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(54) MACHINE FOR WASHING LAUNDRY EQUIPPED WITH IMPROVED MEANS FOR PREVENTING BACKFLOW OF WATER

(57) The present disclosure refers to a washing machine (1) configured for washing laundry, the washing machine (1) comprising a tub (2) suitable for collecting water, a water supply unit (3) configured to feed fresh water from a water supply network to the tub (2), a washing agents dispenser (4) configured to feed at least one washing agent, in particular a detergent, to the tub (2), the washing agents dispenser (4) being connected downstream the water supply unit (3) and at least one pump (5) configured to pump out the water from the tub (2) to a drainage system (20) outside the washing machine (1). The water supply unit (3) comprises a water draining device (10) configured to drain a residual water to a collection vessel or hose (6) operatively connected to the tub (2) and to the exterior of the washing machine (1). The water draining device (10) comprises at least an auxiliary conduit (11) comprising an outlet section (11e) feeding the residual water to the collection vessel or hose (6). The auxiliary conduit (11) and the collection vessel or hose (6) are arranged in a predetermined spatial configuration such that a back-siphonage mitigation air break (S) is present between an inlet opening (6a) of the collection vessel or hose (6) and the outlet section (11e) of the auxiliary conduit (11), the back siphonage mitigation air break (S) being configured to mitigate back-siphonage from said drainage system (20) by causing water that may flow back from the drainage system (20) to the collection vessel or hose (6) and/or that may reach an overflow level within said tub (2) to come out at the back-siphonage mitigation air break (S) without climbing back to the auxiliary conduit (11).

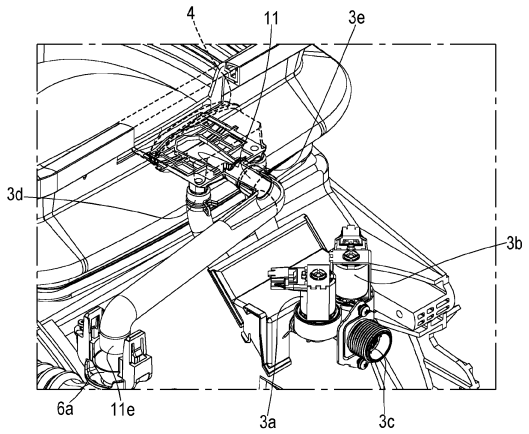

FIG.5

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Description

Field of the art

[0001] The present disclosure relates to the field of home appliances, and in detail concerns a laundry washing machine. The present disclosure further concerns a method for actuating a laundry washing machine.

Background art and aims of the disclosure

[0002] Laundry washing machines are home appliances that are conceived to wash laundry and which are typically connected to a drainage system in order to allow the discharge of the water used for washing laundry; the water used for washing the laundry in the washing machine is fed to the drainage system through a pump unit. Washing machines are connected to a fresh water feeding plant, that in use supplies water under pressure to the washing machine first to a washing agent dispensing unit and then to a tub wherein a rotating drum is allocated. Washing machines typically comprise an electrically actuated valve that may be configured at least in a closed configuration wherein it does not allow the feeding of fresh water from the feeding plant to the drum - thereby isolating the feeding plant from the drum and from the pump unit - and in an open configuration wherein it allows the feeding of fresh water from the feeding plant to the tub.

[0003] In some cases, washing machines may siphon back the water of the drainage system. If this takes place, the washing machine and in particular at least the tub and/or the pump unit may result contaminated with the water of the drainage system.

[0004] EN1717 standard categorizes fluids in five classes according to the precautions that are required according to the risk of pollution and/or biological contamination of the water. While fluid of category 1 (the least dangerous one), which is water to be used for human consumption, coming directly from a potable water distribution system requires no protection, fluids of category 5 (the most dangerous one), which may involve serious risks of human health hazard due to the presence of microbiological or viral elements, in addition to toxic and/or mutagenic or carcinogenic substances, require an unrestricted air gap exhaust. Fluids of the drainage system are fluids of category 5.

[0005] EN61770 standard relates to electric appliances connected to water mains. This standard concerns the avoidance of back-siphonage and failure of hose sets. The last version of such standard, at the moment of filing of the present application is the EN61770:2009/A11:18 published on May 18th, 2018 that will become mandatory on November 14th 2021.

[0006] This latter version of the standard will categorize the fluids in the washing machine in category 5; there is thus the need of providing means to separate the drainage system and the feeding unit of the washing machine, in order to prevent any risk that, should any of the devices of the washing machine, in particular the pump unit, any pressure switch and the valve fail, the fresh water feeding unit will not get contaminated as a result of a fluids backflow from the drainage system.

[0007] Therefore, the main aim of the present disclosure is to make available a laundry washing machine exhibiting outstanding performances as regards its capability of preventing the backflow of non-potable water into the water mains, the environmental safety performances of the laundry washing machine according to the present disclosure being in particular significantly greater than the performances of the closest known technical solutions, in particular of the technical solution disclosed by the patent application DE102018106951A1,

[0008] In fact, it is recalled that document DE102018106951A1 discloses a securing device for a washing machine comprising an input interface for introducing drinking water and an output interface for discharging the drinking water. The device further comprises a chamber unit having an entrance side opening, an exit side opening and a drain opening. The chamber unit is formed to provide a free flow path for the drinking water between the entrance side opening and the exit side opening.

Summary

[0009] The object of the present disclosure is hereinafter presented with its main aspects, which may be combined with one or more parts of the subsequent detailed description and/or with one or more of the annexed claims.

[0010] According to an aspect, the present disclosure relates to a washing machine (1) configured for washing laundry, the washing machine (1) comprising:

- a tub (2) suitable for collecting water;
- a water supply unit (3) configured to feed fresh water from a water supply network to the tub (2),
- a washing agents dispenser (4) configured to feed at least one washing agent, in particular a detergent, to the tub (2), the washing agents dispenser (4) being connected downstream the water supply unit (3),
- at least one pump (5) configured to pump out the water from the tub (2) to a drainage system (20) outside the washing machine (1),

wherein the water supply unit (3) comprises a water draining device (10) configured to drain a residual water to a collection vessel or hose (6) operatively connected to the tub (2) and to the exterior of the washing machine (1),

wherein the water draining device (10) comprises at least an auxiliary conduit (11) comprising an outlet section (11e) feeding the residual water to the collection vessel or hose (6) and

wherein the auxiliary conduit (11) and the collection vessel or hose (6) are arranged in a predetermined spatial configuration such that a back-siphonage mitigation air break (S) is present between an inlet opening (6a) of the collection vessel or hose (6) and the outlet section (11e) of the auxiliary conduit (11), the back siphonage mitigation air break (S) being configured to mitigate back-siphonage from said drainage system (20) by causing water that may flow back from the drainage system (20) to the collection vessel or hose (6) and/or that may reach an overflow level within said tub (2) to come out at the back-siphonage mitigation air break (S) without climbing back to the auxiliary conduit (11).

[0011] According to a further non-limiting aspect, the water supply unit (3) comprises at least one water inlet nozzle (11a, 11b) and at least one water receiving port (12a, 12b, 12c) configured to be fed, in use, by said a water flow coming from at least one water inlet nozzle (11a, 11b).

[0012] According to a further non-limiting aspect, said at least one water inlet nozzle (11a, 11b) is operatively connected to at least one valve (3a, 3b), in particular to at least one electrically actuated valve (3a, 3b), of the water supply unit (3).

[0013] According to a further non-limiting aspect, said at least one valve (3a, 3b) is configured for receiving water from a supply mains (F) and said at least one water receiving port (12a, 12b, 12c) is operatively connected to a respective compartment of the washing agents dispenser (4) in order to withdraw the washing agents loaded in that compartment.

[0014] According to a further non-limiting aspect, an air gap (A) is defined between the at least one water inlet nozzle (11a, 11b) and the at least one water receiving port (12a, 12b, 12c).

[0015] According to a further non-limiting aspect, the water draining device (10) further comprises a water collection recess (13) arranged between the at least one water inlet nozzle (11a, 11b) and the at least one water receiving port (12a, 12b, 12c).

[0016] According to a further non-limiting aspect, the water collection recess (13) is in fluid communication with, or connected to, optionally in direct fluid communication with, or directly connected to, the auxiliary conduit (11) and is configured to collect the residual water that leaks from the at least one water inlet nozzle (11a, 11b) and/or from the at least one water receiving port (12a, 12b, 12c) and to drain said residual water to the auxiliary conduit (11).

[0017] According to a further non-limiting aspect, the collection vessel or hose (6) is operatively connected to the drainage system (20) through the tub (2) and/or the pump (5), the collection vessel or hose (6) having a first ending section opening substantially outwardly the washing machine (1) and a second ending section (6b) substantially exposing and/or directly connected to the tub (2).

[0018] According to a further non-limiting aspect, the first ending section has a height higher than the second ending section (6b) and wherein the inlet opening (6a) has a height lower than the first ending section and higher than the second ending section (6b), in order to allow the water coming out of the collection conduit to be drained into the tub (2).

[0019] According to a further non-limiting aspect, the collection vessel or hose (6) is a vent hose, wherein the second ending section (6b) substantially lays at a predetermined height (30) in an upper portion of the tub (2), wherein the vent hose is in particular configured to allow the water contained in the tub (2) to overflow outside the tub (2).

[0020] According to a further non-limiting aspect, the back-siphonage mitigation air break (S) is arranged at a back-siphonage prevention height (31) from a bottom of the tub (2), the back-siphonage prevention height (31) being in particular substantially equal or above a top height of the tub (2) and the predetermined collection height (30) being below or equal to the back-siphonage prevention height (31).

[0021] According to a further non-limiting aspect, the air gap (A) is at least equal to the double of a size of a cross section of the at least one water inlet nozzle (11a, 11b), optionally being at least equal to the double of the diameter of the at least one water inlet nozzle (11a, 11b), and/or

the air gap (A) has a size of the cross-section, optionally the diameter, at least equal to 20 mm.

According to a further non-limiting aspect, the back-siphonage mitigation air break (S) allows the drain-off of a maximum flow rate of the collection vessel or hose (6) and/or

the back-siphonage mitigation air break (S) is larger than a size of the cross section of the inlet opening (6a) of the collection vessel or hose (6), in particular being larger than the diameter (d1) of the inlet opening (6a) of the collection vessel or hose (6), and/or

the back siphonage mitigation air break (S) has a size of the cross-section, optionally the diameter, at least equal to 20 mm.

[0022] According to a further non-limiting aspect, a size of the cross-section of the inlet opening (6a) of the collection vessel or hose (6), optionally the diameter of the inlet opening (6a) of the collection vessel or hose (6), is larger than a size of the cross-section, optionally larger that the diameter (d2), of the outlet section (11 e) of the auxiliary conduit (11).

[0023] According to a further non-limiting aspect, said inlet opening (6a) comprises a funnel shaped portion (6f) configured to collect water sprinkling from said outlet section (11 e).

[0024] According to a further non-limiting aspect, the washing machine is a top-loading washing machine configured to allow the loading of the laundry into the washing machine and/or the tub along a substantially vertical direction and/or from a top portion thereof.

[0025] Alternatively, according to a further non-limiting

aspect, the washing machine is a front-loading washing machine configured to allow the loading of the laundry into the tub along a substantially horizontal direction and/or from a front portion thereof.

[0026] According to a further non-limiting aspect, the washing machine has a drum (2t) rotatably accommodated into said tub (2), the upper portion of the tub (2) defining a loading mouth, the loading mouth being accessible through a loading door.

[0027] According to a further non-limiting aspect, the washing machine (1) comprises an open configuration wherein the loading door is open and allows an access to said loading mouth and a closed configuration wherein the loading door is closed and seals the loading mouth and the tub (2) from an outer environment.

[0028] According to a further non-limiting aspect, said washing agents dispenser (4) is associated to said drum (2t) or to said loading mouth or to said loading door.

[0029] According to a further non-limiting aspect, the water supply unit (3) comprises a first water inlet nozzle (11a) and a second water inlet nozzle (11b), and comprises a first water receiving port (12a) a second water receiving port (12b) and a third water receiving port (12c), said first water receiving port (12a), second water receiving port (12b) and third water receiving port (12c) being each configured to be fed, in use, by said a spray or water flow coming from at least one nozzle between said first water inlet nozzle (11a) and said second water inlet nozzle (11b).

[0030] According to a further non-limiting aspect, the first water inlet nozzle (11a) and the second water inlet nozzle (11b) are arranged on a first side of the water draining device (10) and wherein the first water receiving port (12a), the second water receiving port (12b) and third water receiving port (12c) are arranged on a second side of the water draining device (10), the first side being substantially opposite to the second side.

[0031] According to a further non-limiting aspect, the water supply unit (3) comprises a first valve (3a) and a second valve (3b), in particular a first electrically actuated valve (3a) and a second electrically actuated valve (3b), said first valve (3a) and said second valve (3b) being configured for receiving water from a supply mains (F), said first valve (3a) being configured to be actuated independently from said second valve (3b), said first valve (3a) being configured to feed the first water inlet nozzle (11a), said second valve (3b) being configured to feed the second water inlet nozzle (11b).

[0032] According to a further non-limiting aspect, the first water inlet nozzle (11a) is axially aligned with the third water receiving port (12c) and wherein the second water inlet nozzle (11b) is axially aligned with the first water receiving port (12a) and wherein the second water receiving port (12b) is configured to be fed, in particular is configured to be simultaneously fed, by said first water inlet nozzle (11a) and by said second water inlet nozzle (11b).

[0033] According to a further non-limiting aspect, the water collection recess (13) defines an air gap (A) arranged at a portion of the water draining device (10) between said first side and said second side.

[0034] According to a further non-limiting aspect, the auxiliary conduit (11) is at least partially axially aligned with the water collection recess (13) and/or is realized within the body of said water supply unit (3) and is integral with the water collection recess (13).

