Disclosed herein is a washing machine including a body, a tub disposed within the body to retain water, a spin basket rotatably installed in the tub, a detergent feeding device to supply detergent and water to the tub. The detergent feeding device includes a detergent housing installed in the body, a detergent case installed in the detergent housing to store liquid detergent, and a detergent introduction module to introduce the liquid detergent stored in the detergent case into the detergent housing. As the detergent introduction module is installed on the outer surface of the detergent case, placement of electrical components inside the detergent case is avoided.
Fig. 9

- **Manipulation Button** connected to **Control Unit**
- **Control Unit** connected to **Drive Motor**
- **Control Unit** connected to **Detergent Introduction Module**
DETERGENT FEEDING DEVICE AND WASHING MACHINE HAVING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Korean Patent Application No. 10-2012-0055359, filed on May 24, 2012 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND

[0002] 1. Field
[0003] Embeddings of the present disclosure relate to a detergent feeding device to feed liquid detergent and a washing machine having the same.

[0004] 2. Description of the Related Art
[0005] A washing machine includes a tub to retain water and a spin basket rotatably installed in the tub. The laundry contained in the spin basket is washed in the tub by rotation of the spin basket.

[0006] The washing machine is provided with a detergent feeding device to feed detergent, to be used for washing, along with water to the tub. Recently, some washing machines have employed a detergent feeding device adapted to liquid detergent which is more soluble in water than powder detergent.

SUMMARY

[0007] Therefore, it is an aspect of the present disclosure to provide a detergent feeding device which eliminates an electrical component from a detergent case.

[0008] Additional aspects will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

[0009] In accordance with one aspect, a washing machine includes a body, a tub disposed within the body to retain water, a spin basket rotatably installed in the tub, a detergent feeding device to supply detergent and water to the tub, and a control unit to control the detergent feeding device, wherein the detergent feeding device comprises a housing installed in the body, a detergent case installed in the detergent housing to store liquid detergent, and a detergent introduction module installed on an outer surface of the detergent case to communicate with an inside of the detergent case and adapted to introduce the liquid detergent stored in the detergent case into the detergent housing according to a command transferred from the control unit.

[0010] The detergent introduction module may be detachably installed on the outer surface of the detergent case.

[0011] The detergent introduction module may include at least one detergent pump to pump the liquid detergent in the detergent case to discharge the liquid detergent into the detergent housing.

[0012] The detergent pump may include a first gear formed in an annular shape and provided with teeth on an inner circumferential surface thereof, a second gear formed to have an outer diameter smaller than an inner diameter of the first gear and provided with teeth on an outer circumferential surface thereof to engage with the teeth provided on the inner circumferential surface of the first gear, and a detergent pump motor to generate rotary power to rotate the second gear.

[0013] The detergent introduction module may include a detergent introduction module housing provided with a channel connected to the detergent case to guide discharge of the liquid detergent, wherein the detergent introduction module housing may include a chamber allowing the first gear and the second gear to be rotatably installed therein, an inflow guide channel to communicate with the detergent case to guide the liquid detergent to the chamber, a discharge guide channel to guide discharge of the liquid detergent to an upper side in the chamber, and a discharge guide pipe connected to an upper end of the discharge guide channel to discharge the liquid detergent downward.

[0014] The detergent case may be installed in the detergent housing to be moveable forward and backward, and the detergent introduction module may be installed at a rear surface of the detergent case.

[0015] The washing machine may further include a first connector provided at a rear side of the detergent introduction module, and a second connector provided at an inner rear side of the detergent housing to be selectively connected to the first connector depending on a position of the detergent case.

[0016] The detergent case may include a main detergent storage part to store main detergent in a liquid state and a sub-detergent storage part to store sub-detergent in liquid state, and the at least one detergent pump may include a main detergent pump to pump out the main detergent stored in the main detergent storage part, and a sub-detergent pump to pump out the sub-detergent stored in the sub-detergent storage.

