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(54) Title: WAREWASHER WITH INTERMEDIATE BLOWOFF ZONE OR CYCLE STEP

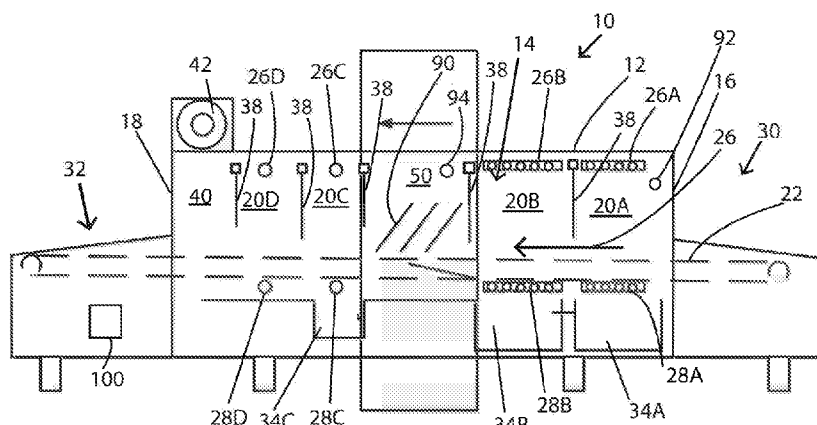


Fig. 1

(57) Abstract: A warewash machine for washing wares includes a housing (12) defining a chamber (14) for receiving wares, the chamber (14) having an inlet end (16), an outlet end (18), multiple liquid spray zones (20A-20D) between the inlet end (16) and the outlet end (18), and a conveyor (22) for moving wares along a conveyance path through the multiple liquid spray zones (20A-20D) in a ware travel direction, the multiple liquid spray zones (20A-20D) including a main wash zone (20B) and a final rinse zone (20C). An intermediate zone (50) is located, relative to the ware travel direction, after the main wash zone (20B) and before the final rinse zone (20C). The intermediate zone (50) includes a blowoff system (52) including multiple blowoff nozzles that direct non-liquid flows onto wares to move residual detergent solution and soils from the wares as the wares move through the intermediate zone (50). A batch-type machine (110) could also be provided with an intermediate non-liquid blowoff step.

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- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

WAREWASHER WITH INTERMEDIATE BLOWOFF ZONE OR CYCLE STEP

TECHNICAL FIELD

[0001] This application relates generally to warewashers such as those used in commercial applications such as cafeterias and restaurants and, more particularly, to systems and methods to utilize air and/or steam to enhance cleaning via a blowoff operation.

BACKGROUND

[0002] Commercial warewashers commonly include a housing which defines one or more internal washing and rinsing zones for dishes, pots pans and other wares. In conveyor-type machines wares are moved through multiple different spray zones within the housing for cleaning (e.g., ASR (automatic soil removal), pre-wash, wash, post-wash (aka power rinse) and rinse zones). One or more of the zones include a tank in which liquid to be sprayed on wares is heated in order to achieve desired cleaning. In batch-type machines wares are typically manually moved into a generally stationary location within a chamber for cleaning (including wash and rinse steps), and then manually removed from the machine upon completion of all operations/steps of the cleaning cycle.

[0003] Reduced water consumption is becoming more important in certain areas in view of the growing demands for water as well as an increase in the number of drought stricken areas.

[0004] The cleanliness of dirty wares through a warewash machine is affected by several factors and includes under-dosing or over-dosing of detergent that could lead to imbalance in food soil load to detergent ratio in the wash solution. Both situations, under-dosing or over-dosing leads to poor wash quality. Under-dosing leads to possible food soils on wares while over-dosing leads to wares with high levels of residual detergent from the wash solution. Achieving the right balance between the detergent dose and food soil load comes with its own challenges because the water types and ware material should be considered.

[0005] Moreover, washing of wares with pulps from tomatoes and/or orange if not prescrapped effectively leads to some form of re-deposition. In the past, use of large amounts of water for washing and rinsing dealt with some of these issues. However, today given the lower water use needs, this presents challenges.

[0006] It would be desirable to provide a warewasher system and method that enhances cleaning even in machines with reduced water consumption.

SUMMARY

[0007] A solution to the aforementioned issues is provided by an intermediate blowoff zone or cycle step that results in blowing off residual wash solution and/or food soil from wares.

[0008] In one aspect, a warewash machine for washing wares includes a housing defining a chamber for receiving wares, the chamber having an inlet end, an outlet end, multiple liquid spray zones between the inlet end and the outlet end, and a conveyor for moving wares along a conveyance path through the multiple liquid spray zones in a ware travel direction, the multiple liquid spray zones including a main wash zone and a final rinse zone. An intermediate zone is located, relative to the ware travel direction, after the main wash zone and before the final rinse zone. The intermediate zone includes a blowoff system including multiple blowoff nozzles that direct non-liquid flows onto wares to move residual detergent solution and soils from the wares as the wares move through the intermediate zone.

