove spiraling in a direction which will inhibit entry of water into said boss, and means mounted for movement with said hub for forming a low pressure region contiguous to the end of said spiral groove into which water in the dishwashing chamber initially enters the groove.

3. In a dishwashing machine having a chamber for washing dishes, means for supplying water to the chamber, an imperforate, hollow, open-ended boss in said chamber, a drive shaft extending into the inner end of said hollow boss, the latter forming a water-tight enclosure for the shaft except for the outer end thereof which is open, an impeller unit within said dishwashing chamber for impelling water in said chamber against the dishes therein, said impeller unit having a hub, said impeller hub and boss being in close mutual telescoping relation, the impeller covering the open outer end of said boss and being rotatable with respect to said boss, and means for inhibiting leakage of water into the outer end of said boss from between the boss and the impeller hub comprising a spiral groove formed on the surface of said impeller hub confronting said boss, said groove spiraling in a direction which will inhibit entry of water into said boss, and means mounted for movement with said hub for forming a low pressure region contiguous to the end of said spiral groove into which water in the dishwashing chamber initially enters the groove, said latter means comprising a hollow projecting portion on the outside of said hub which projecting portion has a discharge opening communicating with said end of said spiral groove and facing circumferentially away from the direction in which the impeller is to be rotated.

4. In a dishwashing machine having a chamber for washing dishes, means for supplying water to the chamber, an imperforate hollow open-ended boss extending from an outer wall of said chamber, a drive shaft extending into the inner end of said hollow boss, the latter forming a water-tight enclosure for the shaft except for the outer end thereof which is open, an impeller unit within said dishwashing chamber for impelling water in said chamber against the dishes therein, said impeller unit having a hollow hub which is closed at its outer end and open at its inner end, said hollow impeller hub closely telescoping over the outer open end of said boss and

rotatably mounted thereon, the closed outer end of said hub providing a water-tight cover over the open outer end of said boss, and means for inhibiting leakage of water into the outer end of said boss from between the boss and the surrounding impeller hub comprising a spiral groove formed on the inner surface of said impeller hub and located opposite said boss, said groove spiraling in a direction which will force water in the groove away from the outer end of said boss, said hub having an outlet passage connecting with the inner end of said groove, and means at said outlet passage for drawing out water from said spiral groove, said latter means comprising a projecting portion on the outside of said hub which projecting portion has a discharge opening communicating with said outlet passage and facing circumferentially away from the direction in which the impeller unit is to be rotated.

5. In a dishwashing machine having a chamber for washing dishes, means for supplying water to the chamber, the bottom wall of said chamber having a stationary, imperforate hollow cylindrical boss extending into said chamber, a drive shaft extending into the bottom end of said hollow boss, the latter forming a water-tight enclosure for the shaft except for the upper end thereof which is open, an impeller unit within said dishwashing chamber having upwardly spiraling blade means for impelling water upwardly in said chamber against the dishes therein, said impeller unit having an upstanding hollow cylindrical hub which is closed at its upper end and open at its bottom end, said hollow impeller hub closely telescoping over the top of said stationary boss and rotatably mounted thereon, the closed end of said impeller hub providing a water-tight cover over the open upper end of said boss, and means for inhibiting leakage of water over the outer or upper end of said boss from between the boss and the surrounding impeller hub comprising a spiral groove formed on the inner surface of said impeller hub opposite said boss, said groove spiraling upward in a direction opposite to the direction of spiral of said impeller blade means, and said impeller hub having an outlet passage connecting with the bottom end of said spiral groove.

6. A dishwasher impeller for impelling water against the dishes in the tub of a dishwashing machine, said impeller having a hub, said hub having a spiral groove which spirals axially of the hub in a direction such that water reaching the grooves will be impelled away therefrom when the impeller is rotated in a given direction, a hollow peripheral extension formed on the outside of said hub and communicating with the end of said spiral groove into which water tends to leak, said hollow extension having a discharge opening which faces circumferentially in a direction opposite to said direction in which the impeller is to be rotated to form a region of reduced pressure at said discharge opening as the impeller is rotated to create suction drawing water out of said spiral groove.

7. A dishwasher impeller for impelling water against the dishes in the tub of a dishwashing machine, said impeller having a hollow hub from which extend spiral impeller blade means for directing water outwardly against the dishes as the impeller is rotated in a given direction, said hollow hub having an internal spiral groove which spirals axially of the hub in the opposite direction to the spiral of said impeller blade means so that any water in said groove will be carried inwardly along the interior walls of the hub when the impeller is rotated in said given direction, said hollow hub having a water outlet passage communicating with the inner end of said internal spiral groove, a hollow external hood extension formed on said hub over said outlet passage and having a discharge opening communicating with said passage and which opening faces circumferentially in a direction opposite to said direction in which the impeller is to be rotated to form a region of reduced pressure at said discharge opening upon rotation of the impeller to create suction drawing water out of said internal spiral groove.

8. A dishwashing impeller for impelling water upwardly against the dishes in the tub of a dishwashing machine, said impeller having a hollow upstanding hub from which extend spiral impeller blade means for directing water generally upwardly against the dishes as the impeller is rotated in a given direction about an upstanding axis, said hollow hub having an internal spiral groove which spirals upwardly in the opposite direction to the spiral of said blade means so that any water in said groove will be carried down the interior walls of the hub when the impeller is rotated in said given direction, said hollow hub having a pair of water outlet passages near the bottom thereof and an internal groove in said hub interconnecting the bottoms of said spiral groove and said outlet passages, a hollow external hood extension formed on said hub over each of said outlet passages and each having a discharge opening communicating with the associated outlet passage and facing circumferentially in a direction opposite to said direction in which the impeller is to be rotated to form regions of reduced pressure at said discharge openings upon rotation of the impeller to create suction drawing water out of said hub.

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