[0017] In accordance with one aspect, a detergent feeding device includes a detergent housing, a detergent case installed in the detergent housing to store liquid detergent, and a detergent introduction module installed on an outer surface of the detergent case to communicate with an inside of the detergent case to introduce the liquid detergent stored in the detergent case into the detergent housing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] These and/or other aspects will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

[0019] FIG. 1 is a cross-sectional view illustrating a washing machine having a detergent feeding device according to an exemplary embodiment;

[0020] FIG. 2 is a perspective view illustrating the detergent feeding device according to the embodiment;

[0021] FIG. 3 is an exploded perspective view illustrating a detergent housing of the detergent feeding device of FIG. 2;

[0022] FIG. 4 is an exploded perspective view illustrating a detergent case of the detergent feeding device of FIG. 2;

[0023] FIG. 5 is a perspective view illustrating a detergent case and a detergent introduction module applied to the detergent feeding device of FIG. 2;

[0024] FIG. 6 is an exploded perspective view illustrating the detergent introduction module applied to the detergent feeding device of FIG. 2;

[0025] FIG. 7 is a cross-sectional top view illustrating the detergent introduction module applied to the detergent feeding device of FIG. 2;

[0026] FIG. 8 is a cross-sectional side view illustrating the detergent introduction module applied to the detergent feeding device of FIG. 2; and

[0027] FIG. 9 is a control block diagram illustrating the detergent feeding device of FIG. 2.
DETAILED DESCRIPTION

[0028] Reference will now be made in detail to the embodiments, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

[0029] As shown in FIG. 1, a washing machine includes a housing 10 forming an external appearance of the washing machine, a tub 20 disposed inside the housing 10, a spin basket 30 rotatably installed in the tub 20, and a drive motor 40 to rotate the spin basket 30.

[0030] At the upper portion of the front of the housing 10 is disposed a control panel (not shown) provided with a manipulation button 810, which will be described later, allowing a user to control operation of the washing machine. A circuit board (not shown) forming a control unit 800, which will be described later, is disposed inside the control panel. Also, an introduction port 10a is provided at the center of the front face of the housing 10 to allow introduction of laundry into the spin basket 30, and is opened and closed by a door 11 rotatably installed at the front face of the housing 10.

[0031] The tub 20 is installed inside the housing 10 using a suspension member, and water to be used in washing the laundry is stored therein.

[0032] The spin basket 30 includes a body part 31 having a cylindrical shape, a front plate 32 disposed at the front of the body part 31, and a rear plate 33 disposed at the rear of the body part 31. A plurality of through holes 31a is provided in the body part 31 of the spin basket 30 to allow flow of wash water therethrough, and a plurality of lifters 31b to lift the laundry upward is provided on the inner circumferential surface of the spin basket 30 and arranged spaced apart from each other in a circumferential direction. The front plate 32 is provided with an opening 32a through which the laundry is inserted or removed. Installed at the center of the rear plate 33 is a shaft flange 34 to which a rotating shaft 43 of the drive motor 40, which will be described later, is connected.

[0033] The drive motor 40 includes a stator 41 fixed to the rear surface of the tub 20, a rotator 42 to interact with the stator 41 to rotate, and a rotating shaft 43 having one end fixed to the center of the rotator 42 and the other end fixed to the center of the rear plate 33 of the spin basket 30 through the tub 20.

[0034] Provided at the rear wall of the tub 20 is a bearing housing 21 to support the rotating shaft 43 such that the rotating shaft 43 is rotatable. The bearing housing 21 is manufactured using an insert injection molding process. Installed inside the bearing housing 21 are bearings 22 to support the rotating shaft 43 such that the rotating shaft 43 is rotatable.

[0035] At the upper portion of the tub 20 are disposed a water supply unit 50 to supply water to the tub 20 and a detergent feeding device 70 connected to the water supply unit 50 to supply water delivered through the water supply unit 50 to the tub 20 along with detergent. At the lower portion of the tub 20 is disposed a drain unit 60 to discharge used wash water to the outside of the housing 10.

[0036] The water supply unit 50 includes water supply pipes 51 to connect an external water source (not shown) and the detergent feeding device 70 to each other, and a water supply valve 52 disposed in the water supply pipes 51 to open and close the water supply pipe 51. The drain unit 60 includes a drain pipe 61 to guide water in the tub 20 to be discharged to the outside of the housing 10, and a drain pump 62 disposed at the drain pipe 61 to discharge water through the drain pipe 61.

[0037] The detergent feeding device 70 is connected to the tub 20 via a connection pipe 53 connected to the lower portion of the detergent feeding device 70. Accordingly, water supplied through the water supply pipes 51 is supplied to the tub 20 through the connection pipe 53 via the detergent feeding device 70.

