Aug. 1, 1967 F. E. LA FLAME 3,333,742

DISHWASHER

Filed Dec. 2, 1965

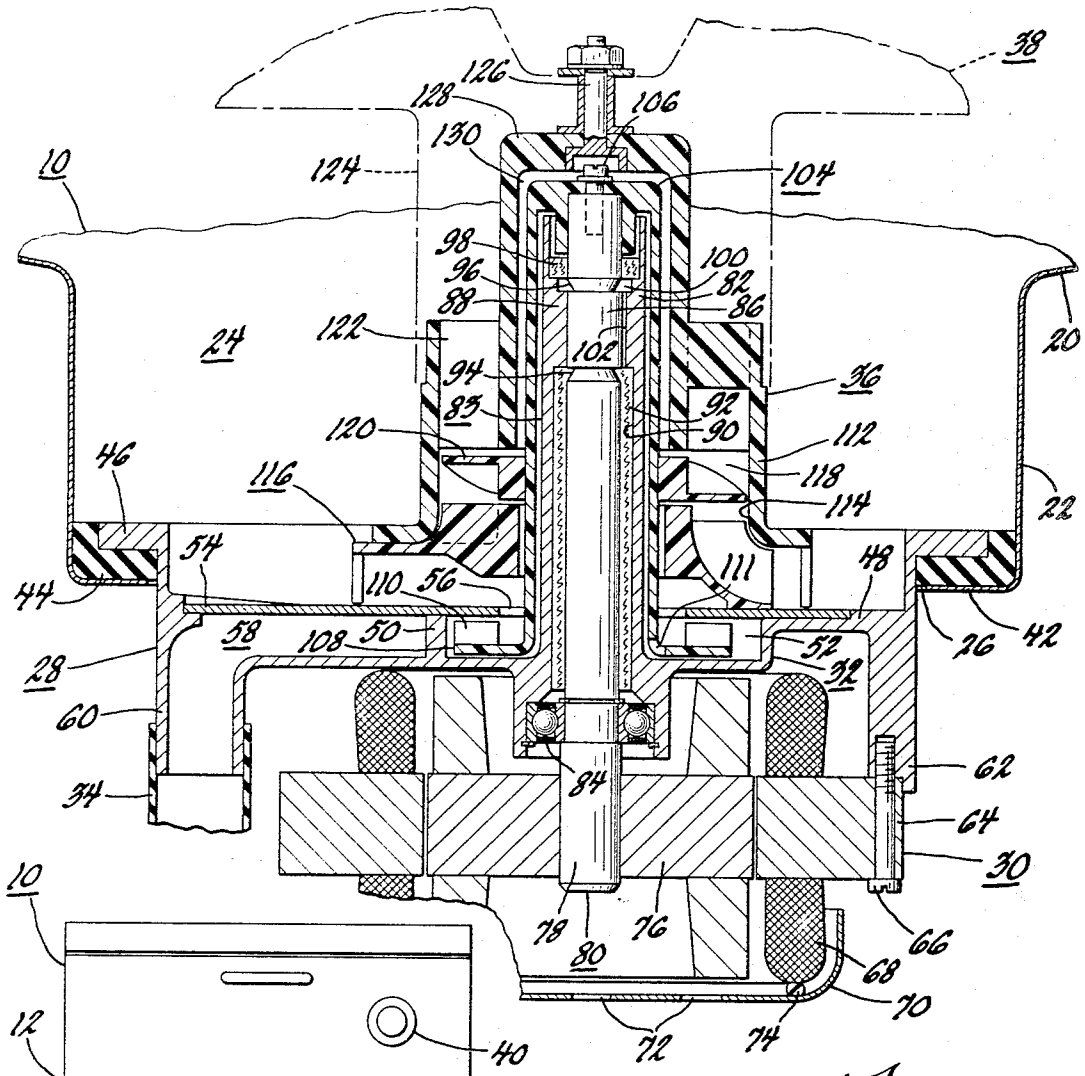


Fig. 2

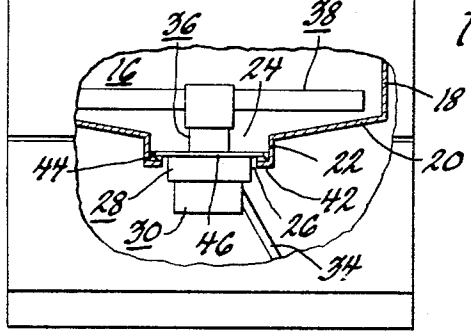


Fig. 1

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United States Patent Office 3,333,742 Patented Aug. 1, 1967

