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(54) **A COOLING PROCESS FOR COOLING HOT WASHED CONTAINERS IN A WASHING MACHINE
AND WASHING MACHINE CARRYING OUT THE SAME PROCESS**

KÜHLVERFAHREN ZUR KÜHLUNG VON HEISSGEWASCHENEN BEHÄLTERN IN EINER
WASCHMASCHINE UND WASCHMASCHINE ZUR DURCHFÜHRUNG DES VERFAHRENS

PROCÉDÉ DE REFROIDISSEMENT DE RÉCIPIENTS LAVÉS À CHAUD DANS UNE MACHINE DE
LAVAGE ET MACHINE DE LAVAGE METTANT EN OEUVRE CE PROCÉDÉ

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(73) Proprietor: **Gebo Packaging Solutions Italy SRL
43126 Parma (IT)**

(72) Inventor: **BERZAGHI, Claudio
37139 Verona (IT)**

(74) Representative: **Sidel Group
c/o Gebo Packaging Solutions France
5-7 Rue du Commerce
ZI - CS 73445 Reichstett
67455 Mundolsheim Cedex (FR)**

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Description

[0001] The invention relates to a cooling process for cooling hot washed containers in a washing machine and to a washing machine that carries out the same process.

[0002] In general, washing machines are known with the purpose of cleaning the empty containers upstream of a filling and a labelling station, in which the containers are respectively filled with a pourable product and labelled with respective labels.

[0003] An example of washing machine is known, e.g. from EP2727660 in the name of the same Applicant.

[0004] Known washing machines essentially comprise:

- a feeding system;
- a washing tunnel;
- a looped chain conveyor advancing the containers along a closed washing path and extending inside the washing tunnel from an inlet station to an outlet station; and
- a plurality of sequential treatment zones arranged between the inlet station and the outlet station, and through which the chain conveyor advances the containers.

[0005] In detail, the chain conveyor comprises a plurality of bars, which are fed at the inlet station by the feeding system with respective rows of containers.

[0006] In particular, each bar comprises a plurality of aligned pockets, which receive, convey and outlet the respective washed containers.

[0007] According to the advancing direction of containers along the washing tunnel, the treatment zones comprise, in sequence, a prewash zone, a first cleaning zone, a second cleaning zone and a plurality of consecutive rinsing zones.

[0008] The prewash zone, the first cleaning zone, and the second cleaning zone comprise respective cleaning baths, which are filled with a washing chemical agent at high temperature and through which the containers are advanced.

[0009] Each rinsing zone comprises a corresponding rinsing bath filled with rinsing liquid and/or ejecting devices for directing sprinkles of rinsing liquid toward the containers.

[0010] The rinsing liquid delivered to the containers has both the function of removing therefrom any residuals of washing chemical agent and of cooling down the same containers after being conveyed out from the cooling baths.

[0011] As the containers are sequentially conveyed through the consecutive rinsing zones of the washing machine, the same containers are cooled more and more and the temperatures of the rinsing liquid in each of the rinsing zones reach respective values decreasing according to the advancing direction of the containers.

[0012] According to known processes for cooling con-

tainers, the overall quantity of rinsing liquid that needs to be used for bringing the containers at room temperature is generally significant.

[0013] Such remark introduces an issue regarding the energetic and environmental impact of the known cooling processes, and the costs related to an increased consumption of rinsing liquid.

[0014] In view of that, a need is felt within the sector for a cooling process using a reduced amount of rinsing liquid in respect to known solutions, without losing cooling performances.

[0015] Documents DE2454100 A1 and EP0637472 A1 disclose cooling processes with heat exchange in a bottle washing machine.

[0016] It is an object of the invention to provide a process for cooling hot washed containers in a washing machine, which allows meeting the abovementioned need in a simple and economic manner.

[0017] This object is achieved by the invention as it relates to a cooling process for cooling hot washed containers in a washing machine, as claimed in claim 1.

[0018] The invention further relates to a washing machine, as claimed in claim 7.

[0019] One preferred embodiment is hereinafter disclosed for a better understanding of the present invention, by way of non-limitative example and with reference to the accompanying drawings, in which:

- Figure 1 is a lateral view of a washing machine for washing empty containers and for carrying out a process for cooling hot washed containers, according to the invention; and
- Figure 2 is a lateral view in an enlarged scale of some components of the washing machine of Figure 1.

[0020] With reference to Figure 1, numeral 1 indicates a washing machine for washing containers 2, in particular empty bottles intended to be filled with a pourable product.

[0021] Each container 2 has an external surface 2a delimiting an inner volume 2b adapted to receive the pourable product and extends along an axis A (lying on a vertical plane, in the embodiment shown) from a base portion 2c to a neck portion 2d.

[0022] The neck portion 2d is provided with an inlet opening 2f about axis A, which allow the filling of the inner volume 2b of the corresponding container 2.

[0023] Washing machine 1 comprises:

- a washing tunnel 3, in which empty containers 2 are fed and accordingly washed; and
- a chain conveyor 4 for advancing containers 2 inside washing tunnel 3 along a closed loop path P, in particular lying on a vertical plane.

[0024] In detail, chain conveyor 4 comprises:

- a pair of chains 15 elongated parallel to path P and

parallel to one another; and

- a plurality of subsequent conveying beams 16, which extend between chains 15 in a transversal and, more in detail, orthogonal manner to chains 15 and path P.

[0025] Specifically, each beam 16 comprises a row of pockets 17 aligned orthogonally to path P and adapted to receive corresponding containers 2.

[0026] In such a manner, containers 2 carried by a corresponding beam 16 are aligned orthogonally to path P and housed inside the respective pockets 17.

[0027] Washing machine 1 comprises also a feeding system 8 for feeding a sequence of empty containers 2 along a direction F and at an inlet station I of washing tunnel 3. In particular, containers 2 fed along direction F are arranged in rows orthogonal to path P.

[0028] Feeding system 8 comprises:

- a plurality of endless conveyors 103 (of which only one is schematically shown) configured to convey the rows of containers 2 towards the inlet station I;
- a motor (not shown), which drives conveyors 103; and
- a sequencing device 105, arranged between inlet station I and endless conveyors 103 and configured to receive a row of containers 2 at a time from conveyors 103 and to feed the received row to the chain conveyor 4 at inlet station I.

[0029] In particular, the most forward containers 2 of each row of containers 2 are transferred by sequencing device 105 to the respective pockets 17 of the beam 16 that is travelling at inlet station I.

[0030] The operation and construction of the sequencing device 105 is known as such and, therefore, not described further in detail.

[0031] In the embodiment shown, direction F is horizontal and orthogonal to axes A of containers 2 fed along the same direction F.

[0032] Washing machine 1 further comprises an out-feed conveyor 14, which receives rows of cleaned containers 2 from chain conveyor 4 at an outlet station O of washing tunnel 3.

[0033] In view of the above, path P comprises:

- a washing branch Q, which extends from inlet station I to outlet station O and along which containers 2 are advanced by chain conveyor 4; and
- a return branch R, which extends from outlet station O to inlet station I and defines a return zone R1, through which beams 16 return towards inlet station I without containers 2.

[0034] Furthermore, according to the advancing direction of the same containers 2, washing machine 1 comprises in sequence along washing branch Q:

- a prewash zone P1;

- a first cleaning zone C1;
- a second cleaning zone C2;
- a first heat exchange zone H1; and
- a second heat exchange zone H2.

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[0035] In the foregoing of the present disclosure, for the sake of clarity, terms like "upstream of" and "downstream of" are to be intended throughout the whole description with reference to such advancing direction of the containers 2 along path P.

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[0036] Within prewash zone P1, first cleaning zone C1, and second cleaning zone C2, washing machine 1 comprises respective baths 11, 12, 13 filled with a cleaning agent, preferably a basic aqueous solution comprising sodium hydroxide.

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[0037] Moreover, within prewash zone P1, washing machine 1 comprises also a plurality of sprinkling devices 106 arranged in sequence along washing branch Q.

[0038] Sprinkling devices 106 deliver, in use, sprinkles of the above cleaning agent to external surfaces 2a and inner volumes 2b of containers 2, while the latter are advanced through the prewash zone P1 itself.

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[0039] The cleaning agent within bath 11 and the cleaning agent ejected by sprinkling devices 106 are brought to a relatively high temperature, for instance between 45 °C and 60 °C, so that the encrusted dirt on containers 2 starts to dissolve as containers 2 themselves advance through prewash zone P1.

