



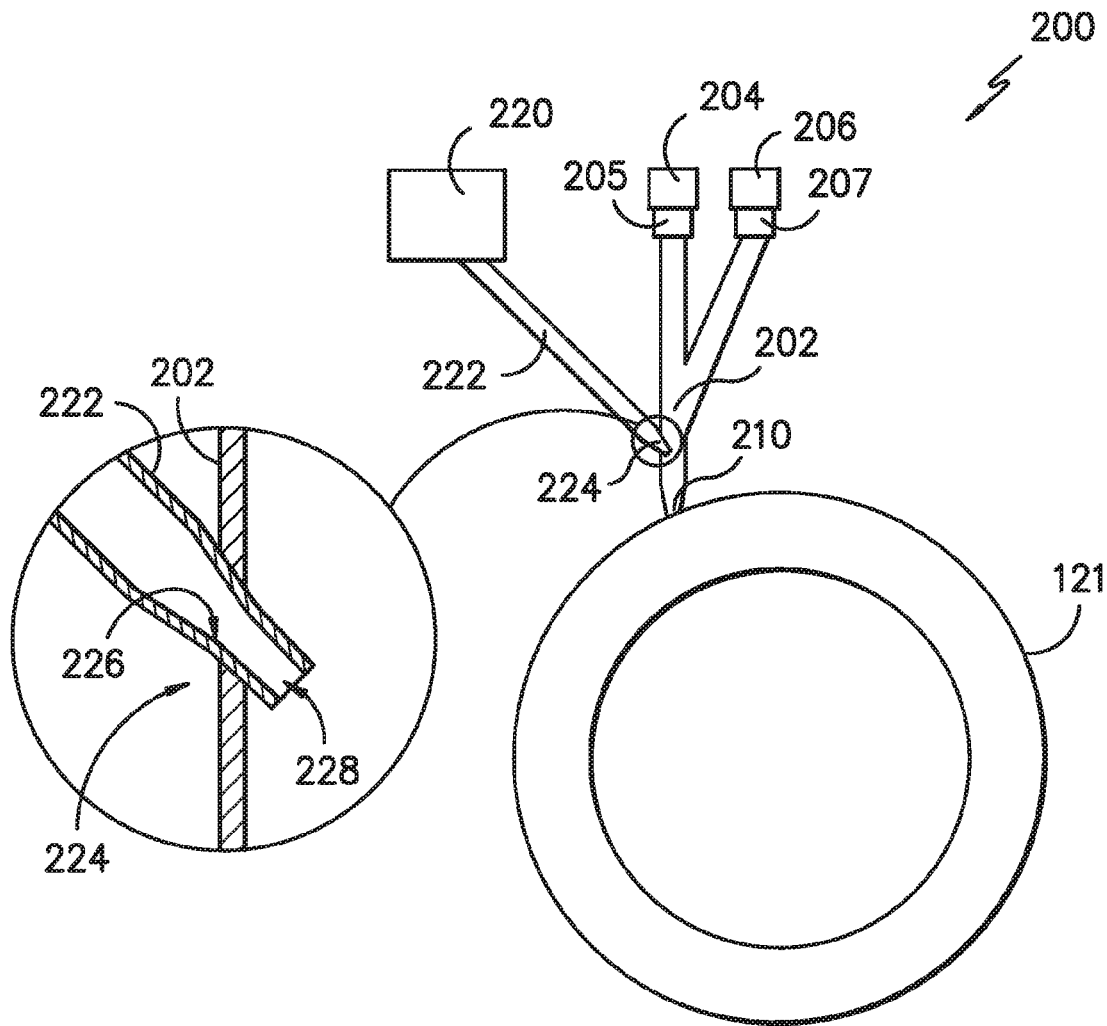
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(19) **United States**(12) **Patent Application Publication**
Kulkarni(10) **Pub. No.: US 2017/0292217 A1**(43) **Pub. Date: Oct. 12, 2017**(54) **LAUNDRY ADDITIVE DISPENSER**(71) Applicant: **General Electric Company,**
Schenectady, NY (US)(72) Inventor: **Ashutosh Kulkarni,** Bangalore (IN)(21) Appl. No.: **15/091,600**(22) Filed: **Apr. 6, 2016****Publication Classification**(51) **Int. Cl.**
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(57)

ABSTRACT

An additive dispensing assembly for providing wash liquid to a wash tub of a washing machine appliance is provided. The additive dispensing assembly includes a water supply conduit configured to provide a flow of water to the wash tub. An additive reservoir is connected to the water supply conduit such that the flow of water through the water supply conduit draws in and entrains the wash additive prior to delivery of the wash liquid into the wash tub. The resulting wash liquid has an optimal additive concentration that is proportional to the amount of water delivered to the wash tub.