[0035] According to a further non-limiting aspect, the at least one water inlet nozzle (11a, 11b) is substantially horizontally aligned with the at least one water receiving port (12a, 12b, 12c) along a determined alignment direction, and the water collection recess (13) extends substantially orthogonally with respect to alignment direction and/or with respect to the at least one water receiving port (12a, 12b, 12c).

[0036] According to a further non-limiting aspect, the washing machine (1) comprises a body defining at least one supporting wall (1s).

[0037] According to a further non-limiting aspect, the washing machine (1) further comprises a mounting bracket (12) configured to support at least the collection vessel or hose (6) and/or to substantially keep the inlet opening (6a) of the collection vessel or hose (6) and the outlet section (11e) of the auxiliary conduit (11) at a predetermined distance corresponding to said air break (S), the mounting bracket (12) being connected, optionally removably connected, to said supporting wall (1s).

[0038] According to a further non-limiting aspect, the mounting bracket (12) is configured to be connected to the supporting wall (1s) by means of a snap fitting and comprises at least one strut (12s) configured to be at least partially introduced in a hole of said supporting wall (1s), the strut (12s) comprising at least one snapping element configured to engage the supporting wall (1s) in substantial correspondence of the hole.

[0039] According to a further non-limiting aspect, the mounting bracket (12) comprises a supporting portion, in particular a ring-shaped supporting portion, configured to sustain the collection vessel or hose (6) in substantial correspondence of said inlet opening (6a), said at least one strut (12s), in particular an end portion of said at least one strut (12s), being connected to said supporting portion,

optionally wherein the mounting bracket comprises a body made in a single piece and comprising said supporting portion and said at least one strut (12s).

[0040] According to a further non-limiting aspect, the mounting bracket (12) comprises a plurality of struts extending substantially parallel to each other.

[0041] According to a further non-limiting aspect, the struts comprise at least a first strut (12s) and a second strut (12s), the first strut (12s) and the second strut (12s) being separated to each other and defining an intermediate space housing at least a part of said funnel shaped portion (6f).

[0042] According to a further non-limiting aspect, the struts are axisymmetrically arranged around said outlet

section (11e) of the auxiliary conduit (11) and are separated to each other by openings allowing the water to come out.

[0043] According to a further non-limiting aspect, the width of the openings is bigger than the width of the struts, the width of the openings being preferably at least two times bigger than the width of the struts, the width of the openings being more preferably at least five times bigger than the width of the struts, the width of the openings being preferably at least ten times bigger than the width of the struts.

[0044] According to a further non-limiting aspect, the supporting wall (1s) comprises a portion (13) at which said outlet section (11 e) of the auxiliary conduit (11) substantially ends, said portion (13) comprising an opening (13c) configured to allow a passage of water from said outlet section (11 e) to said inlet opening (6a) through the air break (S).

[0045] According to a further non-limiting aspect, the opening (13c) comprises a central hole surrounded by a ring dividing portion, and an outer hole arranged outside said ring dividing portion, and wherein a plurality of spokes extend from said ring dividing portion and a perimetral wall of the opening (13c), said spokes defining a plurality of sectors of said outer hole.

[0046] According to a further aspect, it is herewith disclosed a method of actuating a washing machine, optionally a washing machine (1) according to one or more of the preceding claims, the method comprising:

- feeding fresh water to a tub (2) of the washing machine (1) through a water supply unit (3) for fresh water, said tub being suitable for collecting water,

- supplying a washing agent, in particular a detergent, to the tub (2) through a washing agent dispenser (4) connected downstream the water supply unit (3),

- actuating at least one pump (5) for pumping water out of the tub (2) to a drainage system (20) outside the washing machine (1),

- providing a water draining device (10) at the water supply unit (3) and draining a residual water to a collection vessel or hose (6) operatively connected to the tub (2) and to the exterior of the washing machine (1),

wherein draining said residual water comprises feeding the residual water from outlet section (11 e) of an auxiliary conduit (11) of the water draining device (10) to the collection vessel or hose (6),
the method comprising arranging the auxiliary conduit (11) and the collection vessel or hose (6) in a predetermined spatial configuration such that a back-siphonage mitigation air break (S) is present between an inlet opening (6a) of the collection vessel or hose (6) and the outlet section (11 e) of the auxiliary conduit (11), and comprises mitigating a back-siphonage from said tub (2) by causing waste water that may flow back from the drainage system (20) to the collection vessel or hose (6) through the tub (2) and/or that may reach an overflow level within the tub (2) to come out at the back-siphonage mitigation air break (S) without climbing back to the auxiliary conduit (11).

[0047] According to a further non-limiting embodiment, the method comprises feeding at least one receiving port of the water draining device (10) by means of at least one water inlet nozzle (11a, 11b).

[0048] In particular, according to a further non-limiting aspect, the method comprises spraying water, or making water flow, from at least one water inlet nozzle (11a, 11b) of the water draining device (10) to at least one water receiving port (12a, 12b, 12c) of said water draining device (10).

[0049] According to a further non-limiting aspect, the method comprises connecting operatively the water inlet nozzle (11a, 11b) with at least one valve (3a, 3b) of the water supply unit (3), and comprising feeding water from a supply mains (F) to the at least one valve (3a, 3b).

[0050] According to a further non-limiting aspect, the method comprises withdrawing agents loaded in a respective compartment of the washing agents dispenser (4) by means of the at least one water receiving port (12a, 12b, 12c), operatively connected to said respective compartment.

[0051] According to a further non-limiting aspect, the method comprises collecting a residual water that leaks from the at least one water inlet nozzle (11a, 11b) and/or from the at least one water receiving port (12a, 12b, 12c) in a water collection recess (13) being in fluid communication with, or connected to, optionally in direct fluid communication with, or directly connected to, the auxiliary conduit (11).

[0052] According to a further non-limiting aspect, the water collection recess (13) defines an air gap (A) between the at least one water inlet nozzle (11a, 11b) and the at least one receiving port (12a, 12b, 12c).

[0053] According to a further aspect, the method comprises connecting operatively the collection vessel or hose (6) to the drainage system (20) through the tub (2) and/or the pump (5), and/or comprises aerating the tub (2) by making a first ending section of the collection vessel or hose (6) open substantially outwardly the washing machine (1) and by arranging a second ending section (6b) of the collection vessel or hose (6) in such a way it substantially exposes on, and/or is directly connected to, the tub (2).

[0054] According to a further non-limiting aspect, the method comprises arranging the first ending section at a height higher than the second ending section (6b).

[0055] According to a further non-limiting aspect, the method comprises preferably arranging the inlet opening (6a) at a height lower than the first ending section and higher than the second ending section (6b), in order to allow water coming out of the collection conduit (11) to be drained out of the tub (2).

[0056] According to a further non-limiting aspect, the collection vessel or hose (6) is a vent hose and the method comprises arranging the second ending section (6b) of the collection vessel or hose (5) at a predetermined height (30) in an upper portion of the tub (2), the method allowing the water contained in the tub (2) to overflow by means of the vent hose.

[0057] According to a further non-limiting aspect, the method comprises providing the back-siphonage mitigation air break (S) at a back-siphonage prevention height (31) from a bottom of the tub (2), the back-siphonage prevention height (31) being in particular substantially equal or above a top height of the tub (2) and the predetermined collection height (30) being below or equal to the back-siphonage prevention height (31).

[0058] According to a further non-limiting aspect, the method comprises separating the at least one water receiving port (12a, 12b, 12c) and the at least one water inlet nozzle (11a, 11b) in such a way that the air gap (A) is at least equal to the double of a size of a cross section of the at least one water inlet nozzle (11a, 11b), optionally being at least equal to the double of the diameter of the at least one water inlet nozzle (11a, 11b), and/or in such a way that the air gap (A) has a size of the cross-section, optionally the diameter, at least equal to 20 mm.

[0059] According to a further non-limiting aspect, the method comprises arranging the auxiliary conduit (11) and the collection vessel or hose (6) in a predetermined spatial configuration such that the back-siphonage mitigation air break (S) allows the drain-off of a maximum flow rate of the collection vessel or hose (6) and/or such that the back-siphonage mitigation air break (S) is larger than a size of the cross section of the inlet opening (6a) of the collection vessel or hose (6), in particular being larger than the diameter (d1) of the inlet opening (6a) of the collection vessel or hose (6), and/or such that the back siphonage mitigation air break (S) has a size of the cross-section, optionally the diameter, at least equal to 20 mm.

[0060] According to a further non-limiting aspect, the method comprises designing the inlet opening (6a) in such a way that a size of the cross-section of the inlet opening (6a) of the collection vessel or hose (6), optionally the diameter of the inlet opening (6a) of the collection vessel or hose (6), is larger than a size of the cross-section, optionally larger that the diameter (d2), of the outlet section (11e) of the auxiliary conduit (11).

[0061] According to a further non-limiting aspect, the method comprises collecting water exiting from the outlet section (11 e) by means of a funnel shaped portion (6f) configured to collect water sprinkling from said outlet section (11e) to the inlet opening (6a).

[0062] In particular, according to a further non-limiting aspect, the method comprises providing the funnel shaped portion (6f) at a top portion of the inlet opening (6a).

[0063] According to a further non-limiting aspect, the method is a method of actuating a top-loading washing machine, configured to allow the loading of the laundry into the washing machine along a substantially vertical direction and/or from a top portion thereof.

[0064] Alternatively, according to a further non-limiting aspect, the method is a method of actuating a front-loading washing machine, configured to allow the loading of the laundry into the washing machine and/or the tub in a substantially horizontal direction and/or from a front portion thereof.

[0065] According to a further non-limiting aspect, the method comprises making the drum (2t) rotate into the tub (2).

[0066] According to a further non-limiting aspect, the method comprises loading laundry into a loading mouth arranged at an upper portion of the tub (2), the loading mouth being accessible through a loading door.

[0067] According to a further non-limiting aspect, the method comprises switching between an open configuration of the washing machine (1) wherein the loading door is open and allows an access to said loading mouth and a closed configuration of the washing machine (1) wherein the loading door is closed and seals the loading mouth and the tub (2) from an outer environment.

[0068] According to a further non-limiting aspect, the water supply unit (3) comprises a first water inlet nozzle (11a) and a second water inlet nozzle (11b), and comprises a first water receiving port (12a) a second water receiving port (12b) and a third water receiving port (12c), the method comprising feeding said first water receiving port (12a), second water receiving port (12b) and third water receiving port (12c) with a spray or water flow coming from at least one nozzle between said first water inlet nozzle (11a) and said second water inlet nozzle (11b).

[0069] According to a further non-limiting aspect, the method comprises arranging the first water inlet nozzle (11a) and the second water inlet nozzle (11b) on a first side of the water draining device (10) and arranging the first water receiving port (12a), the second water receiving port (12b) and third water receiving port (12c) on a second side of the water draining device (10), the first side being substantially opposite to the second side.

[0070] According to a further non-limiting aspect, the method comprises providing the water supply unit (3) with a first valve (3a) and a second valve (3b), in particular a first electrically actuated valve (3a) and a second electrically actuated valve (3b), and comprises supplying water to the first valve (3a) and to the second valve (3b) from a supply mains (F).

[0071] According to a further non-limiting aspect, the method comprises actuating independently the first valve (3a) from said second valve (3b), and comprising feeding the first water inlet nozzle (11a) by means of the first valve (3a) and feeding the second water inlet nozzle (11b) by means of the second valve (3b).

[0072] According to a further non limiting aspect, the method comprises arranging the first and the second inlet nozzle (11a, 11b) and the first, second and third water receiving port (12a, 12b, 12c) in such a way that the first

water inlet nozzle (11a) is axially aligned with the third water receiving port (12c) and in such a way that the second water inlet nozzle (11b) is axially aligned with the first water receiving port (12a) and in such a way that the second water receiving port (12b) may be fed, in particular may be simultaneously fed, by said first water inlet nozzle (11a) and by said second water inlet nozzle (11b).

[0073] According to a further non-limiting aspect, the water collection recess (13) defines an air gap (A) arranged at a portion of the water draining device (10) between said first side and said second side.

[0074] According to a further non-limiting aspect, the method comprises collecting water by means of a water collection recess (13) at least partially axially aligned with the auxiliary conduit (11) and/or comprises realizing the water collection recess (13) within the body of said water supply unit (3) in such a way it is integral with the water collection recess (13).

[0075] According to a further non-limiting aspect, the method comprises substantially horizontally aligning the at least one water inlet nozzle (11a, 11b) with the at least one water receiving port (12a, 12b, 12c) along a determined alignment direction, and making the water collection recess (13) extend substantially orthogonally with respect to alignment direction and/or with respect to the at least one water receiving port (12a, 12b, 12c), in such a way the collection of the residual water takes place at least partially along a vertical direction.

[0076] According to a further non-limiting aspect, the washing machine (1) comprises a body defining at least one supporting wall (1s), and the method comprises supporting at least the collection vessel or hose (6) and/or substantially keeping the inlet opening (6a) of the collection vessel or hose (6) and the outlet section (11 e) of the auxiliary conduit (11) at a predetermined distance corresponding to said air break (S) by means of a mounting bracket (11), the mounting bracket (12) being connected, optionally removably connected, to said supporting wall (1s).

[0077] According to a further non-limiting aspect, the method comprises connecting the mounting bracket (12) to the supporting wall (1s) by means of a snap fitting, the method comprises introducing at least partially at least one strut (12s) of the mounting bracket (12) in a hole of said supporting wall (1s), by making a snapping element of the strut (12s) engage the supporting wall (1s) in substantial correspondence of the hole.

[0078] According to a further non-limiting aspect, the hole is a slotted hole.

[0079] According to a further non-limiting aspect, the method comprises sustaining the collection vessel or hose (6) by means of a supporting portion of the mounting bracket (12), the supporting portion being optionally a ring-shaped supporting portion, the sustaining taking place in substantial correspondence of said inlet opening (6a).