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[0040] On the other hand, the cleaning agent within baths 12, 13 is brought to a higher temperature, for instance between 65 °C and 80 °C, so that dirt on advancing containers 2 is fully removed together with possible labels arranged thereon.

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[0041] Therefore, containers 2 come out from bath 13 cleaned and heated up to a temperature likely between 60 °C and 70 °C, so that the same containers 2 needs to be cooled down to environmental temperature before being discharged at outlet station O.

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[0042] In view of that, washing machine 1 comprises a cooling apparatus 101, which is arranged within heat exchange zone H1 and allows containers 2 and beams 16 to come in thermal contact with heat transfer medium having a temperature lower than that of the cleaning agent within bath 13, such that the same containers 2 and beams 16 are cooled for a first time while the corresponding heat transfer medium is heated.

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[0043] Moreover, washing machine 1 comprises another cooling apparatus 102, which is arranged within heat exchange zone H2 and allows containers 2 and beams 16 to come in thermal contact with further heat transfer medium having a lower temperature, such that the same containers 2 and beams 16 are cooled for a second time while the corresponding heat transfer medium is heated.

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[0044] In detail, each mentioned heat transfer medium comprises a rinsing medium, in particular water, which is brought in contact with containers 2 and beams 16, while the latter are advanced through heat exchange

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zones H1, H2.

[0045] In this manner, the cleaning agent remaining onto containers 2 and onto beams 16 is gradually removed therefrom, as well as dissolved in the rinsing medium.

[0046] In particular, the equilibrium temperatures respectively reached by containers 2, beams 16 and the heat transfer medium at heat exchange zone are between 45 °C and 60 °C, while the equilibrium temperatures respectively reached by containers 2, beams 16 and the heat transfer medium at heat exchange zone H2 is between 25 °C and 35 °C.

[0047] In the embodiment shown, cooling apparatus 101 comprises a basin 70 suitable for holding heat transfer medium and arranged within heat exchange zone H1, in particular along a stretch Q1 of washing branch Q.

[0048] Basin 70 is filled with heat transfer medium and is arranged in a position such that beams 16 are conveyed by chains 15 through the same basin 70.

[0049] In such a manner, beams 16 and external surfaces 2a of containers 2 advancing through the basin 70 are fully in contact with such heat transfer medium and, in particular, immersed therein.

[0050] Since the above heat transfer medium comprises a rinsing medium, basin 70 may be considered part of a rinsing apparatus aimed to remove cleaning agent from containers 2 and from beams 16 by delivering rinsing medium to the containers 2 and beams 16 themselves.

[0051] Immediately downstream of stretch Q1, washing branch Q comprises a stretch Q2 within heat exchange zone H1 and along which containers 2 are advanced with their axes A inclined with respect to a vertical direction.

[0052] In other words, each container 2 advancing along stretch Q2 has a corresponding orientation that is intermediate in respect of two extremal orientations, according to which axis A is vertical and inlet opening 2f is respectively above and below the base portion 2c.

[0053] More in detail, while advancing throughout the whole stretch Q2, each container 2 assumes a plurality of progressive orientations, among which at least one is distinguished by that the corresponding axis A is horizontal.

[0054] In particular, containers 2 are conveyed through stretch Q2 with respective axes A that progressively form angles with the vertical direction between 30° and 140°, more in particular between 60° and 120°.

[0055] In such a manner, containers 2 and beams 16, which advance through basin 70 push a portion of the heat transfer medium toward stretch Q2, at which the same portion falls down from containers 2 and beams 16 themselves due to gravity action.

[0056] Moreover, still with reference to the embodiment shown, washing machine 1 comprises a basin 74 that is suitable for holding heat transfer medium and is arranged in heat exchange zone H1 below stretch Q2, so as to receive and gather the portion of the heat transfer

medium fallen down from containers 2 and beams 16.

[0057] Furthermore, cooling apparatus 102 comprises a rinsing apparatus arranged within heat exchange zone H2, and configured to deliver a rinsing medium onto containers 2 and beams 16, while the latter are advanced through heat exchange zone H2.

[0058] Specifically, the above rinsing apparatus is defined by an ejection assembly 77 and the rinsing medium comprises a liquid defining the heat transfer medium within heat exchange zone H2.

[0059] Ejection assembly 77 comprises a plurality of sprinkling devices 78 arranged in sequence along washing branch Q for delivering sprinkles of the rinsing medium to external surfaces 2a and inner volumes 2b of containers 2, as well as to beams 16 carrying the same containers 2.

[0060] At least one of the sprinkling devices 78 is supplied by a source of rinsing medium; specifically washing machine 1 comprises a tank T4 defining the above source of rinsing medium.

[0061] In the embodiment shown, tank T4 supplies only the last sprinkling device 78 of the respective sequence, according to the advancing direction of containers 2.

[0062] To supply all the other sprinkling devices 78, ejection assembly 77 comprises also a plurality of basins 79 respectively arranged in sequence below sprinkling devices 78 and fluidly connected thereto.

[0063] The last basin 79 in the respective sequence gather rinsing medium that is ejected by the corresponding sprinkling device 78, since the same ejected rinsing medium falls down from containers 2 and beams 16 that advance above the same last basin 79.

[0064] As it will be explained in the foregoing of the disclosure, the previously referred last basin 79 supplies, in use, all the other basins 79, which in turn supply the corresponding sprinkling devices 78.

[0065] In detail, as schematically illustrated in Figure 1 and according to the advancing direction of containers 2, each basin 79, with exception of the first of the respective sequence, comprise at the top a corresponding spillway 80 toward the immediately upstream basin 79.

[0066] Therefore, when a basin 79 (excluded the first one of the respective sequence) is completely filled with rinsing medium, a superficial portion of the latter falls by means of the spillway 80 into the immediately upstream basin 79.

[0067] The last basin 79 in the respective sequence is the first one that is completely filled since indirectly receiving rinsing medium from tank T4 via the corresponding sprinkling device 78; the other basins 79 are completely filled in succession according to a direction opposite to the advancing direction of containers 2.

[0068] In the embodiment shown, the first basin 79 of the respective sequence is adjacent to basin 74 and comprises at the top a spillway 81 toward the same basin 74.

[0069] Advantageously, washing machine 1 further comprises:

- a circulation system 35 for circulating heat transfer medium between first heat exchange zone H1 and return zone R1; and
- a heating apparatus 36 for heating beams 16 at return zone R1 by allowing thermal contact between the same beams 16 and the circulated heat transfer medium, such that the same heat transfer medium is cooled by transferring part of the heat absorbed at first heat exchange zone H1 to the beams 16 themselves before being returned to first heat exchange zone H1 for cooling containers 2.

[0070] In particular, the equilibrium temperatures respectively reached by beams 16 and heat transfer medium at return zone R1 are between 25 °C and 35 °C.

[0071] Heating apparatus 36 comprises a basin 104, which is suitable for holding heat transfer medium and is arranged within return zone R1 in a position such that beams 16 passes through the same basin 104, while the beams 16 themselves are conveyed by chains 15 along return branch R.

[0072] In use, basin 104 is filled with heat transfer medium, such that beams 16 advanced through basin 104 result fully in contact with the heat transfer medium itself and, in particular, immersed therein.

[0073] Circulation system 35 comprises a fluidic circuit 110, which:

- withdraws a first portion of heat transfer medium heated at heat exchange zone H1 to supply the same first portion to the basin 104; and
- withdraws a second portion of heat transfer medium cooled within the basin 104 to convey the same second portion back to heat exchange zone H1.

[0074] In particular, fluidic circuit 110 comprises a fluidic line L1, which fluidly connects the basin 104 to the basin 70 so as to allow flowing of the above second portion from basin 104 to basin 70.

[0075] More in particular, fluidic line L1 is provided with a tank T1, which is filled with the heat transfer medium at the same temperature of the second portion, is arranged below basin 104, and is connected to basin 104 for receiving the second portion.

[0076] Moreover, fluidic circuit 110 is provided also with a pump 114 arranged along fluidic line L1 for pumping the second portion from tank T1 to basin 70, which is arranged above both tank T1 and basin 104.

[0077] Fluidic circuit 110 further comprises another fluidic line L2, which fluidly connects basin 104 to basin 74 so as to allow transport of the above first portion from basin 74 to basin 104.