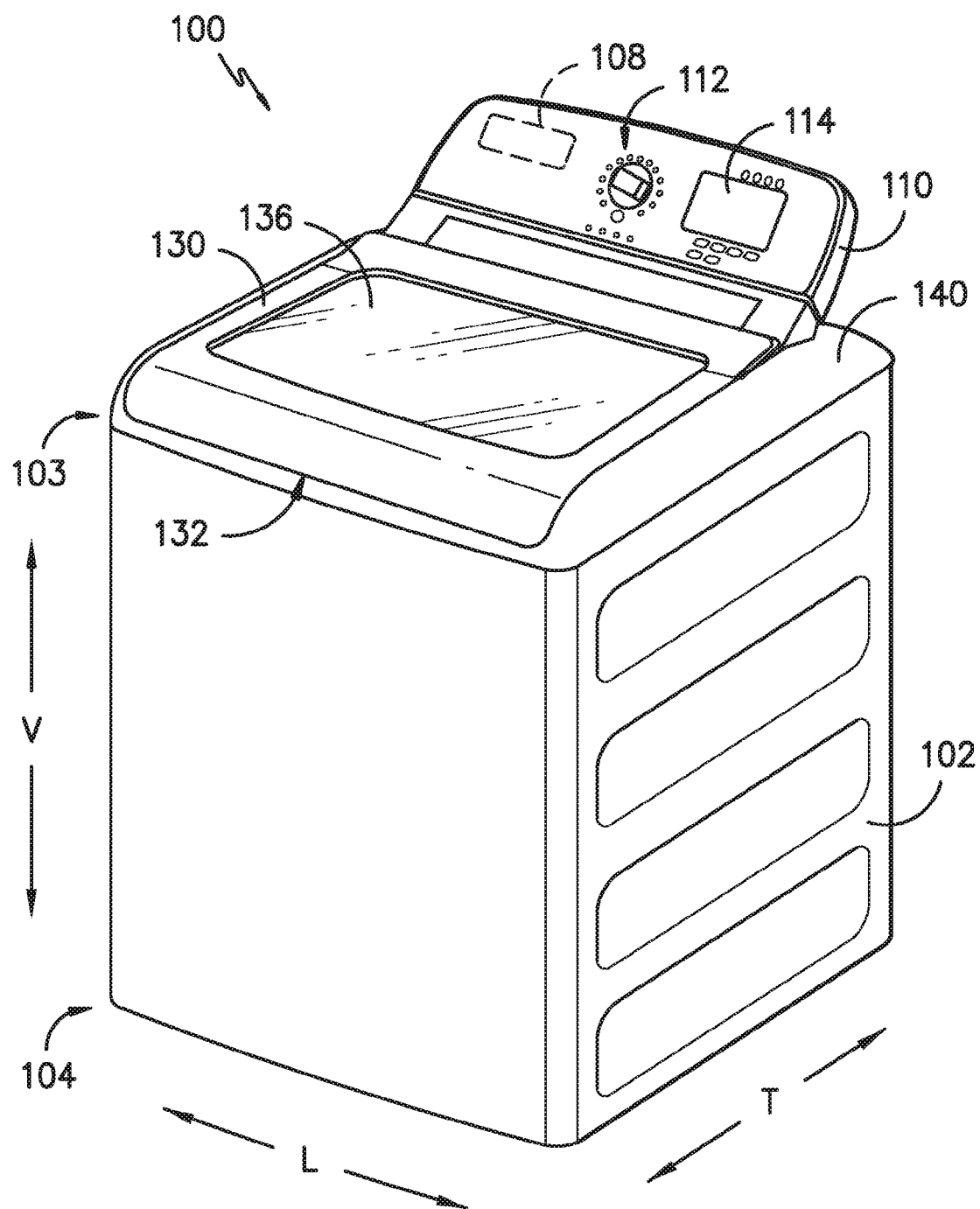


FIG. -1-

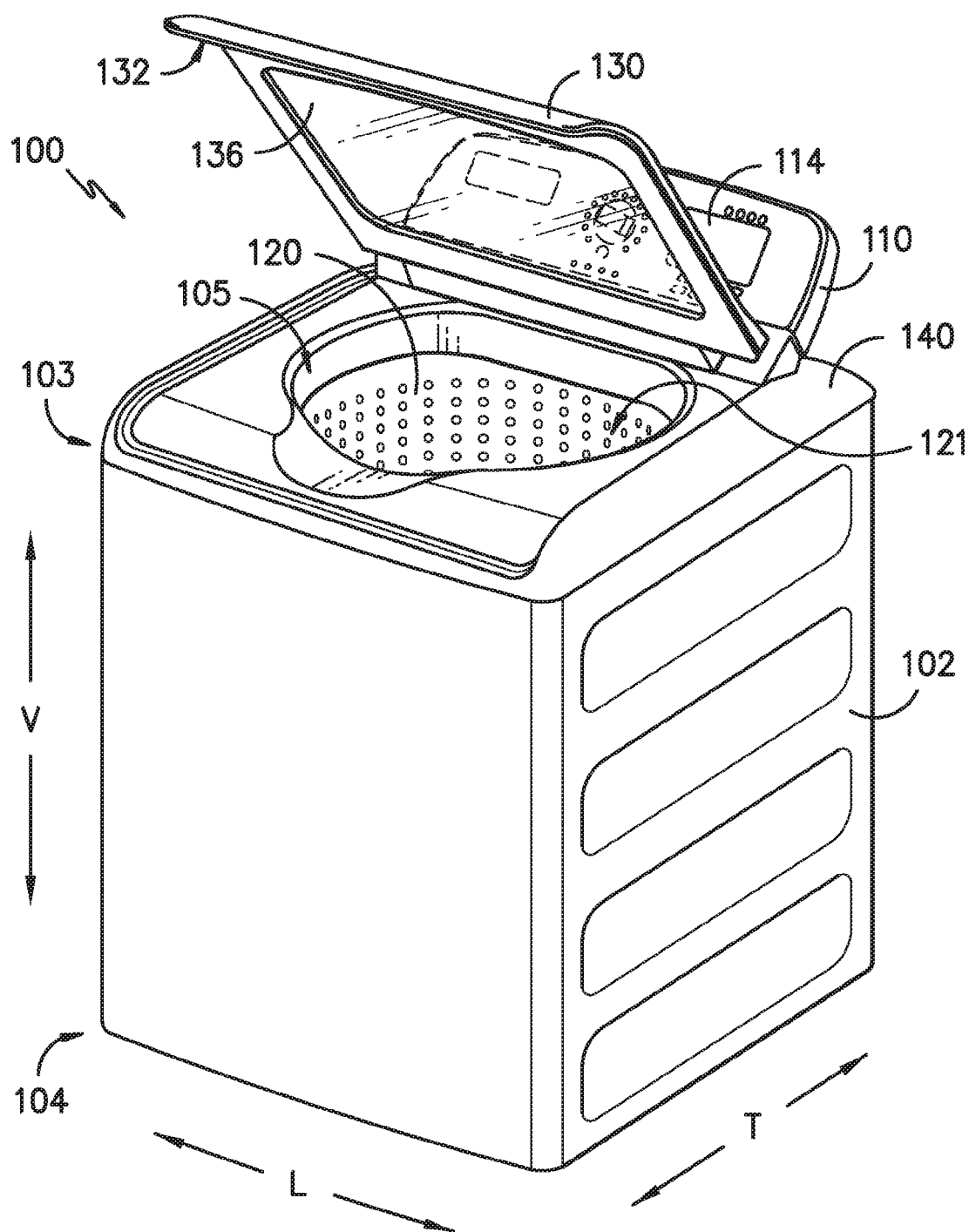


FIG. -2-

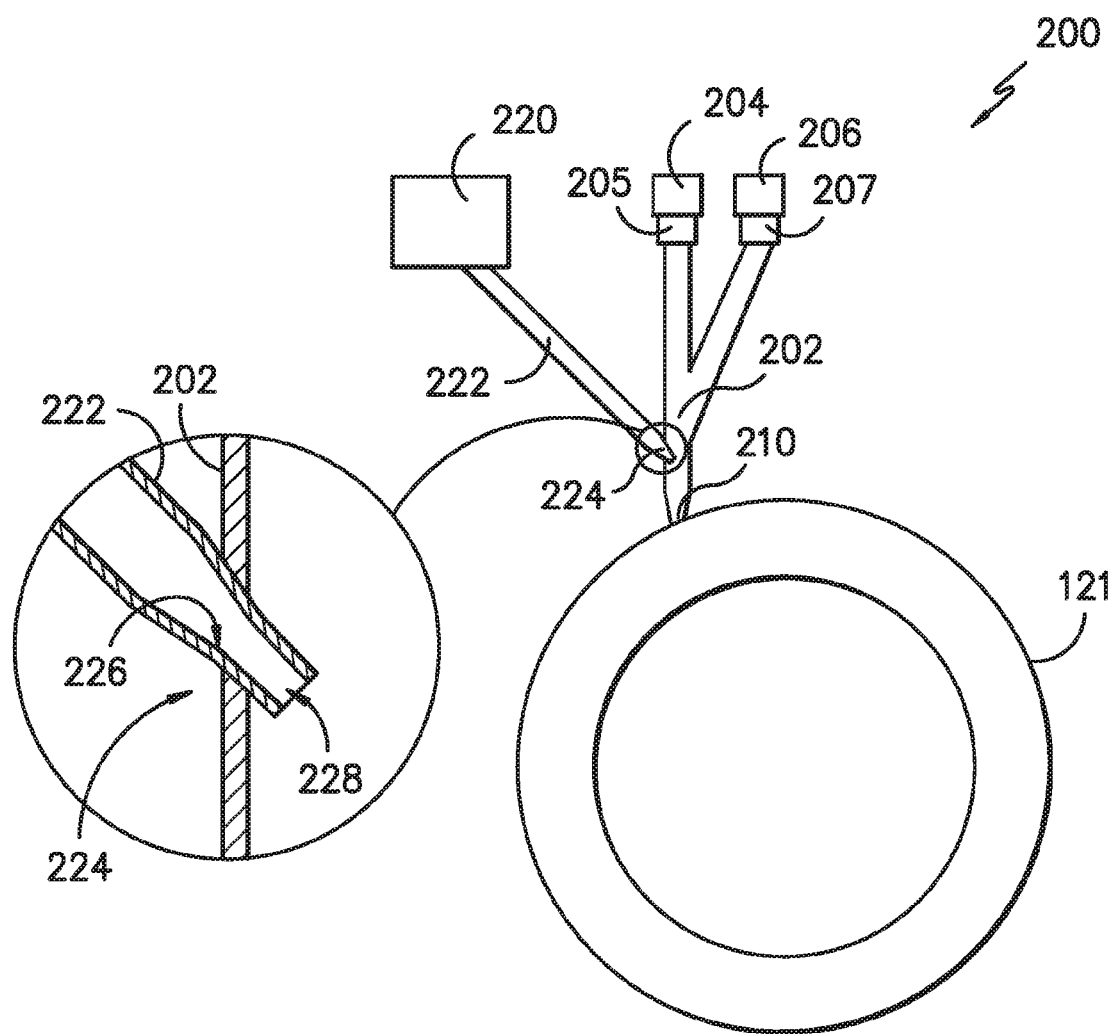


FIG. -3-

