Disclosed herein is a dish washing machine having a sump assembly including a sump housing including a water storage chamber to store wash water and a sidewall portion and a bottom portion, the sidewall portion and the bottom portion defining the water storage chamber, a filter mounted at an upper portion of the sump housing and provided with an opening allowing the washing tub and the water storage chamber to communicate with each other therethrough, a coarse filter formed in a cylindrical shape and mounted on the opening, and a microfilter mounted in the water storage chamber to define a dirt catching chamber for catching of dirt in conjunction with one part of the sidewall portion and one part of the bottom portion of the sump housing, the microfilter being formed in a flat shape.
FIG. 5
DISH WASHING MACHINE AND SUMP ASSEMBLY THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS


BACKGROUND

1. Field

Embodiments of the present disclosure relate to a dish washing machine having a sump assembly arranged at a lower portion of a washing tub to store wash water.

2. Description of the Related Art

A dish washing machine, which is a home appliance to wash the dishes, includes a body provided therein with a washing tub, a basket to accommodate dishes, a spray unit to spray wash water, a water storage chamber to store wash water, and a sump assembly having a plurality of filters to filter out dirt, and a washing pump to pump out the wash water in the water storage chamber toward the spray unit.

In general, the filters to filter out dirt include a fine filter arranged on the bottom of the washing tub and having through holes of an intermediate size, a coarse filter arranged in the opening of the fine filter and having relatively large through holes, and a microfilter arranged in the water storage chamber and having microscopic through holes.

Herein, the microfilter is formed in the shape of a cylinder having an open top and an open bottom and disposed in a water storage space. After passing through the coarse filter, the wash water is introduced into the microfilter through the open top of the microfilter. Dirt whose size is greater than that of the micro through holes formed in the circumferential surface of the microfilter is caught in the microfilter.

Accordingly, a dirt catching chamber is formed in the microfilter, and a circulation chamber connected to a circulation flow passage is formed between the microfilter and a sump housing.

SUMMARY

Therefore, it is an aspect to provide a dish washing machine including a sump assembly having a microfilter formed in a flat shape rather than a cylindrical shape.

It is an aspect to provide a dish washing machine including a sump assembly having a dirt catching chamber defined by a microfilter and a sidewall portion and a bottom portion of a sump housing.

It is an aspect to provide a dish washing machine which may ensure smooth circulation of wash water from a sump assembly to a spray unit.

It is an aspect to provide a dish washing machine which may enhance sealing of a microfilter and a sump.

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 disclosure.

In accordance with one aspect, a dish washing machine includes a body, a washing tub provided in the body, a basket provided in the washing tub to store dishes, a spray unit to spray wash water to wash the dishes in the basket, and a sump assembly arranged at a lower portion of the washing tub to store wash water, wherein the sump assembly includes a sump housing including a water storage chamber to store wash water and a sidewall portion and a bottom portion, the sidewall portion and the bottom portion defining the water storage chamber, a fine filter arranged at an upper portion of the sump housing and provided with an opening allowing the washing tub and the water storage chamber to communicate with each other therethrough, a course cylindrical filter mounted on the opening, and a microfilter mounted in the water storage chamber to define a dirt catching chamber for catching of dirt in conjunction with one part of the sidewall portion and one part of the bottom portion of the sump housing, the microfilter being formed in a flat shape.

The dish washing machine may further include a circulation chamber defined by the other part of the sidewall portion, the other part of the bottom portion of the sump housing, and the microfilter and adapted to circulate the wash water to the spray unit.

The sidewall portion of the sump housing may be provided with a pair of side fitting grooves allowing the microfilter to be fitted thereinto.

Herein, a width of each of the side fitting grooves may gradually decrease as the side fitting grooves extend downward.

The bottom portion of the sump housing may be provided a bottom fitting groove allowing the microfilter to be fitted thereinto.

The microfilter may include a filter mesh to filter out dirt and a filter frame to support the filter mesh, wherein the filter mesh may be formed in a flat shape.

Herein, the microfilter may include a pair of fitting protrusions protruding from both sides of the filter frame to be coupled to the sump housing, wherein a width of each of the fitting grooves may gradually decrease as the fitting grooves extend downward.

The dish washing machine may further include a dirt cover coupled to the sump housing to cover an open top of the dirt catching chamber.

Herein, the dirt cover may be screw-coupled to the sump housing.

The dirt cover may include a through hole allowing the coarse filter to pass therethrough.

The dirt cover may include a filter support protruding toward the microfilter to support the microfilter.

The sump housing may further include a cover support protruding inward to support the dirt cover.

In accordance with an aspect, a dish washing machine includes a body, a washing tub provided in the body, a sump housing arranged at a lower portion of the washing tub and provided with a water storage chamber to store wash water, a fine filter adapted to cover the water storage chamber and provided with an opening allowing the washing tub and the water storage chamber to communicate with each other therethrough, a course cylindrical filter mounted on the opening, and a microfilter mounted in the water storage chamber such that the microfilter crosses the water storage chamber, the microfilter being formed in a flat shape.

Herein, the microfilter may include a filter mesh formed in a flat shape and a filter frame to support the filter mesh.

The microfilter may include a fitting protrusion protruding from the filter frame to be coupled to the sump housing.
0029. The sump housing may include a sidewall portion and a bottom portion, the sidewall portion and the bottom portion defining the water storage chamber, wherein one part of the sidewall portion, one part of the bottom portion of the sump housing, and the microfilter may define a dirt catching chamber, and the other part of the sidewall portion, the other part of the bottom portion of the sump housing, and the microfilter may define a circulation chamber to circulate the wash water to the washing tub.

0030. The dish washing machine may further include a durt cover coupled to the sump housing to cover an open top of the dirt catching chamber.