[0080] According to a further non-limiting aspect, the method comprises providing a connection between said at least one strut (12s), in particular an end portion of said at least one strut (12s), to said supporting portion,

[0081] According to a further non-limiting aspect, the method comprises collecting water through a collection vessel or hose (6) sustained by means of a mounting bracket (12) comprising a plurality of struts extending substantially parallel to each other, said struts comprising at least a first strut (12s) and a second strut (12s), the first strut (12s) and the second strut (12s) being separated to each other and defining an intermediate space housing at least a part of said funnel shaped portion (6f).

[0082] According to a further non-limiting aspect, the method comprises arranging the struts in an axisymmetrical fashion around the outlet section (11 e) and comprises separating the struts by openings allowing the water to come out, the width of the openings being bigger than the width of the struts, the width of the openings being preferably at least two times bigger than the width of the struts, the width of the openings being more preferably at least five times bigger than the width of the struts, the width of the openings being preferably at least ten times bigger than the width of the struts.

[0083] According to a further non-limiting aspect, the method comprises allowing a passage of water from said outlet section (11 e) to said inlet opening (6a) through the air break (S) by means of a portion (13) of the supporting wall (1s) at which said outlet section (11 e) of the auxiliary conduit (11) substantially ends, wherein the opening (13c) comprises a central hole surrounded by a ring dividing portion and an outer hole arranged outside said ring dividing portion and wherein a plurality of spokes extend from said ring dividing portion and a perimetral wall of the opening (13c), said spokes defining a plurality of sectors of said outer hole.

Figures

[0084] Further details of the washing machine and of the method of the present disclosure will be presented in the subsequent detailed description. The detailed description will refer to the annexed figures; a brief description of the figures is here presented.

Figure 1 shows a schematic view of a washing machine according to the present disclosure.

Figure 2 shows a perspective three-dimensional view of a part of washing machine according to the present disclosure.

Figure 3 shows a schematic view of a water feeding unit of the washing machine according to the present disclosure.

Figure 4 shows a perspective three-dimensional view of a washing agents dispenser installed on the washing machine according to the present disclosure.

Figure 5 shows a perspective three-dimensional detailed view of a water feeding unit installed on the washing machine according to the present disclosure.

Figure 6 shows a perspective three-dimensional view of a detail of an air break provided between an auxiliary conduit and a collection vessel or hose.

Figure 7 shows a perspective view of a detail of a supporting wall of the washing machine, provided with an opening configured to allow the passage of water that in use flows from an outlet section of the auxiliary conduit to an inlet opening of the collection vessel or hose.

Detailed description

[0085] In figure 1, the reference number 1 identifies a laundry washing machine. The washing machine is configured to wash clothes or any other laundry item introduced into a rotating drum 2t, which rotates around an own rotation axis that in a preferred and non-limiting embodiment is substantially horizontal.

[0086] The washing machine 1 comprises an outer case and a tub 2, suitable for collection of water, housing the rotating drum 2t. Thus the drum 2t is thus rotatably accommodated in the tub 2. The outer case of the washing machine 1 comprises at least one perimetral wall 1w and at least one supporting wall 1 s configured to support one or more devices of the washing machine 1.

[0087] It is noted that albeit the present disclosure is not limited to a specific type of washing machine, in a preferred embodiment the washing machine is a top-loading washing machine, configured to allow the loading of the laundry into the washing machine, in particular into the drum, along a substantially vertical direction and/or from a top portion thereof. It is in particular noted that figure 2 refers to a specific embodiment of the washing machine that is configured to be loaded from a top portion. In this case, the tub 2 defines a loading mouth that in the embodiment of figure 2 is substantially provided with a rectangular cross-section. The washing machine 1 comprises a loading door, which in the case of a top-loading washing machine is arranged at a top portion of the cabinet of the washing machine. The loading door is configured to allow access to the loading mouth. The washing machine comprises at least one open configuration wherein the loading door is open and allows an access to the loading mouth, and a closed configuration wherein the loading door is closed and seals the loading mouth and the tub from an outer environment. Should, in contrast, the washing machine be of a front-loading type, the loading mouth is arranged at a front portion of the tub 2, in such a way that laundry may be loaded into the tub from a substantially horizontal direction. According to a typical configuration of the top-loading washing machine, the structure of the drum may include at least one slidable or pivotable portion. In order to allow such a portion to be arranged at the loading mouth for loading and unloading of laundry, the washing machine may be provided with means for controlling the angular position of the drum. To this regard, it is pointed out that the patent literature includes several examples of technical solutions devised to control the angular position of the drum in a top-loading washing machine (see e.g. patent application EP2058927A2).

[0088] A motor, in particular an electric motor, is operatively connected to the drum 2t, for instance by means of a belted connection, and is configured to put in rotation the drum 2t according to at least one washing cycle, and preferably a plurality of washing cycles, that may be set by the user through a user-interface arranged on the outer case of the washing machine 1. Alternatively to the belted connection, the electric motor may be directly connected to the drum 2t or, even alternatively, may be connected to the drum by means of a geared connection, e.g. by means of a speed reduction unit. In an embodiment, the electric motor may be configured to rotate at several speeds, in particular speeds imposed by a data processing unit of the washing machine 1.

[0089] For the purpose of allowing the proper washing and cleaning of the clothes items in the drum, the washing machine 1 comprises a washing agents dispenser 4 configured to feed at least one additive substance, in particular a detergent, to the tub 2 and hence into the drum 2t. When the washing machine 1 is a top-loading laundry washing machine, the washing agents dispenser 4 is associated to the drum or to the loading mouth or to the loading door. The washing machine 1 further comprises an additive compartment that is configured to house at least one additive that will be used during the washing cycle. In an embodiment, such additive compartment is an additive drawer. The additive compartment is operatively connected to the washing agents dispenser 4 in such a way that water may flow therein in order to be mixed with at least one additive; in use, the mixture of the at least one additive and water is then fed to tub 2 and hence into the drum 2t. In a preferred embodiment, the washing agents dispenser 4 includes three distinct compartments which are respectfully configured for the containment of the detergent, of the softener and of the pre-washing additive or the bleach and which may be separately flooded with water, e.g. through the device described in the patent GB2353540B or through the device described in the patent EP2344016B1.

[0090] The washing machine 1 according to the present disclosure further comprises at least one pump 5 configured to pump out the water from the drum to a drainage system 20 outside the washing machine 1. The pump 5 is operatively connected to an emptying opening arranged at a bottom portion of the tub 2. Albeit several types of pumps may be employed, in an embodiment the pump 5 is an electrically controlled rotary pump. An operative connection between the pump 5 and a data processing unit of the washing machine 1 provides for

allowing a proper automated actuation of the pump 5 according to the washing cycle selected by the user.

[0091] The washing machine 1 comprises a feeding unit 3, configured to feed fresh water to the washing agents dispenser 4 and eventually to the tub 2. In a preferred and non-limiting embodiment, the feeding unit 3 comprises at least one valve 3a, in particular an electrically actuated valve 3a, that is configured to regulate a water flow coming from a fresh water source F that constitutes a supply mains for the washing machine 1. The electrically actuated valve 3a in particular may comprise at least a closed configuration wherein the fresh water flow from the fresh water source F to the drum 2t is interrupted and an open configuration wherein the fresh water flow from the fresh water source F to the drum 2t is allowed. It may be noted that the fresh water source F may comprise a fresh water domestic distribution plant and in particular a distribution faucet. A fresh water conduit 40 is shown in figure 1; such fresh water conduit 40 connects the fresh water source F to the feeding unit 3. Albeit several installation positions may be provided, in an embodiment the feeding unit 3 may be provided substantially at a top portion of the washing machine 1. This allows a more effective feeding of water to the tub 2.

[0092] The electrically actuated valve 3a comprises a water inlet 3c that is configured to be connected at a portion of the fresh water conduit 40, in particular at an end portion of the fresh water conduit 40. The water inlet 3c may comprise a threaded portion or any other type of connection which may be useful to allow a proper and secure connection of the fresh water conduit with the electrically actuated valve 3a.

[0093] In an embodiment, the electrically actuated valve 3a comprises an outlet conduit 3d that provides a regulated flow of fresh water to the washing agents dispenser 4; thus, it is clear that the washing agents dispenser 4 is arranged downstream the feeding unit 3.

[0094] In the embodiment shown in the annexed figures the feeding unit 3 comprises a first valve 3a and a second valve 3b. The first valve 3a may be controlled independently of the second valve 3b. In a preferred, non-limiting, embodiment, the first valve 3a and the second valve 3b are respectively a first electrically actuated valve 3a and a second electrically actuated valve 3b. This allows a proper electronic control of several washing cycles wherein the various compartments of the washing agents dispenser 4 shall be fed with water according to a predetermined feeding sequence.

[0095] In the embodiment shown in the annexed figures, the first electrically actuated valve 3a and the second electrically actuated valve 3b have a common water inlet 3c, that is configured to be connected at a portion of the fresh water conduit 40, in particular at an end portion of the fresh water conduit 40. Thus, in use, the fresh water that enters the water inlet 3c is fed simultaneously to the first electrically actuated valve 3a and the second electrically actuated valve 3b. Otherwise, the first electrically actuated valve 3a and the second electrically actuated valve 3b may be connected respectively with a cold water supply network and with a hot water supply network.

[0096] In the embodiment shown in the annexed figures, the feeding unit 3 comprises a first outlet conduit 3d that is connected to an outlet port of the first electrically actuated valve 3a and provides a regulated flow of fresh water to the washing agents dispenser 4; the feeding unit 3 further comprises a second outlet conduit 3e that is connected to an outlet port of the second electrically actuated valve 3b and provides a regulated flow of fresh water to the washing agents dispenser 4.

[0097] In a preferred, non-limiting, embodiment, the first outlet conduit 3d and the second outlet conduit 3e are flexible conduits.

[0098] The washing machine 1 may further comprises a vent hose that is configured to allow air to enter or exit from the tub 2. The purpose of the vent hose is to avoid pressurization into the tub 2 when at least one between the first electrically actuated valve 3a or the second electrically actuated valve 3b are in an open configuration while the pump 5 is deactivated and to avoid formation of vacuum into the tub when the pump 5 is active and the first electrically actuated valve 3a and the second electrically actuated valve 3b are in the closed configuration.

[0099] For this purpose, the vent hose comprises a first ending portion 6b in communication with the tub 2 and at least one inlet opening 6a configured to allow the introduction or extraction of air respectively into or from the tub 2. The vent hose further comprise a first ending section opening substantially outwardly the washing machine 1.

[0100] As shown in figures 2-5, the water draining device 10 comprises at least an auxiliary conduit 11 configured to drain and feed residual water to a collection vessel or hose 6 operatively connected to the exterior of the washing machine 1, in particular to the drainage system 20. In detail, the collection vessel or hose 6 is operatively connected to the drainage system 20 by means of the pump 5. The auxiliary conduit 11 comprises an outlet section 11e feeding the residual water to the collection vessel or hose 6.

[0101] The auxiliary conduit 11 and the collection vessel or hose 6 are arranged in a predetermined spatial configuration such that a back-siphonage mitigation air break S is present between the inlet opening 6a of the collection vessel or hose 6 and the outlet section 11e of the auxiliary conduit 11.

[0102] In a preferred and non-limiting embodiment, the inlet opening 6a comprises a funnel-shaped ending portion 6f which is configured to collect water that sprinkles from the outlet section 11e of the auxiliary conduit 11.

[0103] The back-siphonage mitigation air break S is configured to mitigate back-siphonage from the drainage system 20 by causing water that may flow back from the drainage system 20 to the collection vessel or hose 6, and/or that may reach an overflow level within said tub

2, to come out at the back-siphonage mitigation air break S without climbing back to the auxiliary conduit 11 and then contaminate the water supply unit 3. The Applicant notices that the pump 5 is not of an occlusive type, and therefore in some cases, also with the pump 5 stopped, water from the drainage system may climb back up to the tub 2 or even above. In addition, in case of a overfilling of the tub 2 that may e.g. take place when at least one of the electrically actuated valves is broken or when the pump 5 is not operative, without such back-siphonage mitigation air break S, the water level could reach the water supply unit 3 that in this latter case should be considered contaminated.

[0104] In particular, in case of a simultaneous malfunction of at least one and preferably both the first electrically actuated valve 3a and the second electrically actuated valve 3b, the pressure switch and the pump 5, water level in the tub 2 may reach a top filling height identified by reference number 30 which for the purpose of the present disclosure will constitute a predetermined collection height 30. Should the air break S not be present, the water could climb back above the predetermined collection height 30 and reach the water feeding unit 3 and/or the washing agents dispenser 4; in such a case, there would be a contamination of the water feeding unit 3 and, thus of the fresh water source F with water of the drainage system 20, that (as already described in the background section) is considered a type 5 fluid.

[0105] The above-referred spatial configuration may be such that the outlet section 11e of the auxiliary conduit 11 is arranged at a height higher than the height at which the opening of the collection vessel or hose 6 lies. It is noted that in a preferred embodiment, the heights herein disclosed may be referred to the bottom of the tub. In particular, the first ending section of the vent hose is arranged at a height higher that the second ending section 6b, and the inlet opening 6a is arranged at a height lower than the first ending section and higher that the second ending section 6b, in order to allow the water coming out of the auxiliary conduit 11 to be properly drained into the tub 2. The second ending section 6b in particular is arranged at a predetermined height 30 in the upper portion of the tub 2.

[0106] As it is apparent from the annexed figures, the back-siphonage mitigation air break S is arranged at a back siphonage prevention height 31 from a bottom of the tub 2 and the back-siphonage prevention height 31 is substantially equal or above a top height of the tub 2. It thus results that the predetermined collection height 30 is lower than, or equal to, the back-siphonage prevention height 31.

[0107] The auxiliary conduit 11 and the collection vessel or hose 6 are installed in a particular configuration that is described hereinafter. In detail, the body of the washing machine 1 comprises at least one supporting wall 1s, which is arranged inside the outer perimetral wall 1w of the body and which is configured at least to provide a proper support for the collection vessel or hose 6. In an embodiment, as clearly visible e.g. from figure 6, the collection vessel or hose 6 extends below said supporting wall 1s.