[0038] As shown in FIGS. 2 to 4, the detergent feeding device 70 includes a detergent case 710 to retain detergent, a detergent housing 700 to accommodate the detergent case 710. A plurality of water supply ports 702a is provided at the upper portion of the rear end of the detergent housing 700 to be connected with the water supply pipes 51, and a connection port 700b is provided at the lower portion of the detergent housing 700 to be connected with the connection pipe 53.

[0039] As shown in FIG. 3, the detergent housing 700 is mounted and fixed to the housing 10 of the washing machine, and includes a housing cover 701 to cover the top of the detergent housing 700. Also, installed at the inner upper portion of the detergent housing 700 is a first water supply guide 702 disposed at the upper portion of the detergent case 710 and provided at the rear end thereof with the water supply ports 702a to distribute water supplied through the water supply pipes 51 to a powder detergent storage part 710c, which will be described later, or a manual detergent supply unit 710d, which will be described later. Installed at the inner rear side of the detergent housing 700 is a second water supply guide 703 connected to the first water supply guide 702 to distribute water supplied through the water supply pipes 51 to the left and right sides in the detergent housing 700.

[0040] The detergent case 710 is movably installed in the detergent housing 700 though the detergent case inserting hole 700a provided at the front of the detergent housing 700. Accordingly, a user is allowed to introduce detergent into the detergent case 710 by retracting the detergent case 710 from the detergent housing 700, or to remove the detergent case 710 from the detergent housing 700 to clean the detergent case 710.

[0041] The detergent case 710 is provided with a plurality of detergent storage parts 710a, 710b, 710c and 710d to store detergent. The detergent storage parts 710a, 710b, 710c and 710d include liquid detergent storage parts 710a and 710b to store liquid detergent, a powder detergent storage part 710c to store powder detergent, a manual detergent supply unit 710d allowing the user to supply a rinse additive or bleach. Also, the liquid detergent storage parts 710a and 710b are divided into a main detergent storage part 710a to accommodate main detergent in a liquid state and a sub-detergent storage part 710b to store sub-detergent in a liquid state such as the rinse additive or bleach.

[0042] A detergent case cover 711 is mounted to the upper portion of the detergent case 710 to prevent overflow of detergent in the detergent case 710. Also, the detergent case cover 711 is provided with a plurality of detergent introduction ports 711a, 711b, 711c and 711d to introduce detergent into the respective detergent storage parts 710a, 710b, 710c and 710d. Among the detergent introduction ports 711a, 711b, 711c and 711d, the detergent introduction ports for the main detergent storage part 710a and sub-detergent storage part 710b retaining a large amount of liquid detergent are provided with storage covers 711e and 711f to prevent overflow of the liquid detergent.

[0043] The detergent feeding device 70 also includes a detergent introduction module 730 controlled by a control unit 800 to introduce liquid detergent stored in the detergent
case 710 into the detergent housing 700 to thereby allow the liquid detergent to be mixed with water in the detergent housing 700 and supplied to the tub 20 along with water.

[0044] As shown in FIG. 5, the detergent introduction module 730 is installed to communicate with the detergent case 710. The detergent introduction module 730 is arranged at the outer surface of the detergent case 710 to avoid arranging electrical connection structures in the detergent case 710. In the illustrated embodiment, the detergent introduction module 730 is installed at the rear surface of the detergent case 710.

[0045] As shown in FIG. 6, the detergent introduction module 730 includes detergent pumps 731M and 731S to pump liquid detergent in the detergent case 710 to discharge the liquid detergent to the detergent housing 700. A detergent introduction module housing 732 is provided in the manner to communicate with the detergent case 710 and guide discharge of the liquid detergent. The detergent introduction module 730 also includes a detergent introduction module cover 734 to cover the top of the detergent introduction module housing 732, and a bottom plate 735 disposed at the bottom surface of the detergent introduction module housing 732 to define a chamber, which will be described later. In the illustrated embodiment, the detergent pumps 731M and 731S include a main detergent pump 731M to pump main detergent stored in the main detergent storage 710a and a sub-detergent pump 731S to pump sub-detergent stored in the sub-detergent storage 710b installed in the detergent introduction module housing 732.

[0046] To allow liquid detergent to be transferred from the detergent case 710 to the detergent introduction module 730, a pair of communication holes 710e and 710f respectively connected to the main detergent storage part 710a and the sub-detergent storage part 710b is provided on the rear surface of the detergent case 710. The detergent introduction module housing 732 is provided with inlets 732a at positions corresponding to the communication holes 710e and 710f to allow liquid detergent to flow into the detergent introduction module housing 732. Disposed between communication holes 710e and 710f and the inlets 732a are sealing members 736.