0031. In accordance with an aspect, a dish washing machine including a body, a washing tub provided in the body, a sump housing arranged at a lower portion of the washing tub and provided with a water storage chamber to store wash water, a sidewall portion, and a bottom portion, the sidewall portion and the bottom portion defining the water storage chamber, a fine filter adapted to cover the water storage chamber and provided with an opening allowing the washing tub and the water storage chamber to communicate with each other therethrough, a coarse filter formed in a cylindrical shape and mounted on the opening, and a microfilter mounted in the water storage chamber, a vane to move within the washing tub and reflect the...
wash water sprayed from the spray nozzle toward dishes, and a rail extending from a front of the washing tub to a back of the washing tub to guide movement of the vane, wherein the coarse filter may be disposed such that one of two sidewalls of the washing tub is closer than the other sidewall to the coarse filter.

Herein, a bottom surface of the washing tub may be provided with a drainage hole, the dish washing machine further including a fine filter mounted to the drainage hole.

In accordance with an aspect, a dish washing machine includes a body, a washing tub provided in the body, the washing tub having a bottom surface provided with a drainage hole, a fixed nozzle fixed to one side of the washing tub to spray wash water, a vane to move within the washing tub and reflect the wash water sprayed from the fixed nozzle toward dishes, a rail extending from a front of the washing tub to a back of the washing tub to guide movement of the vane, a sump provided with a water storage chamber to store wash water, a fine filter mounted to the drainage hole, a microfilter mounted to the water storage chamber to partition the water storage chamber into a dirt catching chamber to catch dirt and a circulation chamber to circulate the wash water to the fixed nozzle, and a coarse filter mounted to the sump to filter out dirt in the wash water flowing to the dirt catching chamber, the coarse filter being positioned such that one of two sidewalls of the washing tub is closer than the other sidewall to the coarse filter.

Herein, the coarse filter may be mounted to the sump by being inserted into the sump vertically downward and then turned from a release position to a lock position.

In addition, the coarse filter may press the microfilter downward and laterally to maintain sealing of the sump and the microfilter.

**BRIEF DESCRIPTION OF THE DRAWINGS**

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:

**FIG. 1** is a view schematically illustrating a structure of a dish washing machine according to an exemplary embodiment;

**FIG. 2** is a view illustrating the structure of the lower portion of a washing tub of the dish washing machine of FIG. 1;

**FIG. 3** is a view illustrating the sump assembly of the dish washing machine of FIG. 1;

**FIG. 4** is an exploded perspective view illustrating constituents of the sump assembly of the dish washing machine of FIG. 1;

**FIG. 5** is an exploded perspective view illustrating constituents of the sump assembly of the dish washing machine of FIG. 1, as viewed from a different angle;

**FIG. 6** is a view illustrating the sump assembly of the dish washing machine of FIG. 1 with the coarse filter and fine filter removed;

**FIG. 7** is a cross-sectional view taken along line I-I of FIG. 3;

**FIG. 8** is a cross-sectional view taken along line II-II of FIG. 3;

**FIG. 9** is a view illustrating a process of catching dirt in the sump assembly of the dish washing machine of FIG. 1;

**FIG. 10** is a view illustrating a sump, a coarse filter and a fine filter of a dish washing machine according to an embodiment;

**FIG. 11** is an exploded view illustrating the sump, coarse filter, fine filter and microfilter of the dish washing machine of FIG. 10;

**FIG. 12** is a cross-sectional view taken along line III-III of FIG. 10;

**FIG. 13** is an enlarged view illustrating section B of FIG. 12;

**FIG. 14** is a cross-sectional view taken along line IV-IV of FIG. 10;

**FIG. 15** is an enlarged view illustrating section C of FIG. 14;

**FIG. 16** is a plan view illustrating the sump and coarse filter of the dish washing machine of FIG. 10, in which the coarse filter performs a locking operation;

**FIG. 17** is a side view illustrating the coarse filter of the dish washing machine of FIG. 10;

**FIG. 18** is a view illustrating the sump and coarse filter of the dish washing machine of FIG. 10, in which the coarse filter performs a locking operation;

**FIG. 19** is a cross-sectional view illustrating the sump, coarse filter and microfilter of the dish washing machine of FIG. 10;

**FIG. 20** is an enlarged plan view illustrating parts of the coarse filter and microfilter of the dish washing machine of FIG. 10; and

**FIG. 21** is a plan view illustrating the lower portion of a washing tub of the dish washing machine of FIG. 10.

**DETAILED DESCRIPTION**

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.

**FIG. 1** is a view schematically illustrating a structure of a dish washing machine according to an exemplary embodiment, and **FIG. 2** is a view illustrating the structure of the lower portion of a washing tub of the dish washing machine of FIG. 1.

**FIG. 10** refers to FIGS. 1 and 2, a dish washing machine 1 of this embodiment includes a body 10, a washing tub 12 provided in the body 10, baskets 17 and 18 provided in the washing tub 12 to store dishes, spray units 21, 22 and 23 to spray wash water to wash the dishes in the baskets 17 and 18, a water flow passage 40 allowing wash water to be supplied to the washing tub 12 therethrough, a sump assembly 100 provided to a lower portion of the washing tub 12 to store wash water, a circulation pump 43 to pump wash water from the sump assembly 100 to the spray units 21, 22 and 23, a circulation flow passage 42 to connect the sump assembly 100 to the spray units 21, 22 and 23, a drainage pump 45 to discharge the wash water in the sump assembly 100 from the body 10, and a drainage flow passage 44 to connect the sump assembly 100 to an exterior of the body 10.

**FIG. 13** is a cross-sectional view taken along line I-I of FIG. 3;

**FIG. 16** is a cross-sectional view taken along line II-II of FIG. 3;

**FIG. 9** is a view illustrating a process of catching dirt in the sump assembly of the dish washing machine of FIG. 1;
upper basket 17 and a lower rack 16 to support the lower basket 18 may be provided to the washing tub 12.

