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(54) **DISHWASHING MACHINE**
GESCHIRRSPÜLMASCHINE
LAVE-VAISSELLE

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Description

[0001] The present invention relates to a dishwashing machine.

[0002] More specifically, the present invention relates to a rack-type dishwashing machine, to which the following description will make explicit reference without however losing in generality.

[0003] As is known, a rack-type dishwashing machine, also called tunnel dishwashing machine, basically comprises: a boxlike outer casing provided with a rectilinear, pass-through tunnel extending substantially horizontally within the casing; and a linear conveyor adapted to advance a succession of dishwasher racks along the pass-through tunnel. A washing station and a rinsing station are moreover arranged one downstream the other inside the pass-through tunnel, so as to be crossed in succession by each dishwasher rack travelling inside the pass-through tunnel.

[0004] At the washing station, a number of high-pressure jets of hot water at nearly 60°C mixed with detergent/s are directed towards the dishwasher rack momentarily located at washing station, so as to remove the filth from the dishware in said dishwasher rack. At the rinsing station, a number of high-pressure jets of hot water at nearly 80°C mixed with rinse agent/s are directed towards the dishwasher rack momentarily located at rinsing station, so as to remove any residual of detergent/s from the dishware in said dishwasher rack and sanitize the same dishware.

[0005] More in particular, inside the segment of the tunnel corresponding to the washing station, the rack-type dishwashing machine generally comprises: a large washing-water catchment sink which is arranged on the bottom of the tunnel for collecting and accumulating the mixture of water and detergent/s trickling down from the dishware in the dishwasher rack; a number of washing nozzles which are arranged above and beneath the moving path of the dishwasher racks, and are oriented so as to direct the corresponding water jets towards the dishwasher rack momentarily located at rinsing station; a water-circulating pump that sucks the mixture of water and detergent/s from the aforesaid catchment sink and feeds said mixture towards the washing nozzles with a pressure of usually 2-3 bars; and one or more resistors that are located inside the washing-water catchment sink for selectively heating up the mixture of water and detergent/s momentarily contained into the washing-water catchment sink.

[0006] Inside the segment of the tunnel corresponding to the rinsing station, the rack-type dishwashing machine additionally comprises: a rinsing-water catchment sink which is arranged on the bottom of the tunnel for collecting and accumulating the mixture of water and rinse agent/s trickling down from the dishes in the dishwasher rack; a number of rinsing nozzles which are arranged above and beneath the moving path of the dishwasher racks, and are oriented so as to direct the corresponding

water jets towards the dishwasher rack momentarily located at rinsing station; a boiler that receives the fresh water from the water mains and is adapted to continuously heat up said fresh water at a temperature usually above 80°C; and a second water-circulating pump that sucks a mixture of hot water and rinse agent/s from said boiler and feeds it towards the rinsing nozzles with a pressure of usually 2-3 bars.

[0007] Finally the rack-type dishwashing machine includes a bypass pump that moves the mixture of water and rinse agent/s that accumulates into the rinsing-water catchment sink, from the rinsing-water catchment sink to the washing-water catchment sink. The fresh water used for rinsing the dishware, therefore, is afterward used for washing the dishware, thus reducing the fresh-water consumption.

[0008] In the recent years, the aforesaid layout has been deeply modified to further improve the washing performances of the rack-type dishwashing machines.

[0009] More specifically, the newest models of rack-type dishwashing machine are provided, along the segment of the tunnel corresponding to the rinsing station, with two discrete rinsing-water catchment sinks that are arranged on the bottom of the tunnel, one downstream the other.

[0010] The first rinsing-water catchment sink is located immediately upstream of the outlet of the tunnel and is adapted to collect and accumulate the mixture of water and rinse agent/s projected from the rinsing nozzles arranged above the same catchment sink. The second rinsing-water catchment sink is located between the first rinsing-water catchment sink and the washing-water catchment sink, and is adapted to collect and accumulate the mixture of water and rinse agent/s projected from a number of auxiliary pre-rinsing nozzles located above the same catchment sink.

[0011] These rack-type dishwashing machines are additionally provided with a third water-circulating pump that sucks the mixture of water and detergent/s from the first rinsing-water catchment sink and feeds said mixture towards the pre-rinsing nozzles with a pressure of usually 2-3 bars.

[0012] The bypass pump, in turn, moves the mixture of water and rinse agent/s that accumulates into the second rinsing-water catchment sink, from the second rinsing-water catchment sink to the washing-water catchment sink.

[0013] Document EP 2 772 178 A1 discloses a rack-type dishwashing machine comprising a washing station with two discrete washing-liquid catchment sinks and a rinsing station with two discrete rinsing-water catchment sinks; the rinsing station also comprises pre-rinsing nozzles arranged above the upstream rinsing-water catchment sink and final-rinsing nozzles arranged above the downstream rinsing-water catchment sink, said nozzles spraying the rinsing water coming from the respective above catchment sink.

[0014] Aim of the present invention is to further reduce

the fresh-water consumption of these new rack-type dishwashing machines, additionally improving the washing performances while also reducing the electricity power consumption of the dishwashing machine.

[0015] In compliance with the above aim, according to the present invention it is provided a dishwashing machine comprising: an outer casing which is provided with a pass-through tunnel extending substantially horizontally within said casing; and a linear conveyor adapted to advance a succession of dishwasher racks along the pass-through tunnel;

the pass-through tunnel having a washing section wherein jets of a washing liquid are directed towards a dishwasher rack momentarily traveling inside the washing section, and a rinsing section which is located downstream of the washing section and wherein jets of a rinsing liquid are directed towards a dishwasher rack momentarily travelling inside the rinsing section;

inside the washing section, the dishwashing machine comprising: a first catchment sink which is arranged on the bottom of the tunnel so as to collect and accumulate the washing liquid trickling down from a dishwasher rack momentarily traveling inside the washing section; a number of washing nozzles which are arranged above the catchment sink and are oriented so as to direct jets of washing liquid towards a dishwasher rack momentarily traveling inside the washing section; and a washing-liquid feed line adapted to feed the washing liquid accumulated into the first catchment sink towards the washing nozzles; inside the rinsing section, the dishwashing machine comprising: a second and a third catchment sinks which are arranged on the bottom of the tunnel one downstream the other, so as to separately collect and accumulate the washing liquid trickling down from a dishwasher rack momentarily traveling above said second and third catchment sinks; a number of final rinsing nozzles which are arranged above the third catchment sink and are oriented so as to direct corresponding jets of rinsing liquid towards a dishwasher rack momentarily traveling inside the rinsing section, above the third catchment sink; a first rinsing-liquid feed line adapted to feed the rinsing liquid towards the final rinsing nozzles; a number of pre-rinsing nozzles which are arranged above the second catchment sink and are oriented so as to direct corresponding jets of rinsing liquid towards a dishwasher rack momentarily travelling inside the rinsing section, above the second catchment sink; and a second rinsing-liquid feed line which is adapted to feed the rinsing liquid accumulated into the second catchment sink towards the pre-rinsing nozzles;

the dishwashing machine being characterized in that the third catchment sink is connected to the second catchment sink via an overflow assembly which is structured to automatically channel, from third catchment sink to second catchment sink, the rinsing liquid contained into the third catchment sink and exceeding a given threshold level; and in that said second rinsing-liquid feed line is additionally adapted to feed the rinsing liquid accumulat-

ed into the second catchment sink also towards the third catchment sink.

[0016] Preferably, though not necessarily, the dishwashing machine is furthermore characterized in that said second and third catchment sinks are adjacent to one another; and in that the dishwashing machine additionally comprises, inside the rinsing section: a number of intermediate rinsing nozzles which are substantially vertically aligned above the border between said second and said third catchment sinks, and are oriented so as to direct the corresponding jets of rinsing liquid towards a dishwasher rack momentarily located inside the rinsing section, astride the second and third catchment sinks; and a third rinsing-liquid feed line which is adapted to feed the rinsing liquid accumulated into the third catchment sink towards said intermediate rinsing nozzles.

[0017] Preferably, though not necessarily, the dishwashing machine is furthermore characterized in that said overflow assembly includes: a connecting pipe that puts the third catchment sink in fluid communication with the second catchment sink, so as to allow the rinsing liquid to flow from the third catchment sink to second catchment sink; and an overflow member which is fitted into the third catchment sink, is coupled to said connecting pipe in watertight and manually detachable manner, and is structured to automatically channel, into said connecting pipe, the rinsing liquid contained into the third catchment sink and exceeding said threshold level.

[0018] Preferably, though not necessarily, the dishwashing machine is furthermore characterized in that a drain line branches off from the third catchment sink and said overflow member is structured to additionally obstruct/block up said drain line when coupled to the connecting pipe.

[0019] Preferably, though not necessarily, the dishwashing machine is furthermore characterized in that the third catchment sink is provided with a drain sumps; in that the connecting pipe branches off from said drain sump; and in that the overflow member is coupled in detachable manner to the connecting pipe within said drain sump.

[0020] Preferably, though not necessarily, the dishwashing machine is furthermore characterized in that also the second catchment sink is provided with a corresponding drain sump, and in that the connecting pipe puts the drain sump of the third catchment sink in permanent fluid communication with the drain sump of said second catchment sink.

[0021] Preferably, though not necessarily, the dishwashing machine is furthermore characterized by additionally comprising an on-off valve connecting the third catchment sink to a drain piping for allowing selective emptying of said second and third catchment sinks.

[0022] Preferably, though not necessarily, the dishwashing machine is furthermore characterized in that said on-off valve is interposed between said drain piping and the drain sump of said third catchment sink.

[0023] Preferably, though not necessarily, the dish-

washing machine is furthermore characterized in that said second rinsing-liquid feed line comprises: a first circulating pump which sucks the rinsing liquid from the second catchment sink, and feeds said rinsing liquid to both the pre-rinsing nozzles and the third catchment sink with a given pressure; and a first filtering assembly located upstream of the suction mouth of said first circulating pump, and is structured to hold/block almost any solid contaminants in suspension in the rinsing liquid directed towards the first circulating pump.

[0024] Preferably, though not necessarily, the dishwashing machine is furthermore characterized in that said third rinsing-liquid feed line comprises: a second circulating pump which sucks the rinsing liquid from the third catchment sink, and feeds said rinsing liquid to the intermediate rinsing nozzles with a given pressure; and a second filtering assembly located upstream of the suction mouth of said second circulating pump, and is structured to hold/block almost any solid contaminants in suspension in the rinsing liquid directed towards the second circulating pump

[0025] Preferably, though not necessarily, the dishwashing machine is furthermore characterized by additionally comprising a rinsing-liquid transfer line which is adapted to feed the rinsing liquid accumulating into the second catchment sink directly towards the first catchment sink.

[0026] Preferably, though not necessarily, the dishwashing machine is furthermore characterized in that said rinsing-liquid transfer line comprises: a third circulating pump which sucks the rinsing liquid from the second catchment sink, and feeds said rinsing liquid directly to the first catchment sink with a given pressure; and a third filtering assembly which is located upstream of the suction mouth of said third circulating pump, and is structured to hold/block any solid contaminants in suspension in the rinsing liquid directed towards said third circulating pump.

[0027] Preferably, though not necessarily, the dishwashing machine is furthermore characterized in that said first circulating pump and said third circulating pump share a same filtering assembly.

[0028] Preferably, though not necessarily, the dishwashing machine is furthermore characterized by additionally comprising a first heating device capable of heating up the rinsing liquid contained into the second catchment sink.

