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(54) **SINGLE DRIVE AXIS MOTOR FOR A DISHWASHER SPRAY SYSTEM**

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(57) **ABSTRACT**

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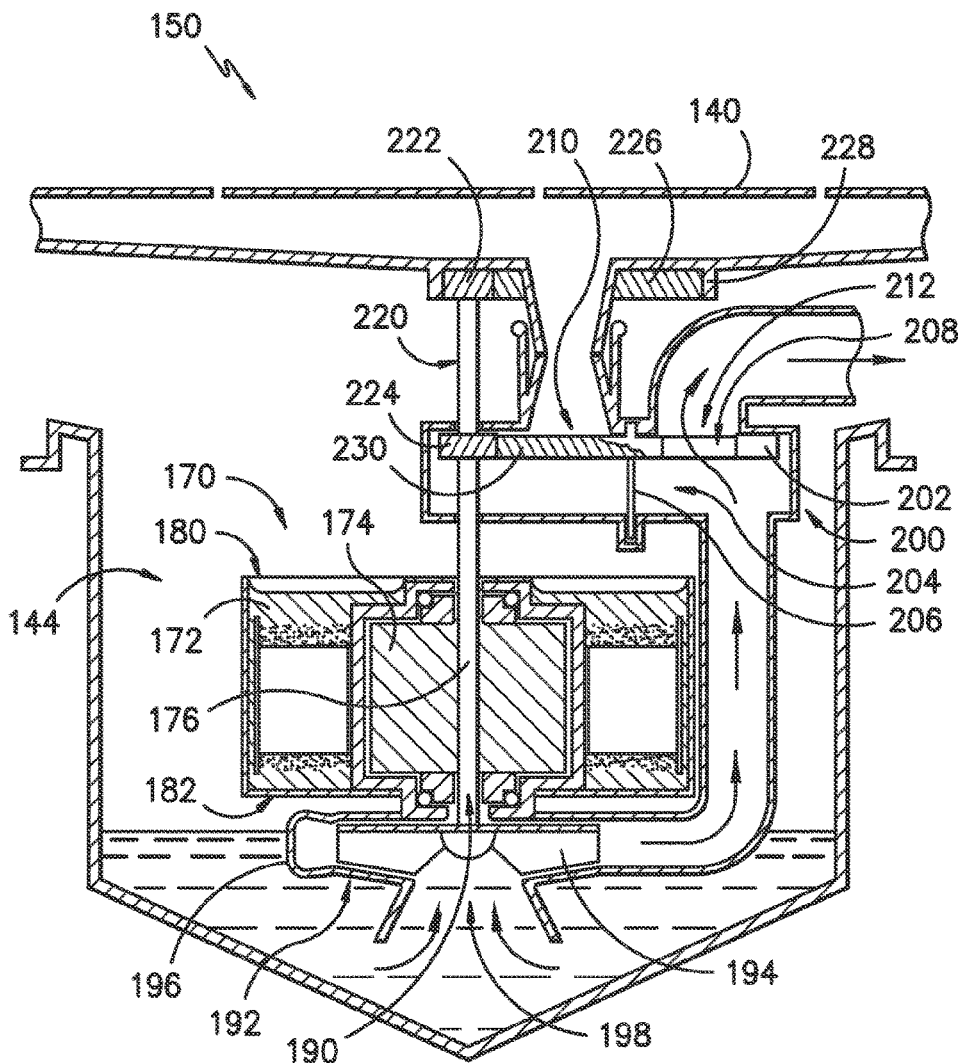
A dishwasher appliance is provided having a motor that has a drive shaft with a pump shaft extending from one side and a secondary shaft portion extending from the other. The pump shaft portion drives a pump impeller within a pump housing to circulate wash fluid. The secondary shaft portion has a spur gear that is configured to engage a secondary gear that is operably coupled to a secondary component within the dishwasher, such as a diverter valve or spray arm. The meshing of the spur gear with the secondary gear acts both as a speed reducer and the drive means for the secondary component. The motor is configured to rotate the pump shaft portion and secondary shaft portion such that the pump impeller rotates at a first speed and the secondary component rotates at a second speed.

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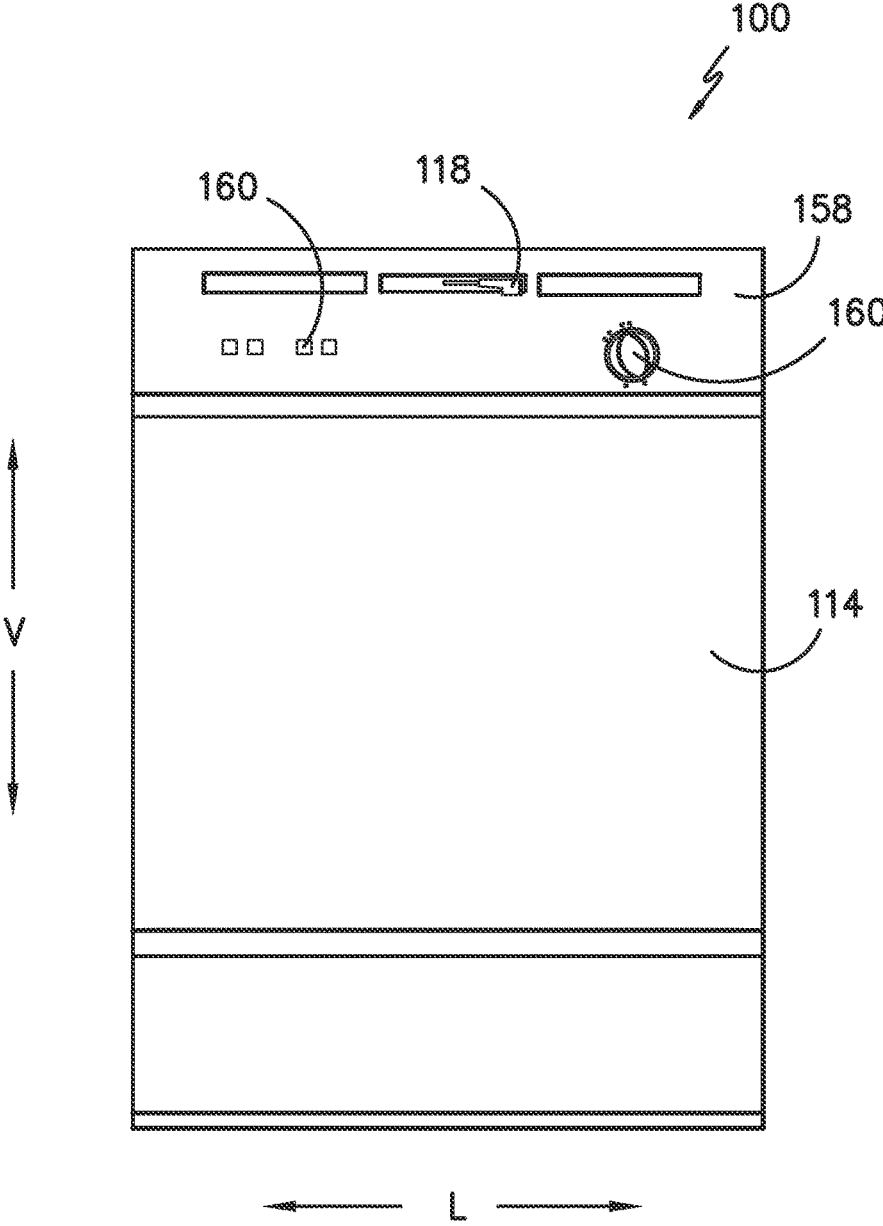


