

DESCRIPTION**WASHING MACHINE****TECHNICAL FIELD**

- 5 [0001] The present disclosure relates to a washing machine.

BACKGROUND ART

- [0002] Conventionally, a washing machine has been proposed which includes a storage bag that emits antibacterial silver ions.
- 10 [0003] The washing machine includes a storage bag which has a mesh pattern that allows water passage and which stores silver crystal materials that dissolve in water and emit antibacterial silver ions. The storage bag is attached to the water supply path of the washing machine (See, for example, Patent Literature (PTL)1).

15 **Citation List**

Patent Literature

- [0004] [PTL 1] Japanese Unexamined Patent Application Publication No. 2010-119633

SUMMARY OF THE INVENTION

- 20 [0005] The present disclosure provides a washing machine capable of providing a steady supplemental effect to laundry.
- [0006] The washing machine according to the present disclosure includes a supplemental agent unit which stores a supplemental agent, a detergent case which includes a supplemental agent unit housing which removably houses the supplemental
- 25 agent unit, and a water supply unit which supplies water to the supplemental agent unit.
- [0007] The washing machine according to the present disclosure is capable of providing a steady supplemental effect to laundry.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 is a longitudinal cross-sectional view of a washing machine according to a first embodiment.

5 FIG. 2 is an exploded perspective view of the vicinity of an upper frame body of the washing machine according to the first embodiment.

FIG. 3 is a longitudinal cross-sectional view of the vicinity of a detergent case of the washing machine according to the first embodiment.

10 FIG. 4A is a top view of a water injection device lid of the washing machine according to the first embodiment.

FIG. 4B is a top view of a water injection structure of the washing machine according to the first embodiment.

FIG. 4C is a top view of the detergent case of the washing machine according to the first embodiment.

15 FIG. 5 is a transverse cross-sectional view of the vicinity of a silver crystal unit housing of the washing machine according to the first embodiment.

FIG. 6A is an external perspective view of the vicinity of the silver crystal unit housing of the washing machine according to the first embodiment with the silver crystal unit removed.

20 FIG. 6B is an external perspective view of the vicinity of the silver crystal unit housing of the washing machine according to the first embodiment with the silver crystal unit attached.

FIG. 7A is an external perspective view of a storage case of the washing machine according to the first embodiment with a storage case lid closed.

25 FIG. 7B is an external perspective view of the storage case of the washing machine according to the first embodiment with the storage case lid opened.

FIG. 8A is a top view of the storage case of the washing machine according to the first embodiment.

30 FIG. 8B is a cross-sectional view of the storage case taken along line 8B-8B of FIG. 8A.

FIG. 8C is a cross-sectional view of the storage case taken along line 8C-8C of FIG. 8A.

FIG. 9A is a top view of a silver crystal unit of the washing machine according

to the first embodiment.

FIG. 9B is a bottom view of the silver crystal unit of the washing machine according to the first embodiment.

FIG. 9C is a cross-sectional view of the silver crystal unit taken along line 9C-
5 9C of FIG. 9A.

FIG. 10 schematically illustrates a flow of water into the silver crystal unit in a longitudinal cross-sectional view of the vicinity of the detergent case of the washing machine according to the first embodiment.

FIG. 11 schematically illustrates a flow of water into the silver crystal unit in a
10 transverse cross-sectional view of the vicinity of the detergent case of the washing machine according to the first embodiment.

FIG. 12A is a cross-sectional view of the silver crystal unit of the washing machine according to the first embodiment taken along line 12A-12A of FIG. 9A with a full complement of silver crystals in the silver crystal unit.

FIG. 12B is a cross-sectional view of the silver crystal unit of the washing
15 machine according to the first embodiment taken along line 12B-12B of FIG. 9A with a small amount of silver crystals remaining in the silver crystal unit.

DESCRIPTION OF EMBODIMENT

20 [0009] Hereinafter, an embodiment of the present disclosure will be described in detail with reference to the drawings. It should be noted that the accompanying drawings and the following description are provided for those skilled in the art to fully understand the present disclosure, and are not intended to limit the subject matter described in the claims.

[0010] (First Embodiment)

25 Hereinafter, a washing machine according to a first embodiment will be described with reference to FIG. 1 to FIG. 12B.

[0011] (Configuration of Washing Machine)

FIG. 1 is a longitudinal cross-sectional view of a washing machine according to the first embodiment.