[0085] The spray units 21, 22 and 23 to spray wash water may include a first spray unit 21 disposed at the upper side, a second spray unit 22 disposed in the middle, and a third spray unit 23 disposed at a lower side.

[0086] The first spray unit 21 and the second spray unit 22 may be rotor type spray units which spray wash water directly onto the dishes while rotating about an axis of rotation.

[0087] The third spray unit 23 may be fixed to one side of the washing tub 12 in order to spray wash water toward an inclined surface 31 of a reflecting plate assembly 30 in an approximately horizontal direction rather than onto the dishes. The wash water sprayed onto the inclined surface 31 may be reflected on the inclined surface 31 toward the dishes at the upper side of the inclined surface 31. The reflecting plate assembly 30 may be provided with a roller 32. Thereby, the reflecting plate assembly 30 may reciprocate along a rail 19 provided to a sidewall 14 of the washing tub 12.

[0088] To this end, the dish washing machine I may be provided with a drive unit to drive the reflecting plate assembly 30. The drive unit may include a drive pump 35 to generate driving power, a pulley 36 to transmit the driving power of the drive pump 35 to the reflecting plate assembly 30, and a wire 37 to connect the pulley 36 to the reflecting plate assembly 30.

[0089] When the drive pump 35 is driven, the wire 37 may be pulled toward the drive pump 35 and the reflecting plate assembly 30 connected to the wire 37 may move toward spray nozzles 24 of the third spray unit 23. When wash water is sprayed from the spray nozzles 24 with the drive pump 35 remaining stationary, the reflecting plate assembly 30 may be moved in the spray direction of the spray nozzles 24 by water pressure.

[0090] In this way, the reflecting plate assembly 30 may rectilinearly reciprocate. Accordingly, the third spray unit 23 may spray wash water into the washing tub 12 such that the wash water reaches all positions in the washing tub 12.

[0091] The configuration of the drive unit of this embodiment is simply illustrative. Any commonly known element adapted to implement rectilinear reciprocation may be employed.

[0092] In addition, while the dish washing machine is illustrated as being provided with two rotor type spray units 21 and 22, and one spray unit 23 to rectilinearly move, embodiments of the present invention are not limited thereto.

[0093] The water flow passage 40 connects an external water supply source with the interior of the washing tub 12. The water flow passage 40 may be provided with a water supply valve 41 to regulate supply of water.

[0094] The sump assembly 100 is arranged at a lower portion of the washing tub 12 to store wash water. The bottom surface 13 of the washing tub 12 is inclined toward the sump assembly 100. Thereby, wash water is allowed to flow down the bottom surface 13 and be collected in the sump assembly 100.

[0095] The sump assembly 100 includes a sump housing 150, a water storage chamber 151 (FIG. 4) provided in the sump housing 150, and a plurality of filters to filter out dirt contained in the wash water. The sump housing 150 may be provided with a circulation port 161 connected to the circulation flow passage 42 and a drainage port 162 connected to the drainage flow passage 44.

[0096] The filters includes a coarse filter 110 having relatively large through holes, a fine filter 120 having through holes of an intermediate size, and a microfilter 130 (FIG. 4) having relatively small through holes. Particularly, the microfilter 130 defines a dirt catching chamber 152 (FIG. 7) which catches dirt and drains the dirt along with the wash water during draining.

[0097] Hereinafter, constituents of the sump assembly 100 will be described in detail.

[0098] FIG. 3 is a view illustrating the sump assembly of the dish washing machine of FIG. 1. FIG. 4 is an exploded perspective view illustrating constituents of the sump assembly of the dish washing machine of FIG. 1. FIG. 5 is an exploded perspective view illustrating constituents of the sump assembly of the dish washing machine of FIG. 1, which are viewed from a different angle. FIG. 6 is a view illustrating the sump assembly of the dish washing machine of FIG. 1 with the coarse filter and fine filter removed. FIG. 7 is a cross-sectional view taken along line I-I of FIG. 3. FIG. 8 is a cross-sectional view taken along line II-II of FIG. 3.

[0099] Referring to FIGS. 3 to 8, the sump assembly 100 of the dish washing machine according to this embodiment includes a sump housing 150 having a water storage chamber 151 to store wash water, a fine filter 120 arranged at the upper portion of the sump housing 150, a coarse cylindrical filter 110 mounted on an opening 123 of the fine filter 120, and a microfilter 130 provided in the water storage chamber 151.

[0100] The sump housing 150 may have an approximately semispherical shape having an open top. The sump housing 150 includes a sidewall portion 154 and a bottom portion 155, which define the water storage chamber 151. The water storage chamber 151 is formed in a space surrounded by the sidewall portion 154 and bottom portion 155 of the sump housing 150 and is provided with an open top.

[0101] The sump housing 150 includes a circulation port 151, a drainage port 152, a first auxiliary port 163, and a second auxiliary port 164, which communicate with the water storage chamber 151. The circulation port 151 is connected to a circulation flow passage, and the drainage port 152 is connected to a drainage flow passage. When necessary, a turbidity sensor and an air discharge hose may be connected to the first auxiliary port 163 and the second auxiliary port 164.

[0102] The sidewalk portion 154 of the sump housing 150 is provided with a pair of side fitting grooves 156 into which the microfilter 130 is fitted, and the bottom portion 155 of the sump housing 150 is provided with a bottom fitting groove 157 (FIG. 8) into which the microfilter 130 is fitted.

[0103] The microfilter 130 may be detachably fitted into the side fitting grooves 156 and bottom fitting groove 157 of the sump housing 150. By fitting the microfilter 130 into the sump housing 150, sealing of the gap between the microfilter 130 and the sump housing 150 may be secured and dirt may be prevented from passing through a portion at which the microfilter 130 and the sump housing 150 are coupled to each other.

[0104] The side fitting grooves 156 may have a width gradually decreasing as the grooves extend downward. Thereby, the microfilter 130 may be easily inserted into the side fitting grooves 156.