[0009] In another aspect, a warewash machine includes a housing defining a chamber for receiving wares, the chamber accessible by a door that is movable between open and closed positions relative to a chamber access opening. A wash spray system is provided in the chamber for spraying wash liquid from multiple wash nozzles. A rinse spray system is provided in the chamber for spraying rinse liquid from multiple rinse nozzles. A blowoff system is provided in the chamber for delivering non-liquid flows from multiple blowoff nozzles toward wares in the chamber. A controller is configured to selectively run at least one cleaning cycle that includes a washing step involving wash liquid sprays from the wash nozzles, a rinsing step involving rinse liquid sprays from the rinse nozzles and an intermediate blowoff step involving non-liquid flows from the blowoff nozzles, wherein at least part of the intermediate blowoff step occurs after the washing step has concluded and before the rinsing step has started.

[0010] The details of one or more embodiments are set forth in the accompanying drawings and the description below. Other features, objects, and advantages will be apparent from the description and drawings, and from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

- [0011] Fig. 1 is a schematic side elevation of one embodiment of a warewasher incorporating an intermediate blowoff zone;
- [0012] Fig. 2 is schematic side elevation of one embodiment of an intermediate blowoff zone;
- [0013] Fig. 3 is schematic side elevation of another embodiment of an intermediate blowoff zone;
- [0014] Fig. 4 is schematic side elevation of another embodiment of an intermediate blowoff zone;
- [0015] Fig. 5 is schematic side elevation of another embodiment of an intermediate blowoff zone;
- [0016] Fig. 6 is a schematic top plan view of a conveyor machine including two intermediate blowoff zones; and
- [0017] Fig. 7 is a schematic side elevation of a batch-type machine with a blowoff system.

DETAILED DESCRIPTION

[0018] Fig. 1 shows a warewash machine 10 of the conveyor-type. The machine includes a housing 12 defining an internal chamber 14 for receiving wares 90 for the purpose of cleaning. The chamber has an inlet end 16, an outlet end 18 and multiple liquid spray zones 20A-20D between the inlet end 16 and the outlet end 18. A conveyor 22 moves wares along a conveyance path 24 through the multiple liquid spray zones in a ware travel direction 26. Various of types of conveyors may be used, including continuous conveyors or reciprocating jog type conveyors that move ware racks through the chamber in a series of intermittent steps. Infeed area 30 for ware staging and outfeed area 32 for receiving exiting wares are also provided.

[0019] Here, the multiple liquid spray zones include a pre-wash zone 20A, a main wash zone 20B, a dual rinse zone 20C and a final rinse zone 20D. Pre-wash zone 20A includes sets of upper 26A and lower 28A spray arms with spray nozzles, where a pre-wash liquid is delivered to the arms 26A and 28A from a collection tank 34A via a pump (not shown) in a recirculating manner. Likewise, main wash zone 20B includes sets of upper 26B and lower 28B spray arms with spray nozzles, where a wash liquid is delivered to the arms 26B and 28B from a collection tank 34B via a pump (not shown) in a recirculating manner. Dual rinse zone 20C includes an upper 26C and lower 28C spray arm with spray

nozzles, where a rinse liquid is delivered to the arms 26C and 28C from a collection tank 34C via a pump (not shown) in a recirculating manner. One or more of the collection tanks 34A-34C may include a heating element for maintaining desired liquid temperatures. Final rinse zone 20D includes upper 26D and lower 28D spray arms with spray nozzles, where fresh hot rinse liquid is delivered to the arms via a pump (not shown) or line pressure from, for example, a booster heater (not shown) of the machine. A drying zone 40 with an associated blower 42 is located after the final rinse zone, but machines without drying zones are also possible.

[0020] As indicated above, variations in the number of liquid spray zones is also possible in such machines. The zones may be demarcated from each other via hanging curtain structures 38 as shown, which curtain structures help avoid excess overspray from one zone into any immediately adjacent zones.

[0021] Notably, an intermediate zone 50 is located, relative to the ware travel direction 26, after the main wash zone 20B and before the final rinse zone 20D. Here, the intermediate zone 50 is located immediately after the main wash zone 20B and immediately before the dual rinse zone 20C, but variations are possible as will be described in further detail below. The intermediate zone includes a blowoff system including multiple blowoff nozzles that direct non-liquid flows onto wares to move residual detergent solution and soils from the wares as the wares move through the intermediate zone. The blowoff nozzles may output streams of one or more of compressed air, steam or blower dryer air onto the wares as the wares move through the intermediate zone. Thus, no liquid sprays occur in the intermediate blowoff zone 50.