3,333,742

DISHWASHER

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Filed Dec. 2, 1965, Ser. No. 511,043
1 Claim. (Cl. 222—333)

ABSTRACT OF THE DISCLOSURE

In preferred form, a dishwasher pump assembly located in the lower sump of a washing compartment and including a drain pump and a primary circulation pump and wherein the pump impeller is secured to a shaft assembly including an inverted tubular fluid seal component that seals a shaft directed upwardly and interiorly of the sump.

This invention is directed to an improved dishwasher assembly and more particularly to an improved plural pump assembly for draining fluid from the washing compartment of a dishwasher and for distributing washing fluid through said washing compartment.

In many dishwasher assemblies a plural pump fluid distributing arrangement is included that is driven by a single motor to selectively drain fluid from the dishwasher and to distribute washing fluid in the washing compartment thereof for removing soil from articles supported in the washing compartment. In the past, rather elaborate motor mounting arrangements have been provided that are characterized by relatively expensive bearing arrangements for supporting the shaft of the single drive motor with respect to driven impellers in the plural pump assembly and elaborate seal arrangements to prevent fluid leakage along the shaft from within the washing compartment of the dishwasher.

An object of the present invention, therefore, is to improve dishwashing apparatus of the type including a washing compartment having a lower sump region in which drain pump means are provided to drain fluid from the dishwashing apparatus and fluid circulating pump means are provided to distribute washing fluid in cleaning contact with articles supported in the compartment by the provision of a low-cost, unitary bearing support that locates a single motor shaft in driving relationship with impellers in both the drain and primary wash circulation pumps while eliminating the need for a shaft seal assembly to prevent leakage of fluid from the washing compartment of the dishwasher.

A further object of the present invention is to improve dishwashing apparatus of the type including a washing compartment having a lower sump region with a bottom opening by the provision therein of closure means for sealing the bottom opening including a depending portion for supporting the stator of a motor exteriorly of the sump region and an upwardly directed open-ended tubular portion extending within the sump region and having the uppermost end thereof located without the sump region and wherein bearing means are provided within the tubular extension to serve as the sole means for rotatably supporting a rotor connected drive shaft of the motor in driving relationship with plural pump assemblies located within the sump region.

A still further object of the present invention is to provide dishwashing assemblies of the type set forth in the preceding object wherein said closure means includes means for forming a drain pump chamber having an inlet opening thereto surrounding said tubular extension and wherein a pump casing surrounds an upward portion of said tubular extension to form in cooperation therewith a primary washing fluid pumping chamber and wherein

a single coupling is provided for operatively connecting pump impellers in said drain pump chamber and said pump casing in driving relationship with the drive shaft of the single motor.

A further object of the present invention is to provide a dishwasher assembly of the type set forth in the preceding object wherein improved means are included within the tubular extension for lubricating the bearing means therein and for preventing the escape of lubricant interiorly of the sump region.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a view in elevation, partially broken away, of a dishwashing apparatus including the present invention; and

FIGURE 2 is an enlarged view in vertical section showing the improved motor mounting and sealing arrangement in the dishwasher of the present invention.

Referring now to FIGURE 1, a dishwasher **10** is illustrated having an outer casing **12** and a downwardly pivoting front door **14** that provides access into a washing compartment **16** formed by a water container **18** having a bottom wall **20** formed downwardly at **22** to form a sump region **24** in direct communication with the washing compartment **16**. The downwardly formed portion **22** of the bottom wall **20** has an opening **26** formed therein which is sealed by a closure member **28** on which is supported a drive motor **30** for operating a drain pump **32** that periodically withdraws fluid from the sump region **24** to be discharged through an exterior drain **34**. The motor **30** also is operatively associated with a primary wash fluid circulating pump assembly **36** located within the sump region **24** for discharging fluid from the sump region **24** through a fluid distributing system **38** into washing contact with articles supported within the washing compartment **16**. The motor **30** is a reversible electrical motor that is controlled selectively for reverse rotation by a dishwashing cycle controller **40**.