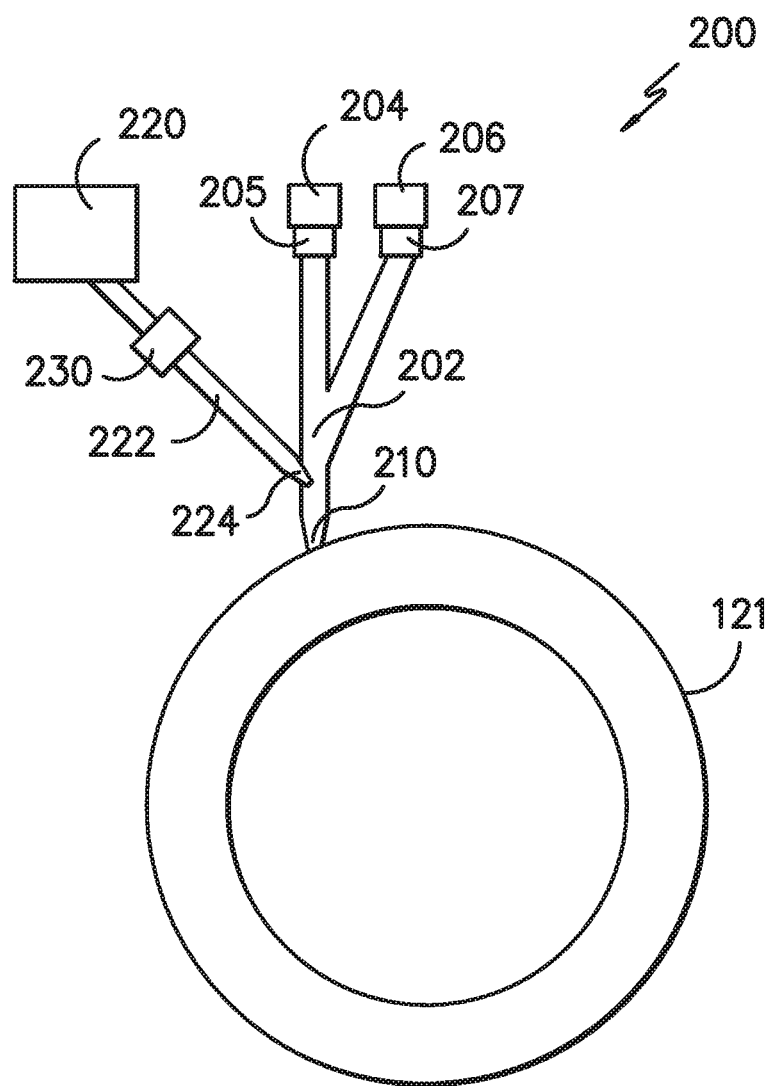


FIG. -4-

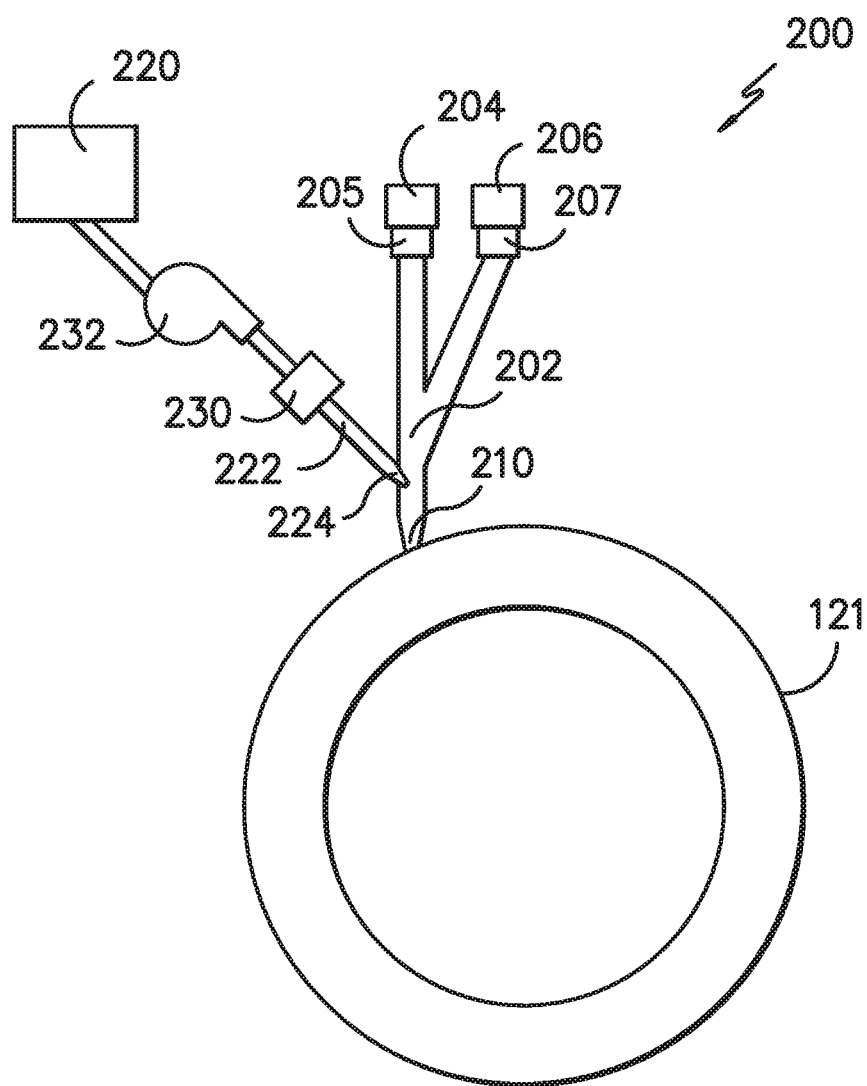


FIG. -5-

LAUNDRY ADDITIVE DISPENSER

FIELD OF THE INVENTION

[0001] The present subject matter relates generally to washing machine appliances and more particularly to additive dispensers for washing machine appliances.