[0029] Preferably, though not necessarily, the dishwashing machine is furthermore characterized by additionally comprising a first temperature sensor capable of determining the temperature of the rinsing liquid contained into the second catchment sink.

[0030] Preferably, though not necessarily, the dishwashing machine is furthermore characterized by additionally comprising a first level sensor capable of determining the level of the rinsing liquid contained into the second catchment sink.

[0031] Preferably, though not necessarily, the dish-

washing machine is furthermore characterized by additionally comprising a second heating device capable of heating up the washing liquid contained into the first catchment sink.

[0032] Preferably, though not necessarily, the dishwashing machine is furthermore characterized by additionally comprising a second temperature sensor capable of determining the temperature of the washing liquid contained into the first catchment sink.

[0033] Preferably, though not necessarily, the dishwashing machine is furthermore characterized by additionally comprising a second level sensor capable of determining the level of the washing liquid contained into the first catchment sink.

[0034] Preferably, though not necessarily, the dishwashing machine is furthermore characterized by additionally comprising a second overflow assembly which is structured to automatically drain, from the first catchment sink, the washing liquid exceeding a given maximum level and to channel said washing liquid in excess towards a drain line.

[0035] Preferably, though not necessarily, the dishwashing machine is furthermore characterized in that the dishwashing machine additionally comprises a boiler which receives the fresh water from the water mains, and is adapted to continuously heat up said fresh water at a given temperature; and in that said first rinsing-liquid feed line is adapted to feed/channel the hot water of the boiler towards the final rinsing nozzles with a given pressure.

[0036] A non-limiting embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

- Figure 1 is a perspective view of a rack-type dishwashing machine realized in accordance with the teachings of the present invention, with parts in section and parts removed for clarity;
- Figures 2 is a sectioned perspective view of the central section of the rack-type dishwashing machine shown in Figure 1, with parts removed for clarity;
- Figures 3 is a schematic view of the hydraulic circuits of the rack-type dishwashing machine shown in Figure 1; and
- Figures 4 is a side view of a portion of the central section of the rack-type dishwashing machine shown in Figure 2, sectioned along the vertical midplane of the machine and with parts removed for clarity;
- Figures 5 is an enlarged perspective view of a part of the central section of the rack-type dishwashing machine shown in Figure 2, sectioned along the vertical midplane of the machine and with parts removed for clarity;
- Figures 6 is a sectioned perspective view of part of the central section of the rack-type dishwashing machine shown in Figure 2, sectioned perpendicularly to the vertical midplane of the machine and with parts removed for clarity;
- Figures 7 is an enlarged perspective view of part of

the central section of the rack-type dishwashing machine shown in Figure 2, sectioned along the vertical midplane of the machine and with parts removed for clarity;

- Figures 8 is an enlarged view of part of the central section of the rack-type dishwashing machine shown in Figure 2, with parts removed for clarity.

[0037] With reference to Figures 1 and 2, reference number 1 denotes as a whole a rack-type dishwashing machine particularly adapted to rapidly wash up and rinse a succession of known dishwasher racks 100 each accommodating some dishware, cutlery or the like.

[0038] The dishwashing machine 1 basically comprises: a preferably substantially parallelepiped-shaped, boxlike outer casing 2 which is provided with a preferably substantially rectilinear, pass-through tunnel 3 extending preferably substantially horizontally within the outer casing 2; and a preferably electrically-powered, linear conveyor 4 adapted to advance a succession of dishwasher racks 100 along the pass-through tunnel 3.

[0039] More specifically, the dishwashing machine 1 preferably includes: a main washing unit 5 which is adapted to wash up with a specific washing liquid and subsequently rinse the contents of each dishwasher rack 100 travelling inside the pass-through tunnel 3; and optionally also one or more auxiliary modular units which are discrete from washing unit 5 and are coupled to the washing unit 5, either upstream or downstream of the washing unit 5.

[0040] In other words, the dishwashing machine 1 is preferably divided into a number of discrete modular units coupled to one another, so as to make up the pass-through tunnel 3, and to be crossed in succession by the dishwasher racks 100 travelling inside the pass-through tunnel 3.

[0041] Preferably, these one or more auxiliary modular units additionally include one or more pre-wash units 6 (one in the example shown) and/or a drying unit 7.

[0042] More specifically, the one or more pre-wash units 6 are arranged upstream of the washing unit 5, preferably adjoined to one another, and are adapted to wash up, preferably with cold or warm water, the contents of each dishwasher rack 100 travelling inside the pass-through tunnel 3. The drying unit 7, in turn, is arranged downstream of the washing unit 5, preferably adjoined to the latter, and is adapted to rapidly dry the contents of each dishwasher rack 100 travelling inside the pass-through tunnel 3.

[0043] Preferably the linear conveyor 4 is furthermore a rollers conveyor or a twin chain conveyor.

[0044] With reference to Figures 1 and 2, the portion of pass-through tunnel 3 preferably extending inside/delimited by the washing unit 5 is additionally divided into one or more washing sections 8 (one in the example shown) and one or more rinsing sections 9 (one in the example shown) arranged one downstream the other, so as to be crossed in succession by each dishwasher rack

100 travelling inside the pass-through tunnel 3.

[0045] At washing section 8 of tunnel 3, a number of high-pressure jets of a relatively-hot washing liquid are directed towards the dishwasher rack 100 momentarily traveling inside the washing section 8, so as to remove the filth from the dishware placed inside said dishwasher rack 100. Furthermore the washing liquid is preferably a mixture of hot water and one or more detergent agents, and the temperature of the washing liquid preferably ranges between 60°C and 70°C.

[0046] At rinsing section 9 of tunnel 3, a number of high-pressure jets of a hot rinsing liquid are directed towards the dishwasher rack 100 momentarily travelling inside the rinsing section 9, so as to remove any residual of washing liquid from the dishware placed inside said dishwasher rack 100 and preferably also sanitize the same dishware.

[0047] Furthermore, the rinsing liquid is preferably hot water or a mixture of hot water and one or more rinsing agents, and the temperature of the washing liquid preferably ranges between 70°C and 90°C

[0048] More in detail, with reference to Figures 2, 3 and 4, the dishwashing machine 1 preferably comprises, inside the washing section 8 of tunnel 3: a first, relatively large, preferably rectangular-shaped, catchment sink 10 which is arranged on the bottom of tunnel 3 so as to collect and accumulate the washing liquid trickling down from the dishwasher rack 100 momentarily traveling inside the washing section 8; and a number of washing nozzles 11 which are arranged above the catchment sink 10, preferably above and beneath the moving path P of the dishwasher racks 100, and are oriented so as to direct the corresponding jets of washing liquid towards the dishwasher rack 100 momentarily traveling inside the washing section 8.

[0049] Furthermore the dishwashing machine 1 additionally comprises a washing-liquid feed line 12 which is adapted to feed the washing liquid accumulated into the catchment sink 10 towards the washing nozzles 11 with a given pressure preferably ranging between 1,5 and 3 bars.

[0050] With reference to Figure 3, in the example shown, in particular, the feed line 12 preferably includes: a preferably electrically-powered, circulating pump 13 which sucks the washing liquid from the catchment sink 10, and feeds said washing liquid to the washing nozzles 11, preferably with a pressure ranging between 1,5 and 3 bars; and optionally also a filtering assembly 14 which is located upstream of the suction mouth of circulating pump 13, and is structured to hold/block almost any solid contaminants in suspension in the washing liquid directed towards the circulating pump 13, such as relatively big foodstuff particulates and the like.

[0051] Preferably, the filtering assembly 14 is furthermore fitted/accommodated, preferably in manually removable manner, into a drain sump 15 present on the bottom of catchment sink 10. The circulating pump 13, in turn, is preferably connected to the drain sump 15 for

sucking the washing liquid from the inside of drain sump 15.

[0052] In addition to the above, the dishwashing machine 1 additionally comprises: a heating device 16 capable of heating up the washing liquid contained into the catchment sink 10; and preferably also a temperature sensor 17 capable of determining the current temperature of the washing liquid contained into the catchment sink 10.

[0053] More specifically, in the example shown the heating device 16 preferably basically comprises: one or more resistors which are located inside the catchment sink 10, preferably close to the bottom of the latter; and an electric power unit (not shown) that supplies electric current to the resistors, preferably while controlling the value of said electric current on the basis of the electronic signals of the temperature sensor 17.

[0054] With reference to Figures 2, 3 and 4, the dishwashing machine 1 is moreover provided with an overflow assembly 18 which is fitted or incorporated into the catchment sink 10 and is structured to automatically drain, from catchment sink 10, the washing liquid exceeding a given maximum level and to channel said washing liquid in excess towards a drain piping 19 preferably communicating with an external sewage system.

[0055] Preferably, the dishwashing machine 1 additionally comprises: a level sensor 20 capable of determining the current level of the washing liquid contained into the catchment sink 10; and/or a preferably electrically-operated, on-off valve 21 connecting the catchment sink 10 to the drain piping 19 for allowing selective drain of the washing liquid of catchment sink 10 towards the drain piping 19, thus to selectively empty the catchment sink 10.

[0056] More specifically, in the example shown the on-off valve 21 preferably connects the drain sump 15 of catchment sink 10 to the drain piping 19 of dishwashing machine 1.

[0057] With reference to Figures 2 to 8, inside the rinsing section 9 of tunnel 3 the dishwashing machine 1 additionally preferably comprises: a second and a third, preferably rectangular-shaped, catchment sinks 22 and 23 which are arranged on the bottom of tunnel 3 one downstream and adjacent the other, so as to separately collect and accumulate the washing liquid trickling down from the dishwasher rack 100 momentarily traveling above the same catchment sinks 22 and 23; a number of final rinsing nozzles 24 which are arranged above catchment sink 23, i.e. the catchment sink farthest from catchment sink 10, preferably above and beneath the moving path of the dishwasher racks 100, and are oriented so as to direct the corresponding jets of rinsing liquid towards the dishwasher rack 100 momentarily traveling inside the rinsing section 9, above the same catchment sink 23; and a first rinsing-liquid feed line 25 adapted to feed the rinsing liquid towards the final rinsing nozzles 24 with a given pressure preferably ranging between 1,5 and 3 bars.

[0058] The dishwashing machine 1 preferably comprises a boiler 26 which receives the fresh water preferably from the water mains, and is adapted to continuously heat up said fresh water at a given temperature preferably above 80°C; and the feed line 25 is preferably adapted to feed/channel the hot water of the boiler 26 towards the final rinsing nozzles 24 with a given pressure preferably ranging between 1,5 and 3 bars, optionally while also mixing one or more rinsing agents to the hot water flowing towards the final rinsing nozzles 24.

[0059] More in detail, in the advantageous example shown, the boiler 26 is preferably an air-tight closed container that preferably receives pressurized fresh water with a given pressure preferably ranging between 1,5 and 3 bars, from a second, preferably electrically-powered, circulating pump 27 which, in turn, sucks the fresh water from an air-gap container 28 that receives a flow of, preferably cold, fresh water from the water mains.

[0060] In other words, the air-gap container 28 is connected/connectable to the water mains via a fresh water supply line, and this fresh water supply line preferably includes a preferably electrically-operated, on-off valve 29.

[0061] Preferably the boiler 26 additionally includes a temperature sensor 30 capable of determining the current temperature of the fresh water contained into the boiler 26.

[0062] In addition to the above, the dishwashing machine 1 is preferably additionally provided with a recirculation line 31 which channels part of the fresh water coming out from the delivery mouth of circulation pump 27, back towards the air-gap container 28. This recirculation line 31 preferably includes a flowrate reducer.

