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(54) Title: SYSTEM FOR WASHING WASHWARE AND METHOD FOR OPERATING A SYSTEM OF THIS TYPE

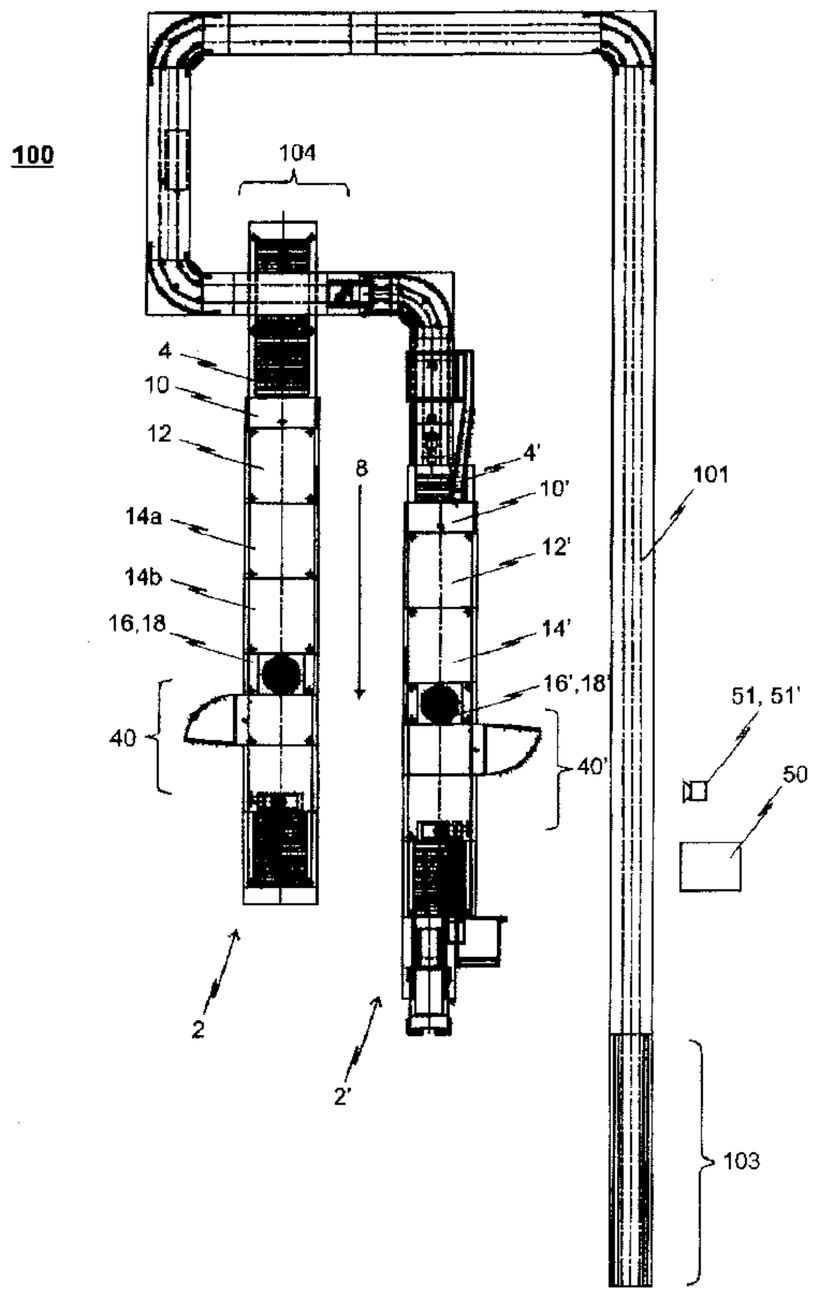

Fig. 1

(57) Abrégé/Abstract:
The invention relates to a dishwashing system (100) comprising at least one conveyor system (101) for feeding washware to one conveyor dishwasher (2, 2') and a conveyor system (101) for feeding dishware to the at least one conveyor dishwasher (2, 2') In

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(57) Abrégé(suite)/Abstract(continued):
order to further reduce the consumption of fresh water, chemicals and energy during operation, the invention provides a washware detector apparatus (51) which is designed to detect the number of units of washware, which are fed to the at least one conveyor dishwasher (2, 2') with the aid of the conveyor system (101) per unit time, in a prespecified or prespecifiable region of the conveyor system (101). Furthermore, a control device (50) is provided which is designed to select a predefined or predefinable treatment program.