FIG. -1-

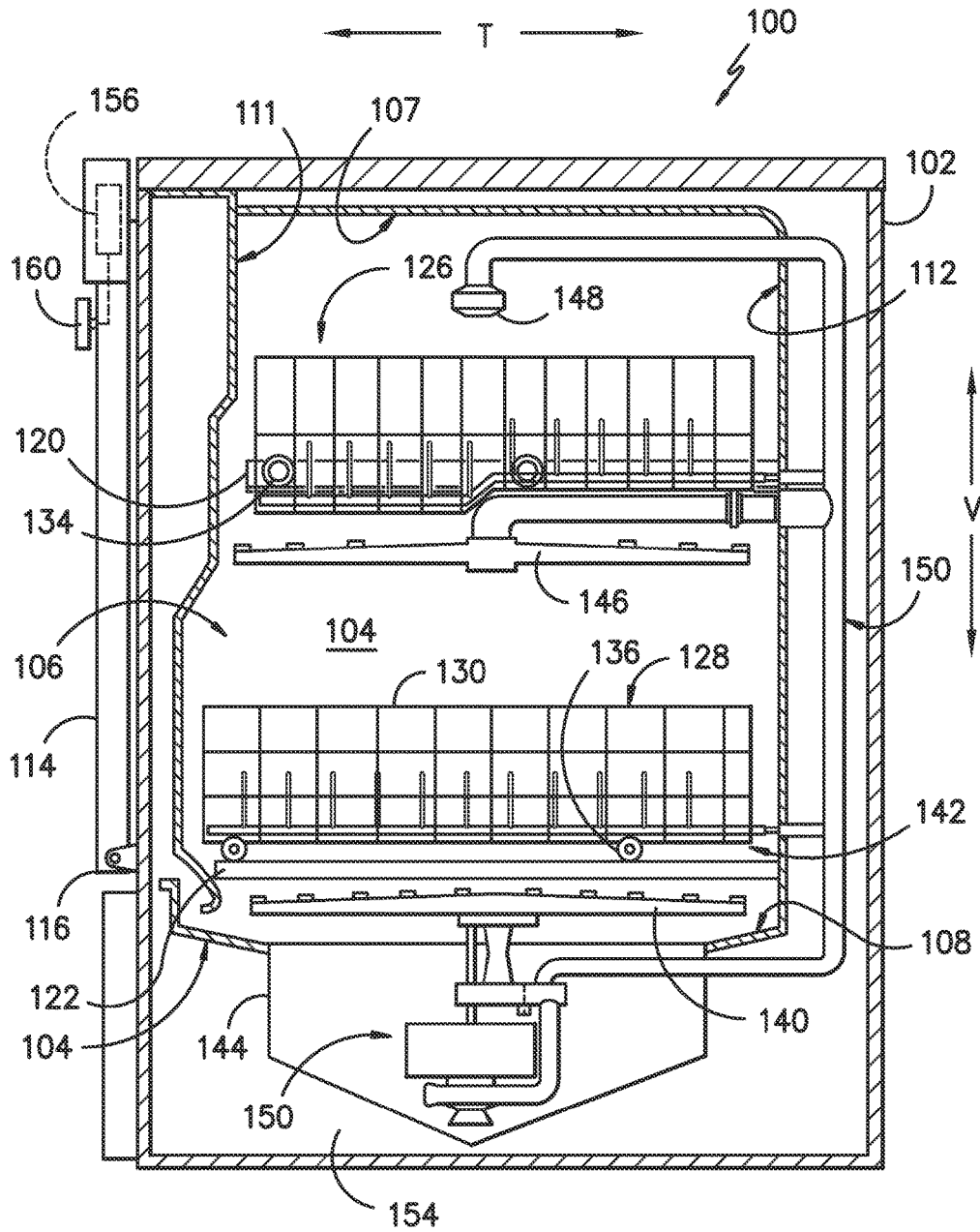


FIG. -2-

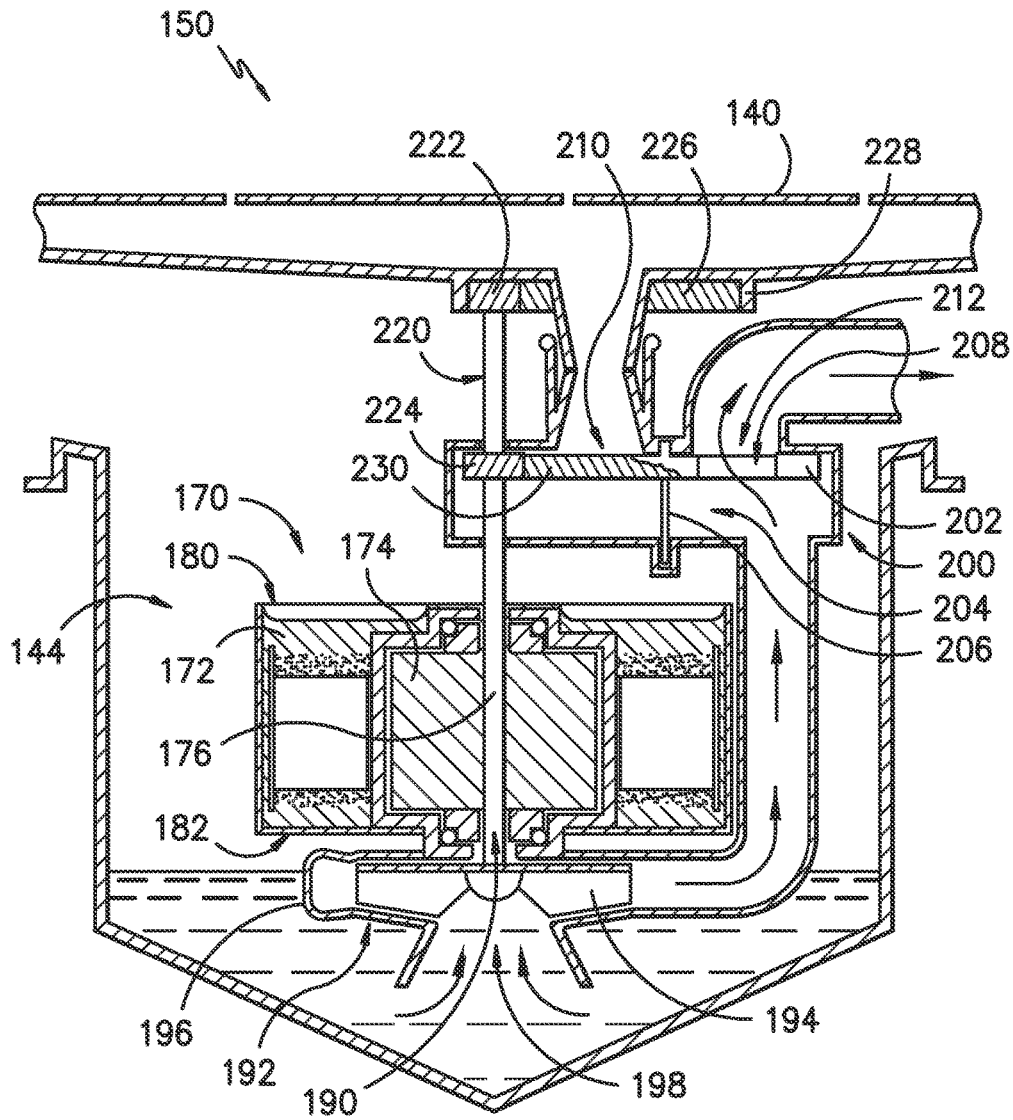


FIG. -3-

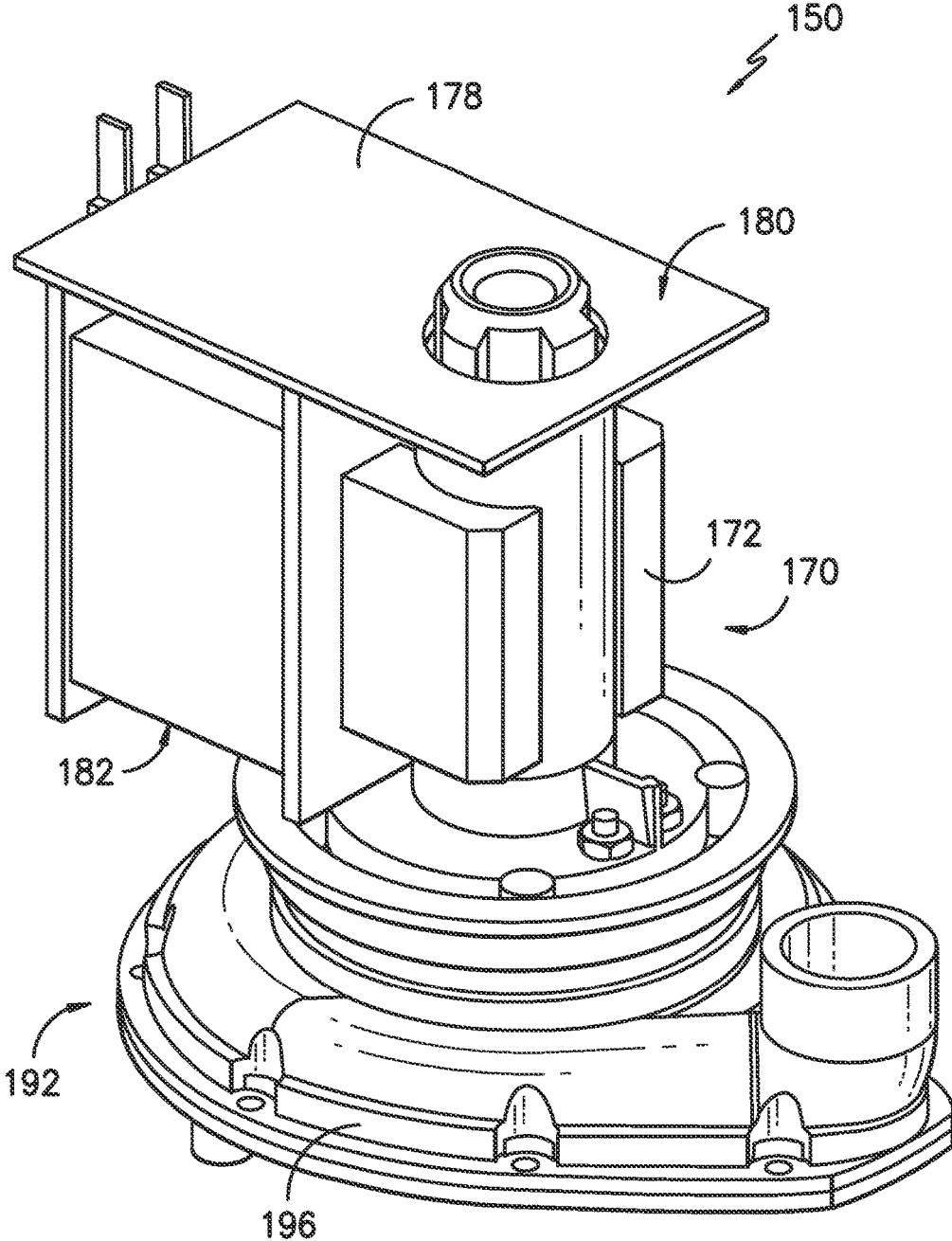


FIG. -4-

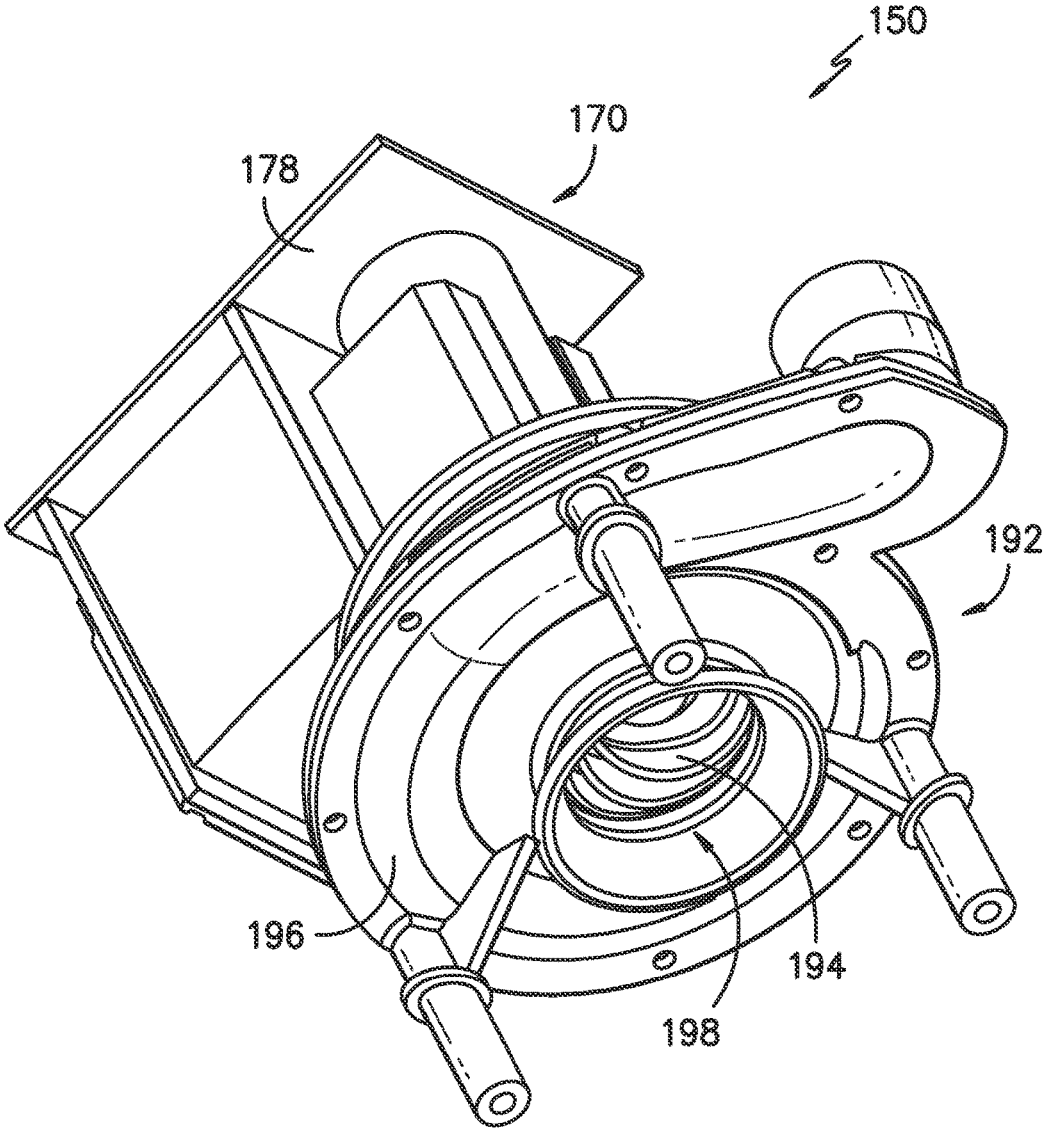


FIG. -5-

SINGLE DRIVE AXIS MOTOR FOR A DISHWASHER SPRAY SYSTEM

FIELD OF THE INVENTION

[0001] The present disclosure relates generally to dishwasher appliances, and more particularly to an improved fluid circulation assembly for dishwasher appliances.

BACKGROUND OF THE INVENTION

[0002] Dishwasher appliances generally include a tub that defines a wash chamber. Rack assemblies can be mounted within the wash chamber of the tub for receipt of articles for washing. Wash fluid (e.g., various combinations of water and detergent along with optional additives) may be introduced into the tub where it collects in a sump space at the bottom of the wash chamber. During wash and rinse cycles, a circulation pump may be used to pump wash fluid to spray assemblies within the wash chamber that can apply or direct wash fluid towards articles disposed within the rack assemblies in order to clean such articles.

[0003] Conventional circulation pumps are motor driven and positioned outside of the wash chamber in a horizontal orientation. Notably, this positioning requires that one or more seals be used to connect the pump inlet and outlet to the wash chamber, thereby increasing the likelihood of leaks. In addition, in order to ensure that there is a sufficient amount of water to keep the pump primed, a curved pump inlet is often used to collect water at the inlet. The curved inlets, however, cause higher hydraulic losses and set the inlet water into an undesirable rotation.

[0004] Placing the circulation pump and motor outside of the wash chamber also restricts the ability to use the motor for other purposes within the wash chamber. For example, dishwasher appliances typically use multiple spray assemblies. To save energy and water, a diverter valve is typically used to divert the flow from one spray assembly to another instead of powering the entire system simultaneously. In addition to a separate motor which drives the circulation pump, conventional dishwasher appliances having motor-driven diverters use a separate, external motor to drive the diverter valve.