[0078] Basin 74 is arranged above basin 104, such that the first portion is conveyed by fluidic line L2 due to gravity action, without the need of any pump.

[0079] Furthermore, washing machine 1 comprises another fluidic circuit 111, which withdraws a further portion of the heat transfer medium heated at heat exchange

zone H1 to convey the same further portion to prewash zone P1.

[0080] In particular, fluidic circuit 111 comprises a fluidic line L3, which fluidly connects basin 74 with sprinkling devices 106, so as to supply the same sprinkling devices 106 with the above further portion of the heat transfer medium.

[0081] Preferably, the washing machine 1 comprises an ultrasonic wave generator UG, which is coupled to the basin 104 and is configured to propagate ultrasonic waves through the heat transfer medium within basin 104 itself, such that beams 16 receive an ultrasonic cleaning treatment while advancing through basin 104.

[0082] More in detail, the ultrasonic wave generator comprises a plurality of ultrasonic transducers 90 (Figure 2), which are conveniently plate-shaped, configured to convert electric power into ultrasounds, and sequentially arranged adjacent and parallel to each other along a stretch R2, which is part of return branch R and is placed within basin 104.

[0083] Ultrasonic transducers 90 preferably emit ultrasonic waves having an action range of at least 350 mm and a frequency between 25 kHz and 28 kHz.

[0084] Specifically, ultrasonic transducers 90 are parallel to stretch R2 and fixed with respect to basin 104, so as to be placed immediately below the advancing beams 16.

[0085] In particular, ultrasonic transducers 90 have a maximum clearance from beams 16 that is equal to 10 mm, according to a direction orthogonal to stretch R2.

[0086] While beams 16 advances through stretch R2, the same beams 16 have respective lower portions facing ultrasonic transducers 90 in close proximity.

[0087] Stretch R2 is preferably rectilinear and, more preferably horizontal. Moreover, stretch R2 conveniently has a length between 0.5 m and 2 m.

[0088] Preferably, beams 16 are advanced throughout the whole stretch R2 during a time interval between 20 s and 60 s, in order to have optimal performances of the ultrasonic cleaning treatment.

[0089] Washing machine 1 further comprises:

- an electric power generator EG connected to ultrasonic transducers 90; and
- a control unit ECU connected to the electric power generator EG and configured to control power supply of each ultrasonic transducer 90 by operating electric power generator EG.

[0090] In particular, control unit ECU controls the activation of ultrasonic transducers 90 in a periodic or discontinuous manner, e.g. for a duration of 30 s after each period of 420 working hours of the washing machine 1.

[0091] Ultrasonic waves generated by ultrasonic wave generator UG have a relative periodic motion with respect to the heat transfer medium in which the same waves propagate; therefore, local micro-zones within the heat transfer medium pass periodically from a depressurized

to a pressurized state.

[0092] During the depressurized state, air dissolved within the heat transfer medium tends to form many microbubbles, which implode when pressure increases, so as to release energy towards beams 16 that are advanced through basin 104.

[0093] Such energy is useful to disaggregate possible tough calcium deposit or encrusted dirt on the beams 16 themselves.

[0094] The operation of washing machine 1 is described in detail in the following.

[0095] Feeding system 8 advances a plurality of rows of containers 2 to be washed through conveyor 103 in a parallel manner to direction F.

[0096] The properly positioned containers 2 are arranged with respective axes A orthogonal to path P and with respective base portions 2c lying on conveyor 103.

[0097] Beams 16 of chain conveyor 4 withdraw respective rows of containers 2 at inlet station I from sequencing device 105, advance containers 2 inside washing tunnel 3 along the washing branch Q, discharge rows of cleaned containers 2 at outlet station O onto outfeed conveyor 14, and return along return branch R without containers 2.

[0098] In detail, containers 2 of each row are first carried by pockets 17 through prewash zone P1, where containers 2 are preliminary washed and heated through immersion within bath 11 and by means of sprinkling devices 106.

[0099] Hence, the same containers 2 are conveyed also through following baths 12, 13, respectively at cleaning zones C1, C2, so that containers 2 are completely cleaned and deprived of any labels attached thereon.

[0100] Here, both containers 2 and beams 16 continue to receive heat from cleaning agent within baths 12, 13 up to reach elevated temperatures, for instance between 60 °C and 70° C.

[0101] At this point, a cooling process is carried out for cooling the hot washed containers 2 before the same containers 2 are discharged at outlet station O.

[0102] In particular, containers 2 and beams 16 are advanced through basin 70 within heat exchange zone H1, where the containers 2 and the beams 16 themselves are immersed into heat transfer medium and establish a thermal equilibrium with the latter, so as to reach intermediate temperatures, for instance between 45 °C and 60 °C.

[0103] Here, part of the heated heat transfer medium, at a similar temperature to the above intermediate temperatures, is dragged out from basin 70 by containers 2 and beams 16, while the latter are conveyed out from the basin 70 itself.

[0104] The dragged part falls down within basin 74 while the same containers 2 and the same beams 16 advance through the stretch Q2.

[0105] The entire heat transfer medium gathered within basin 74 has a temperature essentially equal to that of the above part; then, two different further parts of the heat transfer medium within the same basin 74 are split

to be respectively supplied to sprinkling devices 106 via fluidic line L3 and transported to basin 104 via fluidic line L2.

[0106] When containers 2 and beams 16 reach the heat exchange zone H2, the containers 2 and beams 16 themselves receive the heat transfer medium by means of sprinkling devices 78, so as to be further cooled down to low temperatures, for instance between 25 °C and 35 °C.

[0107] Then, cooled beams 16 advance through the return branch R whereas containers 2 at the above low temperatures are discharged at outlet station O.

[0108] Cooled beams 16 are immersed within basin 104 while advancing through the return branch R; here, a heat exchange occurs between the heat transfer medium within basin 104 and the cooled beams 16.

[0109] During heat exchange, beams 16 receive a complete ultrasonic cleaning treatment by means of ultrasonic wave generator UG, with above described modes.

[0110] After such heat exchange, beams 16 are warmed and conveyed toward inlet station I, whereas the heat transfer medium is cooled down.

[0111] Then, part of the cooled down heat transfer medium is transported to basin 70, so as to be re-used for cooling other containers 2 and beams 16, which advance through basin 70 itself.

[0112] From an analysis of the features of the cooling process and washing machine 1 according to the invention, the advantages they allow to obtain are apparent.

[0113] Basin 70 is supplied with recycled heat transfer medium from basin 104, which is maintained at low temperatures by beams 16 cooled at heat exchange zone H2 and passing through basin 104 itself.

[0114] Thanks to that, there is no need of supplying basin 70 with fresh heat transfer medium at low temperatures; in other words, the amount of heat transfer medium circulated by circulation system 35 is sufficient to guarantee effective cooling of containers 2.

[0115] Fresh heat transfer medium is supplied just only to one sprinkling device 78; thanks to the peculiar arrangement of basins 79, all the other sprinkling devices 78 are effectively supplied with recycled heat transfer medium.

[0116] Therefore, the usage of fresh heat transfer medium is reduced at the minimum necessary, so that costs and environmental impact of washing machine 1 are cut down.

[0117] Besides, part of the heat accumulated by heat transfer medium within heat exchange zone H1 is conveniently exploited at the prewash zone P1 thanks to fluidic circuit 111.

[0118] Clearly, changes may be made to the process for cooling hot washed containers 2 and washing machine 1 as described and illustrated herein without, however, departing from the scope of protection as defined in the accompanying claims.

[0119] In particular, instead of being supplied with heat

transfer medium gathered into basin 74, basin 104 may be supplied by exploiting other collecting means, possibly suitable for actively withdrawing heat transfer medium from heat exchange zone H1, such as pumping systems that trap heat transfer medium from basin 70.

[0120] Many kinds of cooling or heating apparatus may be used to allow heat transfers between beams 16 and heat transfer media at heat exchange zones H1, H2, and at return zone R1, including heat exchangers, fans, nebulizers, and the like.

[0121] In view of that, basin 70 may be placed within heat exchange zone H2 whereas ejection assembly 77 may be placed within heat exchange zone H1, as well as heat exchange zones H1, H2 may be provided with rinsing apparatus including further basins and/or ejection assemblies.