[0105] Once the microfilter 130 is mounted to the sump housing 150 by fitting the microfilter 130 into the side fitting grooves 156 and the bottom fitting groove 157, the water storage chamber 151 may be partitioned into a dirt catching chamber 152 (FIGS. 7 and 8) and a circulation chamber 153 (FIGS. 7 and 8) by the microfilter 130.
The fine filter 120 includes a fine filter body 121, fine through holes 122 formed in the fine filter body 121 and having a relatively intermediate size, and an opening 123 formed in the fine filter body 121 to allow the washing tub to communicate with the water storage chamber 151. The fine filter body 121 is inclined toward the opening 123.

The coarse filter 110 is approximately formed in a cylindrical shape. The coarse filter 110 is mounted on the opening 123 of the fine filter 120 to filter out dirt contained in the wash water passing through the opening 123 of the fine filter 120. The coarse filter 110 includes a coarse cylindrical filter body 111, coarse through holes 112 formed in the coarse filter body 111 and having a relatively large size, and a grip 113 facilitating holding of the coarse filter 110.

The microfilter 130 is approximately formed in a flat shape. The microfilter 130 is fitted into the sump housing 150 and disposed in the water storage chamber 151 of the sump housing 150. While the microfilter 130 is illustrated as being formed in a flat shape, the microfilter may have any non-cylindrical shape different from the flat shape.

For example, the microfilter 130 may have a bent shape or zigzag shape, but is not limited to any set shape.

That is, a microfilter having a bent shape or zigzag shape may be within the scope of the spirit of the present disclosure if the microfilter is allowed to be disposed across the water storage chamber such that a dirt catching chamber is defined by being surrounded by the microfilter and the sump housing.

The microfilter 130 includes a filter mesh 131 having a flat shape and micro through holes and a filter frame 132 to support the filter mesh 131.

The filter frame 132 may include an outer frame 133 joined to the edge of the filter mesh 131 and a middle frame 134 arranged at the center of the filter mesh 131. The lower end 135 of the filter frame 132 may be fitted into the bottom fitting groove 157 of the sump assembly 150.

In addition, the microfilter 130 may include a pair of fitting protrusions 136 protruding from the filter frame 132 to be fitted into the side fitting grooves 156 of the sump housing 150. The width of the fitting protrusions 136 may decrease as the fitting protrusions 136 extends downward such the fitting protrusions 136 correspond to the side fitting grooves 156 of the sump housing 150.

By fitting the fitting protrusions 136 on both sides of the microfilter 130 into the side fitting grooves 156 of the sump housing 150, the microfilter 130 is mounted to the sump housing 150 across the water storage chamber 151.

Accordingly, the water storage chamber 151 is divided into two chambers 152 and 153 by the microfilter 130. Chamber 152 is disposed under the opening 123 of the fine filter 120. Accordingly, dirt having passed through the coarse filter 110 mounted on the opening 123 is introduced into this chamber 152.

The dirt having failed to pass through the filter mesh 131 of the microfilter 130 is caught in the chamber 152. In this context, the chamber 152 is defined as a dirt catching chamber 152, and the other chamber 153 is defined as a circulation chamber 153. The dirt catching chamber 152 communicates with the drainage port 162, and the circulation chamber 153 communicates with the circulation port 161.

The dirt catching chamber 152 is formed in a space surrounded by the microfilter 130, one part 154a of the side-wall portion of the sump housing (FIGS. 7 and 8), and one part 155a of the bottom portion of the sump housing (FIGS. 7 and 8).

In addition, the circulation chamber 153 is formed in a space surrounded by the microfilter 130, the other part 154b of the sidewall portion of the sump housing (FIGS. 7 and 8), and the other part 155b of the bottom portion of the sump housing (FIGS. 7 and 8).

The above configuration results from the microfilter 130 being formed in a flat shape rather than a cylindrical shape and disposed across the water storage chamber 150.

The dirt catching chamber 152 and the circulation chamber 153 take a concentrated form rather than a distributive form like a doughnut shape. The concentrated form may allow smoother flow of wash water than the distributive form.

The dish washing machine may further include a dirt cover 140 coupled to the top of the dirt catching chamber 152 in order to prevent backflow or overflow of the dirt caught in the dirt catching chamber 152.

The dirt cover 140 may be joined to the sump housing 150 by a screw S. To this end, screw fastening holes 143 and 158 (FIG. 5) may be formed respectively in the dirt cover 140 and the sump housing 150. In addition, the sump housing 150 may include a cover support 159 protruding toward the water storage space 151 to support the edge of the dirt cover 140.

The dirt cover 140 may include a cover portion 141 arranged approximately horizontally to cover the top of the dirt catching chamber 152, and a filter support 142 protruding from the cover portion 141 to support the microfilter 130.

The cover portion 141 may be provided with a through hole 144 through which the coarse filter 110 passes. The filter support 142 may include a horizontal support 142a to support the filter frame 132 of the microfilter 130 and a vertical support 142b to support the filter mesh 131 of the microfilter 130. The vertical support 142b may be provided with an insertion groove 142c into which the middle frame 134 of the filter frame 132 is inserted.

Through the configuration as above, the dirt cover 140 may prevent backflow or overflow of the dirt caught in the dirt catching chamber 152 and support the microfilter 130.

FIG. 9 is a view illustrating a process of catching dirt in the sump assembly of the dish washing machine of FIG. 1.

Hereinafter, a process of catching dirt in the sump assembly of the dish washing machine will be described with reference to FIGS. 1 to 9.

Wash water sprayed from the spray units 21, 22 and 23 washes the dishes and falls to the bottom 13 of the washing tub 12, causing the dirt to fall. Then, the wash water is moved to the fine filter 120 by inclination of the bottom 13 of the washing tub 12.