[0063] The air-gap container 28, in turn, preferably comprises: an open-to-air water tank 32 wherein the cold fresh water arriving from the water mains accumulates; and optionally also an overflow assembly 33 which is fitted/incorporated into the water tank 32 and is structured to automatically drain, from water tank 32, the fresh water exceeding a given maximum level and channel said fresh water towards the drain piping 19.

[0064] Furthermore, the air-gap container 28 preferably includes: a temperature sensor 34 capable of determining the current temperature of the fresh water contained into the water tank 32; and/or a level sensor 35 capable of determining the current level of the fresh water contained into the same water tank 32.

[0065] With reference to Figure 3, preferably the dishwashing machine 1 moreover comprises, between boiler 26 and circulating pump 27: a one-way valve 36 or other back-flow prevention device which allows the pressurized fresh water to solely flow from circulating pump 27 to boiler 26; and optionally also an energy saving device 37 which is adapted to pre-heat the pressurized fresh water flowing towards the boiler 26.

[0066] In the example shown, in particular, the energy saving device 37 preferably, though not necessarily, consists in one or more heat exchangers capable of trans-

ferring heat from the hot air previously used for drying the dishes inside the drying unit 7, to the pressurized fresh water flowing towards the boiler 26.

[0067] Preferably, a further temperature sensor 38 is arranged between the energy saving device 37 and the boiler 26. This temperature sensor is capable of determining the current temperature of the fresh water entering into the boiler 26.

[0068] With reference to Figure 3, the rinsing-liquid feed line 25 in turn preferably includes: an electronically-controlled, solenoid valve 40 capable of regulating the flowrate of the hot rinsing liquid, or better the hot fresh water possibly mixed with rinsing agent/s, directed towards the final rinsing nozzles 24; and optionally also a flow meter 41 capable of determining the current flowrate of the hot rinsing liquid, i.e. the hot fresh water possibly mixed with rinsing agent/s, directed towards the final rinsing nozzles 24.

[0069] With reference to Figures 2 to 6, the dishwashing machine 1, or better the main washing unit 5 of dishwashing machine 1, preferably additionally comprises: a number of intermediate rinsing nozzles 42 which are substantially vertically aligned above the border between catchment sink 22 and catchment sink 23, preferably above and beneath the moving path P of the dishwasher racks 100, and are oriented so as to direct the corresponding jets of rinsing liquid towards the dishwasher rack 100 momentarily located inside the rinsing section 9, astride the catchment sinks 22 and 23; and a second rinsing-liquid feed line 43 which is adapted to feed the hot rinsing liquid accumulated into the catchment sink 23 towards the intermediate rinsing nozzles 42 with a given pressure preferably ranging between 1,5 and 3 bars.

[0070] Due to the particular position of the intermediate rinsing nozzles 42, the hot rinsing liquid projected by the intermediate rinsing nozzles 42, after bumping into the contents of dishwasher rack 100, trickles partly inside catchment sink 22 and partly inside catchment sink 23.

[0071] In the example shown, in particular, the feed line 43 preferably includes: a preferably electrically-powered, circulating pump 44 which sucks the rinsing liquid from the catchment sink 23, and feeds said rinsing liquid to the intermediate rinsing nozzles 42 preferably with a pressure ranging between 1,5 and 3 bars; and optionally also a filtering assembly 45 which is located upstream of the suction mouth of circulating pump 44, and is structured to hold/block almost any solid contaminants in suspension in the hot rinsing liquid directed towards the circulating pump 44.

[0072] More specifically, catchment sink 23 preferably has, on the bottom, a drain sump 46 and the circulating pump 44 of feed line 43 preferably sucks the rinsing liquid from the inside of drain sump 46. Preferably the filtering assembly 45 is furthermore fitted/accommodated, preferably in manually removable manner, into drain sump 46.

[0073] Moreover rinsing-liquid feed line 43 preferably additionally includes a flow meter 47 capable of deter-

mining the current flowrate of the hot rinsing liquid, or better of the hot fresh water possibly mixed with rinsing agent/s, directed towards the intermediate rinsing nozzles 42.

[0074] With reference to Figures 2, 3, 4 and 5, the dishwashing machine 1 preferably additionally comprises a second drain line 48 which connects the catchment sink 23 to the drain piping 19 and which preferably includes a preferably electrically-operated, on-off valve 49 that allows selective drain of the rinsing liquid of catchment sink 23 into drain piping 19, thus to selectively empty the catchment sink 23.

[0075] More specifically, in the example shown the drain line 48 preferably connects the drain sump 46 of catchment sink 23 to the drain piping 19. In other words, the on-off valve 49 is preferably interposed between the drain sump 46 of catchment sink 23 and the drain piping 19.

[0076] With reference to Figures 2 to 7, the dishwashing machine 1, or better the washing unit 5 of dishwashing machine 1, additionally includes a second overflow assembly 50 which is fitted or incorporated into catchment sink 23 and is structured to automatically channel, from catchment sink 23 to catchment sink 22, the rinsing liquid contained into catchment sink 23 and exceeding a given threshold level.

[0077] In other words, catchment sink 23 is fluidically connected to catchment sink 22 via an overflow assembly 50 which is structured to automatically channel, from catchment sink 23 to catchment sink 22, the rinsing liquid contained into catchment sink 23 and exceeding a given threshold level.

[0078] Preferably, this overflow assembly 50 additionally includes: a connecting pipe 51 that puts catchment sink 23 in permanent fluid communication with catchment sink 22, so as to allow the rinsing liquid to freely flow from catchment sink 23 to catchment sink 22; and an overflow member 52 which is fitted or incorporated into catchment sink 23, is coupled to connecting pipe 51 in watertight and easy manually detachable manner, and is structured to automatically channel, into connecting pipe 51, the rinsing liquid contained into catchment sink 23 and exceeding said threshold level.

[0079] Furthermore, connecting pipe 51 preferably branches off from the drain sump 46 of catchment sink 23, and the overflow member 52 is preferably coupled in manually detachable manner to connecting pipe 51 within drain sump 46.

[0080] Preferably, catchment sink 23 furthermore directly communicates with the drain piping 19 via an auxiliary drain line 53 that branches off from the drain sump 46, and the overflow member 52 is structured to additionally obstruct/block up said auxiliary drain line 53 when coupled to connecting pipe 51. Thus, when overflow member 52 is detached from connecting pipe 51, the rinsing liquid contained into catchment sink 23 is allowed to freely flow into drain piping 19 via drain line 53.

[0081] In addition to the above, also catchment sink 22

preferably has, on the bottom, a drain sump 54, and connecting pipe 51 preferably extends from drain sump 46 to drain sump 54 so as to put the drain sumps 46 and 53 in fluid communication to one another. Thus, when on-off valve 49 is set in the opened position and/or the overflow member 52 is detached from connecting pipe 51, the rinsing liquid contained into both catchment sinks 22 and 23 is allowed to freely flow into drain piping 19.

[0082] With particular reference to Figure 7, in the examples shown the filtering assembly 45 preferably includes a cup-shaped member which has a water-permeable structure, and is fitted in watertight and manually removable manner into the upper mouth of drain sump 46, to close the drain sump 46.

[0083] Connecting pipe 51, in turn, preferably branches off directly from a preferably substantially vertically-oriented, tubular section/extension 46a formed in the bottom of drain sump 46, and the overflow member 52 preferably comprises, or better consists of, a straight pipe segment which extends substantially vertically, preferably engages in pass-through manner the filtering assembly 45, and is finally fitted in watertight and removable manner directly into the upper mouth of tubular section 46a.

[0084] In the example shown, in particular, tubular section 46a of drain sump 46 is preferably substantially cylindrical in shape, and cross-section of straight pipe segment 52 is preferably substantially complementary in shape to that of tubular section 46a.

[0085] Preferably the lower mouth of tubular section 46a, furthermore, directly communicates with the auxiliary drain line 53, and the lower end 52a of pipe segment 52 is preferably shaped to obstruct in watertight manner the inside of tubular section 46a, underneath/downstream of the joining point with connecting pipe 51, so as to be capable of channelling the rinsing liquid solely towards connecting pipe 51.

[0086] With reference to Figure 3, optionally the dishwashing machine 1, or better the main washing unit 5 of dishwashing machine 1, moreover includes an auxiliary overflow assembly 55 which is preferably fitted/incorporated into catchment sink 23 and is structured to automatically drain, from catchment sink 23, the rinsing liquid exceeding a given maximum level and to channel the rinsing liquid in excess towards the drain piping 19. Obviously this maximum level is furthermore greater/higher than the aforesaid threshold level.

[0087] With reference to Figures 2, 3 and 4, the dishwashing machine 1, or better the main washing unit 5 of dishwashing machine 1, preferably additionally comprises: a number of pre-rinsing nozzles 58 which are vertically aligned above the catchment sink 22, preferably above and beneath the moving path P of the dishwasher racks 100, and are oriented so as to direct the corresponding jets of rinsing liquid towards the dishwasher rack 100 momentarily travelling inside the rinsing section 9, above the catchment sink 22; and, preferably, a third rinsing-liquid feed line 59 which is adapted to feed the

rinsing liquid accumulated into the catchment sink 22 towards the pre-rinsing nozzles 58 and additionally also back towards the catchment sink 23, with a given pressure, preferably ranging between 1,5 and 3 bars.

[0088] In other words, catchment sink 22 is in, preferably permanent, fluid communication with catchment sink 23 via the overflow assembly 50, and the rinsing-liquid feed line 59 is adapted to, preferably continuously, channel part of the rinsing liquid accumulated into catchment sink 22 back towards catchment sink 23.

[0089] Preferably, the feed line 59 is furthermore structured to feed the rinsing liquid towards the pre-rinsing nozzles 58 and towards the catchment sink 23 with a given flowrate-partition ratio.

[0090] More in detail, the flowrate of the rinsing liquid directed towards catchment sink 23 is preferably at least twice greater than the flowrate of rinsing liquid directed towards catchment sink 23 the pre-rinsing nozzles 58.

[0091] With reference to Figures 3, 5 and 8, additionally the dishwashing machine 1, or better the main washing unit 5 of dishwashing machine 1, preferably includes a rinsing-liquid transfer line 60 which is adapted to move/feed the rinsing liquid accumulating into the catchment sink 22 directly towards the catchment sink 10.

[0092] Preferably, the dishwashing machine 1 moreover comprises: a heating device 61 capable of heating up the rinsing liquid contained into the catchment sink 22; and optionally also a temperature sensor 62 which is capable of determining the current temperature of the rinsing liquid contained into the catchment sink 22.

[0093] More specifically, in the example shown, the heating device 61 preferably basically includes one or more resistors which are located inside the catchment sink 22, preferably close to the bottom of the latter; and an electric power unit (not shown) that supplies electric current to the resistors, preferably while controlling the value of said electric current on the basis of the electronic signals of the temperature sensor 62.

[0094] With reference to Figure 2, preferably the dishwashing machine 1 is additionally provided with a further level sensor 63 capable of determining the current level of the rinsing liquid contained into the catchment sink 22.

[0095] With reference to Figures 3, 4, 5 and 8, the rinsing-liquid feed line 59 preferably includes: a preferably electrically-powered, circulating pump 65 which sucks the rinsing liquid from catchment sink 22, and feeds said rinsing liquid to both the pre-rinsing nozzles 58 and the catchment sink 23, preferably with a pressure ranging between 1,5 and 3 bars; and optionally also a filtering assembly 66 which is located upstream of the suction mouth of circulating pump 65, and is structured to hold/block almost any solid contaminants in suspension in the rinsing liquid directed towards the circulating pump 65.