[0022] Referring to Fig. 2, one arrangement of a blowoff system 52 in intermediate zone 50 is shown, where the system 52 includes overhead arms or manifolds 54A and 54B extending across the conveyance path transverse to the ware travel direction 26. The manifolds 54A and 54B include blowoff nozzles oriented to direct streams 56A and 56B onto the wares as shown, in a primarily downward direction (here with no upward components to the flows). The streams may be, for example, steam that is ejected from the nozzles under pressure, or compressed air that is also ejected under pressure. The steam could be supplied to the manifolds from an on-site steam supply, where the machine includes a steam inlet connection for such purpose. An in-machine steam generator could also be provided. Likewise, the compressed air could be supplied to the manifolds from an on-site compressed air supply, where the machine includes a compressed air inlet

connection for such purpose, or an in-machine air compressor could also be provided. The streams 56A and 56B move residual detergent solution and soils from the wares in the intermediate zone, which fall downward onto a collection pan structure 58, which is oriented and/or configured to direct the solution and soils back into the wash tank 34B so that the solution and soils are not carried over into the next liquid spray zone (here the dual rinse zone 20C).

[0023] Fig. 3 shows another embodiment of a blowoff system 62 in the intermediate zone 50, where the system 62 includes side-located arms or manifolds 64A and 64B at opposite sides of the conveyance path. The manifolds 64A and 64B include blowoff nozzles oriented to direct streams 66A and 66B onto the wares as shown. The streams may be, for example, steam that is ejected from the nozzles under pressure, or compressed air that is also ejected under pressure, as noted above.

[0024] In either system 52 or 62, the number, position and orientation of the manifolds and nozzles can be adjusted as desired to improve on coverage. The nozzles may sweep the ware surfaces (leading and trailing sides) of residual food soil and/or wash solution down to the flow back pan 58, which drains to the wash tank 34A. By way of example, the intermediate zone 50 may include a total non-liquid flow from the blowoff nozzles of between about 500 CFM and about 3500 CFM to achieve desired blowoff of residuals from the wares.

[0025] Fig. 4 shows another embodiment of a blowoff system 72 in the intermediate zone 50, where the system includes a blower 74 that feeds air to overhead outlet nozzles 76A and 76B that are oriented to direct air streams 78A and 78B onto the wares as shown, in a primarily downward direction (here with no upward components to the flows). The blower 74 may include a heating element to heat the air prior to ejecting the streams 78A and 78B.

[0026] Fig. 5 shows a compressed air system arrangement where the temperature of the compressed air entering the machine via compressed air input 80 is heated via heating element 82 to a predefined temperature T2 to maintain desired heat conditions in the machine. In the case of steam flows such heating is not necessary.

[0027] It is recognized that in a conveyor machine the location of the intermediate blowoff zone can vary. For example, the intermediate zone 50 may be located any one of (i) immediately after the main wash zone 20B and immediately before the dual rinse zone 20C as shown, (ii) immediately after the dual rinse zone 20C and immediately before the

final rinse zone 20D, (iii) immediately after the main wash zone 20B and immediately before the final rinse zone 20D (where there is no dual rinse between the two zones), (iv) immediately after the main wash zone 20B and immediately before a power rinse zone (where the power rinse precedes the final rinse and the dual rinse zone), (v) immediately after the power rinse zone and immediately before the dual rinse zone 20C.

[0028] Moreover, in some embodiments more than one intermediate blowoff zone may be provided. For example, Fig. 6 schematically depicts an embodiment in which a first intermediate blowoff zone 50-1 is located immediately after the main wash zone 20B and immediately before the dual rinse zone 20C, and a second intermediate blowoff zone 50-2 is located immediately after the dual rinse zone 20C and before the final rinse zone 20D.

[0029] In an exemplary operation in the case of conveyor type machine 10, the non-liquid flows in the intermediate zone 50 could be activated by a machine controller 100, which selectively turns the non-liquid flows from the blowoff nozzles ON in response to a predefined machine condition. The turn on could be by opening a valve or starting a blower depending upon the blowoff system configuration. For example, the predefined machine condition may be one of (i) initiation of conveyor movement, (ii) a specified time lapse after initiation of conveyor movement, (iii) triggering of a sensor 92 that detects wares in or entering the machine, (iv) triggering of a sensor 94 that detects wares in or entering the intermediate zone, (v) a specified time lapse after a sensor 92 detects wares in or entering the machine, or (vi) a specified time lapse after a sensor 94 detects wares in or entering the intermediate zone. Other predefined machine conditions could also act as the trigger.