BACKGROUND OF THE INVENTION

[0002] Washing machine appliances generally include a tub for containing water or wash liquid, e.g., water and detergent, bleach, and/or other wash additives. A basket is rotatably mounted within the tub and defines a wash chamber for receipt of articles for washing. During normal operation of such washing machine appliances, the wash liquid is directed into the tub and onto articles within the wash chamber of the basket. The basket or an agitation element can rotate at various speeds to agitate articles within the wash chamber, to wring wash fluid from articles within the wash chamber, etc.

[0003] During operation of certain washing machine appliances, a volume of wash liquid is directed into the tub in order to wash and/or rinse articles within the wash chamber. One or more fluid additives may be added to the wash liquid to enhance the cleaning or other properties of the wash liquid. The fluid additives may be in powder or concentrated liquid form, and may be added to a dispenser box of the washing machine appliance by, e.g., a user of the washing machine appliance. The dispenser box may contain various chambers for containing different additives, e.g., wash detergent and softener.

[0004] However, to ensure proper detergent concentrations, users must carefully measure the proper detergent amount for each cycle, considering factors such as the size and type of the load, the temperature of the water, and the selected wash cycle. Although some washing machine appliances have bulk additive dispensers that automatically dispense a controlled amount of detergent from a storage reservoir, such bulk dispensers are configured to provide fixed amounts of detergent for a given cycle, may not take into consideration factors such as water amount, and are often complex subsystems requiring many components.

[0005] Accordingly, a washing machine appliance having and additive dispensing assembly that improves delivery of detergent is desirable. More particularly, a simplified additive dispensing assembly that provides an accurate detergent quantity for a given load and improves wash and rinse performance would be particularly beneficial.

BRIEF DESCRIPTION OF THE INVENTION

[0006] The present subject matter provides an additive dispensing assembly for providing wash liquid to a wash tub of a washing machine appliance. The additive dispensing assembly includes a water supply conduit configured to provide a flow of water to the wash tub. An additive reservoir is connected to the water supply conduit such that the flow of water through the water supply conduit draws in and entrains the wash additive prior to delivery of the wash liquid into the wash tub. The resulting wash liquid has an optimal additive concentration that is proportional to the amount of water delivered to the wash tub. Additional aspects and advantages of the invention will be set forth in

part in the following description, or may be apparent from the description, or may be learned through practice of the invention.

[0007] In one exemplary embodiment, a washing machine appliance defining a vertical, a lateral, and a transverse direction is provided. The washing machine appliance includes a cabinet; a wash tub positioned within the cabinet; and a wash basket rotatably mounted within the wash tub, the wash basket defining a wash chamber for receiving articles for washing. The washing machine appliance further includes an additive dispensing assembly positioned within the cabinet and configured to provide wash liquid to the wash tub. The additive dispensing assembly includes a water supply conduit extending between a water supply and the wash tub; an additive dispenser for storing and dispensing a wash additive; and a siphon channel extending from the additive dispenser to the water supply conduit. A flow of water directed through the water supply conduit creates a siphon which draws the wash additive into the water supply conduit to mix with the flow of water and create a wash liquid that is dispensed into the wash tub.

[0008] In another exemplary embodiment, an additive dispensing assembly for providing wash liquid to a wash tub of a washing machine appliance is provided. The additive dispensing assembly includes a water supply conduit extending between a water supply and the wash tub and a solenoid valve operatively coupled to the water supply and configured to selectively provide a flow of water to the wash tub. The additive dispensing assembly further includes an additive reservoir configured for receiving a wash additive and an additive supply conduit operably coupling the additive reservoir to the water supply conduit such that the flow of water through the water supply conduit creates a negative pressure in the additive supply conduit which draws the wash additive into the water supply conduit to mix with the flow of water and create a wash liquid that is dispensed into the wash tub.

[0009] 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

[0010] 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.

[0011] FIG. 1 provides a perspective view of a washing machine appliance according to an exemplary embodiment of the present subject matter with a door of the exemplary washing machine appliance shown in a closed position.

[0012] FIG. 2 provides a perspective view of the exemplary washing machine appliance of FIG. 1 with the door of the exemplary washing machine appliance shown in an open position.

[0013] FIG. 3 provides a schematic view of an additive dispensing assembly according to an exemplary embodiment of the present subject matter, wherein an additive supply conduit couples an additive reservoir to the water supply conduit.

[0014] FIG. 4 provides a schematic view of an additive dispensing assembly according to an exemplary embodiment of the present subject matter, wherein a solenoid valve controls the flow of wash additive through an additive supply conduit.

[0015] FIG. 5 provides a schematic view of an additive dispensing assembly according to an exemplary embodiment of the present subject matter, wherein a solenoid valve and pump control the flow of wash additive through an additive supply conduit.

DETAILED DESCRIPTION OF THE INVENTION

[0016] 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.

[0017] FIGS. 1 and 2 illustrate an exemplary embodiment of a vertical axis washing machine appliance 100. In FIG. 1, a lid or door 130 is shown in a closed position. In FIG. 2, door 130 is shown in an open position. Washing machine appliance 100 generally defines a vertical direction V, a lateral direction L, and a transverse direction T, each of which is mutually perpendicular, such that an orthogonal coordinate system is generally defined.

[0018] While described in the context of a specific embodiment of vertical axis washing machine appliance 100, using the teachings disclosed herein it will be understood that vertical axis washing machine appliance 100 is provided by way of example only. Other washing machine appliances having different configurations, different appearances, and/or different features may also be utilized with the present subject matter as well, e.g., horizontal axis washing machines.