[0005] In addition, conventional spray arms are driven by torque created by setting a combination of the spray jets at an angle. The “spray jet driven” spray arms however must usually rotate at a speed higher than what is optimal for wash performance in order to ensure that the arm does not stall, resulting in sub-optimal wash performance and coverage of the dishes. To solve this, some dishwasher appliances have motor driven spray arms. However, similar to the motor driven diverters, motor driven spray arms typically require a separate drive motor mounted outside the wash chamber. Notably, additional motors take up more space, add cost, and require additional seals, thus increasing the likelihood of leaks and decreasing appliance reliability.

[0006] Accordingly, dishwasher appliances having multiple motor driven components and simplified construction are desired in the art. In particular, a dishwasher construction that incorporates a motor driven diverter and/or a motor driven spray arm in a compact, leak-free construction without the cost and complexity of additional motors, would be particularly beneficial.

BRIEF DESCRIPTION OF THE INVENTION

[0007] The present subject matter provides a dishwasher appliance having a motor that has a drive shaft with a pump shaft portion extending from one side and a secondary shaft portion extending from the other. The pump shaft portion drives a pump impeller within a pump housing to circulate wash fluid. The secondary shaft portion has a spur gear that is configured to engage a secondary gear that is operably coupled to a secondary component within the dishwasher, such as a diverter valve or spray arm. The meshing of the spur gear with the secondary gear acts both as a speed reducer and the drive means for the secondary component. The motor is configured to rotate the pump shaft portion and secondary shaft portion such that the pump impeller rotates at a first speed and the secondary component rotates at a second speed. The dishwasher appliance therefore has multiple components driven by a single motor positioned vertically within the wash chamber. In this regard, costs are reduced, the likelihood of leaks is eliminated because no seals are required, and the dishwasher appliance may have a more compact sump space. Additional aspects and advantages of the invention will be set forth in part in the following description, may be apparent from the description, or may be learned through practice of the invention.

[0008] In accordance with one exemplary embodiment of the present disclosure, a fluid circulation assembly is provided. The fluid circulation assembly defines a vertical direction and includes a motor having a top side and a bottom side. The motor includes a rotatable drive shaft that includes a pump shaft portion extending out of the bottom side and a spray arm shaft portion extending out of the top side. The fluid circulation assembly also includes a spur gear disposed on the spray arm shaft portion and a spray arm assembly. The spray arm assembly includes a rotatable spray arm and a spray arm gear connected with the spray arm and engaged with the spur gear. The fluid circulation assembly also includes a pump assembly including a pump housing and a pump impeller disposed on the pump shaft portion within the pump housing. The motor is configured to rotate the drive shaft so as to rotate the pump impeller at a first speed and the spray arm at a second speed.

[0009] In accordance with another exemplary embodiment of the present disclosure, a fluid circulation assembly is provided. The fluid circulation assembly defines a vertical direction and includes a motor having a top side and a bottom side, the motor comprising a rotatable drive shaft that includes a pump shaft portion extending out of the bottom side and a diverter shaft portion extending out of the top side. The fluid circulation assembly further includes a spur gear disposed on the diverter shaft portion and a diverter assembly. The diverter assembly includes a diverter disc defining one or more apertures that are selectively aligned with one or more spray arm assemblies to selectively distribute wash fluid and a diverter gear connected with the diverter disc and engaged with the spur gear. The fluid circulation assembly also includes a pump assembly including a pump housing and a pump impeller disposed on the pump shaft portion within the pump housing. The motor is configured to rotate the drive shaft so as to rotate the pump impeller at a first speed and the diverter disc at a second speed.

[0010] In accordance with yet another exemplary embodiment of the present disclosure, a dishwasher appliance is provided. The dishwasher appliance includes a motor having

a top side and a bottom side. The motor includes a rotatable drive shaft that includes a pump shaft portion extending out of the bottom side and a secondary shaft portion extending out of the top side. The pump assembly includes a pump housing and a pump impeller disposed on the pump shaft portion within the pump housing. The appliance further includes a spur gear disposed on the secondary shaft portion and a secondary gear engaged with the spur gear. The motor is configured to rotate the drive shaft so as to rotate the pump impeller at a first speed and the secondary gear at a second speed.

[0011] These and other features, aspects and advantages of the present invention will become better understood with reference to the following description and appended claims. The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] A full and enabling disclosure of the present invention, including the best mode thereof, directed to one of ordinary skill in the art, is set forth in the specification, which makes reference to the appended figures.

[0013] FIG. 1 provides a front view of an exemplary embodiment of a dishwashing appliance of the present disclosure.

[0014] FIG. 2 provides a side, cross sectional view of the exemplary dishwashing appliance of FIG. 1.

[0015] FIG. 3 provides a side, cross sectional view of a fluid circulation assembly according to an example embodiment of the present subject matter.

[0016] FIG. 4 provides a perspective view of the fluid circulation assembly of FIG. 3, with the drive shaft removed for clarity.

[0017] FIG. 5 provides a bottom, perspective view of the fluid circulation assembly of FIG. 3, with the drive shaft removed for clarity.

DETAILED DESCRIPTION OF THE INVENTION

[0018] Reference now will be made in detail to embodiments of the invention, one or more examples of which are illustrated in the drawings. Each example is provided by way of explanation of the invention, not limitation of the invention. In fact, it will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope or spirit of the invention. For instance, features illustrated or described as part of one embodiment can be used with another embodiment to yield a still further embodiment. Thus, it is intended that the present invention covers such modifications and variations as come within the scope of the appended claims and their equivalents.

[0019] As used herein, the term “article” may refer to, but need not be limited to dishes, pots, pans, silverware, and other cooking utensils and items that can be cleaned in a dishwashing appliance. The term “wash cycle” is intended to refer to one or more periods of time during which a dishwashing appliance operates while containing the articles to be washed and uses a detergent and water, preferably with agitation, to e.g., remove soil particles including food and other undesirable elements from the articles. The term “rinse

cycle” is intended to refer to one or more periods of time during which the dishwashing appliance operates to remove residual soil, detergents, and other undesirable elements that were retained by the articles after completion of the wash cycle. The term “wash fluid” refers to a liquid used for washing and/or rinsing the articles and is typically made up of water that may include other additives such as detergent or other treatments.