[0030] Referring now to Fig. 7, an exemplary batch-type machine 110 is shown and includes a housing 112 defining a chamber 114 for receiving wares. The chamber 114 is accessible by a door 116 that is movable between open and closed positions relative to a chamber access opening 118. A wash spray system 120 is provided in the chamber for spraying wash liquid from multiple wash nozzles, and may include wash arms 124, a collection tank or sump 126 and a pump 128. A rinse spray system 130 is provided in the chamber for spraying rinse liquid from multiple rinse nozzles, and may include rinse arms 132 and a hot water booster 134. A blowoff system 140 is provided in the chamber for delivering non-liquid flows from multiple blowoff nozzles toward wares in the chamber, and may include one or more arms or manifolds 142 with blowoff nozzles to direct non-

liquid flow streams 144 onto the wares. A machine controller 150 is configured to selectively run at least one cleaning cycle that includes a washing step involving wash liquid sprays from the wash nozzles, a rinsing step involving rinse liquid sprays from the rinse nozzles and an intermediate blowoff step involving non-liquid flows from the blowoff nozzles, where at least part of the intermediate blowoff step occurs after the washing step has concluded and before the rinsing step has started. Preferably, all non-liquid flows from the blowoff nozzles during the intermediate blowoff step occur after the washing step has concluded and before the rinsing step has started. The blowoff nozzles output streams of one or more of compressed air, steam or blower dryer air, as discussed above.

[0031] In an exemplary operation of the machine 110, the compressed air, steam or a blower dryer could be activated by the controller 150 according to a predefined machine condition, such as any of the following: (i) stopping of the wash pump 128, (ii) draining of the sump at the conclusion of a wash step of the cycle, (iii) a set time period after end of the wash step of the cleaning cycles or (iv) a set time period before beginning a rinse step of the cleaning cycle.

[0032] As used herein, the term controller is intended to broadly encompass any circuit (e.g., solid state, application specific integrated circuit (ASIC), an electronic circuit, a combinational logic circuit, a field programmable gate array (FPGA)), processor(s) (e.g., shared, dedicated, or group - including hardware or software that executes code), software, firmware and/or other components, or a combination of some or all of the above, that carries out the control functions of the machine or the control functions of any component thereof.

[0033] Use of such sheeting zones in flow through machines or sheeting operations as part of the cleaning cycle in a batch type machine may provide advantages including: saving wash solution, make up water detergent and fills, leading to improved ware wash by removing or reducing residual detergent and/or food soil on wares, enhanced performance of the dual rinse, power rinse and/or the final rinse, improvement of HUEs (heat equivalent units) transferred to the wares if steam, heated compressed air, steam or blower dryer system is used, reduction of the frequency of changing the dual rinse and/or power rinse tanks, and/or improved drying.

[0034] It is to be clearly understood that the above description is intended by way of illustration and example only and is not intended to be taken by way of limitation, and that changes and modifications are possible. Accordingly, other embodiments are

contemplated and modifications and changes could be made without departing from the scope of this application.

CLAIMS

What is claimed is:

1. A warewash machine for washing wares, comprising:
a housing with a chamber for receiving wares, the chamber having an inlet end, an outlet end, multiple liquid spray zones between the inlet end and the outlet end, and a conveyor for moving wares along a conveyance path through the multiple liquid spray zones in a ware travel direction, the multiple liquid spray zones including a main wash zone and a final rinse zone;
an intermediate zone located, relative to the ware travel direction, after the main wash zone and before the final rinse zone, where the intermediate zone includes a blowoff system including multiple blowoff nozzles that direct non-liquid flows onto wares to move residual detergent solution and soils from the wares as the wares move through the intermediate zone.
2. The warewash machine of claim 1 wherein the blowoff nozzles output streams of one or more of compressed air, steam or blower dryer air onto the wares as the wares move through the intermediate zone.
3. The warewash machine of claim 1 wherein the blowoff system includes (i) a compressed air input or device to provide compressed air to the blowoff nozzles or (ii) a steam input or steam generator to provide steam to the blowoff nozzles.
4. The warewash machine of claim 1 wherein the intermediate zone does not include any liquid sprays.
5. The warewash machine of claim 4 wherein a first spray blocking curtain is positioned at an upstream end of the intermediate zone and a second spray blocking curtain is positioned as a downstream end of the intermediate zone.