[0019] Washing machine appliance 100 has a cabinet 102 that extends between a top portion 103 and a bottom portion 104 along the vertical direction V. A wash basket 120 (FIG. 2) is rotatably mounted within cabinet 102. A motor (not shown) is in mechanical communication with wash basket 120 to selectively rotate wash basket 120 (e.g., during an agitation or a rinse cycle of washing machine appliance 100). Wash basket 120 is received within a wash tub or wash chamber 121 (FIG. 2) and is configured for receipt of articles for washing. The wash tub 121 holds wash and rinse fluids for agitation in wash basket 120 within wash tub 121. An agitator or impeller (not shown) extends into wash basket 120 and is also in mechanical communication with the motor. The impeller assists agitation of articles disposed within wash basket 120 during operation of washing machine appliance 100.

[0020] Cabinet 102 of washing machine appliance 100 has a top panel 140. Top panel 140 defines an opening 105 (FIG. 2) that permits user access to wash basket 120 of wash tub 121. Door 130, rotatably mounted to top panel 140, permits selective access to opening 105; in particular, door 130

selectively rotates between the closed position shown in FIG. 1 and the open position shown in FIG. 2. In the closed position, door 130 inhibits access to wash basket 120. Conversely, in the open position, a user can access wash basket 120. A window 136 in door 130 permits viewing of wash basket 120 when door 130 is in the closed position, e.g., during operation of washing machine appliance 100. Door 130 also includes a handle 132 that, e.g., a user may pull and/or lift when opening and closing door 130. Further, although door 130 is illustrated as mounted to top panel 140, alternatively, door 130 may be mounted to cabinet 102 or any other suitable support.

[0021] A control panel 110 with at least one input selector 112 (FIG. 1) extends from top panel 140. Control panel 110 and input selector 112 collectively form a user interface input for operator selection of machine cycles and features. A display 114 of control panel 110 indicates selected features, operation mode, a countdown timer, and/or other items of interest to appliance users regarding operation.

[0022] Operation of washing machine appliance 100 is controlled by a controller or processing device 108 (FIG. 1) that is operatively coupled to control panel 110 for user manipulation to select washing machine cycles and features. In response to user manipulation of control panel 110, controller 108 operates the various components of washing machine appliance 100 to execute selected machine cycles and features.

[0023] Controller 108 may include a memory and micro-processor, such as a general or special purpose microprocessor 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. Alternatively, controller 100 may be constructed without using a microprocessor, e.g., using a combination of discrete analog and/or digital logic circuitry (such as switches, amplifiers, integrators, comparators, flip-flops, AND gates, and the like) to perform control functionality instead of relying upon software. Control panel 110 and other components of washing machine appliance 100 may be in communication with controller 108 via one or more signal lines or shared communication busses.

[0024] During operation of washing machine appliance 100, laundry items are loaded into wash basket 120 through opening 105, and washing operation is initiated through operator manipulation of input selectors 112. Wash additives may be added to washing machine appliance 100 to assist in the cleaning process. In this regard, as will be described in detail below, an additive dispensing assembly 200 is configured to provide one or more wash additives, such as powdered detergent, concentrated wash liquid, pretreating additive, bleach, etc.

[0025] Water may be added to additive dispensing assembly 200 to mix with wash additives and create a wash liquid that may be dispensed into wash basket 120. One or more valves can be controlled by washing machine appliance 100 to provide for filling wash basket 120 to the appropriate level for the amount of articles being washed and/or rinsed. By way of example for a wash mode, once wash basket 120 is properly filled with fluid, the contents of wash basket 120

can be agitated (e.g., with an impeller as discussed previously) for washing of laundry items in wash basket **120**.

[0026] After the agitation phase of the wash cycle is completed, wash basket **120** can be drained. Laundry articles can then be rinsed by again adding fluid to wash basket **120** depending on the specifics of the cleaning cycle selected by a user. The impeller may again provide agitation within wash basket **120**. One or more spin cycles also may be used. In particular, a spin cycle may be applied after the wash cycle and/or after the rinse cycle to wring wash fluid from the articles being washed. During a spin cycle, wash basket **120** is rotated at relatively high speeds. After articles disposed in wash basket **120** are cleaned and/or washed, the user can remove the articles from wash basket **120**, e.g., by reaching into wash basket **120** through opening **105**.

[0027] Referring now generally to FIGS. 3 through 5, an additive dispensing assembly **200** that may be used with washing machine appliance **100** will be described in more detail. Although the discussion below refers to additive dispensing assembly **200**, one skilled in the art will appreciate that the features and configurations described may be used for other additive dispensers in other washing machine appliances as well. For example, additive dispensing assembly **200** may be positioned elsewhere within cabinet **102**, may have a different components or configurations, and may dispense water, detergent, or other additives. Other variations and modifications of the exemplary embodiment described below are possible, and such variations are contemplated as within the scope of the present subject matter.

[0028] According to an exemplary embodiment, additive dispensing assembly **200** may be mounted within cabinet **102** using a plurality of mounting features, using mechanical fasteners, or in any other suitable manner. Similarly, glue, snap-fit mechanisms, interference-fit mechanisms, or any suitable combination thereof may secure additive dispensing assembly **200** to cabinet **102**. One skilled in the art will appreciate that additive dispensing assembly **200** may be mounted in other locations and use other mounting means according to alternative exemplary embodiments.