[0096] Furthermore the filtering assembly 66 is preferably fitted/accommodated, preferably in manually removable manner, into the upper mouth of drain sump 54 of catchment sink 22, and the circulating pump 65 of rinsing-

liquid feed line 59 sucks the rinsing liquid directly from the drain sump 54.

[0097] In the examples shown, in particular, the filtering assembly 66 preferably comprises a cup-shaped member which has a water-permeable structure and is fitted in watertight and manually removable manner into the upper mouth of drain sump 65 to close the drain sump 65.

[0098] Preferably, the rinsing-liquid feed line 59 additionally includes a one-way valve, an air-gap assembly or another type of back-flow prevention device which is preferably located along the pipe channelling the rinsing liquid from circulating pump 65 back to catchment sink 23, and is adapted to prevent the rinsing liquid to flow back to circulating pump 65.

[0099] Preferably, the rinsing-liquid feed line 59 also includes a supplementary nozzle 67 which is preferably located on a sidewall of catchment sink 23, preferably below the threshold level maintained by the overflow assembly 50, and is adapted to squirt/pour the rinsing liquid arriving from circulating pump 65 directly into catchment sink 23, preferably towards the bottom of catchment sink 23.

[0100] With reference to Figure 3, preferably the rinsing-liquid transfer line 60 comprises: a preferably electrically-powered, circulating pump 68 which sucks the rinsing liquid from catchment sink 22, and feeds said rinsing liquid directly to catchment sink 10, preferably with a pressure ranging between 1,5 and 3 bars; and optionally also a filtering assembly which is located upstream of the suction mouth of circulating pump 68, and is structured to hold/block solid contaminants in suspension in the rinsing liquid directed towards the circulating pump 68.

[0101] In the example shown, circulating pump 68 preferably sucks the rinsing liquid from the drain sump 54, thus rinsing-liquid feed line 59 and rinsing-liquid transfer line 60 share the filtering assembly 66.

[0102] Preferably, the rinsing-liquid transfer line 60 additionally includes a one-way valve, an air-gap assembly or another type of back-flow prevention device which is preferably located along the pipe channelling the rinsing liquid from circulating pump 68 to catchment sink 10, and is adapted to prevent the rinsing liquid to flow back to circulating pump 68.

[0103] With reference to Figures 2 and 3, in the example shown, furthermore, the rinsing-liquid transfer line 60 preferably also includes a supplementary nozzle 69 which is preferably located on a sidewall of catchment sink 10, preferably below the maximum level permitted by the overflow assembly 18, and is adapted to squirt/pour the rinsing liquid arriving from circulating pump 68 directly into catchment sink 10, preferably towards the bottom of catchment sink 10.

[0104] With reference to Figure 3, preferably the dishwashing machine 1, or better the main washing unit 5 of dishwashing machine 1, additionally comprises an auxiliary fresh-water supply line 70 which is connected/connectable to the water mains or to an alternative hot-water external water source, and is structured to selectively

and independently channel a flow of preferably hot, fresh water towards, respectively, catchment sink 10 and catchment sink 22, to selectively fill up any one of the two catchment sinks 10 and 22.

[0105] This auxiliary fresh-water supply line 70 preferably includes: a common measuring device 71 capable of detecting the temperature and/or flowrate of the preferably hot, fresh water arriving from the water mains or other external water source and directed towards any one of the two catchment sinks 10 and 22; and two preferably electrically-operated, distinct on-off valves 72 and 73 each capable of controlling the flow of the preferably hot, fresh water towards a respective catchment sink 10, 22.

[0106] Preferably, the auxiliary fresh-water supply line 70 additionally includes, for both catchment sink 10 and catchment sink 22, a respective one-way valve, an air-gap assembly or another type of back-flow prevention device which is preferably located along the pipe channelling the preferably hot, fresh water towards the catchment sink 10, 22, and is adapted to prevent the fresh water to flow back to the water mains or other external water source.

[0107] With reference to Figure 3, in the example shown, furthermore, the fresh-water supply line 70 preferably additionally includes: a first supplementary nozzle 74 which is preferably located on a sidewall of catchment sink 10, preferably above the maximum level permitted by the overflow assembly 18, and is adapted to squirt/pour the fresh water flowing along supply line 70 directly into catchment sink 10, preferably towards the bottom of catchment sink 10; and/or a second supplementary nozzle which is preferably located on a sidewall of catchment sink 22, preferably above the threshold level permitted by the overflow assembly 50 of catchment sink 22, and is adapted to squirt/pour the fresh water flowing along supply line 70 directly into catchment sink 22, preferably towards the bottom of catchment sink 22.

[0108] Preferably the dishwashing machine 1 also includes a main electronic control unit (not shown in the figures) which controls the various electric/electronic devices so as to automatically perform the washing program selected by the user.

[0109] General operation of the dishwashing machine 1 is easily inferable from the description above.

[0110] The overflow assembly 50 automatically channels from catchment sink 23 to catchment sink 22, the rinsing liquid contained into catchment sink 23 and exceeding said threshold level. The unidirectional flow of the rinsing liquid from catchment sink 23 to catchment sink 22 obviously continues until the level of the rinsing liquid in catchment sink 23 remains above the threshold level and until the level of the rinsing liquid in catchment sink 22 equalizes the level of the rinsing liquid inside catchment sink 23.

[0111] During operation of the dishwashing machine 1, however, rinsing-liquid feed line 59 and rinsing-liquid transfer line 60, preferably continuously, keep the level

of the rinsing liquid contained into catchment sink 22 below the level of the rinsing liquid inside catchment sink 23.

[0112] Thus, during operation of the dishwashing machine 1, the overflow assembly 50 unidirectionally channels the rinsing liquid exceeding the overflow threshold from catchment sink 23 to catchment sink 22, whereas rinsing-liquid feed line 59 channels the rinsing liquid back into catchment sink 23.

[0113] Overflow assembly 50 and rinsing-liquid feed line 59, therefore, operate a recirculation of the rinsing liquid between catchment sinks 22 and 23.

[0114] During operation of the dishwashing machine 1, moreover, the level of the rinsing liquid contained into catchment sink 23 fluctuates about the threshold level, whereas the level of the rinsing liquid contained into catchment sink 22 is allowed to freely vary, with no correlation with the level of the rinsing liquid contained into catchment sink 23.

[0115] If, during operation, the level of the rinsing liquid contained into catchment sink 22 unexpectedly rises above a given limit level, the electronic control unit automatically opens the on-off valve 49 to drain the rinsing liquid from catchment sink 23 and so stop the outflow of rinsing liquid towards catchment sink 22.

[0116] The advantages resulting from circulating the rinsing liquid in closed loop through catchment sinks 22 and 23 are remarkable.

[0117] Experimental tests revealed that recirculation of the rinsing liquid significantly improves the rinsing performances of dishwashing machine 1 with respect to the rack-type dishwashing machines already on the market. Also electric power and fresh-water consumption are slightly reduced at equal washing conditions.

[0118] Clearly, changes may be made to the rack-type dishwashing machine 1 without, however, departing from the scope of the present invention.

[0119] For example the pass-through tunnel 3 may have one or more bends. The dishwashing machine 1 furthermore may additionally include a descaling system.

Claims

1. Dishwashing machine (1) comprising: an outer casing (2) which is provided with a pass-through tunnel (3) extending substantially horizontally within said casing (2); and a linear conveyor (4) adapted to advance a succession of dishwasher racks (100) along the pass-through tunnel (3);
the pass-through tunnel (3) having a washing section (8) wherein jets of a washing liquid are directed towards a dishwasher rack (100) momentarily traveling inside the washing section (8), and a rinsing section (9) which is located downstream of the washing section (8) and wherein jets of a rinsing liquid are directed towards a dishwasher rack (100) momentarily travelling inside the rinsing section (9);
inside the washing section (8), the dishwashing machine (1) comprising: a first catchment sink (10) which is arranged on the bottom of the tunnel (3) so as to collect and accumulate the washing liquid trickling down from a dishwasher rack (100) momentarily traveling inside the washing section (8); a number of washing nozzles (11) which are arranged above the catchment sink (10) and are oriented so as to direct jets of washing liquid towards a dishwasher rack (100) momentarily traveling inside the washing section (8); and a washing-liquid feed line (12) adapted to feed the washing liquid accumulated into the first catchment sink (10) towards the washing nozzles (11);
inside the rinsing section (9), the dishwashing machine (1) comprising: a second (22) and a third (23) catchment sinks which are arranged on the bottom of the tunnel (3) one downstream the other, so as to separately collect and accumulate the washing liquid trickling down from a dishwasher rack (100) momentarily traveling above said second (22) and third (23) catchment sinks; a number of final rinsing nozzles (24) which are arranged above the third catchment sink (23) and are oriented so as to direct corresponding jets of rinsing liquid towards a dishwasher rack (100) momentarily traveling inside the rinsing section (9), above the third catchment sink (23); a first rinsing-liquid feed line (25) adapted to feed the rinsing liquid towards the final rinsing nozzles (24); a number of pre-rinsing nozzles (58) which are arranged above the second catchment sink (22) and are oriented so as to direct corresponding jets of rinsing liquid towards a dishwasher rack (100) momentarily traveling inside the rinsing section (9), above the second catchment sink (22); and a second rinsing-liquid feed line (59) which is adapted to feed the rinsing liquid accumulated into the second catchment sink (22) towards the pre-rinsing nozzles (58);
said third catchment sink (23) being connected to the second catchment sink (22) via an overflow assembly (50) which is structured to automatically channel, from third catchment sink (23) to second catchment sink (22), the rinsing liquid contained into the third catchment sink (23) and exceeding a given threshold level; the dishwashing machine (1) being characterized in that said second rinsing-liquid feed line (59) is additionally adapted to feed the rinsing liquid accumulated into the second catchment sink (22) also towards the third catchment sink (23).

chine (1) comprising: a first catchment sink (10) which is arranged on the bottom of the tunnel (3) so as to collect and accumulate the washing liquid trickling down from a dishwasher rack (100) momentarily traveling inside the washing section (8); a number of washing nozzles (11) which are arranged above the catchment sink (10) and are oriented so as to direct jets of washing liquid towards a dishwasher rack (100) momentarily traveling inside the washing section (8); and a washing-liquid feed line (12) adapted to feed the washing liquid accumulated into the first catchment sink (10) towards the washing nozzles (11);

inside the rinsing section (9), the dishwashing machine (1) comprising: a second (22) and a third (23) catchment sinks which are arranged on the bottom of the tunnel (3) one downstream the other, so as to separately collect and accumulate the washing liquid trickling down from a dishwasher rack (100) momentarily traveling above said second (22) and third (23) catchment sinks; a number of final rinsing nozzles (24) which are arranged above the third catchment sink (23) and are oriented so as to direct corresponding jets of rinsing liquid towards a dishwasher rack (100) momentarily traveling inside the rinsing section (9), above the third catchment sink (23); a first rinsing-liquid feed line (25) adapted to feed the rinsing liquid towards the final rinsing nozzles (24); a number of pre-rinsing nozzles (58) which are arranged above the second catchment sink (22) and are oriented so as to direct corresponding jets of rinsing liquid towards a dishwasher rack (100) momentarily traveling inside the rinsing section (9), above the second catchment sink (22); and a second rinsing-liquid feed line (59) which is adapted to feed the rinsing liquid accumulated into the second catchment sink (22) towards the pre-rinsing nozzles (58);

said third catchment sink (23) being connected to the second catchment sink (22) via an overflow assembly (50) which is structured to automatically channel, from third catchment sink (23) to second catchment sink (22), the rinsing liquid contained into the third catchment sink (23) and exceeding a given threshold level; the dishwashing machine (1) being characterized in that said second rinsing-liquid feed line (59) is additionally adapted to feed the rinsing liquid accumulated into the second catchment sink (22) also towards the third catchment sink (23).