6. The warewash machine of claim 1 wherein the intermediate zone includes a flowback pan structure to direct falling residual detergent solution and soils into a collection tank upstream of the intermediate zone in the ware travel direction.
7. The warewash machine of claim 1 wherein the intermediate zone is located one of (i) immediately after the main wash zone and immediately before a dual rinse zone, (ii) immediately after a dual rinse zone and immediately before the final rinse zone, (iii) immediately after the main wash zone and immediately before the final rinse zone, (iv) immediately after the main wash zone and immediately before a power rinse zone, (v) immediately after a power rinse zone and immediately before a dual rinse zone.
8. The warewash machine of claim 1 wherein a power rinse zone or dual rinse zone is located between the main wash zone and final rinse zone, wherein the intermediate zone is after the main wash zone and before the power rinse zone or the dual rinse zone, and a second intermediate zone with non-liquid blowoff is located after the power rinse zone or the dual rinse zone and before the final rinse zone.
9. The warewash machine of claim 1 wherein the intermediate zone includes a total non-liquid flow from the blowoff nozzles of between about 500 CFM and about 3500 CFM.
10. The warewash machine of claim 1 wherein the intermediate zone includes first blowoff nozzles that direct non-liquid flows onto leading sides of wares and second blowoff nozzles that direct non-liquid flows onto trailing sides of wares.
11. The warewash machine of claim 1, further comprising a controller that selectively turns the non-liquid flows from the blowoff nozzles ON in response to a predefined machine condition.
12. The warewash machine of claim 11 wherein the predefined machine condition is one of (i) initiation of conveyor movement, (ii) a specified time lapse after initiation of conveyor movement, (iii) triggering of a sensor that detects wares in or entering the machine, (iv) triggering of a sensor that detects wares in or entering the intermediate zone,

(v) a specified time lapse after a sensor detects wares in or entering the machine, or (vi) a specified time lapse after a sensor detects wares in or entering the intermediate zone.

13. The warewash machine of claim 1 wherein all non-liquid flows are downward.

14. A warewash machine for washing wares, comprising:

a housing with a chamber for receiving wares, the chamber accessible by a door that is movable between open and closed positions relative to a chamber access opening, a wash spray system in the chamber for spraying wash liquid from multiple wash nozzles, a rinse spray system in the chamber for spraying rinse liquid from multiple rinse nozzles, and a blowoff system in the chamber for delivering non-liquid flows from multiple blowoff nozzles toward wares in the chamber, wherein a controller is configured to selectively run at least one cleaning cycle that includes a washing step involving wash liquid sprays from the wash nozzles, a rinsing step involving rinse liquid sprays from the rinse nozzles and an intermediate blowoff step involving non-liquid flows from the blowoff nozzles, wherein at least part of the intermediate blowoff step occurs after the washing step has concluded and before the rinsing step has started.

15. The warewash machine of claim 14 wherein the blowoff nozzles output streams of one or more of compressed air, steam or blower dryer air.

16. The warewash machine of claim 14 wherein all non-liquid flows from the blowoff nozzles during the intermediate blowoff step occur after the washing step has concluded and before the rinsing step has started.