[0108] As schematically shown in figure 3, the water supply unit 3 comprises at least one water inlet nozzle 11a, 11b and at least one water receiving port 12a, 12b, 12c configured to be fed, in use, by the spray or water flow coming from at least one water inlet nozzle 11a, 11b. The purpose of the at least one water receiving port 12a, 12b, 12c is to allow the water fed by the at least one water inlet nozzle 11a, 11b to be fed to the washing agents dispenser 4 in an intended way to allow a subsequent distribution of the washing agent contained in the at least one compartment of the dispenser into the tub 2.

[0109] The water draining device 10 comprises a water collection recess 13 arranged between the at least one water inlet nozzle 11a, 11b and the at least one water receiving port 12a, 12b, 12c..

[0110] The water collection recess 13 defines an air gap A between the at least one water inlet nozzle 11a, 11b and the at least one water receiving port 12a, 12b, 12c and is in fluid communication with, or connected to, optionally in direct fluid communication with, or directly connected to, the auxiliary conduit 11. It is noted that the above-referred residual water is the water that incidentally leaks in the process of feeding the at least one water receiving port 12a, 12b, 12c with the at least one water inlet nozzle 11a, 11b. In fact, in theory all the water that is fed by the at least one inlet nozzle 11a, 11b should enter in the water receiving port 12a, 12b, 13c after having passed the water collection recess 13. In practice, since the water inlet nozzle 11a, 11b and the at least one water receiving port 12a, 12b, 12c are separated by the water collection recess 13, it may be the case that some water drops leak from the water inlet nozzle and/or strike against the wall close to the water receiving port 12a, 12b, 12c. As it will be clear by further reading the present description, this residual water is not wasted but is still advantageously collected to the tub 2.

[0111] In the embodiment shown in the annexed figures, the water collection recess 13 and the auxiliary conduit 11 are clearly two different elements, and the auxiliary conduit 11 extends substantially outside a body portion of the water supply unit 3 that contains the at least one water inlet nozzle 11a, 11b, and the at least one water receiving port 12a, 12b, 12c.

[0112] Preferably, the auxiliary conduit 11 is substantially inclined towards its outlet section 11e. This feature reduces the risk of water stagnation and helps to contribute to reduce the risk of proliferation of bacteria or other organisms into the washing machine 1.

[0113] In another embodiment, not shown in the annexed figures, the auxiliary conduit 11, and thus at least part of the water draining device 10, may be substantially integrated in the body portion of the water supply unit 3 that contains the at least one water inlet nozzle 11a, 11b and the at least one water receiving port 12a, 12b, 12c. In this latter case, the auxiliary conduit 11 is substantially

at least partially axially aligned with the water collection recess 13 and/or is substantially realized within the body of the water supply unit 3 and is substantially integral with the collection recess 13. In this latter case, the water collection recess 13 may extend substantially along a direction relevantly inclined with respect to a direction of alignment between the at least one water inlet nozzle 11a, 11b and the at least one water receiving port 12a, 12b, 12c; such direction in particular may be substantially orthogonal to the direction of alignment. In particular, the direction along which the water collection recess 13 may extend is in use substantially vertical.

[0114] In a preferred but non-limiting embodiment, the portion of the body of the water supply unit 3 that contains the at least one water inlet nozzle 11a, 11b and the at least one water receiving port 12a, 12b, 12c, and that thus houses the water collection recess 13 may be realized in plastics, preferably by means of a moulding process. The process of manufacturing of the water supply unit 3 is not herewith described in detail, as it is a common process of the background art. It may be noted that, where possible, the water supply unit 3 is provided with a lightened structure and may include reinforcing ribs.

[0115] As visible from figure 4, preferably, at least one ending portion of said water inlet nozzles 11a, 11b is tapered, and presents a cross-section being smaller than the cross section of a central or back portion of the water inlet nozzles 11a, 11b. This helps increasing the water speed for water sprayed by the nozzle. Of course this particular technical feature shall not be considered limiting, as in other embodiments the ending portion of the water inlet nozzle 11a, 11b may be straight and without any tapering.

[0116] In the specific embodiment of the annexed figures, in particular shown in figure 4, the water draining device 10 comprises: a first water inlet nozzle 11a, a second water inlet nozzle 11b and a first water receiving port 12a, a second water receiving port 12b, a third water receiving port 12c. Each of the first, second and third water receiving ports 12a, 12b, 12c is configured to be fed, in use, by a spray or water flow coming from at least one of the first water inlet nozzle 11a and/or the second water inlet nozzle 11b.

[0117] The water collection recess 13 is arranged between the first and second water inlet nozzles 11a, 11b and the first, second and third water receiving ports 12a, 12b, 12c, in particular being arranged at a substantially central portion between all of them. It may be noted that in the embodiment shown in figure 4, the first water inlet nozzle 11a and the second water inlet nozzle 11b are arranged substantially at a first side with respect to the water collection recess 13 and the first water receiving port 12a, whilst the second water receiving port 12b and the third water receiving port 12c are substantially arranged at a second side with respect to the water collection recess 13, the first side being substantially opposite to the second side. In this case, the collection recess 13 defines an air gap A arranged at a portion of the water draining device 10 between the first side and the second side.

[0118] In the embodiment shown in the annexed figures, the first water inlet nozzle 11a is axially aligned with the third water receiving port 12c and the second water inlet nozzle 11b is axially aligned with the first water receiving port 12a. The second water receiving port 12b is arranged at an intermediate position between the first water receiving port 12a and the third water receiving port 12c. The first, the second and the third water receiving ports 12a, 12b, 12c are arranged substantially at a same plane. The axial alignment of the water nozzles with the water receiving port allows to minimize the leakage of fluid that enters in the water collection recess 13 in use when water is fed to said ports. In any case, due to the configuration of the second water receiving port 12b, the simultaneous feeding of water to the first water inlet nozzle 11a and to the second water inlet nozzle 11b may cause a leakage of water greater than that which is produced by feeding only one between the first water inlet nozzle 11a or the second water inlet nozzle 11b. In fact, when the simultaneous feeding of water to the first water inlet nozzle 11a and to the second water inlet nozzle 11b occurs, crossed water flows are present at a portion substantially corresponding to the water collection recess 13. Albeit this shall not be considered limiting, both the first water inlet nozzle 11a and the second water inlet nozzle 11b comprise a ending portion which is tapered and configured to increase the speed of the water fed thereby.

[0119] It is further noted that in the embodiment of the annexed figures, the first and second water inlet nozzles 11a, 11b are substantially horizontally aligned with the at least one water receiving port 12a, 12b, 12c, along an alignment direction and the collection recess 13 extends substantially orthogonally with respect to the aforementioned alignment direction. This means that the collection recess 13 substantially extends vertically. This allows a proper water collection and feeding of water to the auxiliary conduit 11.

[0120] The washing agents dispenser 4 may in fact comprise a pre-wash compartment, a main-wash compartment and a softener compartment. Those compartments can have a different size and/or shapes. The pre-wash compartment is directly connected to the first water receiving port 12a, the main wash compartment is directly connected with the third water receiving port 12c and the softener compartment is directly connected with the second water receiving port 12b. When the second electrically actuated valve 3b is in an open configuration, fresh water is fed to the second water inlet nozzle 11b and then is fed to the first water receiving port 12a. When the first electrically actuated valve 3a is in an open configuration, fresh water is fed to the first water inlet nozzle 11b and then is fed to the third water receiving port 12c. When both the first electrically actuated valve 3a and the second electrically actuated valve 3b are in an open configuration, fresh water is fed to the first inlet nozzle 11a and to

the second inlet nozzle 11b. Then water is fed to the first, to the second and to the third water receiving ports 12a, 12b, 12c; in this way water is fed simultaneously to the pre-wash compartment, the main-wash compartment and to the softener compartment.

[0121] A mounting bracket 12 is connected, in particular removably connected, to the supporting wall 1s, and is provided with at least one strut 12s that is at least partially introduced in a slotted hole practiced on the supporting wall 1 s. Albeit in the present detailed description reference is made to a slotted hole, it is clear that the shape of the hole may be such that the hole results substantially circular instead of being slotted. As well, it is clear that the hole may have further alternative shapes.

[0122] In detail, in the embodiment shown in figure 6, the mounting bracket 12 is provided with a couple of struts 12s, parallel one another, each being partially introduced in a respective slotted hole practiced on the supporting wall 1s. In use, the struts 12s are arranged substantially vertically. The presence of two struts 12s allows for having better robustness and stability.

[0123] As it is clearly shown in figure 6, the struts 12s are axisymetrically arranged around the outlet section 11e of the auxiliary conduit 11 and are separated to each other by openings that allow the water to come out. The width of the openings is bigger than the width of the struts; the width of the opening is preferably at least five times bigger than the width of the struts; more preferably, the width of the openings is at least ten times bigger than the width of the struts. In such a way, the openings result to be wide enough to drain the water even at the maximum flow rate and to compensate any manufacturing dimensional tolerances,

[0124] In an embodiment, the mounting bracket 12 may be further configured to house fixing screws that pass through the supporting wall, in particular a single fixing screw or a couple of fixing screws. Preferably, the mounting bracket comprises one housing or a couple of housings respectively arranged close to a respective strut 12s, for said fixing screws. In an embodiment, which shall not be considered limiting, the housings for the screws are diametrically opposed and the screws are in use introduced therein along a substantially vertical direction and/or equivalently aligned with the direction of the collection recess 13. In order to allow the passage of the at least one fixing screw, at least one circular bore is obtained in the supporting wall 1s.

[0125] In the embodiment shown in figure 6, both the struts 12s comprise a snapping element, or elastic element, configured to provide a snap fitting into the slotted hole. The elastic element is configured to engage the supporting wall 1s in substantial correspondence of the slotted hole. In detail, such slotted hole is a through-hole. It thus results that the mounting bracket 12 is connected to the supporting wall 1s by means of a snap fitting-type connection.

[0126] The embodiment of the annexed figures in particular shows a specific configuration of the supporting bracket 12 wherein a first strut 12s and a second strut 12s are present.

[0127] Between the first strut 12s and the second strut 12s there is an intermediate space that is sufficient to house the inlet opening 6a of the collection vessel or hose 6. The mounting bracket 12 further comprises a sustaining portion that in the embodiment shown in figure 6 is actually a ring-shaped supporting portion. The ring-shaped supporting portion, connected to the end of the struts 12s, is configured to sustain the collection vessel or hose 6 in substantial correspondence of the inlet opening 6a. In particular, between the first strut 12s and the second strut 12s, such intermediate space is sufficient to house at least part of the funnel shaped ending portion 6f of the inlet opening 6a, which in use lies at a height at least equal to, or above the, height of the ring portion of the mounting bracket 12. In particular, in a specific and non-limiting embodiment, the funnel shaped ending portion 6f is assembled, in particular removably assembled, into the mounting bracket 12. The funnel shaped ending portion 6f is arranged in a supporting structure at least partially housed in, and/or sustained by, the mounting bracket 12. In a particular embodiment, the supporting structure for the funnel shaped ending portion 6f is removably connected to the mounting bracket 12 by a snap fitting. In a particular embodiment, the mounting bracket 12 and the funnel shaped ending portion 6f are separate pieces (which are preferably made of different plastic materials) constituting a sub-assembly which is secured to the collection vessel or hose 6, e.g. by means of a cable tie. In an alternative embodiment, the mounting bracket 12 and the funnel shaped ending portion 6f are made in a single piece, notably through a co-moulding operation.

[0128] Albeit several ways to manufacture the mounting bracket 12 may be realized, in a preferred and non-limiting embodiment, the mounting bracket 12 comprises a body realized in a single piece and comprises the supporting portion and the at least one strut 12. It may be further noted that the struts 12s may be two or more.

[0129] The purpose of the mounting bracket 12 is to substantially keep the inlet opening 6a of the collection vessel or hose 6 and the outlet section 11e of the auxiliary conduit 11 coaxial to each other and at a predetermined distance that corresponds to the back-siphonage mitigation air break S. In particular, the mounting bracket 12 is to substantially keep substantially constant the size of the air break S during any operating condition of the washing machine 1, in particular also in case of a motion or slight displacement of the tub 2 into the case of the washing machine 1 as a result of the load carried by the water therein fed and/or by the laundry or as a result of the forces acting on the tub 2 during the spinning.

[0130] In the embodiment shown in figure 6, the outlet section 11e of the auxiliary conduit 11 ends in substantial contact with the supporting wall 1s. For allowing the water be drained from the outlet section 11e of the auxiliary conduit 11 to the inlet opening 6a of the collection vessel or hose 6, the supporting wall 1s is provided with at least

one opening 13c which is configured to allow the above-referenced water draining.

[0131] Figure 7 shows a particular portion 13 of the supporting wall 1s which is provided with a particular type of opening 13c forming a composite opening for the flow exiting from the auxiliary conduit 11. Such portion 13 may be integral to a top frame of the washing machine 1. In an embodiment, such a top frame is a supporting piece (advantageously a plastic moulded piece) which is fixed to the cabinet of the washing machine 1. The opening 13c comprises a central hole surrounded by a ring dividing portion. Outside the ring dividing portion, there is an outer hole. A plurality of spokes 13f radially extends from the ring dividing portion. In figure the number of spokes is four, but this number shall not be considered limiting. The radially outer portion of the spokes is connected to a perimetral wall of the opening 13c. The plurality of spokes is configured to divide the outer hole in a plurality of sectors (in figure 7, four sectors). The purpose of such design is to allow the stabilization of the water flow, especially in case a relevant water flow passes through the auxiliary conduit 11 and to provide an overall increased stability for the assembly formed by the portion 13 of the supporting wall 1s and the outlet section 11e of the auxiliary conduit 11. It may be noted that the auxiliary conduit 11 may be a rigid tube and which the outlet section 11e of the auxiliary conduit 11 may be connected to the portion of the supporting wall 1s by means of a clamp, in particular a metal clamp. The clamp ensures required robustness to the fixation of the auxiliary conduit 11 to the top frame.