Then, the wash water reaches the top of the fine filter 120. After passing through the holes 122 of the fine filter 120, the wash water is stored in the water storage chamber 151.

Some of the dirt reaching the fine filter 120 passes through the through holes 122 of the fine filter 120 and falls into the circulation chamber 153, and the remaining portion of the dirt is moved to the coarse filter 110 by inclination of the fine filter 120.

Some masses of the dirt moved to the coarse filter 110 has a large size and is thus caught at the exterior of the coarse filter 110, not passing through the through holes 112 of the coarse filter 110. The remaining masses of the dirt pass
through the through holes 112 of the coarse filter 110 and fall into the dirt catching chamber 152.

[0132] When the circulation pump 43 is driven, the wash water in the water storage chamber 151 is pumped out to the spray units 21, 22 and 23. At this time, some of the dirt having passed through the fine filter 120 and fallen into the circulation chamber 153 is also pumped out. Most of the dirt in the dirt catching chamber 152 fails to pass through the densely formed microfilter 130 and continues to remain in the dirt catching chamber 152.

[0133] After the dishes are sufficiently washed by operating the circulation pump 43 several times, the drainage pump 45 is driven to drain the wash water. When the drainage pump 45 is driven, the dirt in the dirt catching chamber 152 and the wash water are drained from the body 10.

[0134] FIG. 10 is a view illustrating a sump, a coarse filter and a fine filter of a dish washing machine according to an embodiment. FIG. 11 is an exploded view illustrating the sump, coarse filter, fine filter and microfilter of the dish washing machine of FIG. 10. FIG. 12 is a cross-sectional view taken along line of FIG. 10. FIG. 13 is an enlarged view illustrating section B of FIG. 12. FIG. 14 is a cross-sectional view taken along line IV-IV of FIG. 10. FIG. 15 is an enlarged view illustrating section C of FIG. 14. FIG. 16 is a plan view illustrating the sump and coarse filter of the dish washing machine of FIG. 10, in which the coarse filter performs a locking operation. FIG. 17 is a side view illustrating the coarse filter of the dish washing machine of FIG. 10. FIG. 18 is a view illustrating the sump and coarse filter of the dish washing machine of FIG. 10, in which the coarse filter performs a locking operation. FIG. 19 is a cross-sectional view illustrating the sump, coarse filter and microfilter of the dish washing machine of FIG. 10. FIG. 20 is an enlarged plan view illustrating parts of the coarse filter and microfilter of the dish washing machine of FIG. 10. FIG. 21 is a plan view illustrating the lower portion of a washing tub of the dish washing machine of FIG. 10.

[0135] Hereinafter, a sump and filters of a dish washing machine according to an embodiment will be described with reference to FIGS. 10 to 12.

[0136] According to this embodiment, the dish washing machine includes a sump 300 to store wash water, a circulation pump 251 to circulate the wash water from the sump 300 to spray nozzles, a drainage pump 252 to discharge the wash water in the sump 300 and dirt from the body, and filters 320, 330 and 340 to filter out the dirt contained in the wash water.

[0137] A bottom plate 235 of the washing tub is provided with a drainage hole 250 (FIG. 21) to discharge wash water to the sump 300. The bottom plate 235 of the washing tub may be inclined toward the drainage hole 250 such that the wash water is guided toward the drainage hole 250 by gravity.

[0138] The sump 300 may be formed approximately in the shape of a semi-sphere having an open top. The sump 300 includes a bottom portion 301, a sidewall portion 303, a water storage chamber 310 formed between the bottom portion 301 and the sidewall portion 303 to store wash water, a circulation port 307 connected with the circulation pump 251, and a drainage port 308 connected with the drainage pump 252.

[0139] The filters 320, 330 and 340 includes a fine filter 320 mounted in the drainage hole 250 of the bottom plate 235, a coarse filter 340 mounted to the sump 300, and a microfilter 330.

[0140] The coarse filter 340 may be approximately formed in a cylindrical shape. The coarse filter 340 may be mounted on the inner surface of the sidewall portion 303 of the sump 300.

[0141] The coarse filter 340 may have a filter portion 342 to filter out dirt having a relatively large size and a handle 341 for installation of the coarse filter 340. The filter portion 342 of the coarse filter 340 may be formed on the circumferential surface of the coarse filter 340.

[0142] The coarse filter 340 is mounted to the sump 300 through a hole 339 of the microfilter 330 and a through hole 321 or the fine filter. The upper portion of the coarse filter 340 protrudes into the washing tub, and the lower portion thereof protrudes toward a dirt catching chamber 311 of the sump 300. The dirt catching chamber 311 will be described later.

[0143] The fine filter 320 may have a filter portion 321 to filter out dirt having a relatively intermediate size or large size and a through hole 322 through which the coarse filter 340 passes. The fine filter 320 is approximately horizontally mounted on the drainage hole 250 in the bottom plate 235 of the washing tub. The fine filter 320 may be inclined to allow the wash water to be guided toward the through hole 322 by gravity.

[0144] The wash water in the washing tub may flow toward the coarse filter 340 along the fine filter 320. Some of the wash water and dirt may pass through the filter portion 321 of the fine filter 320 and flow directly to the water storage chamber 310 of the sump 300.

[0145] The microfilter 330 may have a filter portion 331 adapted to filter out dirt of a relatively small size or a size greater than the small size and having a flat shape, frames 332, 333 and 335 to support the filter portion 331, and a through hole 339 through which the coarse filter 340 passes.

[0146] The frames 332, 333 and 335 include an upper frame 332, a lower frame 333, and side frames 335. The microfilter 330 is mounted to the sump 300 such that the lower frame 333 closely contacts the bottom portion 301 of the sump 300 and that the side frames 335 closely contact the sidewall portion 303 of the sump 300.