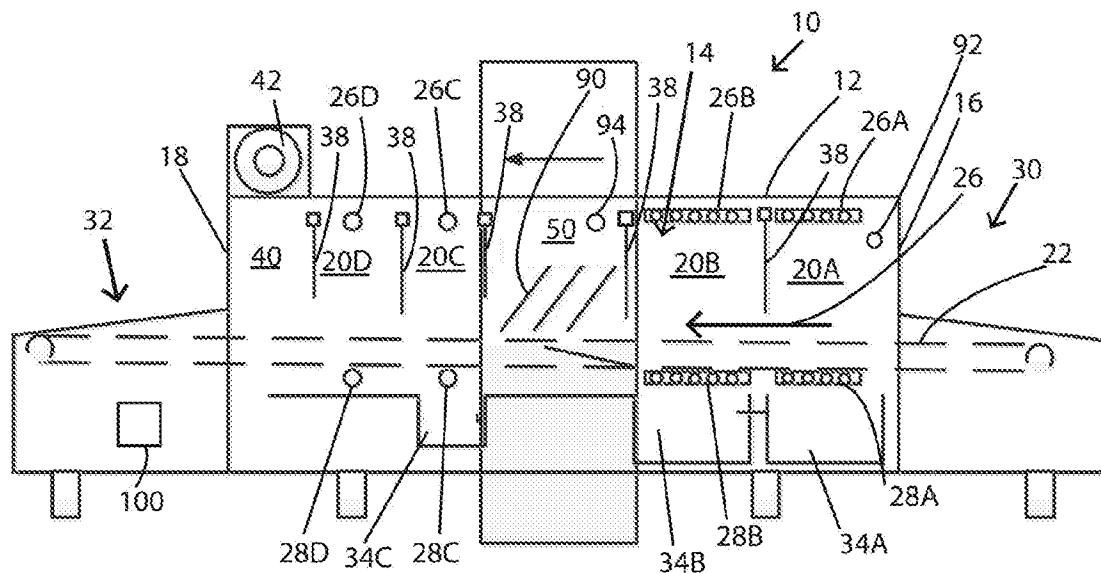


Fig. 1

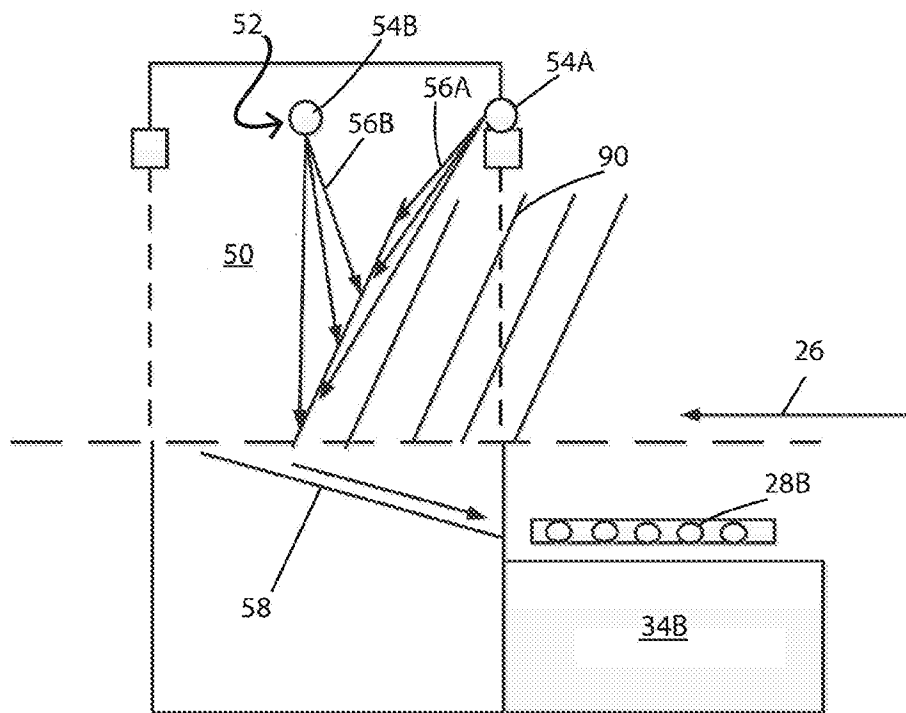


Fig. 2

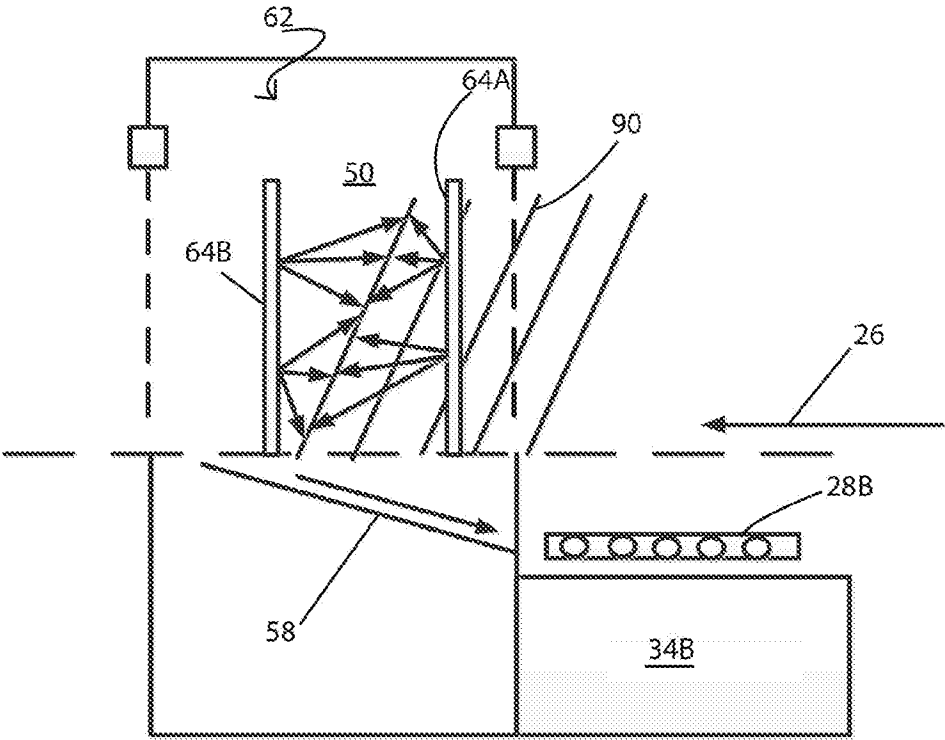