[0047] Each of the detergent pumps 731M and 731S includes a first gear 731a formed in an annular shape and provided with teeth on the inner circumferential surface thereof, a second gear 731b having an outer diameter smaller than the inner diameter of the first gear 731a and teeth provided on the outer circumferential surface thereof to engage with the teeth formed on the inner circumferential surface of the first gear 731a, and a detergent pump motor 731c to generate rotary power to rotate the second gear 731b.

[0048] As shown in FIGS. 7 and 8, the detergent introduction module housing 732 includes a chamber 732b provided at the lower portion of the detergent introduction module housing 732 to allow the first gear 731a and the second gear 731b to be rotatably installed therein, an inflow guide channel 732c connected to the inlet 732a to communicate with the detergent case 710 and adapted to guide the liquid detergent to the chamber 732b, a discharge guide channel 732d to guide the liquid detergent to a higher location in the chamber 732b than that of the liquid detergent stored in the detergent case 710, a discharge guide pipe 733 connected to the upper end of the discharge guide channel 732d to discharge the liquid detergent downward. In the illustrated embodiment, as a pair of detergent pumps is provided, the detergent introduction module 730 is provided with a pair of chambers 732b, a pair of inflow guide channels 732c, a pair of discharge guide channels 732d and a pair of discharge guide pipes 733.

[0049] In the illustrated embodiment, the detergent case 710 is installed in the detergent housing 700 such that the detergent case 710 is movable back and forth, and therefore a first connector 737 is provided at the rear side of the detergent introduction module 730, and a second connector 704 is provided at the inner rear side of the detergent housing 700 to be selectively connected to the first connector 737 depending on the position of the detergent case 710. Accordingly, when the detergent case 710 is accommodated in the detergent housing 700, the first connector 737 is connected with the second connector 704 so that electricity may be applied to the detergent introduction module 730. When the detergent case 710 is protruded from the detergent housing 700, the first connector 737 is disconnected from the second connector 704, and thus electricity is not allowed to be applied to the detergent introduction module 730.

[0050] Such washing machine includes, as shown in FIG. 9, a control unit 800 to control operations of the respective components of the washing machine such as the detergent feeding device 70 and the drive motor 40, and a manipulation button 810 allowing the user to select functions of the washing machine. Thereby, the drive motor 40 and the detergent introduction module 730 are controlled through the control unit 800.

[0051] Accordingly, when an operation of the washing machine is selected by the user through the manipulation button 810, the control unit 800 applies electricity to the drive motor 40 and the detergent introduction module 730 according to cycles such as washing, rinsing and draining that are preset in the control unit 800.

[0052] When electricity is applied to the detergent introduction module 730, the detergent pumps 731M and 731S are driven, and main detergent or sub-detergent in liquid state stored in the main detergent storage part 710a or sub-detergent storage part 710b of the detergent case 710 passes sequentially through the communication holes 710e and 710f, inlets 732a and inflow guide channel 732c and flows into the chamber 732b, and is then discharged into the detergent housing 700 via the discharge guide channel 732d and the discharge guide pipe 733.

[0053] As is apparent from the above description, with an electrically operated detergent introduction module disposed on the outer surface of a detergent case, a connection structure for operation of the detergent introduction module is positioned at the outer side of the detergent case, and therefore a simple configuration of the inside of the detergent case may be ensured.

[0054] Although a few embodiments have been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, and the scope of which is defined in the claims and their equivalents.

What is claimed is:

1. A washing machine comprising:
   a) a body,
   b) a tub disposed within the body to retain water;
   c) a spin basket rotatably installed in the tub;
   d) a detergent feeding device to supply detergent and water to the tub; and
   e) a control unit to control the detergent feeding device,
wherein the detergent feeding device comprises a detergent housing installed in the body, a detergent case installed in the detergent housing to store liquid detergent, and a detergent introduction module installed on an outer surface of the detergent case to communicate with an inside of the detergent case and adapted to introduce the liquid detergent stored in the detergent case into the detergent housing according to a command transferred from the control unit.

2. The washing machine according to claim 1, wherein the detergent introduction module is detachably installed on the outer surface of the detergent case.