[0122] Moreover, washing machine 1 may comprise many more heat exchange zones between cleaning zone C2 and outlet station O. Possibly, some of such heat exchange zones may be placed between heat exchange zones H1, H2.

[0123] Eventually, fluidic circuit 111 may connect heat exchange zone H1 also or only with bath 11.

Claims

1. - A cooling process for cooling hot washed containers (2) in a washing machine (1), the method comprising the steps of:

- advancing, by means of a conveyor device (4), a plurality of said hot washed containers (2) and at least one member (16) of said conveyor (4) along a washing path (P) with an outlet station (O) and a return zone (R1) downstream of said outlet station (O) and upstream of the inlet station (I), according to an advancing direction of said member (16) along said path (P);

- sequentially cooling said member (16) and said containers (2) for a first and a second time by putting said member (16) in thermal contact respectively with a first and a second heat transfer medium, respectively at a first and a second heat exchange zone (H1, H2) arranged in sequence along said path (P) and upstream of said outlet station (O) according said advancing direction, such that said first heat transfer medium is heated up to a temperature higher than that of said second heat transfer medium;

- discharging said containers (2) at said outlet station (O) further comprising the steps of:

- circulating said first heat transfer medium between said first heat exchange zone (H1) and said return zone (R1);

- heating said member (16) and cooling said first heat transfer medium by putting said member (16) in thermal contact with said first heat trans-

fer medium at said return zone (R1); and

- returning the cooled said first heat transfer medium to said first heat exchange zone (H1) for cooling said containers (2).

2. - The process of claim 1, wherein said step of circulating said first heat exchange medium comprises the step of filling a first basin (104) within said return zone (R1) with a first portion of the first heat transfer medium heated at said first heat exchange zone (H1); the process further comprising the step of advancing said member (16) through said first basin (104) to come in thermal contact with said first portion.

3. - The process of claim 2, further comprising the step of propagating ultrasonic waves through said first portion, such that said member (16) receives an ultrasonic cleaning treatment while advancing through said first basin (104).

4. - The process of any one of the foregoing claims, wherein said step of circulating said first heat transfer medium comprises the step of filling a second basin (70) within said first heat exchange zone (H1) with a second portion of the first heat transfer medium cooled at said return zone (R1); the process further comprising the step of advancing said member (16) through said second basin (70) to come in thermal contact with said second portion.

5. - The process of any one of the foregoing claims, wherein said step of circulating said first heat transfer medium comprises the steps of:

- gathering into a third basin (74) within said first heat exchange zone (H1) a third portion of the first heat transfer medium heated at said first heat exchange zone (H1) by said member (16) and said containers (2) during said step of advancing through said first heat exchange zone (H1); and

- transporting a fourth portion of said first heat transfer medium from said third basin (74) to said return zone (R1).

6. - The process of any one of the foregoing claims, further comprising the steps of:

- washing said containers (2) through a prewash zone (P1) arranged along said path (P) upstream of said first heat exchange zone (H1), according to said advancing direction;

- advancing said member (16) through said prewash zone (P1); and

- transporting a fifth portion of the first heat transfer medium heated at said first heat exchange zone (H1) to said prewash zone (P1) for heating

said containers (2) during said step of advancing said member (16) through said prewash zone (P1).

7. - A washing machine (1) comprising:

- a conveyor device (4) for advancing a plurality of containers (2) along a washing path (P) and comprising at least one member (16) movable along said path (P);
- an outlet station (O) arranged along said path (P) and configured to allow discharging of said containers (2);
- a first and a second heat exchange zone (H1, H2) arranged in sequence along said path (P) and upstream of said outlet station (O), according to an advancing direction of said containers (2);
- cooling means (101, 102) operable for sequentially cooling said member (16) and said containers (2) for a first and a second time, respectively at said first and second heat exchange zone (H1, H2), by allowing thermal contact between said member (16) and, respectively, a first and a second heat transfer medium, such that said first heat transfer medium is heated up to a temperature higher than that of said second heat transfer medium; and
- a return zone (R1) arranged along said path (P) downstream of said outlet station (O) and upstream of the inlet station (I), according to said advancing direction;

characterized by further comprising:

- circulation means (35) operable for circulating said first heat transfer medium between said first heat exchange zone (H1) and said return zone (R1); and
- heating means (36) operable for heating said member (16) at said return zone (R1) by allowing thermal contact between said member (16) and said first heat transfer medium, such that said first heat transfer medium is, in use, cooled by transferring part of the heat absorbed at said first heat exchange zone (H1) to said member (16) before being returned to said first heat exchange zone (H1) for cooling said containers (2).

8. - The washing machine of claim 7, wherein:

- said heating means (36) comprise a first basin (104) arranged within said return zone (R1) and suitable for holding said first heat transfer medium; and
- said circulation means (35) comprise a fluidic circuit (110) for moving a first portion of the first heat transfer medium heated at said first heat

exchange zone (H1) to said first basin (104) and a second portion of the first heat transfer medium cooled within said first basin (104) to said first heat exchange zone (104);

said path (P) extending through said first basin (104), such that said member (16) comes in thermal contact with said first portion.

9. - The washing machine of claim 8, wherein:

- said cooling means (35) further comprise a second basin (70) arranged within said first heat exchange zone (H1) and suitable for holding said first heat transfer medium; and
 - said fluidic circuit (110) comprises a first fluidic line (L1) fluidly connecting said second basin (70) with said first basin (104), such that said second basin (70) is supplied with said second portion;
- said path (P) extending through said second basin (70), such that said member (16) comes in thermal contact with said second portion; and/or wherein
- said fluidic circuit (110) comprises a pump (114) arranged along said first fluidic line (L1) between a first branch of said first fluidic line (L1), in which said second portion flows due to gravity action, and a second branch of said first fluidic line (L1), in which said second portion is pushed by said pump (114) to said second basin (70).

10. - The washing machine of claim 8 or 9, further comprising a third basin (74) arranged within said first heat exchange zone (H1) and configured to receive and gather a third portion of the first heat transfer medium heated at said first heat exchange zone (H1);

wherein said fluidic circuit (110) comprises a second fluidic line (L2) fluidly connecting said third basin (74) with said first basin (104), such that said first basin (104) is supplied with said first portion.

11. - The washing machine of claim 10, further comprising:

- a prewash zone (P1) arranged along said path (P) upstream of said first heat exchange zone (H1), according to said advancing direction;
- a prewashing apparatus (106, 11) arranged along said path (P) within said prewash zone (P1) and configured to wash said containers (2); and
- a third fluidic line (L3) fluidly connecting said third basin (74) with said prewashing apparatus (106, 11), such that said prewashing apparatus (106, 11) is supplied with a fifth portion of said first heat transfer medium withdrawn from said

third basin (74).

12. - The washing machine of any one of claims from 8 to 11, further comprising an ultrasonic wave generator (UG) coupled to said first basin (104) for propagating ultrasonic waves through said first portion, such that said member (16) receives an ultrasonic cleaning treatment while advancing through said first basin (104). 5
13. - The washing machine of any one of claims from 7 to 12, further comprising a rinsing apparatus (70; 77) arranged within at least one of said first and second heat exchange zone (H1, H2) and configured to deliver a rinsing medium toward said containers (2) and, preferably, to said member (16); said rinsing medium being correspondingly part of one of said first and second heat transfer medium. 10
14. - The washing machine of claim 13, when dependent on claim 9, wherein said rinsing apparatus (70; 77) comprises: 15
- said second basin (70) for holding said rinsing medium and arranged along said path (P), such that said member (16) advances, in use, through said second basin (70) coming into contact with said rinsing medium; and/or 25
 - at least one ejection assembly (77) configured to direct sprinkles of said rinsing medium toward said containers (2) and said member (16); 30
- said ejection assembly (77) comprising, in particular, a plurality of sprinkling devices (78) and a respective plurality of fourth basins (79) arranged below the corresponding said sprinkling devices, fluidly connected to the corresponding said sprinkling devices, and being fluidly communicating with one another through spillways (80). 35
15. - The washing machine of any one of claims from 7 to 14, wherein said conveyor (4) comprises: 40
- a plurality of beams (16) suitable for carrying respective rows of said containers (2) and extending transversally to said path (P); and 45
 - a conveying chain (15) extending parallel to said path (P) and configured to convey said beams (16) along said path (P); 50
- said beams (16) defining a respective plurality of said members (16) for exchanging heat with said first and second heat transfer medium. 55