[0132] The Applicant points out that a composite opening configuration for the flow exiting from the auxiliary conduit 11 (in particular the composite opening configuration shown in Figure 7) is functional to get a stabilization of the water jet, by avoiding water jet turbulence or some water jet rotation. In an embodiment, the downstream end of the auxiliary conduit 11 is simply contacting the supporting wall 1s at the composite openings. In an alternative embodiment, there is a constraint operative between the downstream end of the auxiliary conduit 11 and the supporting wall 1s adjacently to the composite openings (e.g. a flange may protrude around the composite openings surrounding the downstream portion of the auxiliary conduit 11).

[0133] Albeit in a non-limiting extent, the mounting bracket 12 may be realized in plastics, e.g. by means of a moulding process. As well, at least the funnel shaped ending portion 6f of the inlet opening 6a may be realized in plastics. Albeit this shall not be considered limiting, the collection vessel or hose 6 may be realized in plastics or in rubber. In an embodiment, at least a section of the collection vessel or hose 6, arranged between the inlet opening 6a and the first ending portion 6b, may be corrugated. This technical feature allows to ease the adaptation of the collection vessel or hose 6 to several models of washing machines, thus reducing the scale costs. In particular, the corrugated portion may allow to adapt the inclination and/or the extension of the collection vessel or hose 6 at least between the inlet opening 6a and the first ending portion 6b in accordance to the specific washing machine model and to compensate at least partially the motion of the tub 2 that may be present due to the load caused by the laundry and/or the water fed therein or during any spinning operations.

[0134] It is further noted that in order to meet the requirements of the EN61770:2009/A11:18 regulation, the air gap A is at least equal to the double of a size of the cross section of the at least one water inlet nozzle 11a, 11b. Preferably, albeit in a non-limiting extent, the first water inlet nozzle 11a and the second water inlet nozzle 11b have substantially the same cross-section. In the embodiment shown in the annexed figures, the first water inlet nozzle 11a and the second water inlet nozzle 11b have a substantially circular cross section; this implies that the air gap A is at least equal to the double of the diameter of the at least one water inlet nozzle 11a, 11b. Moreover, said air gap A is in particular at least 20 mm long. It may be noted that the direction along which the air gap A size is measured is substantially orthogonal to that of the cross section.

[0135] Given a predetermined maximum flow rate for the collection vessel or hose 6, the back-siphonage mitigation air break S allows draining off the maximum flow rate of the collection vessel or hose 6. Preferably, the size of the back-siphonage mitigation air break S is larger than a size of the cross section of the inlet opening 6a of the collection vessel or hose 6. In the embodiment shown in the annexed figures, the collection vessel or hose 6 has a circular cross section, and the diameter of the inlet opening is defined by the reference d1; in such a case, the back-siphonage mitigation air break S is greater than the diameter of the inlet opening 6a. More preferably, the size of the back-siphonage mitigation air break S is at least equal to 20 mm. Alternatively, or in combination with the features here described, the size of the cross section of the inlet opening 6a is larger than the size of the cross section of the outlet section 11e of the auxiliary conduit 11. It is noted that the auxiliary conduit 11 has a circular cross section; this means that the diameter d1 of the opening 6a is larger than the diameter d2 of the outlet section 11e of the auxiliary conduit 11.

[0136] It is finally noted that the washing machine 1 of the present disclosure may be provided with a data processing unit operatively connected to the user interface, to the pump 5 and to the first and second valves 3a, 3b. The data processing unit is configured to control at least one washing cycle that may be selected by the user through the user interface. The data processing unit may be provided with a general purpose processor, an application-specific processor that may be suitable to run a software program that is configured to manage or supervise the washing cycle. Electronic data needed for performing the washing cycle is stored in a memory which is operatively accessed by the data processing unit or which is embedded in the data processing unit.

[0137] In use a method of actuating a washing machine comprises feeding fresh water to the tub 2 of the washing machine 1 through a water supply unit 3 for fresh water and further comprises supplying washing agent, in particular a detergent, to the tub 2 through a washing agent dispenser 4 connected downstream the water supply unit 3. The method further comprises actuating the pump 5 for pumping water out of the tub 2 to a drainage system 20 outside the washing machine 1.

[0138] The method further comprises providing a water draining device 10 at the water supply unit 3 and draining a residual water to the collection vessel or hose 6, which is operatively connected to the tub 2 and to the exterior of the washing machine 1. In particular, draining the residual water comprises feeding the residual water from outlet section 11e of the auxiliary conduit 11 of the water draining device 10 to the collection vessel or hose 6.

[0139] The method further comprises arranging the auxiliary conduit 11 and the collection vessel or hose 6 in a predetermined spatial configuration such that the back-siphonage mitigation air break S is present between the inlet opening 6a of the collection vessel or hose 6 and the outlet section 11e of the auxiliary conduit 11. This allows for a mitigation of a back-siphonage from the tub 2 by causing waste water that may flow back from the drainage system 20 to the collection vessel or hose 6 through the tub 2 and/or that may reach an overflow level within the tub 2 to come out at the back-siphonage mitigation air break S without climbing back to the auxiliary conduit 11.

[0140] The method herein disclosed further comprises feeding at least one water receiving port of the water draining device 10 by means of at least one water inlet nozzle 11a, 11b. This allows distributing the clean water in the proper compartment of the dispenser. In particular, the method comprises spraying water, or making water flow, from at least one water inlet nozzle 11a, 11b of the water draining device 10 to the at least one water receiving port 12a, 12b, 12c of the water draining device 10. The method thus comprises withdrawing agents loaded in a respective compartment of the washing agents dispenser 4 by means of the at least one water receiving port 12a, 12b, 12c, operatively connected to said respective compartment. The Applicant notices that the spraying of water is particularly effective in providing a proper distribution or dissolution of the washing agents contained in the dispenser, and optimizes the washing efficacy. Of course, before the withdrawing of the agents from the washing agents dispenser 4, at least one compartment of the washing agents dispenser 4 is at least partially filled with one between a pre-washing agent, a washing agent or a softener.

[0141] The method comprises feeding water from the supply mains F to the at least one valve 3a, 3b by means of an operative connection of the water inlet nozzle 11a, 11b with at least one valve 3a, 3b of the water supply unit 3.

[0142] A further step of the method herein disclosed comprises collecting a residual water that leaks from the at least one water inlet nozzle 11a, 11b and/or from the at least one water receiving port 12a, 12b, 12c in the water collection recess 13 which is connected to the auxiliary conduit 11. It is reminded that the water collection recess 13 defines an air gap A between the at least one water inlet nozzle 11a, 11b and the at least one receiving port 12a, 12b, 12c. This allows for directing such residual water still into the tub 2, by means of the collection vessel or hose 6.

[0143] The collection vessel or hose 6 is operatively connected to the drainage system 20 through the tub 2 and/or the pump 5 for allowing properly discharge surplus water and the water used for washing the laundry to the sewage system. Furthermore, the method comprises aerating the tub 2 by making a first ending section of the collection vessel or hose 6 open substantially outwardly the washing machine 1 and by arranging the second ending section 6b of the collection vessel or hose 6 in such a way it substantially exposes on, and/or is directly connected to, the tub 2.

[0144] The method herein disclosed comprises arranging the first ending section at a height higher than the second ending section 6b. This allows proper aeration of the tub 2 without risking unwanted leakages of water outside the washing machine 1. In particular, the method comprises preferably arranging the inlet opening 6a at a height lower than the first ending section and higher than the second ending section 6b, in order to allow water coming out of the collection conduit 11 to be drained out of the tub 2, reducing the risk of unwanted leakages from the tub 2.

[0145] It is in particular noted that since the collection vessel or hose 6 may be used for aerating the tub 2, such collection vessel or hose 6 may be defined a vent hose and the method comprises arranging the second ending section 6b of the collection vessel or hose 5 at a predetermined height 30 in an upper portion of the tub 2, the method allowing the water contained in the tub 2 to overflow by means of the vent hose, in particular should the tub 2 be continuously filled with water without possibility of discharge through the pump 5.

[0146] In a preferred and non-limiting embodiment, the method herein disclosed comprises providing the back-siphonage mitigation air break S at a back-siphonage prevention height 31 from a bottom of the tub 2, the back-siphonage prevention height 31 being in particular substantially equal or above a top height of the tub 2 and the predetermined collection height 30 being below or equal to the back-siphonage prevention height 31. In other words, the outflow of water from the back-siphonage mitigation air break S represents a real last chance solution for preventing fresh water contamination, in particular as intended by the present regulations.

[0147] For safety reasons, and specifically for allowing a proper water drainage, the method here disclosed the mitigation of the back-siphonage is provided by arranging the auxiliary conduit 11 and the collection vessel or hose

6 in a predetermined spatial configuration such that the back-siphonage mitigation air break S allows the drain-off of a maximum flow rate of the collection vessel or hose 6 and/or such that the back-siphonage mitigation air break S is larger than the size of the cross section of the inlet opening 6a, in particular being larger than the diameter d1 of the inlet opening 6a of the collection vessel or hose 6, and/or such that the back siphonage mitigation air break S has a size of the cross-section, optionally the diameter, at least equal to 20 mm.

[0148] For the same reasons, the inlet opening 6a is designed in such a way that a size of the cross-section of the inlet opening 6a of the collection vessel or hose 6, optionally the diameter of the inlet opening 6a of the collection vessel or hose 6, is larger than the size of the cross-section, optionally larger that the diameter d2, of the outlet section 11e of the auxiliary conduit 11. This ensures that through the inlet opening all the water that may be fed by the outlet section 11e of the auxiliary conduit 11 can be properly collected by the collection vessel or hose 6, and reduces the risk of a water overflow at the back-siphonage air break S in absence of backflow, e.g. in case of a simple - albeit significant - flow of residual water from the auxiliary conduit 11.

[0149] For the purpose of allowing a proper collection of water in the collection vessel or hose 6, the method comprises collecting water by a funnel shaped portion 6f configured to collect water sprinkling from said outlet section 11e to the inlet opening 6a. Such funnel shaped portion may be particularly useful in case the auxiliary conduit 11 has a curved shape like in the annexed figures, since the water flow exiting at the outlet section 11e is not completely laminar and may thus sprinkle. In particular, the method comprises collecting such water by means of a funnel shaped portion 6f arranged at the top portion of the inlet opening 6a.

[0150] It may be noted that the method of actuation here disclosed may be a method of actuation of a top-loading washing machine, configured to allow the loading of the laundry into the washing machine along a substantially vertical direction and/or from a top portion thereof. Alternatively, such method is a method of actuating a front-loading washing machine, configured to allow the loading of the laundry into the washing machine and/or the tub in a substantially horizontal direction and/or from a front portion thereof. Thus the method may comprise feeding the laundry into the drum by means of introducing the laundry along a substantially vertical direction or, alternatively, along a substantially horizontal direction.

[0151] The method of actuation here disclosed comprises making the drum 2t rotate into the tub 2; such rotation is performed by actuating an electric motor according to a predetermined rotation cycle that is superimposed by the data processing unit of the washing machine 1.

[0152] For the purpose of allowing the washing of the laundry, the method comprises loading laundry into a loading mouth arranged at an upper portion of the tub 2, the loading mouth being accessible through a loading door. Alternatively, the method may comprises loading laundry into a loading mouth arranged at front portion of the tub 2.

[0153] In particular at least in a condition wherein the laundry is arranged in the drum, the method comprises switching between an open configuration of the washing machine 1 wherein the loading door is open and allows an access to said loading mouth and a closed configuration of the washing machine 1 wherein the loading door is closed and seals the loading mouth and the tub 2 from an outer environment. The feeding of water to the tub 2 takes place only when the washing machine 1 is in such closed configuration. This avoids the risk of causing the water fed in the tub 2 to exit at the loading door due to a poor design of the control subsystem for the washing machine. Such control is particularly useful in case the washing machine is of a front-loading type.

[0154] In the particular embodiment wherein the water supply unit 3 comprises a first water inlet nozzle 11a and a second water inlet nozzle 11b, and comprises a first water receiving port 12a a second water receiving port 12b and a third water receiving port 12c, the method comprises feeding the first water receiving port 12a, second water receiving port 12b and third water receiving port 12c with a spray or water flow coming from at least one nozzle between the first water inlet nozzle 11a and the second water inlet nozzle 11b.

[0155] In particular, the method herein disclosed comprises arranging the first water inlet nozzle 11a and the second water inlet nozzle 11b on a first side of the water draining device 10 and comprises arranging the first water receiving port 12a, the second water receiving port 12b and third water receiving port 12c on a second side of the water draining device 10, the first side being substantially opposite to the second side.

[0156] In an embodiment, the provision of water to the washing machine 1 through the water supply unit 3 takes place by means of a water supply unit 3 provided with a first valve 3a and a second valve 3b, in particular a first electrically actuated valve 3a and a second electrically actuated valve 3b, and comprises supplying water to the first valve 3a and to the second valve 3b from a supply mains F. Thus in an embodiment the method comprises feeding water simultaneously to the first valve 3a and to the second valve 3b, in such a way that a proper control thereof performed by the data processing unit allows to select (specifically electronically select) which, between the first inlet nozzle 11a and the second inlet nozzle 11b, is/are the nozzle(s) with which the at least one compartment of the washing agents dispenser 4 is fed. In particular, since the first valve 3a and the second valve 3b may be actuated together or alternatively, in an embodiment the method comprises actuating independently the first valve 3a from said second valve 3b, and comprises feeding the first water inlet nozzle 11a by means of the first valve 3a and feeding the second water inlet nozzle 11b by means of the second valve 3b. In detail the method

comprises making water fed by the first valve 3a to the first water inlet nozzle 11a flow in a conduit arranged between, and directly connecting, the outlet of the first valve 3a to the first water inlet nozzle 11a, and further comprises making water fed by the second valve 3b to the second water inlet nozzle 11b flow in a conduit arranged between, and directly connecting, the outlet of the second valve 3b to the second water inlet nozzle 11b.