30 [0012] As illustrated in FIG. 1, water tub 4 for storing water at the time of washing is disposed inside washing machine main body 1. Washing and spin drying tub 3 for accommodating clothes are rotatably disposed inside water tub 4. Pulsator 5 for agitating the clothes during washing and rinsing is disposed below washing and dry spinning tub 3.

Pulsator 5 rotates about the axis of washing and spin drying tub 3 in forward and backward directions, so that the clothes inside washing and spin drying tub 3 are agitated.

[0013] Upper frame body 2 is disposed above washing machine main body 1.

Operation display unit 31 is disposed in the upper rear portion of upper frame body 2, and
 5 control device 7 is disposed below operation display unit 31. A plurality of water supply valves 80 connected to an external water faucet (not illustrated) and a water supply hose (not illustrated) are disposed in the rear portion of upper frame body 2. Water supply valves 80 are capable of opening and closing water channels provided inside water supply valves 80, and each water supply valve 80 is independently opened and closed by
 10 an electromagnetic force.

[0014] The central portion of upper frame body 2 includes laundry access opening 2a for communicating washing and spin drying tub 3 with the outside. The upper part of laundry access opening 2a is covered with lid body 6 in an openable and closable manner. The user is able to load and unload laundry in and out of washing and dry spinning tub 3
 15 through laundry access opening 2a with lid body 6 opened.

[0015] (Water Injection Device, Detergent Case)

FIG. 2 is an exploded perspective view of the vicinity of the upper frame body of the washing machine according to the first embodiment.

[0016] As illustrated in FIG. 2, detergent case housing 12 is disposed in the upper rear
 20 portion of upper frame body 2. Detergent case housing 12 removably houses detergent case 9. Above detergent case 9, water injection device 11 to which tap water is supplied through water supply valve 80 and which injects water into detergent case 9 housed in detergent case housing 12 is disposed. The water supplied into detergent case 9 from water injection device 11 is discharged to detergent case housing 12 through the inside of
 25 detergent case 9 and is provided into water tub 4.

[0017] Detergent case 9 has a box shape that opens upward. Grip portion 9d which can be gripped by the user is disposed on the front side of detergent case 9. Grip portion 9d is flush with laundry access opening 2a of upper frame body 2 in a state where detergent case 9 is housed in detergent case housing 12.

[0018] Detergent case 9 includes powder detergent compartment 9a in which powder detergent is put, liquid detergent compartment 9b in which liquid detergent is put, and softener compartment 9c in which softener is put. Silver crystal unit housing 16 to which silver crystal unit 15 is removably attached is disposed behind softener compartment 9c. Silver crystal unit 15 and silver crystal unit housing 16 will be described later.

[0019] FIG. 3 is a longitudinal cross-sectional view of the vicinity of the detergent case of the washing machine according to the first embodiment. FIG. 4A is a top view of a water injection device lid of the washing machine according to the first embodiment. FIG. 4B is a top view of a water injection structure of the washing machine according to the first embodiment. FIG. 4C is a top view of the detergent case of the washing machine according to the first embodiment.

[0020] As illustrated in FIG. 3, FIG. 4A, and FIG. 4B, water injection device 11 includes water injection device lid 11a that is the upper face and water injection structure 11b that is the lower face. Water injection device lid 11a includes, as water supply ports for introducing water from water supply valves 80, water supply port 8a for the powder detergent compartment and water supply port 8b for the liquid detergent compartment which are connected to first water supply valve 81 (see FIG. 2), and water supply port 8c for the softener compartment which is connected to second water supply valve 82 (see FIG. 2). The water introduced through each water supply port flows down to water injection structure 11b.

[0021] Water injection structure 11b has a box shape. The interior of water injection structure 11b is divided into small compartments so as to correspond to powder detergent compartment 9a, liquid detergent compartment 9b, softener compartment 9c, and silver crystal unit housing 16. Softener compartment 9c and silver crystal unit housing 16 correspond to a common small compartment. Each small compartment includes a plurality of nozzles which communicate with the portion below the compartment to flow water down to detergent case 9. Respective small rooms include powder detergent nozzles 13a, liquid detergent nozzles 13b, softener nozzles 14, and silver crystal nozzles 10 so as to respectively correspond to powder detergent compartment 9a, liquid detergent compartment 9b, softener compartment 9c, and silver crystal unit housing 16. With this, water injection structure 11b is capable of independently supplying water to powder detergent compartment 9a, liquid detergent compartment 9b, softener compartment 9c, and silver crystal unit housing 16.