Patentansprüche

1. Kühlverfahren zur Kühlung von heiß gewaschenen

Behältern (2) in einer Waschmaschine (1), wobei das Verfahren folgende Schritte umfasst:

- Vorwärtsbewegen - mittels einer Fördervorrichtung (4)
- einer Mehrzahl der heiß gewaschenen Behälter (2) und wenigstens eines Elements (16) der Fördervorrichtung (4) entlang eines Waschweges (P) mit einer Auslassstation (O) und einer Rückführzone (R1), die gemäß einer Vorwärtsbewegungsrichtung des Elements (16) entlang des Weges (P) stromabwärts der Auslassstation (O) und stromaufwärts der Einlassstation (I) gelegen ist;
- aufeinanderfolgendes Kühlen des Elements (16) und der Behälter (2) für eine erste und eine zweite Zeit, indem das Element (16) entsprechend mit einem ersten und einem zweiten Wärmeübertragungsmedium in thermischen Kontakt gebracht wird, und zwar entsprechend an einer ersten und einer zweiten Wärmetauscherzone (H1, H2), die nacheinander entlang des Weges (P) und gemäß der Vorwärtsbewegungsrichtung stromaufwärts der Auslassstation (O) angeordnet sind, sodass das erste Wärmeübertragungsmedium auf eine Temperatur erwärmt wird, die höher als diejenige des zweiten Wärmeübertragungsmediums ist;
- Ausgeben der Behälter (2) an der Auslassstation (O), und ferner folgende Schritte umfasst:
- Umwälzen des ersten Wärmeübertragungsmediums zwischen der ersten Wärmetauscherzone (H1) und der Rückführzone (R1) ;
- Erwärmen des Elements (16) und Kühlen des ersten Wärmeübertragungsmediums, indem das Element (16) an der Rückführzone (R1) mit dem ersten Wärmeübertragungsmedium in thermischen Kontakt gebracht wird; und
- Rückführen des gekühlten ersten Wärmeübertragungsmediums zu der ersten Wärmetauscherzone (H1) zum Kühlen der Behälter (2).

2. Verfahren nach Anspruch 1, wobei der Schritt des Umwälzens des ersten Wärmetauschmediums den Schritt des Füllens eines ersten Beckens (104) innerhalb der Rückführzone (R1) mit einer ersten Teilmenge des ersten Wärmeübertragungsmediums, die an der ersten Wärmetauscherzone (H1) erwärmt wurde, umfasst;
- wobei das Verfahren ferner den Schritt des Vorwärtsbewegens des Elements (16) durch das erste Becken (104) hindurch, um mit der ersten Teilmenge in thermischen Kontakt zu kommen, umfasst.

3. Verfahren nach Anspruch 2, das ferner den Schritt des Sendens von Ultraschallwellen durch die erste Teilmenge hindurch umfasst, sodass das Element (16) eine Ultraschallreinigungsbehandlung erfährt, während es sich durch das erste Becken (104) hindurch vorwärtsbewegt. 5
4. Verfahren nach einem der vorangehenden Ansprüche, wobei der Schritt des Umwälzens des ersten Wärmeübertragungsmediums den Schritt des Füllens eines zweiten Beckens (70) innerhalb der ersten Wärmetauscherzone (H1) mit einer zweiten Teilmenge des ersten Wärmeübertragungsmediums, die an der Rückführzone (R1) gekühlt wurde, umfasst; wobei das Verfahren ferner den Schritt des Vorwärtsbewegens des Elements (16) durch das zweite Becken (70) hindurch, um mit der zweiten Teilmenge in thermischen Kontakt zu kommen, umfasst. 10 15
5. Verfahren nach einem der vorangehenden Ansprüche, wobei der Schritt des Umwälzens des ersten Wärmeübertragungsmediums folgende Schritte umfasst: 20
- Sammeln - in ein drittes Becken (74) innerhalb der ersten Wärmetauscherzone (H1) hinein - einer dritten Teilmenge des ersten Wärmeübertragungsmediums, die an der ersten Wärmetauscherzone (H1) durch das Element (16) und die Behälter (2) während des Schritts des Vorwärtsbewegens durch die erste Wärmetauscherzone (H1) hindurch erwärmt wurde; und 25 30
 - Transportieren einer vierten Teilmenge des ersten Wärmeübertragungsmediums von dem dritten Becken (74) zu der Rückführzone (R1). 35
6. Verfahren nach einem der vorangehenden Ansprüche, das ferner folgende Schritte umfasst: 40
- Waschen der Behälter (2) durch eine Vorwaschzone (P1) hindurch, die entlang des Weges (P), gemäß der Vorwärtsbewegungsrichtung stromaufwärts der ersten Wärmetauscherzone (H1), angeordnet ist; 45
 - Vorwärtsbewegen des Elements (16) durch die Vorwaschzone (P1) hindurch; und
 - Transportieren einer fünften Teilmenge des ersten Wärmeübertragungsmediums, die an der ersten Wärmetauscherzone (H1) erwärmt wurde, zu der Vorwaschzone (P1) zum Erwärmen der Behälter (2) während des Schritts des Vorwärtsbewegens des Elements (16) durch die Vorwaschzone (P1) hindurch. 50
7. Waschmaschine (1), umfassend: 55
- eine Fördervorrichtung (4) zum Vorwärtsbewegen einer Mehrzahl von Behältern (2) entlang

eines Waschweges (P) und wenigstens ein Element (16) umfassend, das entlang des Weges bewegbar ist;

- eine Auslassstation (O), die entlang des Weges (P) angeordnet und dazu ausgestaltet ist, ein Ausgeben der Behälter (2) zu erlauben;
- eine erste und eine zweite Wärmetauscherzone (H1, H2), die nacheinander entlang des Weges (P) und gemäß einer Vorwärtsbewegungsrichtung der Behälter (2) stromaufwärts der Auslassstation (O) angeordnet sind;
- Kühlmittel (101, 102), die dazu betriebsfähig sind, das Element (16) und die Behälter (2) nacheinander für eine erste und eine zweite Zeit entsprechend an der ersten und zweiten Wärmetauscherzone (H1, H2) zu kühlen, indem sie einen thermischen Kontakt zwischen dem Element (16) und, entsprechend, einem ersten und einem zweiten Wärmeübertragungsmedium erlauben, sodass das erste Wärmeübertragungsmedium auf eine Temperatur erwärmt wird, die höher als diejenige des zweiten Wärmeübertragungsmediums ist; und
- eine Rückführzone (R1), die entlang des Weges (P), gemäß der Vorwärtsbewegungsrichtung stromabwärts der Auslassstation (O) und stromaufwärts der Einlassstation (I), angeordnet ist;

dadurch gekennzeichnet, dass sie ferner umfasst:

- Umwälzmittel (35), die zum Umwälzen des ersten Wärmeübertragungsmediums zwischen der ersten Wärmetauscherzone (H1) und der Rückführzone (R1) betriebsfähig sind; und
- Erwärmungsmittel (36), die zum Erwärmen des Elements (16) an der Rückführzone (R1) durch Erlauben eines thermischen Kontakts zwischen dem Element (16) und dem ersten Wärmeübertragungsmedium betriebsfähig sind, sodass das erste Wärmeübertragungsmedium bei Gebrauch gekühlt wird, indem ein Teil der Wärme, die an der ersten Wärmetauscherzone (H1) absorbiert wurde, auf das Element (16) übertragen wird, bevor es zum Kühlen der Behälter (2) zu der ersten Wärmetauscherzone (H1) zurückgeführt wird.

8. Waschmaschine nach Anspruch 7, wobei:

- die Erwärmungsmittel (36) ein erstes Becken (104) umfassen, das innerhalb der Rückführzone (R1) angeordnet und zum Aufnehmen des ersten Wärmeübertragungsmediums geeignet ist; und
- die Umwälzmittel (35) einen Strömungskreis (110) zum Bewegen einer ersten Teilmenge des ersten Wärmeübertragungsmediums, die an

der ersten Wärmetauschzone (H1) erwärmt wurde, zu dem ersten Becken (104) und einer zweiten Teilmenge des ersten Wärmeübertragungsmediums, die innerhalb des ersten Beckens (104) gekühlt wurde, zu der ersten Wärmetauschzone (104) umfassen;

wobei der Weg (P) sich durch das erste Becken (104) hindurch erstreckt, sodass das Element (16) mit der ersten Teilmenge in thermischen Kontakt kommt.