[0029] Referring now specifically to FIG. 3, an exemplary embodiment of additive dispensing assembly **200** will be described in detail. As shown, water or wash liquid is provided to wash tub **121** through a water supply conduit **202**. Water supply conduit **202** may receive hot and cold water from a hot water inlet **204** and a cold water inlet **206**, respectively. In order to dispense wash liquid at the desired temperature, hot and cold water may be selectively dispensed in ratios that produce the desired water temperature. For example, the flow of hot water through hot water inlet **204** may be controlled using a hot water solenoid valve **205** and the flow of cold water through cold water inlet **206** may be controlled using a cold water solenoid valve **207**.

[0030] Water supply conduit **202** may terminate at wash tub **121** in any manner suitable for dispensing water and/or wash liquid into wash tub **121**. For example, according to the illustrated embodiment, water supply conduit **202** is fluidly connected to wash tub **121** through a dispensing nozzle **210**. However, according to alternative embodiments, water supply conduit **202** may simply terminate at wash tub **121** with no change in its diameter or may have a venturi-shaped end.

[0031] Additive dispensing assembly **200** may further include an additive dispenser **220**, e.g., a reservoir for storing wash additive. In this regard, additive dispenser **220** may be configured to receive one or more wash additives.

More particularly, according to an exemplary embodiment, additive dispenser **220** is a reservoir that is intended to store sufficient wash additives for multiple wash cycles in order to avoid requiring the user to add a measured quantity of wash additive prior to each wash cycle. In one embodiment, the wash additive is a liquid and in another embodiment, the wash additive is a powdered detergent.

[0032] Additive dispenser **220** is connected to water supply conduit **202** through an additive supply conduit **222**. Additive supply conduit **222** is a siphon channel that draws in wash additive from additive dispenser **220** when water flows through water supply conduit **202**. More particularly, as water is supplied through water supply conduit **202** into wash tub **121**, the flowing water creates a negative pressure within additive supply conduit **222**. This negative pressure draws in wash additive from additive dispenser **220** in proportion to the amount of water flowing through water supply conduit **202**.

[0033] As shown in FIG. 3, additive supply conduit **222** is connected to water supply conduit **202** through a venturi-shaped additive nozzle **224**. The additive supply conduit **222** and additive nozzle **224** may be sized and configured to ensure the desired amount of wash additive is supplied for a given water flow rate through water supply conduit **202**. For example, by adjusting the diameter of the additive supply conduit **222** and the flow restriction of additive nozzle **224**, the flowrate of wash additive may be adjusted.

[0034] According to the illustrated exemplary embodiment, water supply conduit **202** is fluidly connected to wash tub **121** through a dispensing nozzle **210**, and additive supply conduit **222** is connected to water supply conduit **202** through a venturi-shaped additive nozzle **224**. In general, nozzles **210**, **224** may be shaped in any manner suitable for injecting wash liquid into wash tub **121** and wash additive into water supply conduit **202**, respectively.

[0035] According to the exemplary embodiment, nozzles **210**, **224** are shaped in the form of a venturi. For example, as illustrated in FIG. 3, venturi-shaped additive nozzle **224** may be a tapered end of additive supply conduit **222**. More specifically, additive supply conduit **222** may define an inner surface **226** that defines an opening **228** through which additive supply conduit **222** is connected to water supply conduit **202**. Inner surface **226** may be tapered—i.e., may decrease in internal diameter—as the additive supply conduit **222** approaches opening **228** and water supply conduit **202**. In this manner tapered inner surface **226** may result in a flow restriction of additive supply conduit **222**, and as a result of the Venturi effect, the pressure of wash additive flowing through nozzle **224** may decrease in pressure and increase in velocity. Notably, dispensing nozzle **210** may be formed in a similar manner to provide wash liquid to wash tub **121**. One skilled in the art will appreciate that the shape of nozzles **210**, **224** may be varied in order to adjust flow characteristics therethrough, and such variations are contemplated as within the scope of the present subject matter.

[0036] As illustrated, additive supply conduit **222** is connected to water supply conduit **202** slightly upstream of dispensing nozzle **210**. In this manner, the flowing water may entrain, mix, and dissolve the wash additive to form a wash liquid prior to dispensing into wash tub **121** through dispensing nozzle **210**. According to alternative embodiments, additive supply conduit **222** may be connected fur-

ther upstream on water supply conduit **202** or in a location where wash additive may dissolve more quickly, e.g., near hot water inlet **204**.

[0037] In operation, additive dispensing assembly **200** adds a wash additive from additive dispenser **220** in proportion to the amount of water flowing through water supply conduit **202**. More specifically, water is provided from cold water inlet **206** and hot water inlet **204** to achieve the desired water flowrate and temperature. This flowrate and temperature may be controlled by controller **108** or may be manually adjusted by the user. Water flows into the water supply conduit **202** past additive nozzle **224**, creating a negative pressure in additive supply conduit **222**. This negative pressure draws in wash additive from additive dispenser **220**. The wash additive travels through additive supply conduit **222** and is injected into water supply conduit **202** by additive nozzle **224**. The water traveling through water supply conduit **202** entrains, mixes, and dissolves the wash additive to create a wash liquid that is dispensed into wash tub **121**. Notably, the concentration of wash additive in the wash liquid is proportional to the amount of water delivered to wash tub.

[0038] According to an alternative embodiment illustrated in FIG. 4, additive dispensing assembly **200** may further include a valve **230** for controlling the flow of wash additive through additive supply conduit **222**. For example, valve **230** may be a solenoid valve that is electrically connected to controller **108**. However, any other suitable valve may be used to control the flow of wash additive. Controller **108** may selectively open and close valve **230** to allow wash additive to flow from additive dispenser **220** through additive supply conduit **222**. For example, during a rinse cycle where only water is desired, valve **230** may be closed to prevent wash additive from being drawn through additive supply conduit **222**.