Fig. 3

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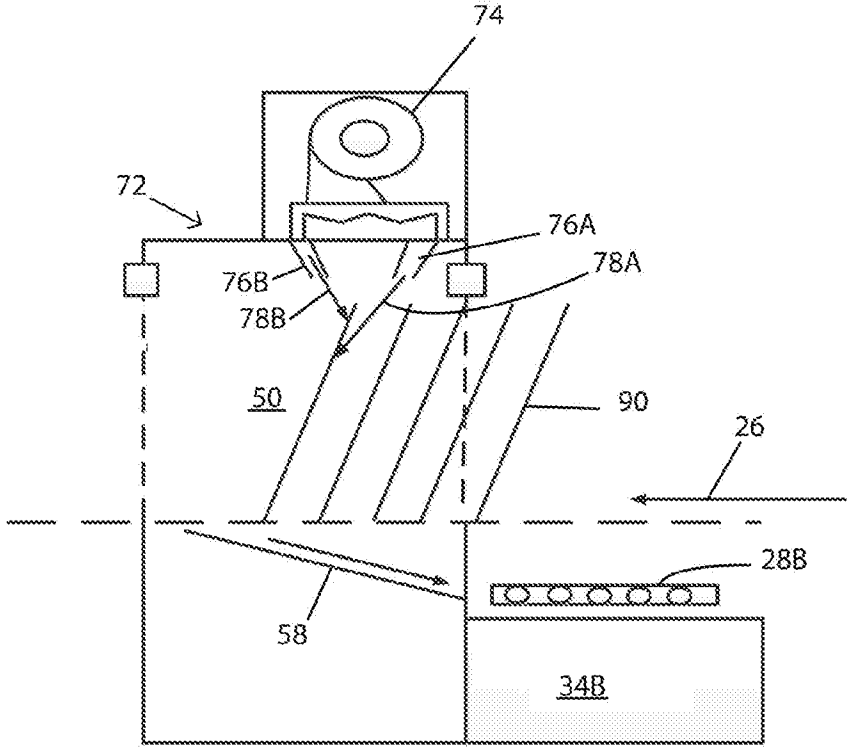