[0147] The microfilter 330 may partition the water storage chamber 310 of the sump 300 into the dirt catching chamber 311 and a circulation chamber 312. The drainage pump 252 is connected to the dirt catching chamber 311, and the circulation pump 251 is connected to the circulation chamber 312.

[0148] Since the lower portion of the coarse filter 340 protrudes toward the dirt catching chamber 311 as described above, the wash water and the dirt therein which have passed through the coarse filter 340 are introduced into the dirt catching chamber 311.

[0149] The wash water introduced into the dirt catching chamber 311 may pass through the microfilter 330 and then flow to the circulation chamber 312. The dirt contained in the wash water introduced into the dirt catching chamber 311 fails to pass through the microfilter 330, and therefore it remains in the dirt catching chamber 311 without flowing to the circulation chamber 312.

[0150] The dirt caught in the dirt catching chamber 311 may be discharged from the body along with the wash water when the drainage pump 252 is driven.

[0151] Meanwhile, to prevent the dirt in the dirt catching chamber 311 from flowing into the circulation chamber 312 through a gap between the microfilter 330 and the sump 300,
the microfilter 330 should closely contact the bottom portion 301 and sidewall portion 303 of the sump 300.

To this end, the lower frame 333 of the microfilter 330 may be provided with a lower sealing groove 334, and each of the side frames 335 may be provided with a side sealing protrusion 336. The bottom portion 301 of the sump 300 may be correspondingly provided with a lower sealing protrusion 302 inserted into the lower sealing groove 334, and the sidewall portion 303 of the sump 300 may be correspondingly provided with a side sealing groove 304 allowing the side sealing protrusion 336 to be inserted therein.

By the structures of the lower and side protrusions and grooves, sealing of the microfilter 330 and the sump 300 may be enhanced.

Meanwhile, the coarse filter 340 may be mounted to the sump 300 when it is inserted vertically downward into the sump 300 and turned from a release position to a lock position.

To this end, the outer circumferential surface of the coarse filter 340 may be provided with a mounting protrusion 343, and the inner surface of the sidewall portion 303 of the sump 300 may be provided with a mounting groove 305 into which the mounting protrusion 343 is horizontally inserted when the coarse filter 340 is turned from the release position to the lock position.

The mounting protrusion 343 may have an upward inclination surface 344 inclined upward as it extends in the direction of turning of the coarse filter 340 from the release position to the lock position. The mounting groove 305 may have a downward inclination surface 306 inclined downward as it extends in the direction of turning of the coarse filter 340 to the lock position.

With this configuration, when the coarse filter 340 is turned from the release position to the lock position, the upward inclination surface 344 of the mounting protrusion 343 may slide along the downward inclination surface 306 of the mounting groove 305, thereby causing the coarse filter 340 to move downward.

When the coarse filter 340 is turned from the release position to the lock position, it may press the microfilter 330 downward while moving downward. To this end, the coarse filter 340 may have a downwardly pressing surface 345 which is horizontally formed to press the microfilter 330 downward. The microfilter 330 may have a downwardly pressed surface 337 which is horizontally formed to be pressed by the downwardly pressing surface 345.

As the coarse filter 340 presses the microfilter 330 downward by being turned from the release position to the lock position, sealing of the gap between the lower frame 333 of the microfilter 330 and the bottom portion 301 of the sump 300 may be further enhanced, and displacement of the microfilter 330 may be prevented.

In addition, the coarse filter 340 may have a laterally pressing surface 346 formed by radially outward expansion of a portion of the outer circumferential surface of the coarse filter 340 so as to laterally pressing the microfilter 330 when it is turned from the release position to the lock position. That is, the coarse filter 340 may have a bulging shape or an oval shape.

The microfilter 330 may have a laterally pressed surface 338 which is laterally pressed by the laterally pressing surface 346.

With this configuration, the microfilter 330 is laterally pressed when the coarse filter 340 is turned from the release position to the lock position. Thereby, sealing of the gap between the side frames 335 of the microfilter 330 and the sidewall portion 303 of the sump 300 may be enhanced.

Meanwhile, as shown in FIG. 21, the coarse filter 340 may be disposed such that one of the two sidewalls 233 and 234 of the washing tub is closer than the other one of the sidewalls 233 and 234 to the coarse filter 340. That is, the coarse filter 340 may be disposed such that the left sidewall 233 is closer than the right sidewall 234 to the coarse filter 340. That is the coarse filter 340 is disposed off center of the center line of the bottom of the washing tub. As the coarse filter 340 is disposed as above, the coarse filter 340 may be readily removed without being interfered with by a rail 440, which guides movement of the reflecting plate 400.

As is apparent from the above description, according to embodiments, a microfilter disposed in a water storage chamber to define a dirt catching chamber for catching of dirt has a flat shape which is simpler than the conventional cylindrical shape.

Thereby, the cost of fabrication of fabricating the microfilter may be reduced.

In addition, cleaning the microfilter may be facilitated. For example, installing a spray nozzle for spray of wash water for cleaning of a filter in a water storage chamber may facilitate cleaning of the microfilter.

Moreover, since a dirt catching chamber to catch dirt and a circulation chamber to circulate wash water through a spray unit are respectively defined by a microfilter and a sidewall portion and bottom portion of a sump housing, the dirt catching chamber and the circulation chamber may take a concentrated form.

Accordingly, wash water may smoothly flow from the circulation chamber into a circulation flow passage, and designing the sizes and specific shapes of the dirt catching chamber and the circulation chamber may be facilitated.

For example, in the case of a sump assembly having a conventional cylindrical microfilter, the circulation chamber is formed in a doughnut shape between the exterior of the microfilter and the sump housing, and accordingly increasing the diameter of the microfilter to increase the size of the dirt catching chamber may adversely affect flow of wash water in the circulation chamber.

On the contrary, a circulation chamber according to an embodiment takes a concentrated form rather than having a doughnut shape, and accordingly it may enhance flow of wash water compared to conventional cases. In addition, shifting the microfilter toward the circulation chamber to increase the size of the dirt catching chamber may rarely change flow of wash water in the circulation chamber.