2. Dishwashing machine according to Claim 1, characterized in that said second (22) and third (23) catchment sinks are adjacent to one another; and in that the dishwashing machine additionally comprises, inside the rinsing section (9): a number of intermediate rinsing nozzles (42) which are substantially vertically aligned above the border between said second (22) and said third (23) catchment sinks, and are oriented so as to direct the corresponding jets of

rinsing liquid towards a dishwasher rack (100) momentarily located inside the rinsing section (9), astride the second (22) and third (23) catchment sinks; and a third rinsing-liquid feed line (43) which is adapted to feed the rinsing liquid accumulated into the third catchment sink (23) towards said intermediate rinsing nozzles (42).

3. Dishwashing machine according to Claim 1 or 2, **characterized in that** said overflow assembly (50) includes: a connecting pipe (51) that puts the third catchment sink (23) in fluid communication with the second catchment sink (22), so as to allow the rinsing liquid to flow from the third catchment sink (23) to second catchment sink (22); and an overflow member (52) which is fitted into the third catchment sink (23), is coupled to said connecting pipe (51) in watertight and manually detachable manner, and is structured to automatically channel, into said connecting pipe (51), the rinsing liquid contained into the third catchment sink (23) and exceeding said threshold level.
4. Dishwashing machine according to Claim 3, **characterized in that** a drain line (53) branches off from the third catchment sink (23) and said overflow member (52) is structured to additionally obstruct/block up said drain line (53) when coupled to the connecting pipe (51).
5. Dishwashing machine according to Claim 3 or 4, **characterized in that** the third catchment sink (23) is provided with a drain sumps (46); **in that** the connecting pipe (51) branches off from said drain sump (46); and **in that** the overflow member (52) is coupled in detachable manner to the connecting pipe (51) within said drain sump (46).
6. Dishwashing machine according to Claim 5, **characterized in that** also the second catchment sink (22) is provided with a corresponding drain sump (54), and **in that** the connecting pipe (51) puts the drain sump (46) of the third catchment sink (23) in permanent fluid communication with the drain sump (54) of said second catchment sink (22).
7. Dishwashing machine according to any one of the preceding claims, **characterized by** additionally comprising an on-off valve (49) connecting the third catchment sink (23) to a drain piping (19) for allowing selective emptying of said second (22) and third (23) catchment sinks.
8. Dishwashing machine according to Claim 7, **characterized in that** said on-off valve (49) is interposed between said drain piping (19) and the drain sump (46) of said third catchment sink (23).

9. Dishwashing machine according to any one of the preceding claims, **characterized in that** said second rinsing-liquid feed line (59) comprises: a first circulating pump (65) which sucks the rinsing liquid from the second catchment sink (22), and feeds said rinsing liquid to both the pre-rinsing nozzles (58) and the third catchment sink (23) with a given pressure; and a first filtering assembly (66) located upstream of the suction mouth of said first circulating pump (65), and is structured to hold/block almost any solid contaminants in suspension in the rinsing liquid directed towards the first circulating pump (65).
10. Dishwashing machine according to any one of Claims 2 to 9, **characterized in that** said third rinsing-liquid feed line (43) comprises: a second circulating pump (44) which sucks the rinsing liquid from the third catchment sink (23), and feeds said rinsing liquid to the intermediate rinsing nozzles (42) with a given pressure; and a second filtering assembly (45) located upstream of the suction mouth of said second circulating pump (44), and is structured to hold/block almost any solid contaminants in suspension in the rinsing liquid directed towards the second circulating pump (44).
11. Dishwashing machine according to any one of the preceding claims, **characterized by** additionally comprising a rinsing-liquid transfer line (60) which is adapted to feed the rinsing liquid accumulating into the second catchment sink (22) directly towards the first catchment sink (10).
12. Dishwashing machine according to Claim 11, **characterized in that** said rinsing-liquid transfer line (60) comprises: a third circulating pump (68) which sucks the rinsing liquid from the second catchment sink (22), and feeds said rinsing liquid directly to the first catchment sink (10) with a given pressure; and a third filtering assembly (66) which is located upstream of the suction mouth of said third circulating pump (68), and is structured to hold/block any solid contaminants in suspension in the rinsing liquid directed towards said third circulating pump (68).
13. Dishwashing machine according to Claim 12, **characterized in that** said first circulating pump (65) and said third circulating pump (68) share a same filtering assembly (66).
14. Dishwashing machine according to any one of the preceding claims, **characterized by** additionally comprising a first heating device (61) capable of heating up the rinsing liquid contained into the second catchment sink (22).
15. Dishwashing machine according to any one of the preceding claims, **characterized by** additionally

comprising a first level sensor (63) capable of determining the level of the rinsing liquid contained into the second catchment sink (22).

Patentansprüche

1. Geschirrspülmaschine (1), Folgendes umfassend: ein Außengehäuse (2), das mit einem Durchgangstunnel (3) versehen ist, der sich im Wesentlichen horizontal innerhalb des Gehäuses (2) erstreckt; und ein Linearförderer (4), der dazu eingerichtet ist, eine Abfolge von Geschirrspülkörben (100) entlang des Durchgangstunnels (3) zu befördern; wobei der Durchgangstunnel (3) einen Waschabschnitt (8) aufweist, in dem Strahlen einer Waschflüssigkeit in Richtung eines Geschirrspülkorbs (100) gerichtet sind, der gerade durch den Waschabschnitt (8) fährt, und einen Spülabschnitt (9), der dem Waschabschnitt (8) nachgelagert angeordnet ist und in dem Strahlen einer Spülflüssigkeit in Richtung eines Geschirrspülkorbs (100) gerichtet sind, der gerade durch den Spülabschnitt (9) fährt; wobei die Geschirrspülmaschine (1) innerhalb des Waschabschnitts (8) Folgendes umfasst: eine erste Auffangwanne (10), die am Boden des Tunnels (3) angeordnet ist, um die Waschflüssigkeit, die von einem Geschirrspülkorb (100) tropft, der gerade durch den Waschabschnitt (8) fährt, aufzufangen und zu sammeln; eine Reihe von Waschküsen (11), die über der Auffangwanne (10) angeordnet sind und so orientiert sind, dass sie Waschflüssigkeitsstrahlen auf einen Geschirrspülkorb (100), der gerade durch den Waschabschnitt (8) fährt, richten; und eine Waschflüssigkeitszufuhrleitung (12), die dazu eingerichtet ist, den Waschküsen (11) die in der ersten Auffangwanne (10) gesammelte Waschflüssigkeit zuzuführen; wobei die Geschirrspülmaschine (1) im Spülabschnitt (9) Folgendes umfasst: eine zweite (22) und eine dritte (23) Auffangwanne, die am Boden des Tunnels (3) nacheinander angeordnet sind, um die Waschflüssigkeit, die von einem Geschirrspülkorb (100) tropft, der gerade über der zweiten (22) und dritten (23) Auffangwanne entlang fährt, getrennt aufzufangen und zu sammeln; eine Reihe von letzten Spüldüsen (24), die über der dritten Auffangwanne (23) angeordnet und so orientiert sind, dass sie zugehörige Spülflüssigkeitsstrahlen auf einen Geschirrspülkorb (100), der gerade über der dritten Auffangwanne (23) durch den Spülabschnitt (9) fährt, richten; eine erste Spülflüssigkeitszufuhrleitung (25), die dazu eingerichtet ist, den letzten Düsen (24) die Spülflüssigkeit zuzuführen; eine Reihe von Vorspüldüsen (58), die über der zweiten Auffangwanne (22) angeordnet sind und so orientiert sind, dass sie zugehörige Spülflüssigkeitsstrahlen auf einen Ge-

schirrspülkorb (100), der gerade über der zweiten Auffangwanne (22) durch den Spülabschnitt (9) fährt, richten; und eine zweite Spülflüssigkeitszufuhrleitung (59), die dazu eingerichtet ist, den Vorspüldüsen (58) die in der zweiten Auffangwanne (22) gesammelte Spülflüssigkeit zuzuführen; wobei die dritte Auffangwanne (23) über eine Überlaufanordnung (50), die dazu konstruiert ist, die in der dritten Auffangwanne (23) enthaltene und einen vorgegeben Schwellenwert übersteigende Spülflüssigkeit automatisch von der dritten Auffangwanne (23) zur zweiten Auffangwanne (22) zu leiten, mit der zweiten Auffangwanne (22) verbunden ist; wobei die Geschirrspülmaschine (1) **dadurch gekennzeichnet ist, dass** die zweite Spülflüssigkeitszufuhrleitung (59) zusätzlich dazu eingerichtet ist, der dritten Auffangwanne ebenfalls (23) die in der zweiten Auffangwanne (22) gesammelte Spülflüssigkeit zuzuführen.

2. Geschirrspülmaschine nach Anspruch 1, **dadurch gekennzeichnet, dass** die zweite (22) und dritte (23) Auffangwanne aneinander angrenzen; und dadurch, dass die Geschirrspülmaschine zusätzlich im Spülabschnitt (9) Folgendes umfasst: eine Reihe von Zwischenspüldüsen (42), die im Wesentlichen vertikal über der Grenze zwischen der zweiten (22) und dritten (23) Auffangwanne ausgerichtet sind und so orientiert sind, dass sie die zugehörigen Spülflüssigkeitsstrahlen in Richtung eines Geschirrspülkorbs (100) richten, der sich gerade im Spülabschnitt (9) gleichauf mit der zweiten (22) und dritten (23) Auffangwanne befindet; und eine dritte Spülflüssigkeitszufuhrleitung (43), die dazu eingerichtet ist, den Zwischenspüldüsen (42) die in der dritten Auffangwanne (23) gesammelte Spülflüssigkeit zuzuführen.
3. Geschirrspülmaschine nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Überlaufanordnung (50) Folgendes aufweist: ein Verbindungsrohr (51), das die dritte Auffangwanne (23) mit der zweiten Auffangwanne (22) in Fluidverbindung bringt, um es der Spülflüssigkeit zu ermöglichen, von der dritten Auffangwanne (23) zur zweiten Auffangwanne (22) zu strömen; und ein Überlaufelement (52), das in der dritten Auffangwanne (23) befestigt ist, mit dem Verbindungsrohr (51) wasserdicht und manuell lösbar gekoppelt ist, und dazu konstruiert ist, die in der dritten Auffangwanne (23) enthaltene und den Schwellenwert übersteigende Spülflüssigkeit automatisch in das Verbindungsrohr (51) zu leiten.
4. Geschirrspülmaschine nach Anspruch 3, **dadurch gekennzeichnet, dass** eine Abflussleitung (53) von der dritten Auffangwanne (23) abzweigt und das Überlaufelement (52) dazu konstruiert ist, die Abflussleitung (53) zusätzlich zu verstopfen/blockieren, wenn es mit dem Verbindungsrohr (51) gekop-

pelt ist.