[0157] For the purpose of allowing the selection of at least one between three compartments of the washing agents dispenser 4, the method comprises arranging the first and the second inlet nozzle 11a, 11b and the first, second and third water receiving port 12a, 12b, 12c in such a way that the first water inlet nozzle 11a is axially aligned with the third water receiving port 12c and in such a way that the second water inlet nozzle 11b is axially aligned with the first water receiving port 12a and in such a way that the second water receiving port 12b may be fed, in particular may be simultaneously fed, by said first water inlet nozzle 11a and by said second water inlet nozzle 11b.

[0158] In a specific embodiment, the method comprises making the residual water that leaks as a result of the feeding of the at least one water receiving port by the at least one water inlet nozzle flow in the water collection recess 13, at least partially axially aligned with the auxiliary conduit 11 and/or comprises realizing the water collection recess 13 within the body of said water supply unit 3 in such a way it is integral with the water collection recess 13. This leads to a very effective water collection, since the resulting structure overall formed by the water feeding unit 3 and the auxiliary conduit 11 is substantially the same, is very compact, and the auxiliary conduit 11 results as a part of the body of the water supply unit 3, extending substantially vertically and avoiding the stagnation of residual water.

[0159] As shown in the annexed figures, the method herein described comprises substantially horizontally aligning the at least one water inlet nozzle 11a, 11b with the at least one water receiving port 12a, 12b, 12c along a determined alignment direction, and making the water collection recess 13 extend substantially orthogonally with respect to alignment direction and/or with respect to the at least one water receiving port 12a, 12b, 12c, in such a way the collection of the residual water takes place at least partially along a vertical direction.

[0160] For the purpose of providing a robust structure for the washing machine 1, this latter comprises a body defining at least one supporting wall 1s, and the method comprises supporting at least the collection vessel or hose 6 and/or substantially keeping the inlet opening 6a of the collection vessel or hose 6 and the outlet section 11e of the auxiliary conduit 11 at a predetermined distance corresponding to the air break S by means of the mounting bracket 11, the mounting bracket 12 being connected, optionally removably connected, to the supporting wall 1s.

[0161] The method herein disclosed in addition comprises sustaining the collection vessel or hose 6 by means of a supporting portion of the mounting bracket 12, the supporting portion being optionally a ring-shaped supporting portion, the sustaining taking place in substantial correspondence of the inlet opening 6a.

[0162] In detail, the method comprises collecting water through a collection vessel or hose 6 suspended by means of a mounting bracket 12 comprising a plurality of struts extending substantially parallel to each other, and defining an intermediate space housing at least a part of the funnel shaped portion 6f.

[0163] In addition to the aforementioned features, the method herein described comprises arranging the struts in an axisymmetrical fashion around the outlet section 11e and comprises separating the struts by openings allowing the water to come out, in particular by allowing the water come out through openings whose width is bigger than the width of the struts, preferably at least two times bigger than the width of the struts, more preferably at least five times bigger than the width of the struts, preferably at least ten times bigger than the width of the struts.

[0164] Finally, the method according to the present disclosure comprises allowing a flow of water from the outlet section 11e to the inlet opening 6a through the air break S by means of a portion 13 of the supporting wall 1s at which the outlet section 11e of the auxiliary conduit 11 substantially ends, wherein the opening 13c comprises a central hole surrounded by a ring dividing portion and an outer hole arranged outside the ring dividing portion and wherein a plurality of spokes extend from the ring dividing portion and a perimetral wall of the opening 13c.

Disclosure's advantages

[0165] The advantages of the washing machine herein disclosed are clear in the light of the description: the washing machine and related actuation method advantageously safeguard the fresh water source (the supply mains for the washing machine) from any contamination with water that may be siphoned back from the draining system, by letting the water exit at a predetermined outlet before it reaches a direct contact with the fresh water source. This is provided by a simple adaptation of the washing machine, which can be advantageously implemented also to pre-existent washing machines or to even to washing machines that are still under manufacturing process. Thus, an enhancement of safety against any contamination with polluted or biologically contaminated water can be provided to washing machines and (indirectly) to the fresh water sources also in case of already produced and already installed washing machines. The object of the present disclosure can be advantageously applied to front-loading and to top-loading washing machines, substantially without any further adaptation.

[0166] The present disclosure achieves the technical effect of realising a laundry washing machine having an optimal capability of preventing the backflow of non-po-

table water into the water mains, in particular a laundry washing machine fully compliant with the severe requirements set forth in recent EN61770 standard. The present disclosure provides for a water draining system to mitigate back-siphonage in top loading washing machines including a water draining device forming a mixing chamber and air gap arranged between an upstream feed orifice and a downstream receiving orifice to discharge of any fluid to the drainage system. The present disclosure also provides for a water draining system defining an air break arranged between a drain to a ventilation hose to drain off a maximum flow rate without contacting an inlet device or injector. Further, the present disclosure provides for an air gap arranged between two orifices upstream of the air break.

[0167] However, the disclosure is not limited to the embodiments shown in the present application. It is thus considered that when reference numbers in the subsequent claims appear, those reference numbers are provided for the sole scope of enhancing the intelligibility of the claims, and for any reason shall be considered limiting.

[0168] It is finally clear that to the present disclosure several adaptations or additions, obvious for a person skilled in the art, may be carried out without for this departing from the scope of protection provided by annexed independent and dependent claims.

Claims

1. Washing machine (1), the washing machine (1) being especially configured for washing laundry, the washing machine (1) comprising:

- a tub (2) suitable for collecting water;
- a water supply unit (3) configured to feed fresh water from a water supply network to the tub (2),
- a washing agents dispenser (4) configured to feed at least one washing agent, in particular a detergent, to the tub (2), the washing agents dispenser (4) being connected downstream the water supply unit (3),
- at least one pump (5) configured to pump out the water from the tub (2) to a drainage system (20) outside the washing machine (1),

wherein the water supply unit (3) comprises a water draining device (10) configured to drain a residual water to a collection vessel or hose (6) operatively connected to the tub (2) and to the exterior of the washing machine (1),
wherein the water draining device (10) comprises at least an auxiliary conduit (11) comprising an outlet section (11e) feeding the residual water to the collection vessel or hose (6) and
wherein the auxiliary conduit (11) and the collection vessel or hose (6) are arranged in a predetermined spatial configuration such that a back-siphonage mitigation air break (S) is present between an inlet opening (6a) of the collection vessel or hose (6) and the outlet section (11e) of the auxiliary conduit (11), the back siphonage mitigation air break (S) being configured to mitigate back-siphonage from said drainage system (20) by causing water that may flow back from the drainage system (20) to the collection vessel or hose (6) and/or that may reach an overflow level within said tub (2) to come out at the back-siphonage mitigation air break (S) without climbing back to the auxiliary conduit (11).

2. Washing machine (1) according to claim 1, wherein the water supply unit (3) comprises at least one water inlet nozzle (11a, 11b) and at least one water receiving port (12a, 12b, 12c) configured to be fed, in use, by a water flow coming from said at least one water inlet nozzle (11a, 11b),
said at least one water inlet nozzle (11a, 11b) being operatively connected to at least one valve (3a, 3b), in particular to at least one electrically actuated valve (3a, 3b), of the water supply unit (3), said at least one valve (3a, 3b) being configured for receiving water from a supply mains (F) and said at least one water receiving port (12a, 12b, 12c) being operatively connected to a respective compartment of the washing agents dispenser (4) in order to withdraw the washing agents loaded in that compartment,
an air gap (A) being defined between the at least one water inlet nozzle (11a, 11b) and the at least one water receiving port (12a, 12b, 12c), the water draining device (10) further comprising a water collection recess (13) arranged between the at least one water inlet nozzle (11a, 11b) and the at least one water receiving port (12a, 12b, 12c),
the water collection recess (13) being in fluid communication with, or connected to, optionally in direct fluid communication with, or directly connected to, the auxiliary conduit (11) and being configured to collect the residual water that leaks from the at least one water inlet nozzle (11a, 11b) and/or from the at least one water receiving port (12a, 12b, 12c) and to drain said residual water to the auxiliary conduit (11).

3. Washing machine (1) according to claim 1 or claim 2, wherein the collection vessel or hose (6) is operatively connected to the drainage system (20) through the tub (2) and/or the pump (5), the collection vessel or hose (6) having a first ending section opening substantially outwardly the washing machine (1) and a second ending section (6b) substantially exposing and/or directly connected to the tub (2).

4. Washing machine (1) according to claim 3, wherein the first ending section has a height higher than the second ending section (6b) and wherein the inlet

opening (6a) has a height lower than the first ending section and higher than the second ending section (6b), in order to allow the water coming out of the collection conduit to be drained into the tub (2).

5. Washing machine (1) according to claim 3 or claim 4, wherein the collection vessel or hose (6) is a vent hose, wherein the second ending section (6b) substantially lays at a predetermined height (30) in an upper portion of the tub (2), wherein the vent hose is in particular configured to allow the water contained in the tub (2) to overflow outside the tub (2) and wherein the back-siphonage mitigation air break (S) is arranged at a back-siphonage prevention height (31) from a bottom of the tub (2), the back-siphonage prevention height (31) being in particular substantially equal or above a top height of the tub (2) and the predetermined collection height (30) being below or equal to the back-siphonage prevention height (31).

6. Washing machine (1) according to one or more of the preceding claims when depending on claim 2, wherein the air gap (A) is at least equal to the double of a size of a cross section of the at least one water inlet nozzle (11a, 11b), optionally being at least equal to the double of the diameter of the at least one water inlet nozzle (11a, 11b), and/or wherein the air gap (A) has a size of the cross-section, optionally the diameter, at least equal to 20 mm.

7. Washing machine (1) according to one or more of the preceding claims, wherein the back-siphonage mitigation air break (S) allows the drain-off of a maximum flow rate of the collection vessel or hose (6) and/or
wherein the back-siphonage mitigation air break (S) is larger than a size of the cross section of the inlet opening (6a) of the collection vessel or hose (6), in particular being larger than the diameter (d1) of the inlet opening (6a) of the collection vessel or hose (6), and/or wherein the back siphonage mitigation air break (S) has a size of the cross-section, optionally the diameter, at least equal to 20 mm and/or
wherein a size of the cross-section of the inlet opening (6a) of the collection vessel or hose (6), optionally the diameter of the inlet opening (6a) of the collection vessel or hose (6), is larger than a size of the cross-section, optionally larger that the diameter (d2), of the outlet section (11e) of the auxiliary conduit (11), and/or
wherein said inlet opening (6a) comprises a funnel shaped portion (6f) configured to collect water sprinkling from said outlet section (11 e).

8. Washing machine (1) according to one or more of the preceding claims, the washing machine being a top-loading washing machine configured to allow the loading of the laundry into the washing machine along a substantially vertical direction and/or from a top portion thereof, the washing machine having in particular a drum (2t) rotatably accommodated into said tub (2), the upper portion of the tub (2) defining a loading mouth, the loading mouth being accessible through a loading door, wherein the washing machine (1) comprises an open configuration wherein the loading door is open and allows an access to said loading mouth and a closed configuration wherein the loading door is closed and seals the loading mouth and the tub (2) from an outer environment and
wherein said washing agents dispenser (4) is associated to said drum (2t) or to said loading mouth or to said loading door.

9. Washing machine (1) according to one or more of the preceding claims when depending on claim 2, wherein the water supply unit (3) comprises a first water inlet nozzle (11a) and a second water inlet nozzle (11b), and comprises a first water receiving port (12a) a second water receiving port (12b) and a third water receiving port (12c), said first water receiving port (12a), second water receiving port (12b) and third water receiving port (12c) being each configured to be fed, in use, by said a spray or water flow coming from at least one nozzle between said first water inlet nozzle (11a) and said second water inlet nozzle (11b), and wherein first water inlet nozzle (11a) and the second water inlet nozzle (11b) are arranged on a first side of the water draining device (10) and wherein the first water receiving port (12a), the second water receiving port (12b) and third water receiving port (12c) are arranged on a second side of the water draining device (10), the first side being substantially opposite to the second side,
wherein the water supply unit (3) comprises a first valve (3a) and a second valve (3b), in particular a first electrically actuated valve (3a) and a second electrically actuated valve (3b), said first valve (3a) and said second valve (3b) being configured for receiving water from a supply mains (F), said first valve (3a) being configured to be actuated independently from said second valve (3b), said first valve (3a) being configured to feed the first water inlet nozzle (11a), said second valve (3b) being configured to feed the second water inlet nozzle (11b),
wherein the first water inlet nozzle (11a) is axially aligned with the third water receiving port (12c) and wherein the second water inlet nozzle (11b) is axially aligned with the first water receiving port (12a) and wherein the second water receiving port (12b) is configured to be fed, in particular is configured to be simultaneously fed, by said first water inlet nozzle (11a) and by said second water inlet nozzle (11b) and wherein the water collection recess (13) defines an air gap (A) arranged at a portion of the water draining

device (10) between said first side and said second side.

10. Washing machine (1) according to one or more of the preceding claims when depending on claim 2, wherein the auxiliary conduit (11) is at least partially axially aligned with the water collection recess (13) and/or is realized within the body of said water supply unit (3) and is integral with the water collection recess (13) and/or
wherein the at least one water inlet nozzle (11a, 11b) is substantially horizontally aligned with the at least one water receiving port (12a, 12b, 12c) along a determined alignment direction, and wherein the water collection recess (13) extends substantially orthogonally with respect to alignment direction and/or with respect to the at least one water receiving port (12a, 12b, 12c).

11. Washing machine (1) according to one or more of the preceding claims, comprising a body defining at least one supporting wall (1s),
the washing machine (1) further comprising a mounting bracket (12) configured to support at least the collection vessel or hose (6) and/or to substantially keep the inlet opening (6a) of the collection vessel or hose (6) and the outlet section (11 e) of the auxiliary conduit (11) at a predetermined distance corresponding to said air break (S), the mounting bracket (12) being connected, optionally removably connected, to said supporting wall (1s).