[0022] As illustrated in FIG. 3 and FIG. 4B, the interior of each water supply valve 80 (see FIG. 2) and each small compartment are formed as wide water channels. On the other hand, detergent nozzles 13, softener nozzles 14, and silver crystal nozzles 10 are formed as small-diameter holes. With this configuration, the flow velocity increases due to the Venturi effect when water passes through each nozzle, so that the force of water falling into detergent case 9 can be increased.

[0023] Silver crystal nozzles 10 include large-diameter first nozzle 10a and small-diameter second nozzle 10b. First nozzle 10a and second nozzle 10b are arranged on a straight line in the front-rear direction.

[0024] As illustrated in FIG. 4C, the central portion of powder detergent compartment 9a includes powder detergent discharge port 30a which opens downward so that detergent water containing the dissolved powder detergent is discharged downward.

[0025] Each of liquid detergent compartment 9b and softener compartment 9c includes Siphon structure 30b. When the liquid stored in liquid detergent compartment 9b and softener compartment 9c reaches a predetermined liquid level, siphon structure 30b sucks up the liquid by a siphon phenomenon and discharges the liquid downward. In other words, when a predetermined amount of water is supplied from the nozzles, the liquid detergent or softener dissolved in the water is delivered downward by siphon structure 30b and discharged to detergent case housing 12.

[0026] The inner bottom portion of silver crystal unit housing 16 includes discharge port 30c of silver crystal unit housing, so that the water discharged from silver crystal unit 15 is discharged downward.

[0027] (Silver Crystal Unit Housing)

FIG. 5 is a transverse cross-sectional view of the vicinity of the silver crystal unit housing of the washing machine according to the first embodiment. FIG. 6A is an external perspective view of the vicinity of the silver crystal unit housing of the washing machine according to the first embodiment with the silver crystal unit removed. FIG. 6B is an external perspective view of the vicinity of the silver crystal unit housing of the washing machine according to the first embodiment with the silver crystal unit attached.

[0028] As illustrated in FIG. 5, FIG. 6A and FIG. 6B, silver crystal unit housing 16 has a box shape, and silver crystal unit 15 is removable from silver crystal unit housing 16.

[0029] The inner peripheral wall of silver crystal unit housing 16 includes a plurality of inclined ribs 16c which extend vertically. Each inclined rib 16c projects more at a lower part. Inclined ribs 16c smoothly guide silver crystal unit 15 when silver crystal unit 15 is inserted downward. The top and bottom end faces of each inclined rib 16c contact with silver crystal unit 15 in a state where silver crystal unit 15 is completely inserted into silver crystal unit housing 16. With this, silver crystal unit 15 is held in silver crystal unit housing 16, and does not fall off even when detergent case 9 is turned upside down.

[0030] Silver crystal unit 15 also includes hinge portion 22 to be described later, and silver crystal unit housing 16 includes silver crystal unit housing claw 16b. Hinge

portion 22 not only acts as a hinge structure, but is also engageable to silver crystal unit housing claw 16b. When the user inserts silver crystal unit 15 into silver crystal unit housing 16, hinge portion 22 engages to silver crystal unit housing claw 16b. With this, silver crystal unit 15 is attached to silver crystal unit housing 16.

5 [0031] One of the holding of silver crystal unit 15 by inclined ribs 16c and the attachment of silver crystal unit 15 by hinge portion 22 may be included or both of them may be included.

[0032] Silver crystal unit 15 also includes screw boss portion 23 (to be described later) which protrudes from one side surface of silver crystal unit 15, and has an overall shape
10 which is not point-symmetrical. Silver crystal unit housing 16 has cutout portion 16a at a position corresponding to screw boss portion 23 so as not to interfere with screw boss portion 23. When screw boss portion 23 is inserted into cutout portion 16a, silver crystal unit 15 is positioned so as to be in a normal position (to be described later), that is, a correct storage position with respect to silver crystal unit housing 16. This prevents the
15 user from attaching silver crystal unit 15 in a wrong direction. The positioning structure provided in silver crystal unit 15 does not have to be screw boss portion 23.