[0020] FIGS. 1 and 2 depict an exemplary domestic dishwasher or dishwashing appliance 100 that may be configured in accordance with aspects of the present disclosure. For the particular embodiment of FIGS. 1 and 2, the dishwasher 100 includes a cabinet 102 having a tub 104 therein that defines a wash chamber 106. As shown in FIG. 2, the tub extends between a top 107 and a bottom 108 along a vertical direction V, between a first side and a second side along a lateral direction L, and between a front side 111 and a rear side 112 along a transverse direction T. Each of the vertical direction V, lateral direction L, and transverse direction T are mutually perpendicular to one another. The tub 104 includes a front opening (not shown) and a door 114 hinged at its bottom 116 for movement between a normally closed vertical position (shown in FIGS. 1 and 2), wherein the wash chamber 106 is sealed shut for washing operation, and a horizontal open position for loading and unloading of articles from the dishwasher 100. Latch 118 is used to lock and unlock door 114 for access to wash chamber 106.

[0021] Upper and lower guide rails 120, 122 are mounted on the first and second sides of tub 104 and accommodate roller-equipped rack assemblies 126 and 128. Each of the rack assemblies 126, 128 is fabricated into lattice structures including a plurality of elongated members 130 (for clarity of illustration, not all elongated members making up assemblies 126 and 128 are shown in FIG. 2). Each rack 126, 128 is adapted for movement between an extended loading position (not shown) in which the rack is substantially positioned outside the wash chamber 106, and a retracted position (shown in FIGS. 1 and 2) in which the rack is located inside the wash chamber 106. This is facilitated by rollers 134 and 136, for example, mounted onto racks 126 and 128, respectively. A silverware basket (not shown) may be removably attached to rack assembly 128 for placement of silverware, utensils, and the like, that are otherwise too small to be accommodated by racks 126, 128.

[0022] The dishwasher 100 further includes a lower spray arm assembly 140 that will be described in more detail below. Lower spray arm assembly 140 may be disposed in a lower region 142 of the wash chamber 106 and above a tub sump portion 144 so as to rotate in relatively close proximity to rack assembly 128. A mid-level spray arm assembly 146 is located in an upper region of the wash chamber 106 and may be located in close proximity to upper rack 126. Additionally, an upper spray arm assembly 148 may be located above the upper rack 126. As will be described in detail below, spray arm assemblies 140, 146, 148 may be part of a fluid circulation assembly 150 for circulating water and dishwasher fluid in the tub 104.

[0023] Each spray arm assembly 140, 146, 148 includes an arrangement of discharge ports or orifices for directing washing liquid received from fluid circulation assembly 150 onto dishes or other articles located in rack assemblies 126 and 128. The arrangement of the discharge ports, also referred to as jets, apertures, or orifices, may provide a rotational force by virtue of washing fluid flowing through

the discharge ports. Alternatively, spray arm assemblies **140**, **146**, **148** may be motor-driven, as described in detail below. The resultant movement of the spray arm assemblies **140**, **146**, **148** provides coverage of dishes and other dishwasher contents with a washing spray. Other configurations of spray assemblies may be used as well. For example, dishwasher **100** may have additional spray assemblies for cleaning silverware, for scouring casserole dishes, for spraying pots and pans, for cleaning bottles, etc. One skilled in the art will appreciate that the embodiments discussed herein are used for the purpose of explanation only, and are not limitations of the present subject matter.

[0024] The dishwasher **100** is further equipped with a controller **156** to regulate operation of the dishwasher **100**. The controller **156** may include one or more memory devices and one or more microprocessors, such as general or special purpose microprocessors operable to execute programming instructions or micro-control code associated with a cleaning cycle. The memory may represent random access memory such as DRAM, or read only memory such as ROM or FLASH. In one embodiment, the processor executes programming instructions stored in memory. The memory may be a separate component from the processor or may be included onboard within the processor.

[0025] The controller **156** may be positioned in a variety of locations throughout dishwasher **100**. In the illustrated embodiment, the controller **156** may be located within a control panel area **158** of door **114** as shown in FIGS. **1** and **2**. In such an embodiment, input/output (“I/O”) signals may be routed between the control system and various operational components of dishwasher **100** along wiring harnesses that may be routed through the bottom **116** of door **114**. Typically, the controller **156** includes a user interface panel/controls **160** through which a user may select various operational features and modes and monitor progress of the dishwasher **100**. In one embodiment, the user interface **160** may represent a general purpose I/O (“GPIO”) device or functional block. In one embodiment, the user interface **160** may include input components, such as one or more of a variety of electrical, mechanical or electro-mechanical input devices including rotary dials, push buttons, and touch pads. The user interface **160** may include a display component, such as a digital or analog display device designed to provide operational feedback to a user. The user interface **160** may be in communication with the controller **156** via one or more signal lines or shared communication busses.

[0026] It should be appreciated that the invention is not limited to any particular style, model, or configuration of dishwasher **100**. The exemplary embodiment depicted in FIGS. **1** and **2** is for illustrative purposes only. For example, different locations may be provided for user interface **160**, different configurations may be provided for racks **126**, **128**, different spray arm assemblies **140**, **146**, **148** may be used, and other differences may be applied as well.

[0027] Referring now to FIGS. **3** through **5**, a fluid circulation assembly **150** according to an example embodiment of the present subject matter will be described. Fluid circulation assembly **150** may include a drive motor **170** that may be disposed within sump portion **144** of tub **104** and may be configured to rotate multiple components of dishwasher **100**. As best shown in FIG. **4**, drive motor **170** may be, for example, a synchronous induction motor having a stator **172**, a rotor **174**, a drive shaft **176** attached to rotor **174**, and a control board **178**. Control board **178** may control the

speed of motor **170** and rotation of drive shaft **176** by selectively applying electric current to stator **172** to cause rotor **174** and drive shaft **176** to rotate.

[0028] According to an exemplary embodiment, drive motor **170** and all its components may be potted. In this manner, drive motor **170** may be shock-resistant, submersible, and generally more reliable. Notably, because drive motor **170** is mounted inside wash chamber **106** and is completely submersible, no seals are required and the likelihood of leaks is reduced. In addition, because drive motor **170** is mounted in the normally unused space between lower spray arm **140**, instead of beneath the sump portion **144**, this design is inherently more compact than conventional designs. One skilled in the art will appreciate that the above-described drive motor **170** is used only for the purpose of explaining aspects of the present subject matter. Other motors and control means are also possible and within the scope of the invention.