According to embodiments, sealing of a microfilter and a sump may be enhanced. Thereby, the dirt catching capability of the dish washing machine may be improved.

In addition, as a course filter is arranged such that one of the two sidewalls is closer than the other sidewall to the coarse filter. Accordingly, the course filter may be readily installed and separated without being interfered with by rails guiding the vane.

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, the scope of which is defined in the claims and their equivalents.
What is claimed is:

1. A dish washing machine comprising:
a body;
a washing tub provided in the body;
a basket provided in the washing tub to store dishes;
a spray unit to spray wash water to wash the dishes in the basket; and
a sump assembly arranged at a lower portion of the washing tub to store wash water, wherein the sump assembly comprises:
  a sump housing comprising a water storage chamber to store wash water and a sidewall portion and a bottom portion, the sidewall portion and the bottom portion defining the water storage chamber;
a fine filter arranged at an upper portion of the sump housing and provided with an opening allowing the washing tub and the water storage chamber to communicate with each other therethrough;
a coarse filter formed in a cylindrical shape and mounted on the opening; and
a microfilter mounted in the water storage chamber to define a dirt catching chamber for catching of dirt in conjunction with one part of the sidewall portion and one part of the bottom portion of the sump housing, the microfilter being formed in a flat shape.

2. The dish washing machine according to claim 1, further comprising a circulation chamber defined by the other part of the sidewall portion, the other part of the bottom portion of the sump housing, and the microfilter and adapted to circulate the wash water to the spray unit.

3. The dish washing machine according to claim 1, wherein the sidewall portion of the sump housing is provided with a pair of side fitting grooves allowing the microfilter to be fitted thereinto.

4. The dish washing machine according to claim 3, wherein a width of each of the side fitting grooves gradually decreases as the side fitting grooves extend downward.

5. The dish washing machine according to claim 1, wherein the bottom portion of the sump housing is provided a bottom fitting groove allowing the microfilter to be fitted thereinto.

6. The dish washing machine according to claim 1, wherein the microfilter comprises a filter mesh to filter out dirt and a filter frame to support the filter mesh, wherein the filter mesh is formed in a flat shape.

7. The dish washing machine according to claim 6, wherein the microfilter comprises a pair of fitting protrusions protruding from both sides of the filter frame to be coupled to the sump housing, wherein a width of each of the fitting grooves gradually decreases as the fitting grooves extend downward.

8. The dish washing machine according to claim 1, further comprising a dirt cover coupled to the sump housing to cover an open top of the dirt catching chamber.

9. The dish washing machine according to claim 8, wherein the dirt cover is screw-coupled to the sump housing.

10. The dish washing machine according to claim 8, wherein the dirt cover comprises a through hole allowing the coarse filter to pass therethrough.

11. The dish washing machine according to claim 8, wherein the dirt cover comprises a filter support protruding toward the microfilter to support the microfilter.

12. The dish washing machine according to claim 8, wherein the sump housing further comprises a cover support protruding inward to support the dirt cover.

13. A dish washing machine comprising:
a body;
a washing tub provided in the body;
a sump housing arranged at a lower portion of the washing tub and provided with a water storage chamber to store wash water;
a fine filter adapted to cover the water storage chamber and provided with an opening allowing the washing tub and the water storage chamber to communicate with each other therethrough;
a coarse filter formed in a cylindrical shape and mounted on the opening; and
a microfilter mounted in the water storage chamber such that the microfilter crosses the water storage chamber, the microfilter being formed in a flat shape.

14. The dish washing machine according to claim 13, wherein the microfilter comprises a filter mesh formed in a flat shape and a filter frame to support the filter mesh.

15. The dish washing machine according to claim 13, wherein the microfilter comprises a fitting protrusion protruding from the filter frame to be coupled to the sump housing.

16. The dish washing machine according to claim 13, wherein the sump housing comprises a sidewall portion and a bottom portion, the sidewall portion and the bottom portion defining the water storage chamber, wherein:
one part of the sidewall portion, one part of the bottom portion of the sump housing, and the microfilter define a dirt catching chamber to catch dirt; and
the other part of the sidewall portion, the other part of the bottom portion of the sump housing, and the microfilter define a circulation chamber to circulate the wash water to the washing tub.

17. The dish washing machine according to claim 16, further comprising a dirt cover coupled to the sump housing to cover an open top of the dirt catching chamber.

18. A dish washing machine comprising:
a body;
a washing tub provided in the body;
a sump housing arranged at a lower portion of the washing tub and provided with a water storage chamber to store wash water, a sidewall portion, and a bottom portion, the sidewall portion and the bottom portion defining the water storage chamber;
a fine filter adapted to cover the water storage chamber and provided with an opening allowing the washing tub and the water storage chamber to communicate with each other therethrough;
a coarse filter formed in a cylindrical shape and mounted on the opening;
a microfilter mounted in the water storage chamber;
da dirt catching chamber defined by the microfilter, one part of the sidewall portion, and one part of the bottom portion of the sump housing, and adapted to communicate with the opening; and
a circulation chamber defined by the microfilter, the other part of the sidewall portion, the other part of the bottom portion of the sump housing, and adapted to circulate the wash water to the washing tub.

19. The dish washing machine according to claim 18, wherein the circulation chamber takes a non-circular concentrated form.

20. The dish washing machine according to claim 18, wherein the microfilter is formed in a flat shape.
21. The dish washing machine according to claim 18, further comprising a dirt cover to cover an open top of the dirt catching chamber.

22. A dish washing machine comprising:
   a body;
   a washing tub provided in the body;
   a water storage chamber arranged at a lower portion of the washing tub to store wash water; and
   a microfilter arranged in the water storage chamber to divide the water storage chamber into a dirt catching chamber to catch dirt and a circulation chamber to circulate wash water to the washing tub, the microfilter being formed in a non-cylindrical shape.