Fig. 4

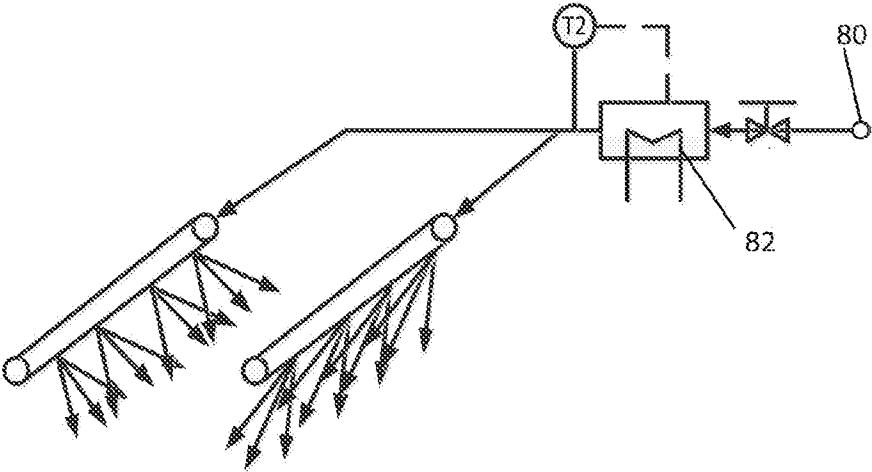


Fig. 5

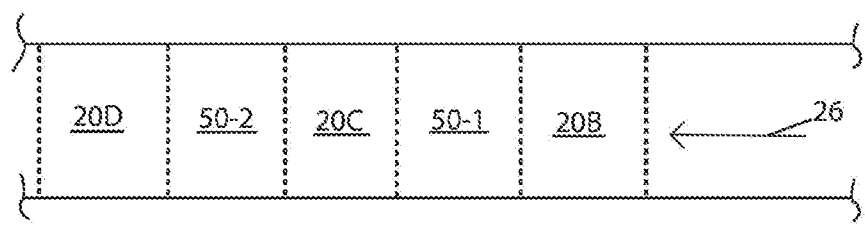


Fig. 6

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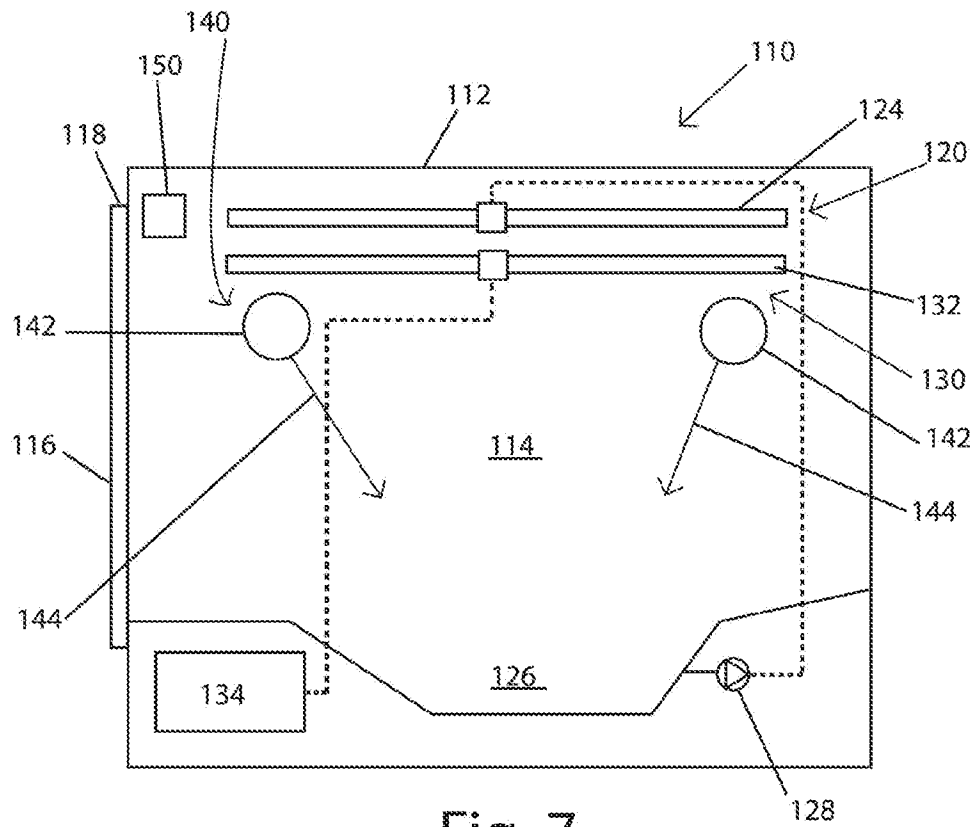


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/033622

A. CLASSIFICATION OF SUBJECT MATTER

INV. A47L15/00 A47L15/24 A47L15/42 A47L15/48
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP H11 138440 A (WASHIO CHUURI KOGYO KK; KOOKEN ENGINEERING KK) 25 May 1999 (1999-05-25)	1-5,7, 9-13
Y	paragraphs [0010] - [0023]; figure 1 -----	6
Y	US 2014/102485 A1 (ABDULFATTAH ABDULRAHMAN FOAD [SA] ET AL) 17 April 2014 (2014-04-17)	6
A	paragraphs [0050], [0079], [0089] - [0103]; figures 1,2,4 -----	1
A	US 2008/202558 A1 (GAUS BRUNO [DE]) 28 August 2008 (2008-08-28) paragraphs [0037] - [0039]; figure 1 -----	1,2,10
A	DE 196 08 034 C1 (STIERLEN MAQUET AG [DE]) 10 July 1997 (1997-07-10) figure 1 -----	1
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Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

28 August 2018

Date of mailing of the international search report

07/11/2018

Name and mailing address of the ISA/

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Kising, Axel

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2018/033622

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 319 930 A (YANO SHUNJI ET AL) 16 March 1982 (1982-03-16) column 5, line 54 - column 6, line 3; figure 2 -----	1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2018/033622

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of Item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-13

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-13

Claim 1 (and dependent claims 2 to 13) of the first invention is directed to a warewash machine comprising a housing having a conveyor for moving wares along a conveyance path through multiple liquid spray zones, wherein after the main wash zone and before the final rinse zone an intermediate zone is provided that comprises a blowoff sytem with multiple blowoff nozzles to remove detergent solution and soils from the wares as the wares move through the intermediate zone.

2. claims: 14-16

Claim 14 (and dependent claims 15,16) of the second invention is directed to a warewash machine having a housing, a wash spray system, a rinse spray system and a blowoff system all provided in a (single) chamber, wherein a controller is configured to selectively run cleaning step having a washing step, a rinsing step and an intermediate blowoff step using nozzles with non-liquid fluids.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2018/033622

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP H11138440	A	25-05-1999	NONE	

US 2014102485	A1	17-04-2014	NONE	

US 2008202558	A1	28-08-2008	DE 102007009252 A1	28-08-2008
			US 2008202558 A1	28-08-2008

DE 19608034	C1	10-07-1997	NONE	

US 4319930	A	16-03-1982	NONE	