[0033] (Silver Crystal Unit)

FIG. 7A is an external perspective view of a storage case of the washing machine according to the first embodiment with a storage case lid closed. FIG. 7B is an
20 external perspective view of the storage case of the washing machine according to the first embodiment with the storage case lid opened.

[0034] Silver crystal unit 15 mainly includes silver crystals 29 (to described later, see FIG. 3), storage case 18 which stores silver crystals 29, and storage case lid 19.

[0035] Silver crystals 29 are made of materials in which silver components having an
25 antibacterial effect are kneaded into water-soluble Diboron trioxide (B_2O_3), and have a large number of granular small pieces. Since silver crystals 29 are granularly formed, silver crystals 29 each have a large surface area, and are easily dissolved in water. By immersing silver crystals 29 in water, antibacterial silver ions elute into water. In this way, silver crystals 29 function as a supplemental agent which produces silver ion water
30 and provides an antibacterial effect to the laundry.

[0036] Storage case 18 has a box shape which opens upward. The upper face of storage case 18 is covered by storage case lid 19. Storage case lid 19 is connected to storage case 18 by hinge portion 22 which is bendable.

[0037] Storage case lid 19 includes fitting claw projections 25 on the outer lateral sides

of storage case lid 19. On the other hand, the inner lateral sides of storage case 18 near the opening include fitting claw recesses 26 at positions corresponding to fitting claw projections 25. With this configuration, in a state where storage case lid 19 is closed, fitting claw projections 25 are engaged into fitting claw recesses 26, so that storage case lid 19 is temporarily fixed to storage case 18.

[0038] Storage case lid 19 includes screw boss portion 23 which projects laterally and extends downward. Screw boss portion 23 and screw seat portion 24 are positioned opposite to hinge portion 22. Screw boss portion 23 includes screw hole 23a for screwing from below. While being temporarily fixed to storage case 18, storage case lid 19 is screwed to screw seat portion 24 and screw boss portion 23 by screw 24a.

[0039] In such a manner, in a state where storage case lid 19 is closed, fitting claw projections 25 are engaged into fitting claw recesses 26 and storage case lid 19 is temporarily fixed. Hence, when screw 24a is screwed to screw hole 23a of screw boss portion 23, it is possible to prevent storage case lid 19 from opening naturally. This makes it easy to put silver crystals 29 in storage case 18.

[0040] FIG. 8A is a top view of the storage case of the washing machine according to the first embodiment. FIG. 8B is a cross-sectional view of the storage case taken along line 8B-8B of FIG. 8A. FIG. 8C is a cross-sectional view of the storage case taken along line 8C-8C of FIG. 8A. FIG. 9A is a top view of the silver crystal unit of the washing machine according to the first embodiment. FIG. 9B is a bottom view of the silver crystal unit of the washing machine according to the first embodiment. FIG. 9C is a cross-sectional view of the silver crystal unit taken along line 9C-9C of FIG. 9A.

[0041] Storage case lid 19 includes first opening 20 for introducing water into silver crystal unit 15. Storage case bottom surface 28 which is the bottom surface of storage case 18 includes second opening 21 for discharging water. With this, silver crystal unit 15 discharges the silver ion water, generated by immersing silver crystals 29 in water, downward through second opening 21.

[0042] Second opening 21 is arranged so as not to be positioned vertically below first opening 20, and has an opening area greater than the opening area of first opening 20.

First opening 20 is located closer to the edge of storage case lid 19 relative to the approximately central portion, and partially overlaps with second opening 21.

[0043] Moreover, storage case bottom surface 28 of storage case 18 is inclined downward. With this, silver crystals 29 inside storage case 18 moves downward due to its own weight, and tends to accumulate at the lower part of the inclination.

[0044] As illustrated in FIG. 9C, first opening 20 and second opening 21 are integrally molded with water passing members 27 by insert molding so that the opening portions are covered by water passing members 27. Water passing members 27 are made of materials different from the material of storage case 18, and has a mesh pattern with approximately 100 mesh. With this, water passing members 27 allow passage of water and prevents passage of silver crystals 29 having a certain size or larger. In addition, silver crystals 29 gradually become smaller as they dissolve in water, and the grains of silver crystals 29 dissolved to a size that allows passage through mesh of water passing member 27 are invisible to the user.

[0045] The operations and effects of the washing machine and the silver ion elution device configured as described above will be described below.