23. The dish washing machine according to claim 22, wherein the microfilter is formed in a flat shape.

24. The dish washing machine according to claim 22, further comprising a sump housing provided with the water storage chamber, a sidewall portion, and a bottom portion, the sidewall portion and the bottom portion defining the water storage chamber, wherein:
   the dirt catching chamber is defined by the microfilter, one part of the sidewall portion, and one part of the bottom portion of the sump housing; and
   the circulation chamber is defined by the microfilter, the other part of the sidewall portion, and the other part of the bottom portion of the sump housing.

25. A sump assembly for a dish washing machine comprising:
   a sump housing comprising a water storage chamber to store wash water and a sidewall portion and a bottom portion, the sidewall portion and the bottom portion defining the water storage chamber;
   a fine filter arranged at an upper portion of the sump housing and provided with an opening allowing the washing tub and the water storage chamber to communicate with each other therethrough;
   a coarse filter formed in a cylindrical shape and mounted on the opening; and
   a microfilter mounted in the water storage chamber to define a dirt catching chamber for catching of dirt in conjunction with one part of the sidewall portion and one part of the bottom portion of the sump housing, the microfilter being formed in a flat shape.

26. A dish washing machine comprising:
   a body;
   a washing tub provided in the body;
   a sprayer nozzle to spray wash water;
   a sump provided with a water storage chamber to store wash water;
   a microfilter mounted to the water storage chamber to partition the water storage chamber into a dirt catching chamber to catch dirt and a circulation chamber to circulate the wash water to the spray nozzle, the microfilter being provided with a flat filter portion; and
   a coarse filter mounted to the sump to pre-filter out dirt contained in the wash water flowing to the dirt catching chamber and to press the microfilter downward and laterally such that sealing of a gap between the sump and the microfilter is maintained.

27. The dish washing machine according to claim 26, wherein the coarse filter is mounted to the sump by being inserted into the sump vertically downward and then turned from a release position to a lock position.

28. The dish washing machine according to claim 27, wherein, in turning the coarse filter from the release position to the lock position, the coarse filter moves downward and presses the microfilter downward.

29. The dish washing machine according to claim 28, wherein the coarse filter comprises a downwardly pressing surface to press the microfilter downward.

30. The dish washing machine according to claim 29, wherein the microfilter comprises a downwardly pressed surface pressed by the downwardly pressing surface.

31. The dish washing machine according to claim 28, wherein the coarse filter comprises a mounting protrusion provided with an upward inclination surface inclined upward as the upward inclination surface extends in a direction of turning of the coarse filter from the release position to the lock position.

32. The dish washing machine according to claim 31, wherein the sump comprises a mounting groove allowing the mounting protrusion to be inserted thereinto, the mounting groove being provided with a downward inclination surface configured to contact the upward inclination surface and inclined downward as the downward inclination surface extends in the direction of turning of the coarse filter from the release position to the lock position.

33. The dish washing machine according to claim 27, wherein the coarse filter comprises a laterally pressing surface formed by expanding a portion of an outer circumferential surface of the coarse filter radially outward such that the laterally pressing surface presses the microfilter laterally when the coarse filter is turned from the release position to the lock position.

34. The dish washing machine according to claim 33, wherein the microfilter comprises a laterally pressed surface pressed by the laterally pressing surface.

35. The dish washing machine according to claim 26, wherein the microfilter comprises a frame portion adapted to surround the filter portion to support the filter portion, the frame portion comprising an upper frame, lower frame, and two side frames.

36. The dish washing machine according to claim 35, wherein the lower frame comprises a sealing groove adapted to seal the sump.

37. The dish washing machine according to claim 36, wherein the sump comprises a lower sealing protrusion inserted into the sealing groove of the lower frame.

38. The dish washing machine according to claim 35, wherein each of the side frames comprises a side sealing protrusion adapted to seal the sump.

39. The dish washing machine according to claim 38, wherein the sump comprises seal side grooves allowing the side protrusions of the side frames to be inserted thereinto.

40. The dish washing machine according to claim 26, further comprising a vane to move within the washing tub and reflect the wash water sprayed from the spray nozzle toward dishes, and a rail extending from a front of the washing tub to a back of the washing tub to guide movement of the vane, wherein the coarse filter is disposed such that one of two sidewalls of the washing tub is closer than the other sidewall to the coarse filter.

41. The dish washing machine according to claim 26, wherein a bottom surface of the washing tub is provided with a drainage hole, the dish washing machine further comprising a fine filter mounted to the drainage hole.
42. A dish washing machine comprising:
   a body;
   a washing tub provided in the body, the washing tub having
     a bottom surface provided with a drainage hole;
   a fixed nozzle fixed to one side of the washing tub to spray
     wash water;
   a vane to move within the washing tub and reflect the wash
     water sprayed from the fixed nozzle toward dishes;
   a rail extending from a front of the washing tub to a back of
     the washing tub to guide movement of the vane;
   a sump provided with a water storage chamber to store
     wash water;
   a fine filter mounted to the drainage hole;
   a microfilter mounted to the water storage chamber to
     partition the water storage chamber into a dirt catching
     chamber to catch dirt and a circulation chamber to cir-
     culate the wash water to the fixed nozzle; and
   a coarse filter mounted to the sump to filter out dirt in the
     wash water flowing to the dirt catching chamber, the
     coarse filter being positioned such that one of two side-
     walls of the washing tub is closer than the other sidewall
     to the coarse filter.

43. The dish washing machine according to claim 42, wherein the coarse filter is mounted to the sump by being
    inserted into the sump vertically downward and then turned
    from a release position to a lock position.

44. The dish washing machine according to claim 42, wherein the coarse filter presses the microfilter downward
    and laterally to maintain sealing of the sump and the micro-
    filter.