[0029] According to an exemplary embodiment, fluid circulation assembly **150** may be vertically mounted within sump portion **144** of wash chamber **106**. More particularly, drive motor **170** of fluid circulation assembly **150** may be mounted such that drive shaft **176** is oriented along vertical direction V (FIG. **2**) of dishwasher **100**. So oriented, drive motor **170** may include a top side **180** facing top **107** of tub **104** and a bottom side **182** facing bottom **108** of tub **104**. As best shown in FIG. **3** and described below, rotatable drive shaft **176** may extend out both top **180** and bottom **182** of motor **170** to drive multiple components of dishwasher **100**.

[0030] Still referring to FIG. **3**, a pump shaft portion **190** of drive shaft **176** extends out of bottom **182** of motor **170** toward the bottom of sump portion **144**. Pump shaft portion **190** is configured to drive a pump assembly **192** to provide wash fluid to spray arm assemblies **140**, **146**, **148**. According to the illustrated embodiment, pump assembly **192** may include a pump impeller **194** disposed on the distal end of pump shaft portion **190** within a pump housing **196**. Pump housing **196** defines a pump intake **198** for drawing wash fluid into pump impeller **194**. According to the illustrated embodiment, pump intake **198** is facing down and is located very near the bottom of sump portion **144**. In this manner, the amount of water required to prime and operate pump assembly **192** is minimized. This is particularly advantageous when running low water cycles for the purpose of water and energy savings.

[0031] In operation, pump impeller **194** draws wash fluid in from sump portion **144** and pumps it to a diverter assembly **200**. Diverter assembly **200** may include a diverter disc **202** disposed within a diverter chamber **204** for selectively distributing the wash fluid to the spray arm assemblies **140**, **146**, **148**. More particularly, diverter disc **202** may be rotatably mounted about a vertical axis defined by a diverter spindle **206**. Diverter disc **202** may have a plurality of apertures that are configured to align with a one or more outlet ports at the top of diverter chamber **204**.

[0032] More particularly, according to the exemplary embodiment illustrated in FIG. **3**, diverter disc **202** may define a single aperture **208**. A first outlet port **210** may be in fluid communication with lower spray arm assembly **140** and a second outlet port **212** may be in fluid communication with mid-level and upper spray arm assemblies **146**, **148**. When diverter disc **202** is rotated such that aperture **208** aligns with first outlet port **210**, lower spray arm **140** may receive wash fluid. Similarly, when diverter disc **202** is

rotated such that aperture 208 aligns with second outlet port 212, mid-level and upper spray arm assemblies 146, 148 may receive wash fluid.

[0033] Although the exemplary embodiment refers only to lower, mid-level, and upper spray arm assemblies 140, 146, 148 and diverter disc 202 having a single aperture 208, one skilled in the art will appreciate that other spray assemblies and diverter configurations may be used. Fluid circulation assembly 150 may be configured to have any number of outlet ports and spray arm assemblies. In addition, diverter disc 202 may have different configurations including, for example, multiple apertures configured to provide wash fluid to any combination of outlet ports. The configuration illustrated in FIG. 3 is intended only for the purpose of explaining aspects of the present invention and is not intended to limit the scope of the present subject matter.

[0034] According to the illustrated embodiment, a secondary shaft portion 220 of drive shaft 176 may extend out of top 180 of motor 170 toward the top of the tub 104. Notably, secondary shaft portion 220 is part of the same, continuous, straight drive shaft 176 and thus rotates at the same speed as pump shaft portion 190. One or more spur gears may be disposed on secondary shaft portion 220 to drive additional components of dishwasher 100. More particularly a first spur gear 222 and a second spur gear 224 may be disposed on secondary shaft portion 220. As described in detail below, first and second spur gears 222, 224 may be configured to engage secondary gears that are operably coupled with secondary components. The meshing of the spur gears 222, 224 with the secondary gears acts both as a speed reducer and the drive means for the secondary components. In this regard, as drive motor 170 rotates both pump shaft portion 190 and secondary shaft portion 220 at the same speed, pump impeller 194 may rotate at one speed while the secondary components may rotate at different speeds.

[0035] For example, according to an example embodiment, secondary shaft portion 220 may be configured for driving a spray arm, e.g., lower spray arm 140. In this manner, lower spray arm 140 may define an internal gear 226 configured to engage first spur gear 222. More particularly, the bottom side of lower spray arm 140 may define a hollow cylindrical boss 228 having gear teeth protruding radially inward to engage gear teeth of first spur gear 222, which extend radially outward. According to the illustrated embodiment, the diameter of first spur gear 222 is smaller than the diameter of internal gear 226, such that the rotational speed of the lower spray arm 140 is slower than the rotational speed of secondary shaft portion 220. One skilled in the art will appreciate that different gear arrangements are possible and within the scope of the present invention. In addition, the size of the gears and the gear ratio may be adjusted depending on the needs of the application.

[0036] According to the illustrated embodiment, secondary shaft portion 220 and second spur gear 224 may also be used to drive diverter disc 202. In this manner, diverter disc 202 may define a geared perimeter 230 for engaging second spur gear 224. More specifically, gear teeth may extend radially outward from an outer perimeter surface of diverter disc 202 to engage the gear teeth of second spur gear 224. Although FIG. 3 illustrates two simple gears for driving diverter disc 202, one skilled in the art will appreciate that other gear arrangements may be used which rotate diverter disc 202 at any desirable speed. Moreover, drive arrange-

ment may even allow for more discrete positioning of diverter disc 202—e.g., 180 degree rotations every several minutes.

[0037] As illustrated in FIG. 3, secondary shaft portion 220 has first and second spur gears 222, 224 to drive lower spray arm 140 and diverter disc 202, respectively. One skilled in the art will appreciate that more or fewer spur gears may be disposed on secondary shaft portion 220, for example, to drive additional components of dishwasher 100. In this regard, aspects of the present invention may be used to drive other components of dishwasher 100. In addition, the position of spur gears may vary and their size may be adjusted depending on the needs of the application. For example, it may be desirable to rotate diverter disc 202 slower than lower spray arm 140. To achieve this, second spur gear 224 may have a smaller diameter than first spur gear 222.