[0046] (Washing Operation)

The user opens lid body 6 to load clothes into washing and spin drying tub 3, operates operation display unit 31 to set the details of the operation, and causes control device 7 to start the washing operation. The user puts powder detergent or liquid detergent in an amount according to the amount of clothes into detergent case 9.

[0047] When the washing process starts, control device 7 opens first water supply valve 81 to supply water to water injection device 11 via water supply port 8a for the powder detergent compartment and water supply port 8b for the liquid detergent compartment.

Water injection device 11 then injects water into powder detergent compartment 9a and liquid detergent compartment 9b via powder detergent nozzles 13a and liquid detergent nozzle 13b of detergent nozzle 13. The detergent in detergent case 9 is dissolved in water, discharged to detergent case housing 12, and provided to water tub 4 and washing and spin drying tub 3 together with water. When a predetermined amount of water is supplied, control device 7 closes first water supply valve 81, and performs washing agitation by causing pulsator 5 to agitate the clothes loaded in washing and spin drying tub 3. When the washing process is completed, the rinsing process starts.

[0048] When the rinsing process starts, the first rinsing operation starts. The first rinsing operation may be performed a plurality of times. In the first rinsing operation, first water supply valve 81 is opened to inject water into empty powder detergent compartment 9a and empty liquid detergent compartment 9b, and water containing no softener and no silver ions is supplied into water tub 4 and washing and dry spinning tub 3. Subsequently, pulsator 5 starts agitating the clothes to rinse away the detergent components adhered to the clothes.

[0049] Control device 7 opens second water supply valve 82 to supply water to softener nozzles 14 and silver crystal nozzles 10 in order to cause water injection device 11 to supply water to softener compartment 9c and silver crystal unit housing 16. The water discharged downward through softener nozzles 14 dissolves the softener put in softener compartment 9c, is carried by siphon structure 30b, and is discharged to detergent case housing 12. As described later, the water discharged downward through silver crystal nozzles 10 passes through silver crystal unit 15, turns into silver ion water, and is discharged into detergent case housing 12. The water containing the softener and silver ions discharged into detergent case housing 12 is provided to water tub 4 and washing and dry spinning tub 3. Subsequently, pulsator 5 starts agitating the clothes, so that the softener and the silver ions are adhered to the clothes. When the final rinsing operation is completed, the rinsing process is completed.

[0050] Since silver ions are cations, they have the property of easily adhering to normal clothes containing a negatively polarized molecular structure. However, when silver ions are provided together with the detergent containing an anionic surfactant, the amount of silver ions adhering to the clothes is reduced due to the interaction that occurs between the silver ions and the anionic surfactant.

[0051] On the other hand, when silver ions are provided together with a softener containing a cationic surfactant as in the present embodiment, a synergistic effect occurs and silver ions can be firmly adhered to the clothes. Accordingly, by causing water injection device 11 to supply water to softener compartment 9c and silver crystal unit housing 16, the antibacterial effect of silver ions can be efficiently obtained.

[0052] (Operations of Peripheral Components of Silver Crystal Unit)

FIG. 10 schematically illustrates a flow of water into the silver crystal unit in a longitudinal cross-sectional view of the vicinity of the detergent case of the washing machine according to the first embodiment. FIG. 11 schematically illustrates a flow of water into the silver crystal unit in a transverse cross-sectional view of the vicinity of the detergent case of the washing machine according to the first embodiment.

[0053] When second water supply valve 82 is opened, water is introduced into water injection device 11. The water introduced into water injection device 11 is discharged downward through first nozzle 10a and second nozzle 10b, which are silver crystal nozzles 10, and is supplied to silver crystal unit 15 through water passing member 27.

[0054] As illustrated in FIG. 11, each of silver crystal nozzles 10 is formed as a small-diameter hole. In general, the width of the flow of water discharged through the hole

gradually increases as the distance from the hole increases.

[0055] Silver crystal unit 15 has a structure where water passing member 27 and silver crystal nozzles 10 are close to each other. With this, the water discharged through silver crystal nozzles 10 reaches water passing member 27 earlier than when the width of the flow of water increases. Since the narrow flow of water is capable of passing through the fine mesh of water passing member 27, the flow of water can be efficiently supplied into silver crystal unit 15 while maintaining the force.