12. Washing machine (1) according to claim 11, wherein the mounting bracket (12) is configured to be connected to the supporting wall (1s) by means of a snap fitting and comprises at least one strut (12s) configured to be at least partially introduced in a hole of said supporting wall (1s), the strut (12s) comprising at least one snapping element configured to engage the supporting wall (1s) in substantial correspondence of the hole.

13. Washing machine (1) according to claim 11 or 12, wherein the mounting bracket (12) comprises a supporting portion, in particular a ring-shaped supporting portion, configured to sustain the collection vessel or hose (6) in substantial correspondence of said inlet opening (6a), said at least one strut (12s), in particular an end portion of said at least one strut (12s), being connected to said supporting portion,
optionally wherein the mounting bracket comprises a body made in a single piece and comprising said supporting portion and said at least one strut (12s).

14. Washing machine (1) according to one of claims 12 or 13, wherein the mounting bracket (12) comprises a plurality of struts extending substantially parallel to each other, said struts comprising at least a first strut (12s) and a second strut (12s), the first strut (12s) and the second strut (12s) being separated to each other and defining an intermediate space housing at least a part of said funnel shaped portion (6f) and
wherein said struts are axisymmetrically arranged around said outlet section (11 e) of the auxiliary conduit (11) and are separated to each other by openings allowing the water to come out, the width of the openings being bigger than the width of the struts, the width of the openings being preferably at least two times bigger than the width of the struts, the width of the openings being more preferably at least five times bigger than the width of the struts, the width of the openings being preferably at least ten times bigger than the width of the struts.

15. Washing machine (1) according to any of claims 11 to 14, wherein the supporting wall (1s) comprises a portion (13) at which said outlet section (11e) of the auxiliary conduit (11) substantially ends, said portion (13) comprising an opening (13c) configured to allow a passage of water from said outlet section (11 e) to said inlet opening (6a) through the air break (S), wherein the opening (13c) comprises a central hole surrounded by a ring dividing portion and an outer hole arranged outside said ring dividing portion and wherein a plurality of spokes extend from said ring dividing portion and a perimetral wall of the opening (13c), said spokes defining a plurality of sectors of said outer hole.