Referring more particularly to FIGURE 2, the downwardly formed portion **22** has a radially inwardly directed edge portion **42** thereof that supportingly receives an annular resilient sealing member **44** that sealingly supportingly receives an annular flange portion **46** of the closure member **28**. The closure member **28** further includes a bottom portion **48** extending across the full planar extent of the opening **26** in which is formed an integral wall member **50** that defines a drain pump chamber **52** in the bottom **48** of the closure **28** which is closed by a cover plate **54** having an opening **56** therein that serves as an inlet to the drain pumping chamber **52** from the sump region **24**. The bottom **48** is formed to have a passageway **58** therein that serves as the discharge from the drain pumping chamber **52** and a depending tubular portion **60** that communicates with passageway **58** and is connected to one end of the drain **43**. Details of the fluid communication between passageway **58** and the pumping chamber **52** are more specifically set forth in my copending application, Serial No. 341,209, filed Jan. 30, 1964, now Patent No. 3,265,311, issued Aug. 9, 1966.

The closure member **28** further includes depending portions **62**, one of which is illustrated, on which are secured a stator block **64** of the motor **30** by suitable means such as screws **66**. The stator block supports a stator coil **68** which has a dust shield **70** located on the bottom end thereof including openings **72** therein for circulation of cooling air across the coil **68**. The shield **70**

is held on the coil **68** by a ring **74** of a suitable adhesive material. The stator coil **68** is operatively associated with a rotor **76** of the motor **30** which is secured to a lower end **78** of a vertically disposed drive shaft **80** that is directed upwardly from the rotor **76** interiorly of an open-ended, elongated, upwardly extending tubular portion **82** of the closure member **28** forming the housing of a unitary bearing and seal unit **83** for the motor drive shaft **80**. The tubular portion **82** includes a lower open end located closely adjacent the bottom **48** of the closure **28** in which is supported a ball bearing assembly **84** for supporting the lower end **78** of the shaft **80** for rotation within the closure member **28** and against axial thrust of the rotor **76**. An upper portion **86** of the shaft **80** is rotatably supported by a bearing sleeve **88** formed integrally and interiorly of the upper end of the tubular portion **82**.

Between the bearings **84** and **88**, the tubular portion **82** of the closure member **28** is spaced from the outer periphery of the shaft **80** to form a space **90** therebetween in which is located a lubricant impregnated, porous member **92**. The porous lubricant containing member **92** serves as a reservoir for lubricant for the lower and upper bearings **84, 88**. The shaft **80** has an inwardly tapered portion **94** thereon immediately below the sleeve bearing **88** and a like inwardly tapered portion **96** located immediately above the bearing **88**. The tapered portion **96** cooperates with an annular felt oil bearing member **98** seated in the upper end of the tubular portion **82** to form a lubricant collecting chamber **100**. The lubricant collecting chamber **100** is communicated with the porous lubricated member **92** through a drain passageway **102** formed in the bearing **88**. By virtue of the illustrated arrangement, the lubricant contained in the porous member **92** continually lubricates the ball bearing assembly **84** and the surface of the sleeve bearing **88** and further slings any oil that tends to migrate to the upper end of the shaft **80** exteriorly of the shaft to collect in the chamber **100** to be returned through the passageway **102**. Accordingly, there is no oil leakage into the sump region **24** that might contaminate the washing chamber **16** of the dishwasher **10**.

The tubular portion **82** of the improved seal and bearing arrangement of the present invention isolates the bearings **84, 88** from water contained in the sump region **24** since the upper end thereof is located above the water level in sump region **24** during all phases of the dishwashing operation.

In the illustrated arrangement, an inverted elongated cup-shaped drive coupling member **104** has the base thereof secured by suitable means, shown as a screw **106**, to the upper end of the drive shaft **80** and is telescoped downwardly about the upwardly directed tubular portion **82** so that a radially outwardly directed flange **108** on the lowest end of member **104** is located within the drain pumping chamber **52**. The edge **108** carries a plurality of blades **110** that, upon rotation of the motor **30** in a predetermined direction, will draw fluid from the sump region **24** through the inlet opening **56** and thence discharge it through the drain passageway **58** into the drain conduit **34**. The coupling member **104** is located in close spaced relationship with the tubular portion **82** of the closure member **28** to maintain a compact arrangement that utilizes a minimum of space in the sump region **24** whereby fluid is relatively free to return from the washing compartment **16** into the sump region **24**, for example, to be drained therefrom by the drain pump **32**. An opening **111** in flange **108** by-passes the pressure side of impeller blades **110** to the suction side thereof to prevent fluid flow into member **104**.