[0056] As illustrated in FIG. 10, the water injected through large-diameter first nozzle 10a and small-diameter second nozzle 10b causes turbulence in storage case 18. Since the turbulent water evenly immerses silver crystals 29 in water, the turbulent water turns into high-concentration silver ion water. In addition, since entire silver crystals 29 are uniformly exposed to water each time water is injected, the concentration of silver ion water can be kept constant in each washing operation.

[0057] As illustrated in FIG. 11, granular silver crystals 29 are moved inside storage case 18 by a stream of water. With this, silver crystals 29 evenly contact with water, and rubs against the grains of other silver crystals 29 or the inner wall of storage case 18, so that silver crystals 29 are promptly dissolved in water. In such a manner, storage case 18 is filled with granular silver crystals 29 so as to have a gap between silver crystals 29, so that silver crystals 29 can be promptly dissolved in water.

[0058] Moreover, the water introduced into silver crystal unit 15 through first opening 20 does not flow down linearly, but flows down while bypassing the inside of storage case 18 and reaches second opening 21. By arranging second opening 21 so as not to be positioned vertically below first opening 20 as described above, it is possible to bring silver crystals 29 into contact with water over a distance longer than the vertical dimension of storage case 18. Such an effect allows water to be evenly brought into contact with entire silver crystals 29, so that high-concentration silver ion water can be stably generated every time the washing operation is performed.

[0059] As illustrated in FIG. 11, the silver ion water generated in silver crystal unit 15 is discharged through second opening 21. In the present embodiment, second opening 21 is larger than first opening 20. This prevents the amount of supplied water from exceeding the amount of discharged water, and prevents water from overflowing from the upper part of silver crystal unit 15.

[0060] (Decrease in Silver Crystals, Replacement of Silver Crystal Unit)

FIG. 12A is a cross-sectional view of the silver crystal unit of the washing

machine according to the first embodiment taken along line 12A-12A of FIG. 9A with a full complement of silver crystals in the silver crystal unit. FIG. 12B is a cross-sectional view of the silver crystal unit of the washing machine according to the first embodiment taken along line 12B-12B of FIG. 9A with a small amount of silver crystals remaining in the silver crystal unit.

[0061] Since silver crystals 29 are water-soluble, the amount of silver crystals 29 gradually decreases every time the washing operation is performed. As illustrated in FIG. 12A and FIG. 12B, since storage case bottom surface 28 of storage case 18 is inclined, a small amount of remaining silver crystals 29 is likely to accumulate at the lower part of the inclination. Moreover, as illustrated in FIG. 10, since storage case bottom surface 28 of storage case 18 is inclined downward in the direction in which first nozzle 10a that discharges a large amount of water is disposed, a small amount of remaining silver crystals 29 can be efficiently dissolved in water.

[0062] As the elution of silver ions progresses, the amount of silver crystals 29 gradually decreases. When the amount of silver crystals 29 decreases to a certain level or lower, the antibacterial effect on laundry clothes also decreases. Accordingly, the user is capable of maintaining the antibacterial performance of the washing machine by replacing silver crystal unit 15 with a new one at an appropriate timing.

[0063] Since the amount of decrease in silver crystals 29 correlates with the number of times the washing operation is performed, the recommended number of washing operations for replacement of silver crystal unit 15 can be experimentally obtained. In the washing machine according to the present embodiment, control device 7 measures the number of times the washing operation is performed, and when the number of times the washing operation is performed reaches the recommended number of times for replacement, the LED (not illustrated) of operation display unit 31 blinks. As a result, the user is able to know the remaining amount of silver crystals 29 without visually observing the inside of silver crystal unit 15, which eliminates the need to provide a window for visual observation of the inside of silver crystal unit 15.

[0064] Moreover, the operation display unit may indicate the remaining number of times silver crystal unit 15 can be used. With this, the user is able to know in advance when to replace silver crystal unit 15, so that silver crystal unit 15 for replacement can be prepared in advance.

[0065] (Advantageous Effects, etc.)

As described above, the washing machine according to the present embodiment

includes silver crystal unit 15 which stores silver crystals 29 and detergent case 9 including silver crystal unit housing 16 which removably houses silver crystal unit 15, and water injection device 11 which supplies water to silver crystal unit 15.

5 [0066] With this configuration, when the remaining amount of silver crystals 29 has become low, silver crystal unit 15 can be replaced. In addition, the washing operation can be performed with silver crystal unit 15 removed as necessary.