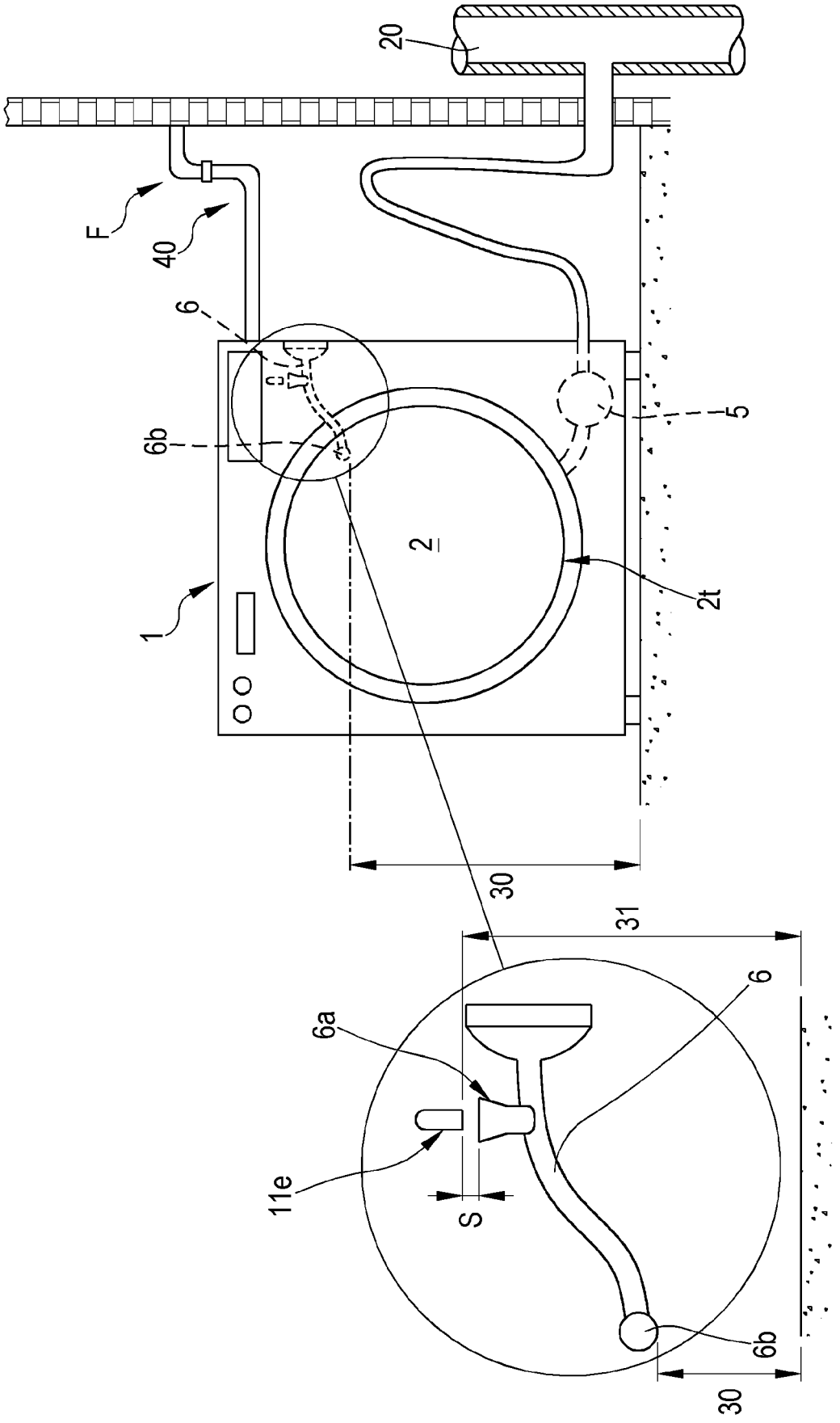

FIG.1

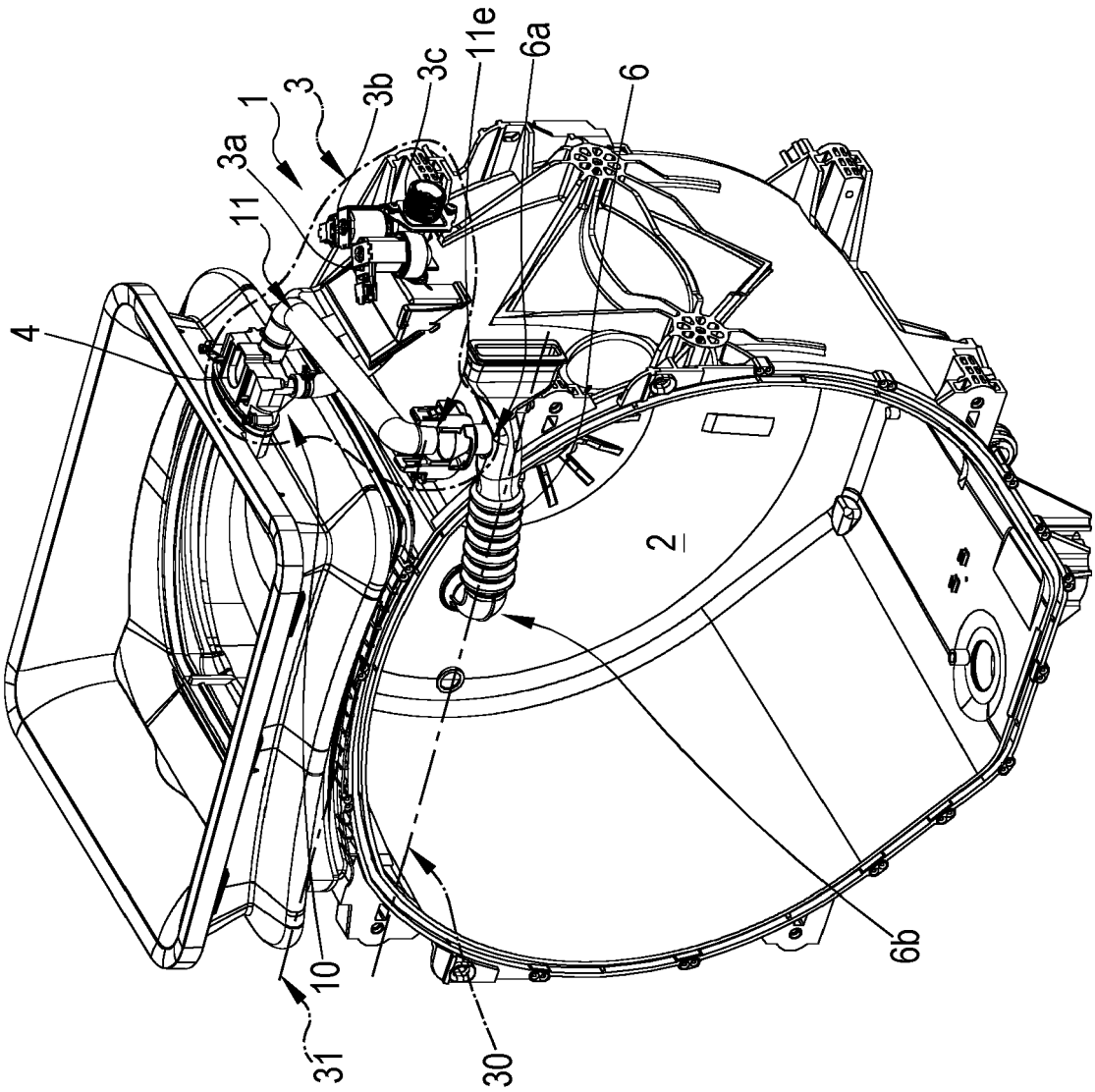

FIG.2

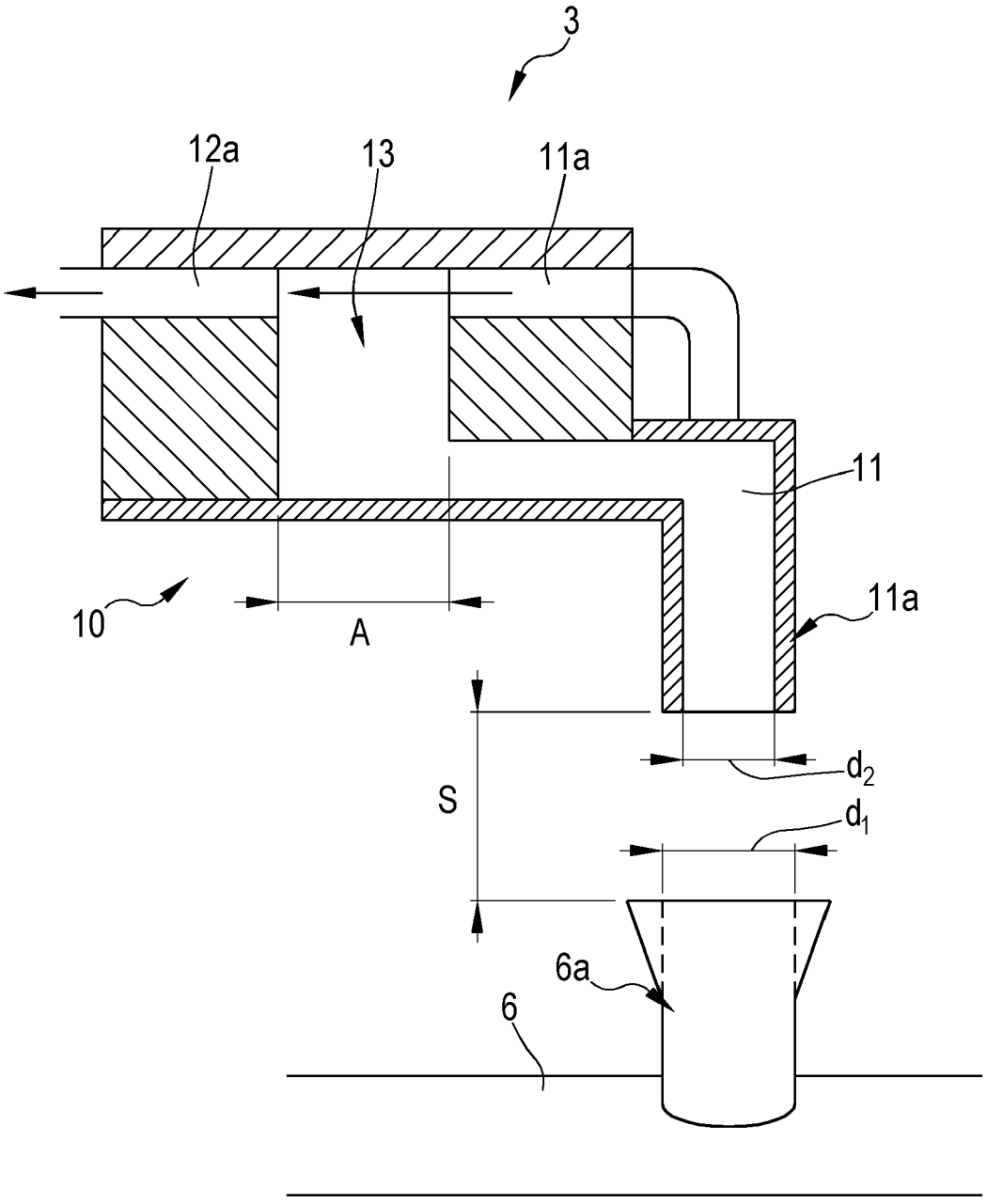

FIG.3

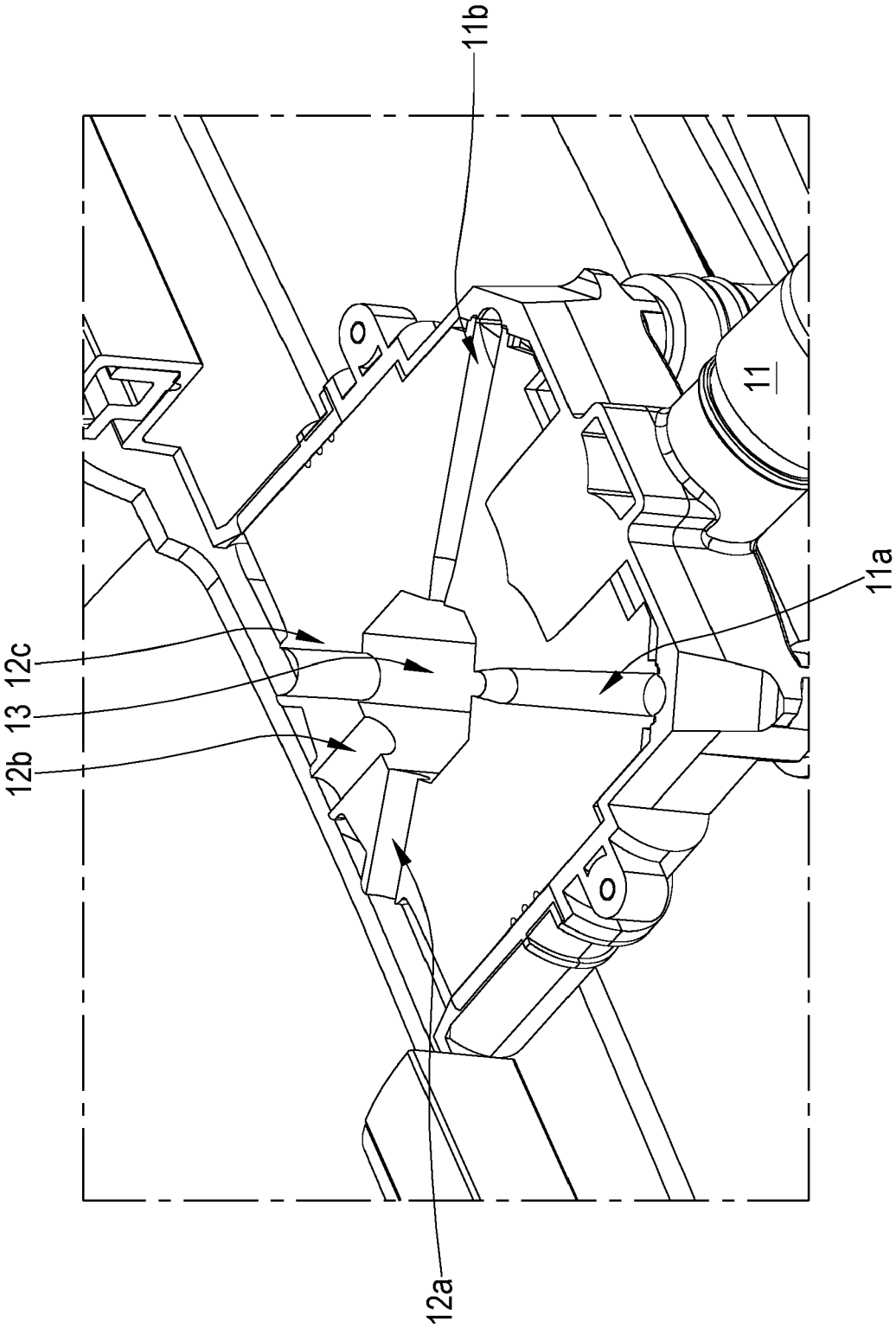

FIG.4

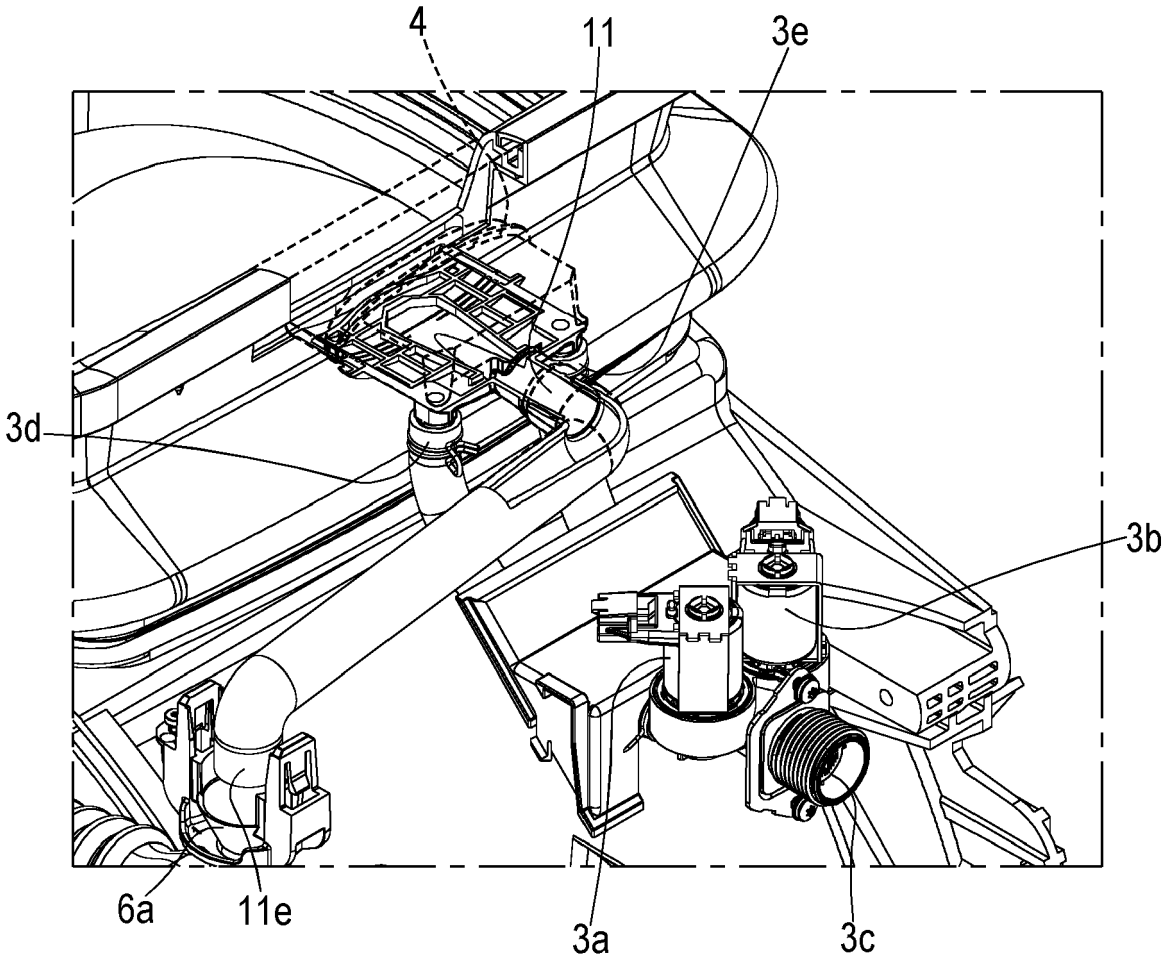

FIG.5

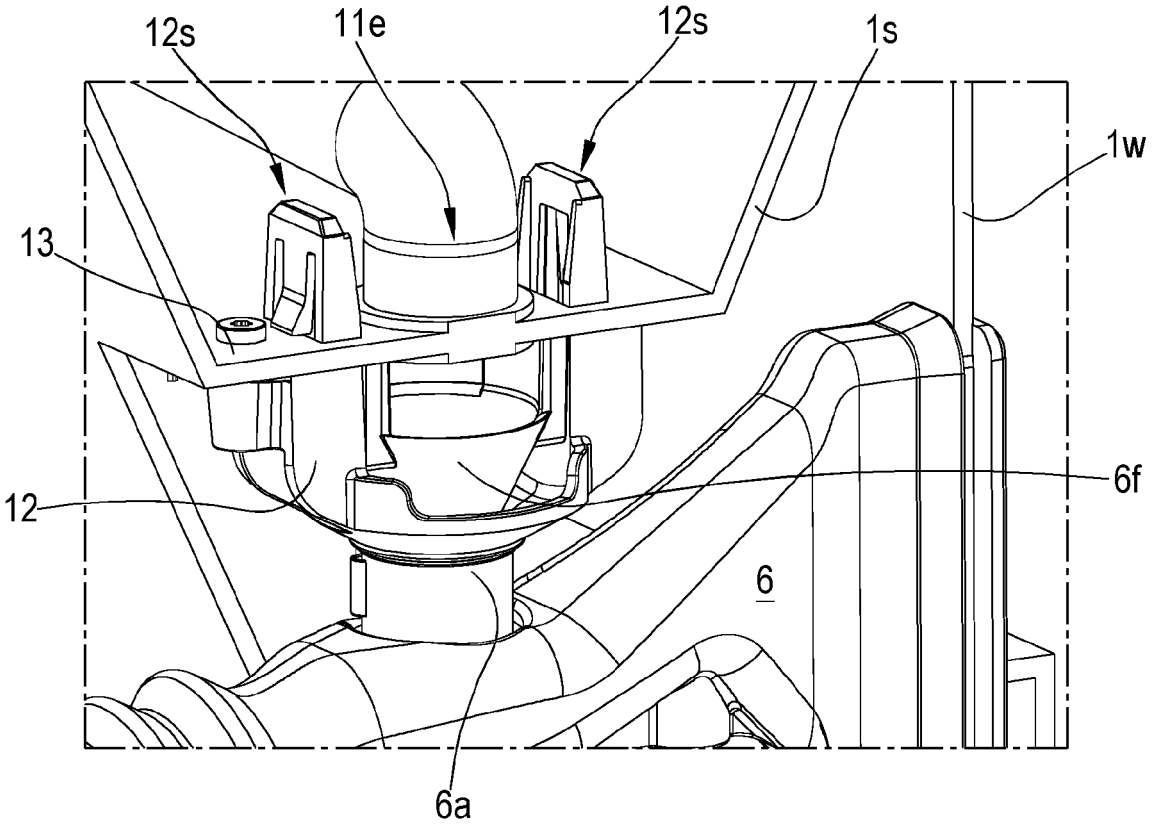

FIG.6

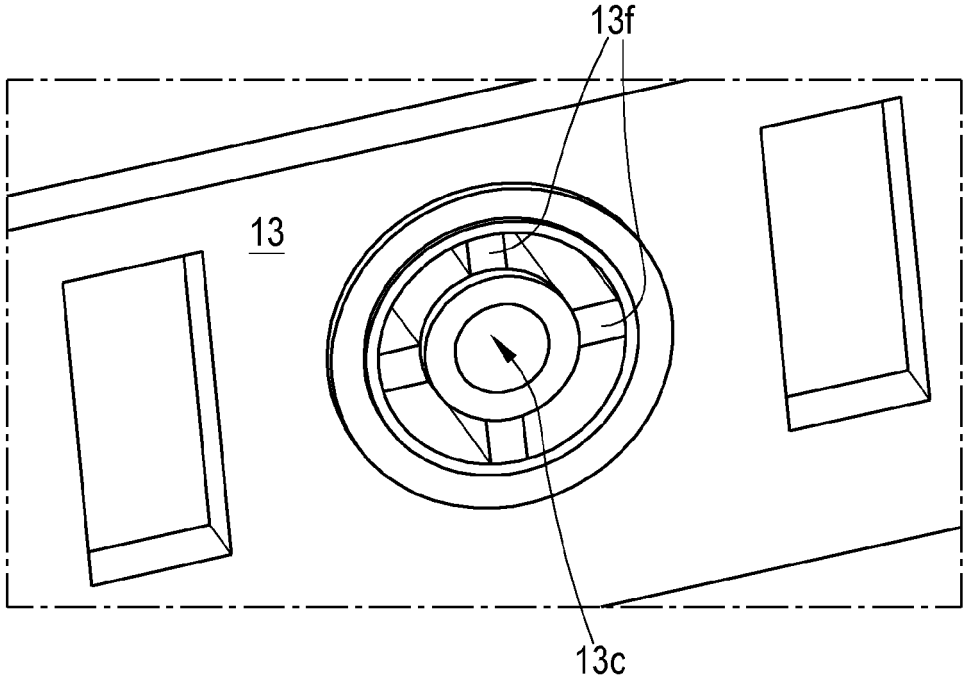

FIG.7

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EUROPEAN SEARCH REPORT

Application Number
EP 21 18 5451

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 2 554 737 A1 (ELECTROLUX HOME PROD CORP [BE]) 6 February 2013 (2013-02-06) * paragraph [0094] - paragraph [0151]; figures 13-14 *	1-15	INV. D06F39/08 ADD. A47L15/42
A	GB 2 111 537 A (ZANUSSI A SPA INDUSTRIE) 6 July 1983 (1983-07-06) * the whole document *	1-15	
A,D	DE 10 2018 106951 A1 (MIELE & CIE [DE]) 26 September 2019 (2019-09-26) * the whole document *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)
D06F
A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 December 2021	Diaz y Diaz-Caneja

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14-12-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2554737 A1	06-02-2013	AU 2012292217 A1	06-02-2014
		BR 112014002508 A2	14-03-2017
		CN 103717798 A	09-04-2014
		EP 2554737 A1	06-02-2013
		RU 2014107939 A	10-09-2015
		US 2014165665 A1	19-06-2014
		WO 2013017482 A2	07-02-2013
GB 2111537 A	06-07-1983	DE 8230454 U1	19-05-1983
		ES 267688 U	01-04-1983
		FR 2517951 A3	17-06-1983
		GB 2111537 A	06-07-1983
DE 102018106951 A1	26-09-2019	DE 102018106951 A1	26-09-2019
		EP 3543391 A1	25-09-2019

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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Patent documents cited in the description

- DE 102018106951 A1 **[0007] [0008]**
- EP 2058927 A2 **[0087]**
- GB 2353540 B **[0089]**
- EP 2344016 B1 **[0089]**