A further characteristic of the improved motor shaft and seal assembly is that it is readily adapted for association with low-cost, high-capacity primary fluid circulation pumps, for example, of the axial flow type. Thus, in the illustrated arrangement, the pump **36** is seen to include a tubular outer casing **112** that has an opening **114** in its lower end in which is received a fluid diverter element **116** of the type more specifically set forth in my copending application, Ser. No. 341,209, now Patent No. 3,265,-311, issued Aug. 9, 1966, referred to hereinbefore. This diverter directs fluid from the sump region **24** into an interior pumping chamber **118** of the tubular casing **112** where an axial flow impeller **120** is located and secured to the outer surface of the coupling member **104** intermediate the ends thereof for rotation therewith. The rotating impeller **120** will displace fluid from pumping chamber **118** upwardly through flow straightening vanes **122** in the tubular casing **112** thence into the interior of a rotary spray bar **124** (shown in broken lines) that is secured for rotation with respect to the casing **112** by a stud element **126** with a head fit into an interior surface of a central hub **128** that extends upwardly from the upper end of the casing **112** in surrounding relationship with the coupling member **104**. The hub **128** is spaced from the coupling member **104** to form an opening **130** therebetween in communication with the pumping chamber **118**. The coupling member **104** serves as a seal against fluid passing from the pumping chamber **118** into the shaft bearing assembly.

The above-described dishwashing apparatus including the low-cost, compact, plural pump and single drive motor assembly therein is characterized by reliable operation with elimination of water leakage from the sump regions of dishwashing apparatus outwardly along a drive motor shaft. The apparatus is also characterized in part by a low-cost, easily accessible unitary bearing and seal assembly that eliminates the need for expensive rotary seal assemblies of the type previously found in dishwashing apparatus with such two-pump assemblies. Furthermore, the unit is characterized by an improved lubricant arrangement that is self-contained within the bearing support for the single drive motor which prevents the ingress of lubricant into the interior of the dishwasher. A further advantage is that the bearing mount and seal arrangement in the plural pump and single drive combination is arranged in an unusually compact fashion wherein it will not interfere with the fluid flow patterns in the dishwashing apparatus during both drain and wash cycles of operation.

Furthermore, the plural pump and its included bearing and seal arrangement makes use of a single closure member to form a drain pumping chamber, a support for the stator of a motor without requiring an end motor frame and a housing for a combined shaft bearing assembly and water seal assembly that is included in a single tubular portion on the same closure member.

A further feature of the invention is that the combination includes a single coupling member that includes plural impellers directly connected thereto for providing a low-cost coupling between the drive shaft of a motor and pump assemblies of the type under discussion.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

In a dishwasher assembly, the combination of, wall means forming a washing compartment including a sump region having a bottom opening, closure means for sealing said bottom opening including motor mounting means having a first portion supportingly received by said wall means, a second portion depending from said wall means and an upwardly directed tubular extension with a lower open end located closely adjacent said sump region and an upper open end located within said washing compartment above said sump region, a motor having a rotor and a stator, means for securing said stator to said depending portion of said closure means, a shaft having one end thereof connected to said rotor and directed interiorly of said tubular portion to locate the opposite end thereof at the upper open end of said tubular extension, thrust bearing means in said lower open end of said tubular

extension for supporting said shaft for rotation with respect to said tubular extension, second bearing means in said tubular extension below said upper open end thereof for rotatably supporting said other end of said shaft for rotation with respect to said tubular extension, means in said closure means for forming a drain pump chamber therein including means for forming an opening about said tubular extension communicating said drain pump chamber with said sump region, pump casing means surrounding said tubular portion above said drain pump chamber and within said sump region and forming a primary fluid pumping chamber, first impeller means located in said drain pump chamber, second impeller means located in said pump casing, an inverted tubular member telescoped over said tubular portion including an upper end portion connected to said other shaft end and a lower portion secured to said first impeller, said second impeller being secured to said inverted cup-shaped member intermediate the ends thereof within said primary pumping

chamber, means for communicating said primary pumping chamber with said sump region and with said washing compartment and means for communicating said drain pump chamber with an exterior drain, said inverted elongated cup-shaped member serving to direct power from said motor shaft to said first and second impellers and cooperating with said tubular extension of said closure member to prevent fluid leakage exteriorly of said sump region along said shaft.

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