9. Waschmaschine nach Anspruch 8, wobei:

- die Kühlmittel (35) ferner ein zweites Becken (70) umfassen, das innerhalb der ersten Wärmetauschzone (H1) angeordnet und zum Aufnehmen des ersten Wärmeübertragungsmediums geeignet ist; und

- der Strömungskreis (110) eine erste Strömungsleitung (L1) umfasst, die das zweite Becken (70) fließfähig mit dem ersten Becken (104) verbindet, sodass dem zweiten Becken (70) die zweite Teilmenge zugeführt wird;

wobei der Weg (P) sich durch das zweite Becken (70) hindurch erstreckt, sodass das Element (16) mit der zweiten Teilmenge in thermischen Kontakt kommt; und/oder wobei

der Strömungskreis (110) eine Pumpe (114) umfasst, die entlang der ersten Strömungsleitung (L1) zwischen einem ersten Zweig der ersten Strömungsleitung (L1), in der die zweite Teilmenge aufgrund der Schwerkraftwirkung fließt, und einem zweiten Zweig der ersten Strömungsleitung (L1), in dem die zweite Teilmenge durch die Pumpe (114) zu dem zweiten Becken (70) gedrückt wird, angeordnet ist.

10. Waschmaschine nach Anspruch 8 oder 9, die ferner ein drittes Becken (74) umfasst, das innerhalb der ersten Wärmetauschzone (H1) angeordnet und zum Aufnehmen und Sammeln einer dritten Teilmenge des ersten Wärmeübertragungsmediums, die an der ersten Wärmetauschzone (H1) erwärmt wurde, ausgestaltet ist;

wobei der Strömungskreis (110) eine zweite Strömungsleitung (L2) umfasst, die das dritte Becken (74) fließfähig mit dem ersten Becken (104) verbindet, sodass dem ersten Becken (104) die erste Teilmenge zugeführt wird.

11. Waschmaschine nach Anspruch 10, ferner umfassend:

- eine Vorwaschzone (P1), die entlang des Weges (P), gemäß der Vorwärtsbewegungsrichtung stromaufwärts der ersten Wärmetauschzone (H1), angeordnet ist;

- eine Vorwascheinrichtung (106, 11), die ent-

lang des Weges (P) innerhalb der Vorwaschzone (P1) angeordnet und zum Waschen der Behälter (2) ausgestaltet ist; und

- eine dritte Strömungsleitung (L3), die das dritte Becken (74) fließfähig mit der Vorwascheinrichtung (106, 11) verbindet, sodass der Vorwascheinrichtung (106, 11) eine fünfte Teilmenge des ersten Wärmeübertragungsmediums, die aus dem dritten Becken (74) entnommen wurde, zugeführt wird.

12. Waschmaschine nach einem der Ansprüche 8 bis 11, die ferner einen Ultraschallwellengenerator (UG) umfasst, der mit dem ersten Becken (104) gekoppelt ist, um Ultraschallwellen durch die erste Teilmenge hindurch zu senden, sodass das Element (16) eine Ultraschallreinigungsbildung erfährt, während es sich durch das erste Becken (104) hindurch vorwärtsbewegt.

13. Waschmaschine nach einem der Ansprüche 7 bis 12, die ferner eine Spüleinrichtung (70; 77) umfasst, die innerhalb der ersten und/oder zweiten Wärmetauschzone (H1, H2) angeordnet und dazu ausgestaltet ist, ein Spülmedium hin zu den Behältern (2) und vorzugsweise zu dem Element (16) abzugeben; wobei das Spülmedium, entsprechend, ein Teil des ersten oder zweiten Wärmeübertragungsmediums ist.

14. Waschmaschine nach Anspruch 13, wenn abhängig von Anspruch 9, wobei die Spüleinrichtung (70; 77) Folgendes umfasst:

- das zweite Becken (70) zum Aufnehmen des Spülmediums und entlang des Weges (P) angeordnet, sodass das Element (16) sich bei Gebrauch durch das zweite Becken (70) hindurch vorwärtsbewegt und dabei mit dem Spülmedium in Kontakt kommt; und/oder

- wenigstens eine Ausstoßanordnung (77), die dazu ausgestaltet ist, Sprühtropfen des Spülmediums hin zu den Behältern (2) und dem Element (16) zu richten;

wobei die Ausstoßanordnung (77) insbesondere eine Mehrzahl von Sprühhvorrichtungen (78) und eine entsprechende Mehrzahl vierter Becken (79), die unter den entsprechenden Sprühhvorrichtungen angeordnet, fließfähig mit den entsprechenden Sprühhvorrichtungen verbunden und durch Überläufe (80) fließfähig miteinander verbunden sind, umfasst.

15. Waschmaschine nach einem der Ansprüche 7 bis 14, wobei die Fördervorrichtung (4) Folgendes umfasst:

- eine Mehrzahl von Trägern (16), die zum Tra-

gen entsprechender Reihen der Behälter (2) geeignet sind und sich quer zu dem Weg (P) erstrecken; und

- eine Förderkette (15), die sich parallel zu dem Weg (P) erstreckt und dazu ausgestaltet ist, die Träger (16) entlang des Weges (P) zu fördern;

wobei die Träger (16) eine entsprechende Mehrzahl der Elemente (16) zum Wärmetauschen mit dem ersten und zweiten Wärmeübertragungsmedium definieren.

Revendications

1. Procédé de refroidissement pour refroidir des récipients lavés à chauds (2) dans une machine à laver (1), le procédé comprenant les étapes de :

- avancement, au moyen d'un dispositif de convoyage (4), d'une pluralité desdits récipients lavés à chaud (2) et d'au moins un élément (16) dudit convoyeur (4) le long d'un trajet de lavage (P) avec une station de sortie (O) et une zone de retour (R1) en aval de ladite station de sortie (O) et en amont de la station d'entrée (I), selon une direction d'avancement dudit élément (16) le long dudit trajet (P) ;

- refroidissement séquentiellement dudit élément (16) et desdits récipients (2) pendant un premier et un second temps en mettant ledit élément (16) en contact thermique respectivement avec un premier et un second milieu de transfert de chaleur, respectivement au niveau d'une première et d'une seconde zone d'échange de chaleur (H1, H2) agencées en séquence le long dudit trajet (P) et en amont de ladite station de sortie (O) selon ladite direction d'avancement, de sorte que ledit premier milieu de transfert de chaleur est chauffé à une température supérieure à celle dudit second milieu de transfert de chaleur ;

- déchargement desdits récipients (2) au niveau de ladite station de sortie (O)

comprenant en outre les étapes de :

- circulation dudit premier milieu de transfert de chaleur entre ladite première zone d'échange de chaleur (H1) et ladite zone de retour (R1) ;
 - chauffage dudit élément (16) et refroidissement dudit premier milieu de transfert de chaleur en mettant ledit élément (16) en contact thermique avec ledit premier milieu de transfert de chaleur au niveau de ladite zone de retour (R1) ; et
 - renvoi dudit premier milieu de transfert de chaleur refroidi vers ladite première zone d'échange de chaleur (H1) pour refroidir lesdits récipients

(2).

2. Procédé selon la revendication 1, ladite étape de mise en circulation dudit premier milieu d'échange de chaleur comprenant l'étape de remplissage d'un premier bassin (104) à l'intérieur de ladite zone de retour (R1) avec une première partie du premier milieu de transfert de chaleur chauffé au niveau de ladite première zone d'échange de chaleur (H1) ; le procédé comprenant en outre l'étape d'avancement dudit élément (16) à travers ledit premier bassin (104) pour venir en contact thermique avec ladite première partie.

3. Procédé selon la revendication 2, comprenant en outre l'étape de propagation d'ondes ultrasonores à travers ladite première partie, de sorte que ledit élément (16) reçoit un traitement de nettoyage ultrasonique tout en avançant à travers ledit premier bassin (104).

4. Procédé selon l'une quelconque des revendications précédentes, ladite étape de mise en circulation dudit premier milieu de transfert de chaleur comprenant l'étape de remplissage d'un deuxième bassin (70) à l'intérieur de ladite première zone d'échange de chaleur (H1) avec une deuxième partie du premier milieu de transfert de chaleur refroidi au niveau de ladite zone de retour (R1) ; le procédé comprenant en outre l'étape d'avancement dudit élément (16) à travers ledit deuxième bassin (70) pour venir en contact thermique avec ladite deuxième partie.