5. Geschirrspülmaschine nach Anspruch 3 oder 4, **dadurch gekennzeichnet, dass** die dritte Auffangwanne (23) mit Abflusssumpfen (46) versehen ist; dadurch, dass das Verbindungsrohr (51) vom Abflusssumpf (46) abzweigt; und dadurch, dass das Überlaufelement (52) lösbar in dem Abflusssumpf (46) mit dem Verbindungsrohr (51) gekoppelt ist. 5
6. Geschirrspülmaschine nach Anspruch 5, **dadurch gekennzeichnet, dass** die zweite Auffangwanne (22) ebenfalls mit einem zugehörigen Abflusssumpf (54) versehen ist und dadurch, dass das Verbindungsrohr (51) den Abflusssumpf (46) der dritten Auffangwanne (23) in dauerhafte Fluidverbindung mit dem Abflusssumpf (54) der zweiten Auffangwanne (22) bringt. 10
7. Geschirrspülmaschine nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** diese zusätzlich ein Schaltventil (49) umfasst, das die dritte Auffangwanne (23) mit einem Abflussrohr (19) verbindet, um ein selektives Leeren der zweiten (22) und dritten (23) Auffangwanne zu ermöglichen. 20 25
8. Geschirrspülmaschine nach Anspruch 7, **dadurch gekennzeichnet, dass** das Schaltventil (49) zwischen der Abflussleitung (19) und dem Abflusssumpf (46) der dritten Auffangwanne (23) angeordnet ist. 30
9. Geschirrspülmaschine nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die zweite Spülflüssigkeitszufuhrleitung (59) Folgendes umfasst: 35

eine erste Umwälzpumpe (65), die die Spülflüssigkeit aus der zweiten Auffangwanne (22) absaugt und die Spülflüssigkeit sowohl den Vorspüldüsen (58) als auch der dritten Auffangwanne (23) mit einem gegebenen Druck zuführt; und eine erste Filteranordnung (66), die der Ansaugöffnung der ersten Umwälzpumpe (65) vorgelagert ist und dazu konstruiert ist, fast alle festen Verschmutzungen in der in Richtung der ersten Umwälzpumpe (65) geleiteten Spülflüssigkeit festzuhalten/zu blockieren. 40 45
10. Geschirrspülmaschine nach einem der Ansprüche 2 bis 9, **dadurch gekennzeichnet, dass** die dritte Spülflüssigkeitszufuhrleitung (43) Folgendes umfasst: eine zweite Umwälzpumpe (44), die die Spülflüssigkeit aus der dritten Auffangwanne (23) ansaugt und die Spülflüssigkeit den Zwischenspüldüsen (42) mit einem gegebenen Druck zuführt; und eine zweite Filteranordnung (45), die der Ansaugöffnung der zweiten Umwälzpumpe (44) vorgelagert ist 50 55

und dazu konstruiert ist, fast alle festen Verschmutzungen in der in Richtung der zweiten Umwälzpumpe (44) geleiteten Spülflüssigkeit festzuhalten/zu blockieren.

11. Geschirrspülmaschine nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** sie zusätzlich eine Spülflüssigkeitstransferleitung (60) umfasst, die dazu eingerichtet ist, die in der zweiten Auffangwanne (22) gesammelte Spülflüssigkeit direkt der ersten Auffangwanne (10) zuzuführen. 10
12. Geschirrspülmaschine nach Anspruch 11, **dadurch gekennzeichnet, dass** die Spülflüssigkeitstransferleitung (60) Folgendes umfasst: eine dritte Umwälzpumpe (68), die die Spülflüssigkeit aus der zweiten Auffangwanne (22) ansaugt und die Spülflüssigkeit der ersten Auffangwanne (10) mit einem gegebenen Druck direkt zuführt; und eine dritte Filteranordnung (66), die der Ansaugöffnung der dritten Umwälzpumpe (68) vorgelagert ist und dazu konstruiert ist, alle festen Verschmutzungen in der in Richtung der dritten Umwälzpumpe (68) geleiteten Spülflüssigkeit festzuhalten/zu blockieren. 15 20 25
13. Geschirrspülmaschine nach Anspruch 12, **dadurch gekennzeichnet, dass** die erste Umwälzpumpe (65) und die dritte Umwälzpumpe (68) dieselbe Filteranordnung (66) verwenden. 30
14. Geschirrspülmaschine nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** sie zusätzlich eine erste Heizvorrichtung (61) umfasst, die die in der zweiten Auffangwanne (22) enthaltene Spülflüssigkeit erwärmen kann. 35
15. Geschirrspülmaschine nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** sie zusätzlich einen ersten Füllstandssensor (63) umfasst, der den Füllstand der in der zweiten Auffangwanne (22) enthaltenen Spülflüssigkeit bestimmen kann. 40 45

Revendications

1. Lave-vaisselle (1) comprenant : un boîtier externe (2) qui est muni d'un tunnel traversant (3) s'étendant sensiblement horizontalement à l'intérieur dudit boîtier (2) ; et un convoyeur linéaire (4) conçu pour faire avancer une succession de paniers du lave-vaisselle (100) le long du tunnel traversant (3) ; le tunnel traversant (3) comportant une section de lavage (8) dans laquelle des jets d'un liquide de lavage sont dirigés vers un panier du lave-vaisselle (100) se déplaçant momentanément à l'intérieur de la section de lavage (8), et une section de rinçage

(9) qui est située en aval de la section de lavage (8) et dans laquelle des jets d'un liquide de rinçage sont dirigés vers un panier du lave-vaisselle (100) se déplaçant momentanément à l'intérieur de la section de rinçage (9) ;

le lave-vaisselle (1) comprenant, à l'intérieur de la section de lavage (8) : un premier bac de captage (10) qui est disposé sur le fond du tunnel (3) de façon à recueillir et accumuler le liquide de lavage ruisselant depuis un panier du lave-vaisselle (100) se déplaçant momentanément à l'intérieur de la section de lavage (8) ; un certain nombre de buses de lavage (11) qui sont disposées au-dessus du bac de captage (10) et sont orientées de façon à diriger les jets de liquide de lavage vers un panier du lave-vaisselle (100) se déplaçant momentanément à l'intérieur de la section de lavage (8) ; et une conduite d'alimentation de liquide de lavage (12) conçue pour conduire le liquide de lavage accumulé dans le premier bac de captage (10) en direction des buses de lavage (11) ;

le lave-vaisselle (1) comprenant, à l'intérieur de la section de rinçage (9) : un deuxième (22) et un troisième (23) bacs de captage qui sont disposés sur le fond du tunnel (3) l'un en aval de l'autre, de façon à recueillir et accumuler séparément le liquide de lavage ruisselant depuis un panier du lave-vaisselle (100) se déplaçant momentanément au-dessus desdits deuxième (22) et troisième (23) bacs de captage ; un certain nombre de buses de rinçage final (24) qui sont disposées au-dessus du troisième bac de captage (23) et qui sont orientées de façon à diriger des jets correspondants de liquide de rinçage en direction d'un panier du lave-vaisselle (100) se déplaçant momentanément à l'intérieur de la section de rinçage (9), au-dessus du troisième bac de captage (23) ; une première conduite d'alimentation de liquide de rinçage (25) conçue pour conduire le liquide de rinçage en direction des buses de rinçage final (24) ; un certain nombre de buses de pré-rinçage (58) qui sont disposées au-dessus du deuxième bac de captage (22) et sont orientées de façon à diriger des jets correspondants de liquide de rinçage vers un panier du lave-vaisselle (100) se déplaçant momentanément à l'intérieur de la section de rinçage (9), au-dessus du deuxième bac de captage (22) ; et une seconde ligne d'alimentation de liquide de rinçage (59) qui est conçue pour conduire le liquide de rinçage accumulé dans le deuxième bac de captage (22) en direction des buses de pré-rinçage (58) ; ledit troisième bac de captage (23) étant relié au deuxième bac de captage (22) par le biais d'un ensemble de trop-plein (50) qui est structuré pour conduire automatiquement, du troisième bac de captage (23) au deuxième bac de captage (22), le liquide de rinçage contenu dans le troisième bac de captage (23) et dépassant un niveau de seuil donné ; le lave-vaisselle (1) étant **caractérisé en ce que** ladite

deuxième conduite d'alimentation de liquide de rinçage (59) est en outre conçue pour conduire également le liquide de rinçage accumulé dans le deuxième bac de captage (22) en direction du troisième bac de captage (23).

2. Lave-vaisselle selon la revendication 1, **caractérisé en ce que** lesdits deuxième (22) et troisième (23) bacs de captage sont adjacents l'un à l'autre ; et **en ce que** le lave-vaisselle comprend en outre, à l'intérieur de la section de rinçage (9) : un certain nombre de buses de rinçage intermédiaire (42) qui sont alignées sensiblement verticalement au-dessus de la limite entre lesdits deuxième (22) et troisième (23) bacs de captage, et sont orientées de façon à diriger des jets correspondants de liquide de rinçage vers un panier du lave-vaisselle (100) se déplaçant momentanément à l'intérieur de la section de rinçage (9) à cheval sur les deuxième (22) et troisième (23) bacs de captage ; et une troisième conduite d'alimentation de liquide de rinçage (43) qui est conçue pour conduire le liquide de rinçage accumulé dans le troisième bac de captage (23) en direction desdites buses de rinçage intermédiaire (42).
3. Lave-vaisselle selon la revendication 1 ou 2, **caractérisé en ce que** ledit ensemble de trop-plein (50) comprend : un tuyau de raccordement (51) qui place le troisième bac de captage (23) en communication hydraulique avec le deuxième bac de captage (22), de façon à permettre au liquide de rinçage de s'écouler du troisième bac de captage (23) au deuxième bac de captage (22) ; et un organe de trop-plein (52) qui est fixé dans le troisième bac de captage (23), est couplé audit tuyau de raccordement (51) de manière étanche et détachable manuellement, et est structuré pour conduire automatiquement, dans ledit tuyau de raccordement (51), le liquide de rinçage contenu dans le troisième bac de captage (23) et dépassant ledit niveau de seuil.
4. Lave-vaisselle selon la revendication 3, **caractérisé en ce qu'une** conduite de vidange (53) est dérivée à partir du troisième bac de captage (23) et ledit organe de trop-plein (52) est structuré pour en outre obstruer/bloquer ladite conduite de vidange (53) lorsqu'il est couplé au tuyau de raccordement (51).
5. Lave-vaisselle selon la revendication 3 ou 4, **caractérisé en ce que** le troisième bac de captage (23) est muni d'un puisard de vidange (46) ; **en ce que** le tuyau de raccordement (51) est dérivé à partir dudit puisard de vidange (46) ; et **en ce que** l'organe de trop-plein (52) est couplé de manière détachable au tuyau de raccordement (51) à l'intérieur dudit puisard de vidange (46) .
6. Lave-vaisselle selon la revendication 5, **caractérisé**

en ce que le deuxième bac de captage (22) est également muni d'un puisard de vidange (54) correspondant, et **en ce que** le tuyau de raccordement (51) place le puisard de vidange (46) du troisième bac de captage (23) en communication hydraulique permanente avec le puisard de vidange (54) dudit deuxième bac de captage (22) .