3. The washing machine according to claim 1, wherein the detergent introduction module comprises at least one detergent pump to pump the liquid detergent in the detergent case to discharge the liquid detergent into the detergent housing.

4. The washing machine according to claim 3, wherein the detergent pump comprises a first gear formed in an annular shape and provided with teeth on an inner circumferential surface thereof, a second gear formed to have an outer diameter smaller than an inner diameter of the first gear and provided with teeth on an outer circumferential surface thereof to engage with the teeth provided on the inner circumferential surface of the first gear, and a detergent pump motor to generate rotary power to rotate the second gear.

5. The washing machine according to claim 4, wherein the detergent introduction module comprises a housing provided with a channel connected to the detergent case to guide discharge of the liquid detergent.

6. The washing machine according to claim 1, wherein: the detergent case is installed in the detergent housing to be movable forward and backward; and the detergent introduction module is installed at a rear surface of the detergent case.

7. The washing machine according to claim 6, further comprising a first connector provided at a rear side of the detergent introduction module, and a second connector provided at an inner rear side of the detergent housing to be selectively connected to the first connector depending on a position of the detergent case.

8. The washing machine according to claim 3, wherein: the detergent case comprises a main detergent storage part to store main detergent in a liquid state and a sub-detergent storage part to store sub-detergent in a liquid state; and

the at least one detergent pump comprises a main detergent pump to pump out the main detergent stored in the main detergent storage part, and a sub-detergent pump to pump out the sub-detergent stored in the sub-detergent storage.

9. A detergent feeding device comprising:
   a detergent housing;
   a detergent case installed in the detergent housing to store liquid detergent; and
   a detergent introduction module installed on an outer surface of the detergent case to communicate with an inside of the detergent case to introduce the liquid detergent stored in the detergent case into the detergent housing.

10. The detergent feeding device according to claim 9, wherein the detergent introduction module is detachably installed on the outer surface of the detergent case.

11. The detergent feeding device according to claim 9, wherein the detergent introduction module comprises at least one detergent pump to pump out the liquid detergent in the detergent case to discharge the liquid detergent into the detergent housing.

12. The detergent feeding device according to claim 11, wherein the detergent pump comprises a first gear formed in an annular shape and provided with teeth on an inner circumferential surface thereof, a second gear formed to have an outer diameter smaller than an inner diameter of the first gear and provided with teeth on an outer circumferential surface thereof to engage with the teeth provided on the inner circumferential surface of the first gear, and a detergent pump motor to generate rotary power to rotate the second gear.

13. The detergent feeding device according to claim 12, wherein the detergent introduction module comprises a detergent introduction module housing provided with a channel connected to the detergent case to guide discharge of the liquid detergent, wherein the detergent introduction module housing comprises a chamber allowing the first gear and the second gear to be rotatably installed therein, an inflow guide channel to communicate with the detergent case to guide the liquid detergent to the chamber, a discharge guide channel to guide discharge of the liquid detergent to an upper side in the chamber, and a discharge guide pipe connected to an upper end of the discharge guide channel to discharge the liquid detergent downward.

14. The detergent feeding device according to claim 9, wherein:
   the detergent case is installed in the detergent housing to be movable forward and backward; and
   the detergent introduction module is installed at a rear surface of the detergent case.

15. The detergent feeding device according to claim 14, further comprising a first connector provided at a rear side of the detergent introduction module, and a second connector provided at an inner rear side of the detergent housing to be selectively connected to the first connector depending on a position of the detergent case.

16. The detergent feeding device according to claim 11, wherein:
   the detergent case comprises a main detergent storage part to store main detergent in a liquid state and a sub-detergent storage part to store sub-detergent in a liquid state; and
   the at least one detergent pump comprises a main detergent pump to pump out the main detergent stored in the main detergent storage part, and a sub-detergent pump to pump out the sub-detergent stored in the sub-detergent storage.

17. A washing machine comprising:
   a body;
   a tub disposed within the body to retain water;
   a spin basket rotatably installed in the tub; and
   a detergent feeding device to supply detergent and water to the tub; and
a control unit to control the detergent feeding that allows for a user to set how much liquid detergent is supplied to the tub;
wherein the detergent feeding device comprises:
a detergent housing;
a detergent case installed in the detergent housing to store liquid detergent; and
a detachable detergent introduction module comprising at least one pump is installed on an outer surface of the detergent case to communicate with an inside of the detergent case to introduce the liquid detergent stored in the detergent case into the detergent housing.