5. Procédé selon l'une quelconque des revendications précédentes, ladite étape de mise en circulation dudit premier milieu de transfert de chaleur comprenant les étapes de :

- rassemblement dans un troisième bassin (74) à l'intérieur de ladite première zone d'échange de chaleur (H1) d'une troisième partie du premier milieu de transfert de chaleur chauffé au niveau de ladite première zone d'échange de chaleur (H1) par ledit élément (16) et desdits récipients (2) pendant ladite étape d'avancement à travers ladite première zone d'échange de chaleur (H1) ; et

- transport d'une quatrième partie dudit premier milieu de transfert de chaleur depuis ledit troisième bassin (74) vers ladite zone de retour (R1).

6. Procédé selon l'une quelconque des revendications précédentes, comprenant en outre les étapes de :

- lavage desdits récipients (2) à travers une zone

de prélavage (P1) agencée le long dudit trajet (P) en amont de ladite première zone d'échange de chaleur (H1), selon ladite direction d'avancement ;

- avancement dudit élément (16) à travers ladite zone de prélavage (P1) ; et
- transport d'une cinquième partie du premier milieu de transfert de chaleur chauffé dans ladite première zone d'échange de chaleur (H1) vers ladite zone de prélavage (P1) pour chauffer lesdits récipients (2) pendant ladite étape d'avancement dudit élément (16) à travers ladite zone de prélavage (P1).

7. Machine à laver (1) comprenant :

- un dispositif de convoyage (4) pour faire avancer une pluralité de récipients (2) le long d'un trajet de lavage (P) et comprenant au moins un élément (16) mobile le long dudit trajet (P) ;
- une station de sortie (O) agencée le long dudit trajet (P) et configurée pour permettre le déchargement desdits récipients (2) ;
- une première et une seconde zones d'échange de chaleur (H1, H2) agencées en séquence le long dudit trajet (P) et en amont de ladite station de sortie (O), selon une direction d'avancement desdits récipients (2) ;
- des moyens de refroidissement (101, 102) pouvant fonctionner pour refroidir séquentiellement ledit élément (16) et lesdits récipients (2) pendant un premier et un second temps, respectivement au niveau desdites première et seconde zones d'échange de chaleur (H1, H2), en permettant un contact thermique entre ledit élément (16) et, respectivement, un premier et un second milieu de transfert de chaleur, de sorte que ledit premier milieu de transfert de chaleur est chauffé à une température supérieure à celle dudit second milieu de transfert de chaleur ; et
- une zone de retour (R1) agencée le long dudit trajet (P) en aval de ladite station de sortie (O) et en amont de la station d'entrée (I), selon ladite direction d'avancement ;

caractérisé en ce qu'il comprend en outre :

- des moyens de circulation (35) pouvant fonctionner pour faire circuler ledit premier milieu de transfert de chaleur entre ladite première zone d'échange de chaleur (H1) et ladite zone de retour (R1) ; et
- un moyen de chauffage (36) pouvant fonctionner pour chauffer ledit élément (16) au niveau de ladite zone de retour (R1) en permettant un contact thermique entre ledit élément (16) et ledit premier milieu de transfert de chaleur, de sorte que ledit premier milieu de transfert de chaleur

est, en utilisation, refroidi en transférant une partie de la chaleur absorbée au niveau de ladite première zone d'échange de chaleur (H1) vers ledit élément (16) avant d'être renvoyé vers ladite première zone d'échange de chaleur (H1) pour refroidir lesdits récipients (2).

8. Machine à laver selon la revendication 7,

- lesdits moyens de chauffage (36) comprenant un premier bassin (104) agencé à l'intérieur de ladite zone de retour (R1) et adapté pour contenir ledit premier milieu de transfert de chaleur ; et
- lesdits moyens de circulation (35) comprenant un circuit fluide (110) pour déplacer une première partie du premier milieu de transfert de chaleur chauffé au niveau de ladite première zone d'échange de chaleur (H1) vers ledit premier bassin (104) et une deuxième partie du premier milieu de transfert de chaleur refroidi à l'intérieur dudit premier bassin (104) vers ladite première zone d'échange de chaleur (104) ;

ledit trajet (P) s'étendant à travers ledit premier bassin (104), de sorte que ledit élément (16) vient en contact thermique avec ladite première partie.

9. Machine à laver selon la revendication 8,

- lesdits moyens de refroidissement (35) comprenant en outre un deuxième bassin (70) agencé à l'intérieur de ladite première zone d'échange de chaleur (H1) et adapté pour contenir ledit premier milieu de transfert de chaleur ; et
- ledit circuit fluide (110) comprenant une première ligne fluide (L1) reliant de manière fluide ledit deuxième bassin (70) audit premier bassin (104), de sorte que ledit deuxième bassin (70) est alimenté par ladite deuxième partie ; ledit trajet (P) s'étendant à travers ledit deuxième bassin (70), de sorte que ledit élément (16) vient en contact thermique avec ladite deuxième partie ; et/ou
ledit circuit fluide (110) comprenant une pompe (114) agencée le long de ladite première ligne fluide (L1) entre une première branche de ladite première ligne fluide (L1), dans laquelle ladite deuxième partie s'écoule en raison de l'action de la gravité, et une seconde branche de ladite première ligne fluide (L1), dans laquelle ladite deuxième partie est poussée par ladite pompe (114) vers ledit deuxième bassin (70).

10. Machine à laver selon la revendication 8 ou 9, comprenant en outre un troisième bassin (74) agencé à l'intérieur de ladite première zone d'échange de chaleur (H1) et configuré pour recevoir et recueillir une

troisième partie du premier milieu de transfert de chaleur chauffé au niveau de ladite première zone d'échange de chaleur (H1) ;
 ledit circuit fluide (110) comprenant une deuxième ligne fluide (L2) reliant de manière fluide ledit troisième bassin (74) audit premier bassin (104), de sorte que ledit premier bassin (104) est alimenté par ladite première partie.

11. Machine à laver selon la revendication 10, comprenant en outre :

- une zone de prélavage (P1) agencée le long dudit trajet (P) en amont de ladite première zone d'échange de chaleur (H1), selon ladite direction d'avancement ;
- un appareil de prélavage (106, 11) agencé le long dudit trajet (P) à l'intérieur de ladite zone de prélavage (P1) et configuré pour laver lesdits récipients (2) ; et
- une troisième ligne fluide (L3) reliant fluidiquement ledit troisième bassin (74) audit appareil de prélavage (106, 11), de sorte que ledit appareil de prélavage (106, 11) est alimenté par une cinquième partie dudit premier milieu de transfert de chaleur retiré dudit troisième bassin (74).

12. Machine à laver selon l'une quelconque des revendications 8 à 11, comprenant en outre un générateur d'ondes ultrasonores (UG) couplé audit premier bassin (104) pour propager des ondes ultrasonores à travers ladite première partie, de sorte que ledit élément (16) reçoit un traitement de nettoyage par ultrasons tout en avançant à travers ledit premier bassin (104).

13. Machine à laver selon l'une quelconque des revendications 7 à 12, comprenant en outre un appareil de rinçage (70 ; 77) agencé à l'intérieur d'au moins l'une desdites première et seconde zones d'échange de chaleur (H1, H2) et configuré pour délivrer un milieu de rinçage vers lesdits récipients (2) et, de préférence, audit élément (16) ; ledit milieu de rinçage faisant partie de manière correspondante de l'un desdits premier et second milieux de transfert de chaleur.