7. Lave-vaisselle selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** comprend en outre une vanne tout ou rien (49) raccordant le troisième bac de captage (23) à une canalisation de vidange (19) pour permettre le vidage sélectif desdits deuxième (22) et troisième (23) bacs de captage. 10
8. Lave-vaisselle selon la revendication 7, **caractérisé en ce que** ladite vanne tout ou rien (49) est interposée entre ladite canalisation de vidange (19) et le puisard de vidange (46) dudit troisième bac de captage (23) . 20
9. Lave-vaisselle selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ladite deuxième conduite d'alimentation de liquide de rinçage (59) comprend : une première pompe de circulation (65) qui aspire le liquide de rinçage du deuxième bac de captage (22) et conduit ledit liquide de rinçage à la fois vers les buses de pré-rinçage (58) et vers le troisième bac de captage (23) avec une pression donnée ; et un premier ensemble de filtrage (66) situé en amont de l'embouchure d'aspiration de ladite première pompe de circulation (65) et structuré pour retenir/bloquer presque tout contaminant solide en suspension dans le liquide de rinçage dirigé vers la première pompe de circulation (65). 25 30 35
10. Lave-vaisselle selon l'une quelconque des revendications 2 à 9, **caractérisé en ce que** ladite troisième conduite d'alimentation de liquide de rinçage (43) comprend : une deuxième pompe de circulation (44) qui aspire le liquide de rinçage du troisième bac de captage (23) et alimente ledit liquide de rinçage vers les buses de rinçage intermédiaire (42) avec une pression donnée ; et un deuxième ensemble de filtrage (45) situé en amont de l'embouchure d'aspiration de ladite deuxième pompe de circulation (44) et structuré pour retenir/bloquer presque tout contaminant solide en suspension dans le liquide de rinçage dirigé vers la deuxième pompe de circulation (44). 40 45 50
11. Lave-vaisselle selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** comprend en outre une conduite de transfert de liquide de rinçage (60) qui est conçue pour conduire directement le liquide de rinçage accumulé dans le deuxième bac de captage (22) en direction du pre-

mier bac de captage (10).

12. Lave-vaisselle selon la revendication 11, **caractérisé en ce que** ladite conduite de transfert de liquide de rinçage (60) comprend : une troisième pompe de circulation (68) qui aspire le liquide de rinçage du deuxième bac de captage (22), et alimente directement ledit liquide de rinçage vers le premier bac de captage (10) avec une pression donnée ; et un troisième ensemble de filtrage (66) qui est situé en amont de l'embouchure d'aspiration de ladite troisième pompe de circulation (68) et structuré pour retenir/bloquer tout contaminant solide en suspension dans le liquide de rinçage dirigé vers ladite troisième pompe de circulation (68). 5 10 15
13. Lave-vaisselle selon la revendication 12, **caractérisé en ce que** ladite première pompe de circulation (65) et ladite troisième pompe de circulation (68) partagent un ensemble de filtrage (66) identique.
14. Lave-vaisselle selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** comprend en outre un premier dispositif de chauffage (61) pouvant chauffer le liquide de rinçage contenu dans le deuxième bac de captage (22). 25
15. Lave-vaisselle selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** comprend en outre un premier capteur de niveau (63) apte à déterminer le niveau de liquide de rinçage contenu dans le deuxième bac de captage (22). 30 35