[0039] According to another alternative embodiment illustrated in FIG. 5, additive dispensing assembly **200** may include both a valve **230** and a pump **232**. Valve **230** may operate in the same manner as described with respect to FIG. 4. Pump **232** may be used to pump a desired amount of wash additive from additive dispenser **220** through additive supply conduit **222**, regardless of the flowrate of water. This may be desirable, for example, for extra soiled loads for which it is desirable to provide a concentrated wash liquid into wash tub **121**. Alternatively, pump **232** could supply a lower quantity of wash additive for light loads that do not require concentrated wash liquid. Although FIG. 5 illustrates pump **232** being used with valve **230**, one skilled in the art will appreciate that pump **232** also be used independently of valve **230** in alternative embodiments.

[0040] One skilled in the art will appreciate that in addition to the configurations of additive dispensing assembly **200** described herein, alternative configurations of additive dispensing assembly **200** are possible and within the scope of the present subject matter. For example, although only one additive dispenser **220** is described herein, one skilled in the art will appreciate that more than one additive dispenser may be included in alternative embodiments, e.g., for holding a wash detergent and a softener. Other configurations are also possible.

[0041] 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 languages of the claims.

What is claimed is:

1. A washing machine appliance defining a vertical, a lateral, and a transverse direction, the washing machine appliance comprising:

- a cabinet;
- a wash tub positioned within the cabinet;
- a wash basket rotatably mounted within the wash tub, the wash basket defining a wash chamber for receiving articles for washing; and
- an additive dispensing assembly positioned within the cabinet and configured to provide wash liquid to the wash tub, the additive dispensing assembly comprising:
 - a water supply conduit extending between a water supply and the wash tub;
 - an additive dispenser for storing and dispensing a wash additive; and
 - a siphon channel extending from the additive dispenser to the water supply conduit,
 wherein a flow of water directed through the water supply conduit creates a siphon which draws the wash additive into the water supply conduit to mix with the flow of water and create a wash liquid that is dispensed into the wash tub.

2. The washing machine appliance of claim 1, wherein the siphon channel is connected to the water supply conduit using a venturi-shaped nozzle.

3. The washing machine appliance of claim 1, wherein the water supply conduit is in fluid communication with both a hot water supply through a hot water inlet and a cold water supply through a cold water inlet.

4. The washing machine appliance of claim 1, wherein the siphon channel is calibrated to provide a selected flow rate of the wash additive.

5. The washing machine appliance of claim 4, wherein the selected flow rate of the wash additive is proportional to a flow rate of the flow of water through the water supply conduit.

6. The washing machine appliance of claim 1, further comprising a valve operatively coupled with the siphon channel for controlling the flow of the wash additive through the siphon channel.

7. The washing machine appliance of claim 6, wherein the valve is a solenoid valve that is selectively controlled based on at least one of the selected wash cycle, the soil level of the articles to be washed, and the article type.

8. The washing machine appliance of claim 1, further comprising a pump operatively coupled with the siphon channel, the pump configured to selectively dispense the wash additive from the additive dispenser.

9. The washing machine appliance of claim 8, further comprising a valve operatively coupled with the siphon channel for controlling the flow of the wash additive through the siphon channel.

10. The washing machine appliance of claim 1, wherein the wash additive is either detergent or fabric softener.

11. An additive dispensing assembly for providing wash liquid to a wash tub of a washing machine appliance, the additive dispensing assembly comprising:

- a water supply conduit extending between a water supply and the wash tub;
- a solenoid valve operatively coupled to the water supply and configured to selectively provide a flow of water to the wash tub;
- an additive reservoir configured for receiving a wash additive; and
- an additive supply conduit operably coupling the additive reservoir to the water supply conduit such that the flow of water through the water supply conduit creates a negative pressure in the additive supply conduit which draws the wash additive into the water supply conduit to mix with the flow of water and create a wash liquid that is dispensed into the wash tub.

12. The additive dispensing assembly of claim **11**, wherein the additive supply conduit is connected to the water supply conduit using a venturi-shaped nozzle.

13. The additive dispensing assembly of claim **11**, wherein the water supply conduit is in fluid communication with both a hot water supply through a hot water inlet and a cold water supply through a cold water inlet.

14. The additive dispensing assembly of claim **11**, wherein the additive supply conduit is calibrated to provide a selected flow rate of the wash additive.

15. The additive dispensing assembly of claim **14**, wherein the selected flow rate of the wash additive is proportional to a flow rate of the flow of water through the water supply conduit.

16. The additive dispensing assembly of claim **11**, further comprising a valve operatively coupled with the additive supply conduit for controlling a flow of the wash additive through the additive supply conduit.

17. The additive dispensing assembly of claim **16**, wherein the valve is a solenoid valve that is selectively controlled based on at least one of the selected wash cycle, the soil level of the articles to be washed, and the article type.

18. The additive dispensing assembly of claim **11**, further comprising a pump operatively coupled with the additive supply conduit, the pump configured to selectively dispense the wash additive from the additive reservoir.

19. The additive dispensing assembly of claim **18**, further comprising a valve operatively coupled with the additive supply conduit for controlling a flow of the wash additive through the additive supply conduit.

20. The additive dispensing assembly of claim **11**, wherein the wash additive is either detergent or fabric softener.

* * * * *