14. Machine à laver selon la revendication 13, lorsqu'elle dépend de la revendication 9, ledit appareil de rinçage (70 ; 77) comprenant :

- ledit deuxième bassin (70) destiné à contenir ledit milieu de rinçage et agencé le long dudit trajet (P), de telle sorte que ledit élément (16) avance, en cours d'utilisation, à travers ledit deuxième bassin (70) en entrant en contact avec ledit milieu de rinçage ; et/ou

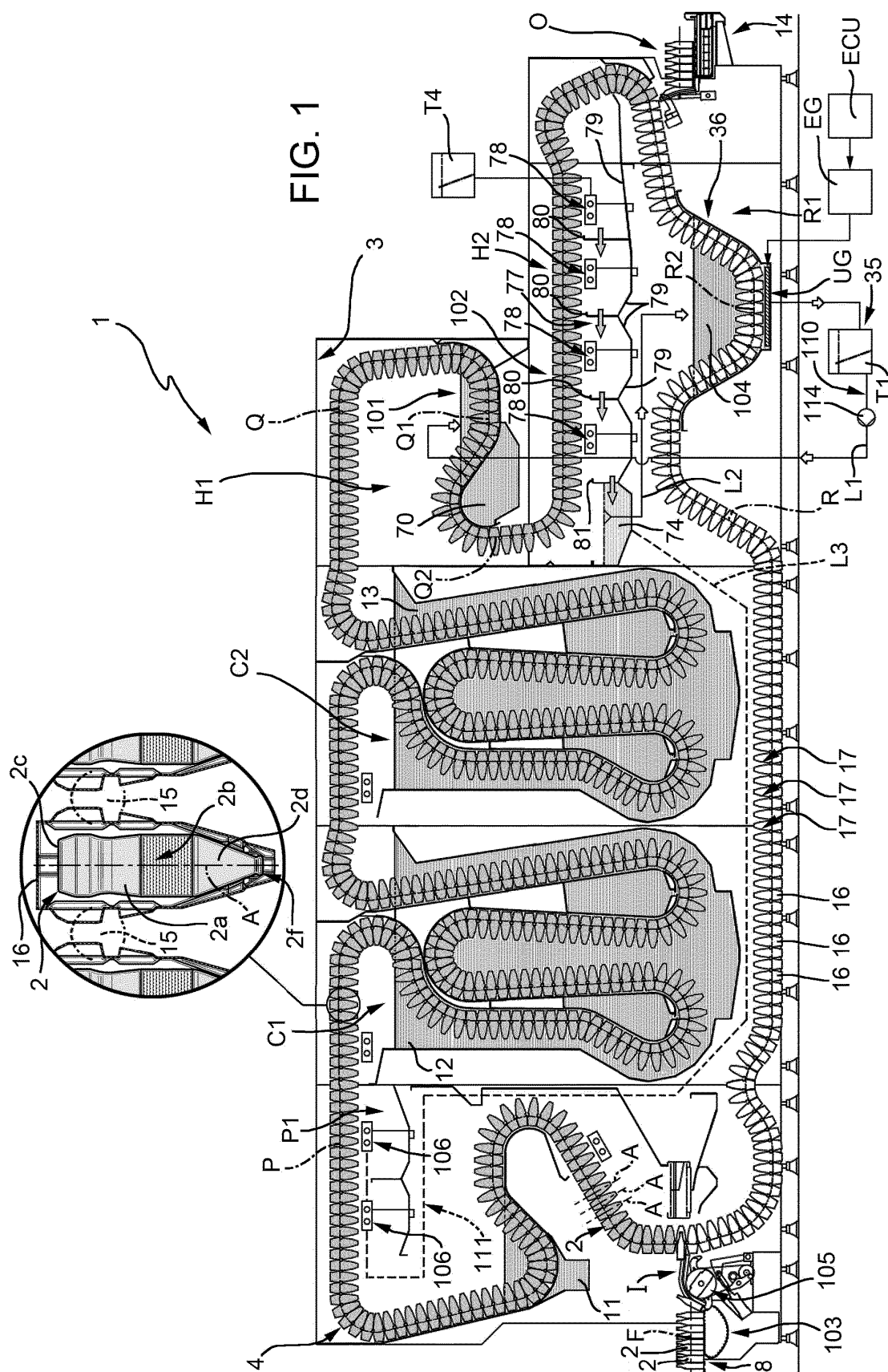
- au moins un ensemble d'éjection (77) configuré pour diriger des aspersion dudit milieu de rinçage vers lesdits récipients (2) et ledit élément (16) ;

ledit ensemble d'éjection (77) comprenant, en particulier, une pluralité de dispositifs d'aspersion (78) et une pluralité respective de quatrièmes bassins (79) agencés au-dessous desdits dispositifs d'aspersion correspondants, reliés de manière fluide auxdits dispositifs d'aspersion correspondants, et communiquant de manière fluide les uns avec les autres par des déversoirs (80).

15. Machine à laver selon l'une quelconque des revendications 7 à 14, ledit convoyeur (4) comprenant :

- une pluralité de profilés (16) appropriés pour porter des rangées respectives desdits récipients (2) et s'étendant transversalement audit trajet (P) ; et
- une chaîne de transport (15) s'étendant parallèlement audit trajet (P) et configurée pour transporter lesdits profilés (16) le long dudit trajet (P) ;

lesdits profilés (16) définissant une pluralité respective desdits éléments (16) pour échanger de la chaleur avec lesdits premier et second milieux de transfert de chaleur.



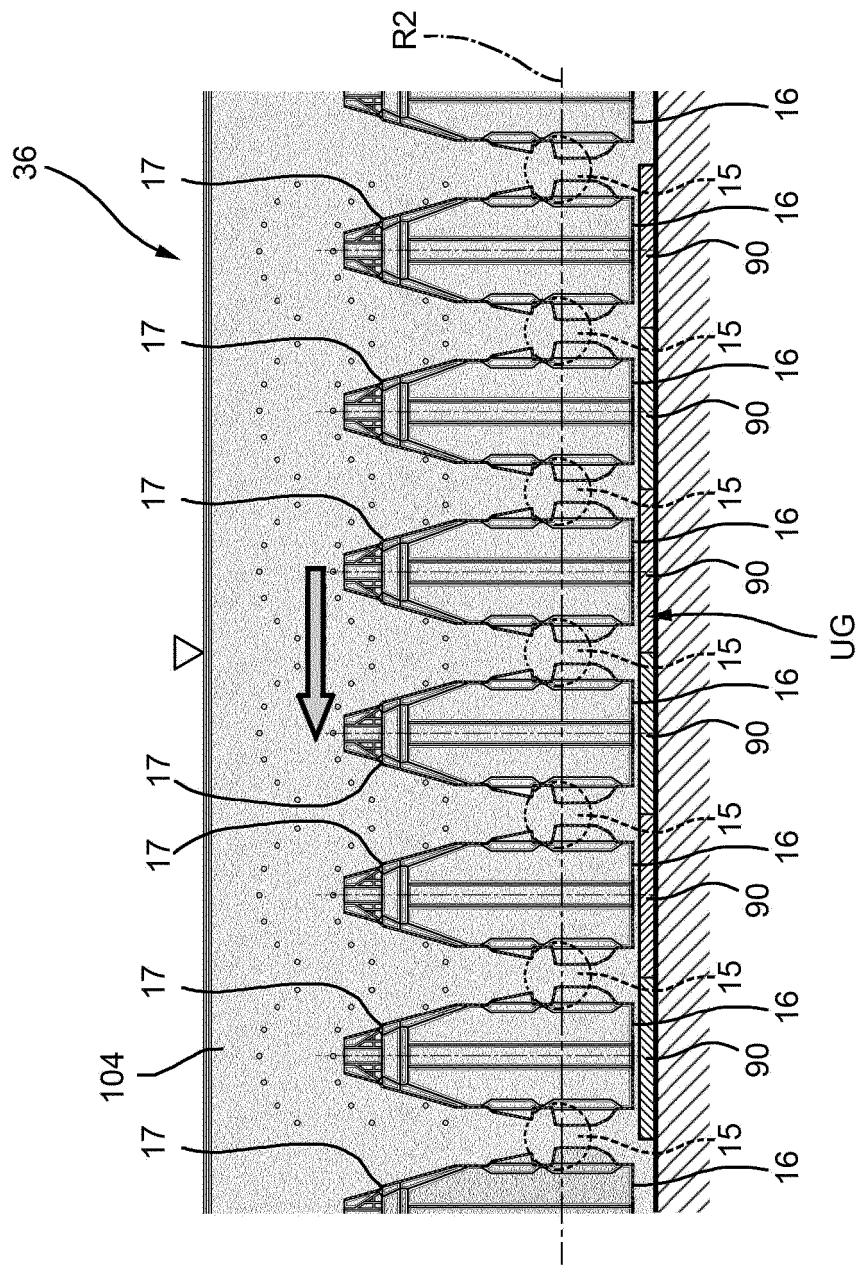


FIG. 2

REFERENCES CITED IN THE DESCRIPTION

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