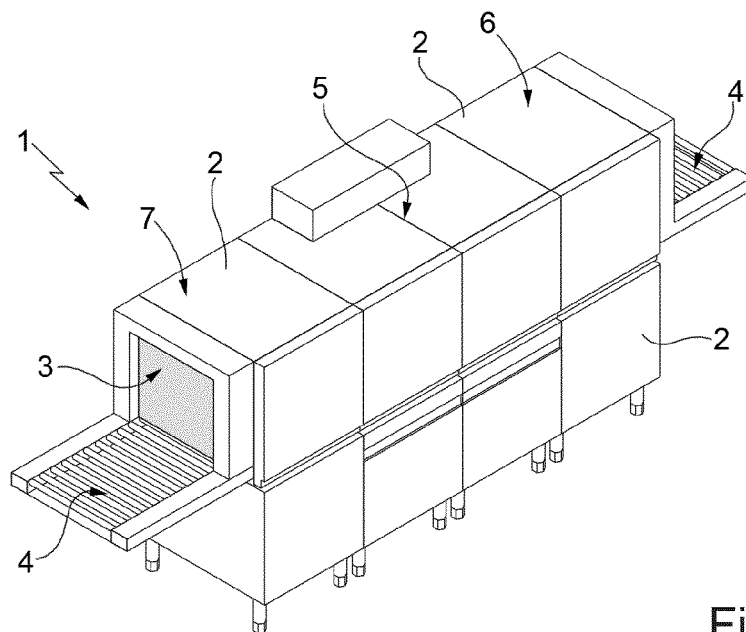


Fig. 1

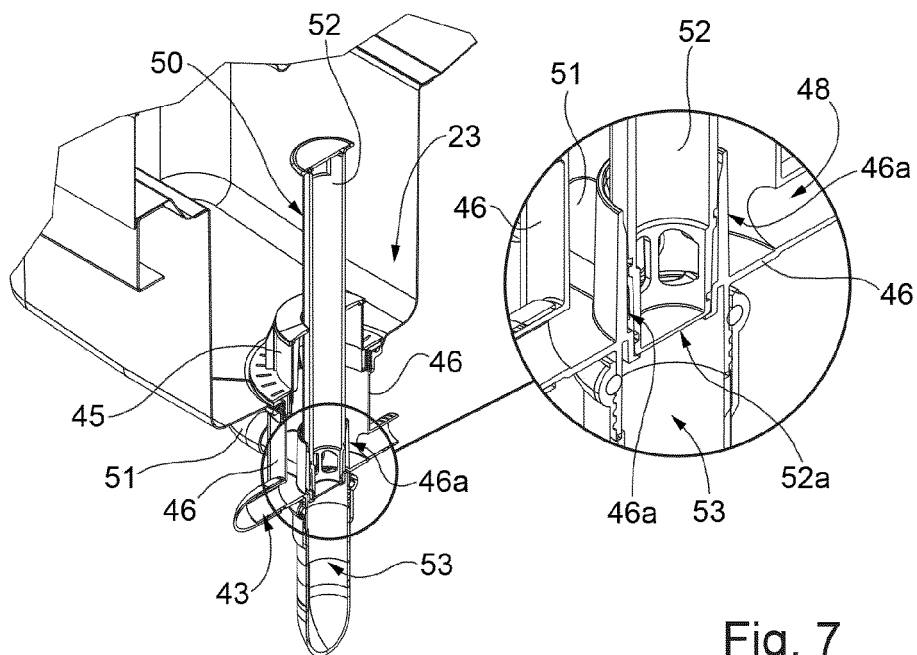


Fig. 7

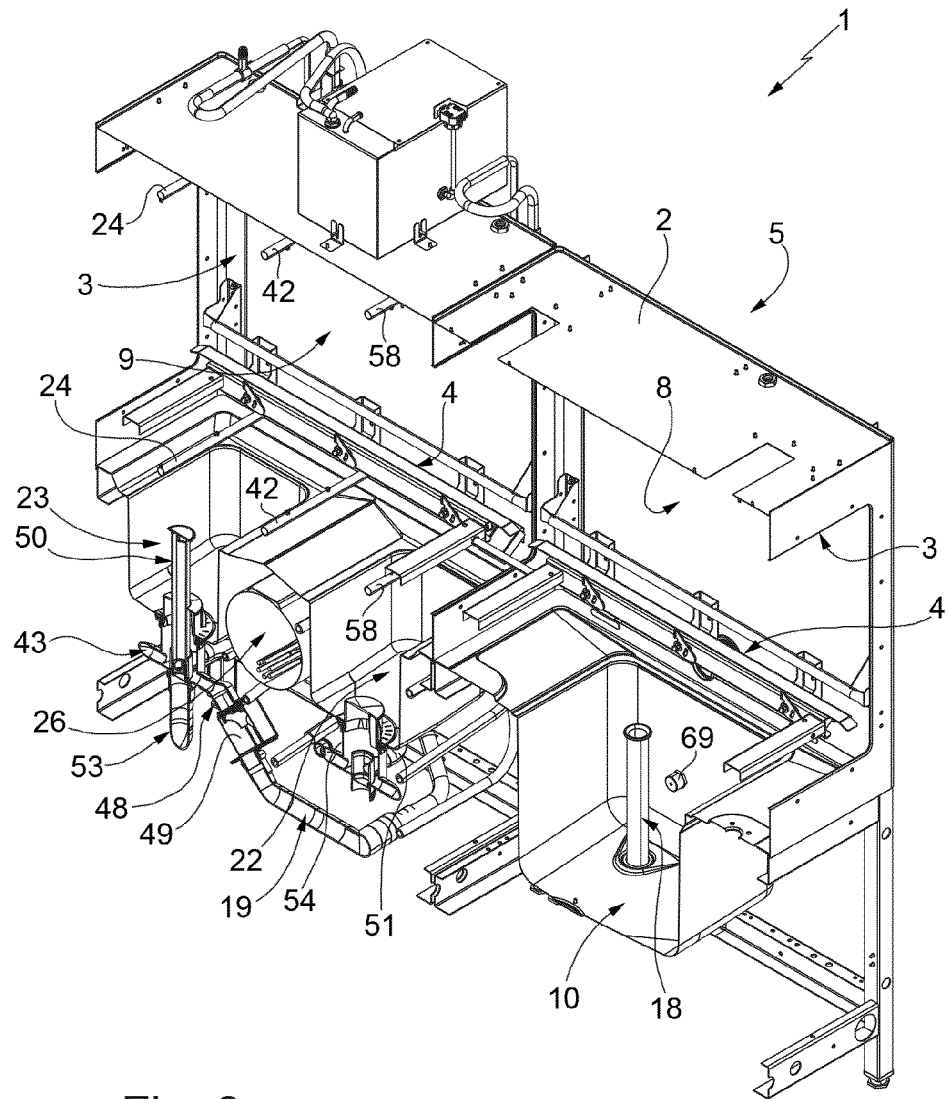


Fig. 2

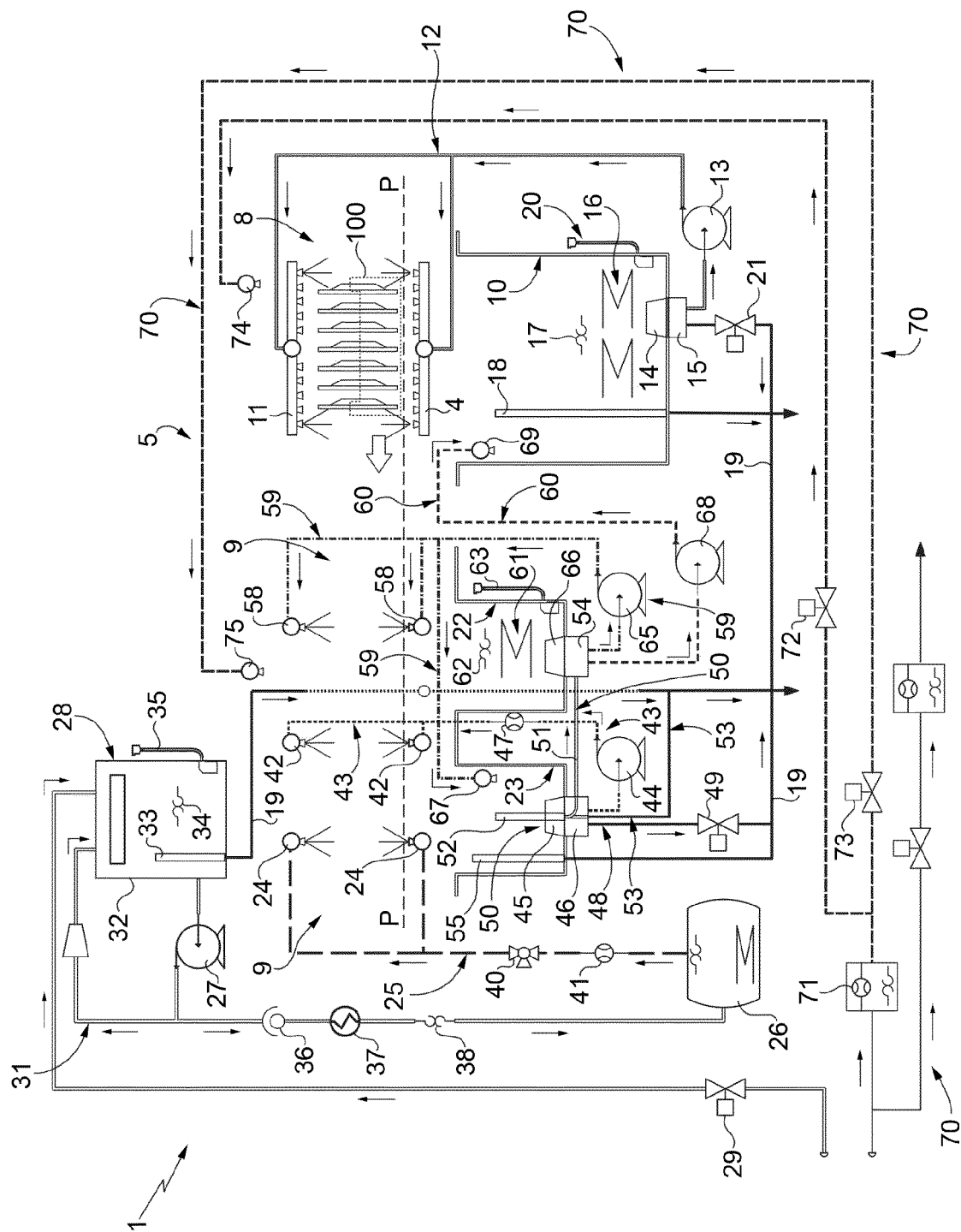


Fig. 3

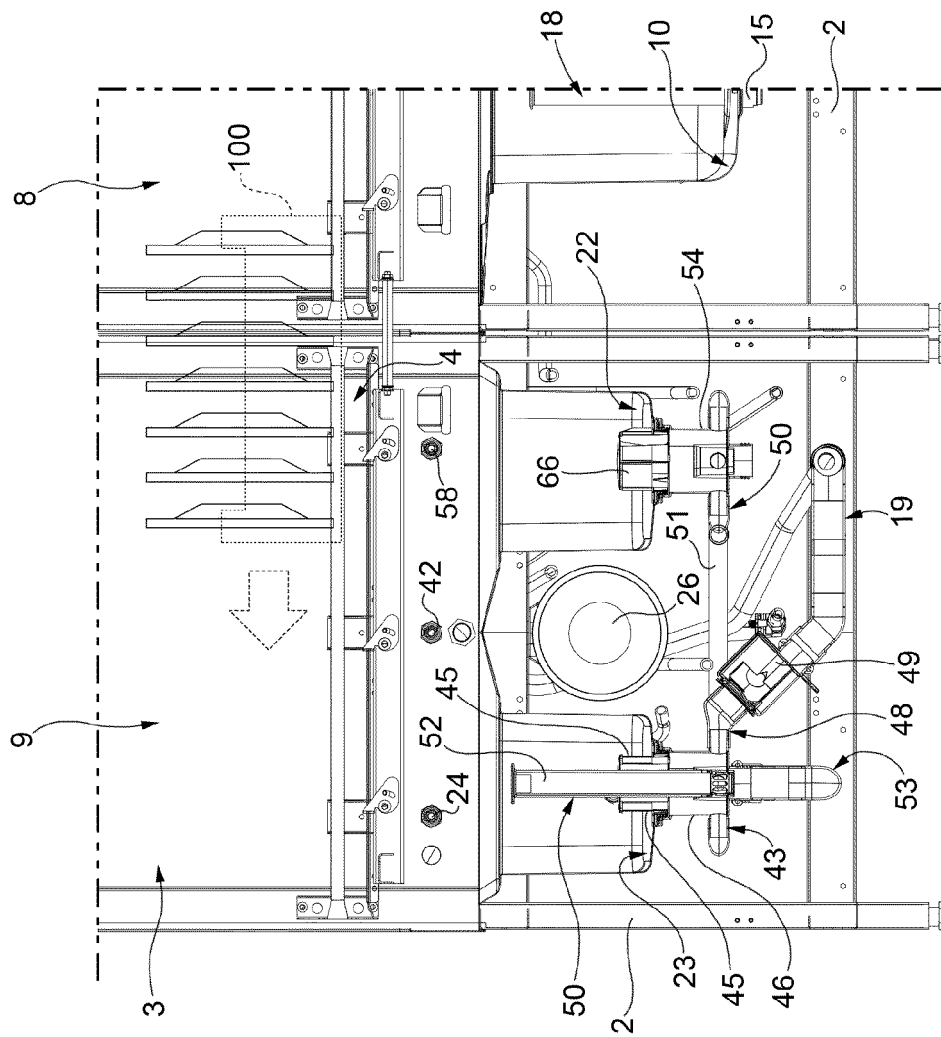


Fig. 4

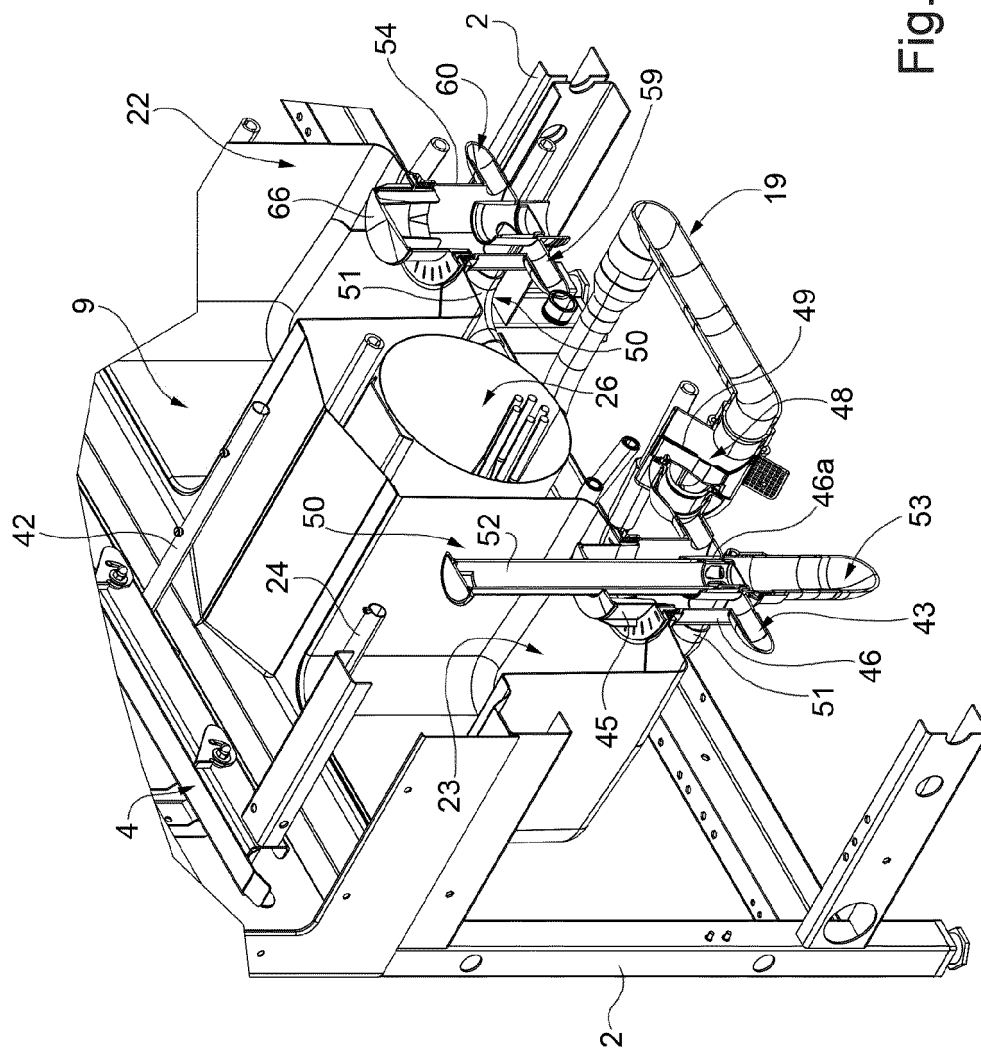


Fig. 5

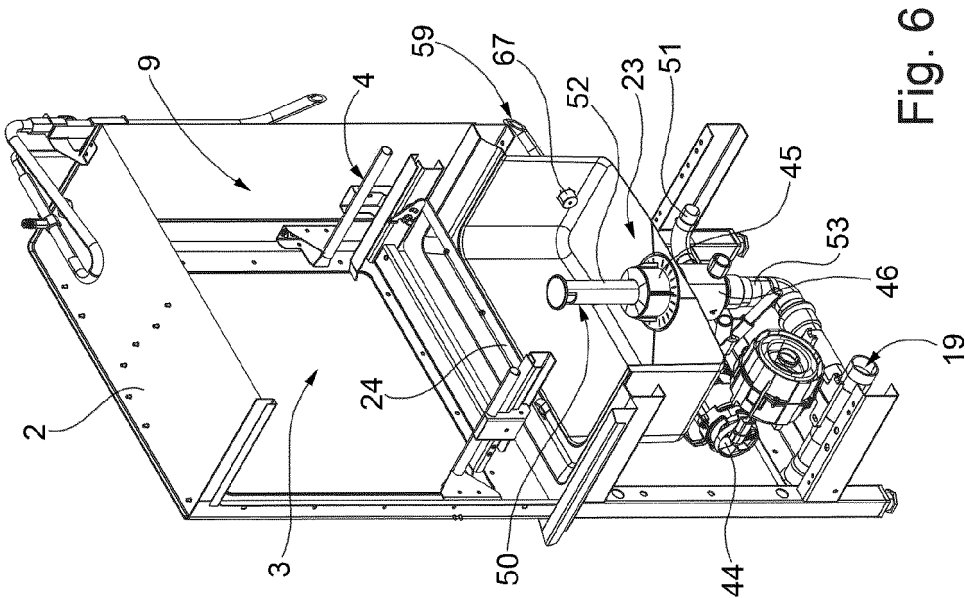


Fig. 6

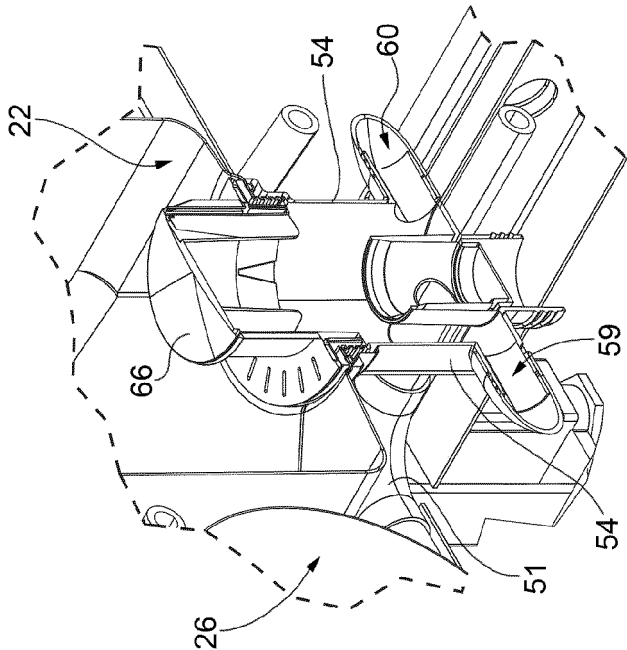


Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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