[0067] As in the present embodiment, silver crystal unit housing 16 may include inclined ribs 16c which guide silver crystal unit 15 in the direction in which silver crystal unit 15 is inserted.

10 [0068] With this configuration, inclined ribs 16c guide silver crystal unit 15 in the direction in which silver crystal unit 15 is inserted, which allows silver crystal unit 15 to be smoothly inserted. Moreover, since the contact area between silver crystal unit 15 and silver crystal unit housing 16 is small, friction at the time of insertion can be reduced.

15 [0069] As in the present embodiment, it may be that hinge portion 22 is disposed on the upper portion of silver crystal unit 15, and when silver crystal unit 15 is inserted into silver crystal unit housing 16, hinge portion 22 may be retained by hooking to silver crystal unit housing claw 16b.

[0070] With this, silver crystal unit 15 is attached to silver crystal unit housing 16, and does not fall off even when detergent case 9 is turned upside down.

20 [0071] As in the present embodiment, silver crystal unit 15 includes storage case 18 and silver crystals 29, and storage case 18 includes a main body which stores silver crystals 29 and storage case lid 19 which covers the upper face of the main body. Storage case lid 19 may include screw boss portion 23 with screw hole 23a to which screw 24a is screwed from below with respect to the main body.

25 [0072] With this configuration, screwing from below makes it hard for screw 24a to come into contact with water.

[0073] Accordingly, it is possible to prevent screw 24a from rusting.

[0074] As in the present embodiment, it may be that storage case 18 includes bendable hinge portion 22 which connects the main body and storage case lid 19, and the main 30 body, storage case lid 19 and hinge portion 22 are integrally formed.

[0075] With this, the number of components can be reduced by such an integration.

[0076] Accordingly, silver crystal unit 15 can be provided at low cost.

[0077] As in the present embodiment, storage case 18 may include fitting claw projections 25 and fitting claw recesses 26 which bring the main body and storage case

lid 19 into engagement with each other.

[0078] With this configuration, by temporarily fixing with fitting claw projections 25 and fitting claw recesses 26, it is possible to prevent storage case 18 and storage case lid 19 from opening naturally when screw boss portion 23 is screwed.

5 [0079] As in the present embodiment, it may be that storage case lid 19 includes first opening 20 and the bottom portion of the main body includes second opening 21, and first opening 20 and/or second opening 21 are covered with water passing members 27 which prevents passage of silver crystals 29 and allows passage of water.

10 [0080] This configuration allows passage of water and prevents leakage of silver crystals 29.

[0081] As in the present embodiment, it may be that silver crystal unit 15 includes a positioning unit which positions silver crystal unit 15 in a normal position with respect to silver crystal unit housing 16.

15 [0082] This configuration allows the water injected from water injection device 11 into silver crystal unit 15 to reliably reach first opening 20.

[0083] As in the present embodiment, silver crystal unit 15 includes storage case 18 which stores silver crystals 29 and storage case lid 19 which covers the upper face of the main body. Moreover, it may be that the positioning unit includes screw boss portion 23 and screw seat portion 24 for fixing storage case 18 and storage case lid 19, and silver
20 crystal unit housing 16 includes cutout portion 16a into which screw boss portion 23 and screw seat portion 24 are inserted in a state where silver crystal unit 15 is housed at a normal position.

[0084] With this configuration, since screw boss portion 23 and screw seat portion 24 can be used as a positioning unit, it is not necessary to provide a dedicated positioning
25 structure.

[0085] (Other Embodiments)

The first embodiment has been described above as an example of the technique disclosed in the present application. However, the technique according to the present disclosure is not limited to such an example.

30 [0086] Other embodiments will be described below.

[0087] In the first embodiment, a vertical type washing machine has been described as an example of the washing machine. The washing machine may be any washing machine as long as clothes can be washed. Accordingly, the washing machine is not limited to a vertical type washing machine, but may be a front-loading washing machine and a two-

tank washing machine.

[0088] In the first embodiment, silver crystals that provide an antibacterial effect to laundry have been described as an example of the supplemental agent. The supplemental agent is not limited to silver crystals as long as the supplemental agent is water-soluble and provides a supplemental effect to the laundry. The supplemental agent may be an agent which provides an effect such as an antibacterial effect, odor eliminating effect, or fragrance effect, or which enhances the effect of a detergent or softener.