[0038] This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they include structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal language of the claims.

What is claimed is:

1. A fluid circulation assembly defining a vertical direction and comprising:
 - a motor having a top side and a bottom side, the motor comprising a rotatable drive shaft that includes:
 - a pump shaft portion extending out of the bottom side; and
 - a spray arm shaft portion extending out of the top side;
 - a spur gear disposed on the spray arm shaft portion;
 - a spray arm assembly comprising:
 - a rotatable spray arm; and
 - a spray arm gear connected with the spray arm and engaged with the spur gear; and
 - a pump assembly comprising:
 - a pump housing; and
 - a pump impeller disposed on the pump shaft portion within the pump housing,
 wherein the motor is configured to rotate the drive shaft so as to rotate the pump impeller at a first speed and the spray arm at a second speed.
2. The fluid circulation assembly of claim 1, wherein the spur gear is a first spur gear, and the fluid circulation assembly further comprises:
 - a second spur gear disposed on the spray arm shaft portion;
 - a rotatable diverter disc; and
 - a diverter gear connected with the diverter disc and engaged with the second spur gear,
 wherein the second spur gear rotates the diverter disc to selectively divert the flow of wash fluid between one or more spray arms within the fluid circulation assembly.
3. The fluid circulation assembly of claim 2, wherein the diverter gear comprises gear teeth extending radially outward from a perimeter of the diverter disc.

4. The fluid circulation assembly of claim 2, wherein the diverter disc and the spray arm assembly rotate at a slower speed than the spray arm shaft portion.

5. The fluid circulation assembly of claim 1, wherein the motor is vertically oriented within a sump area of the dishwasher, such that the drive shaft is vertically oriented relative to the dishwasher.

6. The fluid circulation assembly of claim 5, wherein the pump impeller is positioned near a bottom of the sump area of the dishwasher and the pump housing defines a pump intake that faces down toward the bottom of the sump area.

7. The fluid circulation assembly of claim 1, wherein the motor is a submersible motor.

8. A fluid circulation assembly defining a vertical direction and comprising:

a motor having a top side and a bottom side, the motor comprising a rotatable drive shaft that includes:

a pump shaft portion extending out of the bottom side; and

a diverter shaft portion extending out of the top side;

a spur gear disposed on the diverter shaft portion;

a diverter assembly comprising:

a diverter disc defining one or more apertures that are selectively aligned with one or more spray arm assemblies to selectively distribute wash fluid; and
a diverter gear connected with the diverter disc and engaged with the spur gear; and

a pump assembly comprising:

a pump housing; and

a pump impeller disposed on the pump shaft portion within the pump housing,

wherein the motor is configured to rotate the drive shaft so as to rotate the pump impeller at a first speed and the diverter disc at a second speed.

9. The fluid circulation assembly of claim 8, wherein the spur gear is a first spur gear, and the fluid circulation assembly further comprises:

a second spur gear disposed on the diverter shaft portion; and

a spray arm assembly comprising:

a rotatable spray arm; and

a spray arm gear connected with the spray arm and engaged with the second spur gear,

wherein the second spur gear rotates the spray arm.

10. The fluid circulation assembly of claim 9, wherein the diverter disc and the spray arm rotate at a slower speed than the diverter shaft portion.

11. The fluid circulation assembly of claim 8, wherein the motor is vertically oriented within a sump area of the dishwasher, such that the drive shaft is vertically oriented relative to the dishwasher.

12. The fluid circulation assembly of claim 11, wherein the pump impeller is positioned near a bottom of the sump area of the dishwasher and the pump housing defines a pump intake that faces down toward the bottom of the sump area.

13. The fluid circulation assembly of claim 8, wherein the motor is a submersible motor.

14. A dishwasher appliance, comprising:

a motor having a top side and a bottom side, the motor comprising a rotatable drive shaft that includes:

a pump shaft portion extending out of the bottom side;

a secondary shaft portion extending out of the top side;

a pump assembly comprising:

a pump housing; and

a pump impeller disposed on the pump shaft portion within the pump housing;

a spur gear disposed on the secondary shaft portion; and
a secondary gear engaged with the spur gear,

wherein the motor is configured to rotate the drive shaft so as to rotate the pump impeller at a first speed and the secondary gear at a second speed.

15. The dishwasher appliance of claim 14, further comprising a diverter assembly comprising:

a diverter disc attached to the secondary gear, the diverter disc defining one or more apertures that are selectively aligned with one or more spray arm assemblies to selectively distribute wash fluid,

wherein the spur gear engages the secondary gear so as to rotate the diverter disc at a slower speed than the pump impeller.

16. The dishwasher appliance of claim 15, wherein the spur gear is a first spur gear, and the dishwasher appliance further comprises:

a second spur gear disposed on the secondary shaft portion;

a spray arm assembly comprising:

a rotatable spray arm; and

a spray arm gear connected with the spray arm and engaged with the second spur gear,

wherein the second spur gear rotates the spray arm at a slower speed than the pump impeller.

17. The dishwasher appliance of claim 14, further comprising a spray arm assembly comprising:

a rotatable spray arm attached to the secondary gear,

wherein the spur gear engages the secondary gear so as to rotate the spray arm at a slower speed than the pump impeller.

18. The dishwasher appliance of claim 17, wherein the spur gear is a first spur gear, and the dishwasher appliance further comprises:

a second spur gear disposed on the secondary shaft portion;

a rotatable diverter disc; and

a diverter gear connected with the diverter disc and engaged with the second spur gear,

wherein the second spur gear rotates the diverter disc to selectively divert the flow of wash fluid between one or more spray arms within the dishwasher appliance.

19. The dishwasher appliance of claim 18, wherein the diverter disc defines a geared perimeter for engaging the second spur gear.

20. The dishwasher appliance of claim 14, wherein the motor is vertically oriented within a sump area of the dishwasher appliance, such that the pump impeller is positioned near a bottom of the sump area of the dishwasher appliance.

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