INDUSTRIAL APPLICABILITY

[0089] The present disclosure is applicable to a washing machine which includes a supplemental agent unit. Specifically, the present disclosure is applicable to, for example, vertical type washing machines, front-loading washing machines, and two-tank washing machines.

REFERENCE MARKS IN THE DRAWINGS

15	[0090]	
	1	washing machine body
	2	upper frame body
	2a	laundry access opening
	3	washing and spin drying tub
20	4	water tub
	5	pulsator
	6	lid body
	7	control device
	8a	water supply port for powder detergent compartment
25	8b	water supply port for liquid detergent compartment
	8c	water supply port for softener compartment
	9	detergent case
	9a	powder detergent compartment
	9b	liquid detergent compartment
30	9c	softener compartment
	10	silver crystal nozzle
	10a	first nozzle

	10b	second nozzle
	11	water injection device (water supply unit)
	11a	water injection device lid (water supply unit)
	11b	water injection structure (water supply unit)
5	12	detergent case housing
	13	detergent nozzle
	13a	powder detergent nozzle
	13b	liquid detergent nozzle
	14	softener nozzle
10	15	silver crystal unit (supplemental agent unit)
	16	silver crystal unit housing (silver crystal unit housing)
	16a	cutout portion
	16b	silver crystal unit housing claw (hooking portion)
	16c	inclined rib
15	18	storage case
	19	storage case lid
	20	first opening (opening)
	21	second opening (opening)
	22	hinge portion (claw)
20	23	screw boss portion (fixing unit) (positioning unit)
	23a	screw hole (fixing unit)
	24	screw seat portion (fixing unit) (positioning unit)
	24a	screw
	25	fitting claw projection (engagement unit)
25	26	fitting claw recess (engagement unit)
	27	water passing member (water passing structure)
	28	storage case bottom surface (bottom surface)
	29	silver crystals (supplemental agent)
	30a	powder detergent discharge port
30	30b	Siphon structure
	30c	discharge port of silver crystal unit housing
	31	operation display unit
	80	water supply valve
	81	first water supply valve

82 second water supply valve

CLAIMS

1. A washing machine comprising:
 - a supplemental agent unit which stores a supplemental agent;
 - 5 a detergent case which includes a supplemental agent unit housing which removably houses the supplemental agent unit; and
 - a water supply unit which supplies water to the supplemental agent unit.
2. The washing machine according to claim 1,
 - 10 wherein the supplemental agent unit housing includes an inclined rib which guides the supplemental agent unit in a direction in which the supplemental agent unit is inserted.
3. The washing machine according to claim 1 or claim 2,
 - 15 wherein the supplemental agent unit includes a claw in an upper portion of the supplemental agent unit,
 - the supplemental agent unit housing includes a hooking portion, and
 - the claw is retained by hooking to the hooking portion by an insertion of the supplemental agent unit into the supplemental agent unit housing.
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4. The washing machine according to any one of claims 1 to 3,
 - wherein the supplemental agent unit includes:
 - a storage case; and
 - the supplemental agent,
 - 25 the storage case includes:
 - a main body which stores the supplemental agent; and
 - a lid which covers an upper face of the main body, and
 - the lid includes a fixing unit which is screwed to the main body from below.
5. The washing machine according to claim 4,
 - 30 wherein the storage case includes a hinge portion which is bendable and connects the main body and the lid, and
 - the main body, the lid, and the hinge portion are integrally formed.

6. The washing machine according to claim 4 or claim 5,
wherein the storage case includes an engagement unit which brings the main
body and the lid into engagement with each other.

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7. The washing machine according to any one of claims 4 to 6,
wherein each of the lid and a bottom portion of the main body includes an
opening, and
the opening is covered by a water passage structure which allows passage of
water and prevents passage of the supplemental agent.

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8. The washing machine according to any one of claims 1 to 7,
wherein the supplemental agent unit includes a positioning unit which positions
the supplemental agent unit at a normal position relative to the supplemental agent unit
housing.

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9. The washing machine according to any one of claims 1 to 8,
wherein the supplemental agent unit includes a main body which stores the
supplemental agent and a lid which covers an upper face of the main body,
the positioning unit includes a fixing unit which fixes the main body and the lid,
and

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the supplemental agent unit housing includes a cutout portion into which the
positioning unit is inserted in a state where the supplemental agent unit is housed at the
normal position.

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