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(54) Title: SYSTEM FOR WASHING WASHWARE AND METHOD FOR OPERATING A SYSTEM OF THIS TYPE

(57) Abstract: The invention relates to a dishwashing system (100) comprising at least one conveyor system (101) for feeding washware to one conveyor dishwasher (2, 2') and a conveyor system (101) for feeding dishware to the at least one conveyor dishwasher (2, 2') In order to further reduce the consumption of fresh water, chemicals and energy during operation, the invention provides a washware detector apparatus (51) which is designed to detect the number of units of washware, which are fed to the at least one conveyor dishwasher (2, 2') with the aid of the conveyor system (101) per unit time, in a prespecified or prespecifiable region of the conveyor system (101). Furthermore, a control device (50) is provided which is designed to select a predefined or predefinable treatment program.

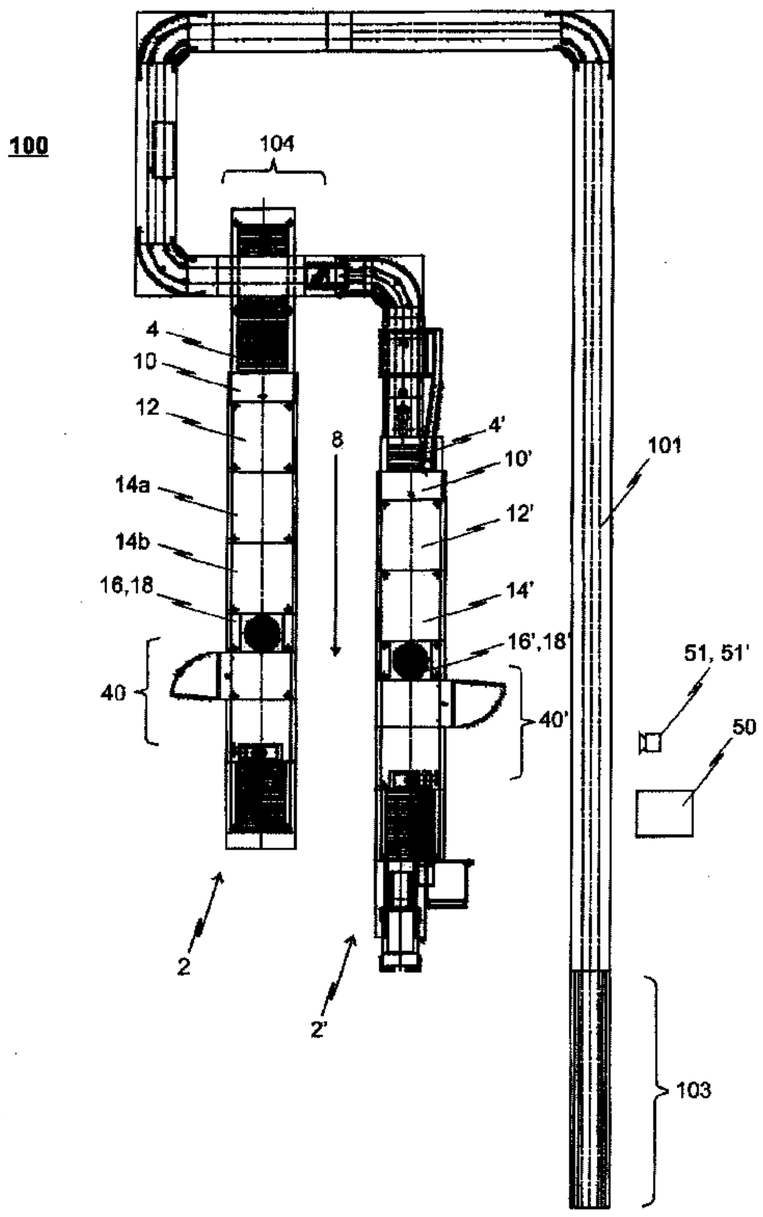

Fig. 1

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SYSTEM FOR WASHING WASHWARE AND METHOD FOR OPERATING A SYSTEM OF THIS TYPE

The invention relates to a system for washing washware, comprising at least one conveyor dishwasher having at least one wash zone, at least one final-rinse zone and a transportation apparatus for transporting washware through the individual treatment zones of the conveyor dishwasher, and a conveyor system for feeding washware to the at least one conveyor dishwasher. The invention also relates to a method for operating a dishwashing system of this type.

The invention accordingly relates, in particular, to a dishwashing system having a flight-type dishwasher (flight-type warewasher) or a rack-conveyor dishwasher (rack-conveyor warewasher), in which the washware to be treated, for example dishes, pots and pans, glasses, cutlery, trays and other utensils to be cleaned, is fed to the conveyor dishwasher with the aid of a conveyor system.

Semi-automated dishwashing systems, in which the dishes are returned via a conveyor system which has, for example, a feed conveyor belt or the like for feeding washware to the conveyor dishwasher, are increasingly being used in relatively large catering establishments in particular. The conveyor system may be in the form, for example, of a tray-return belt onto which trays with dishes or the dishes can be directly placed at a dish-receiving point and from there fed to the conveyor dishwasher either directly or via a manual pre-clearing station or pre-sorting station. It goes without saying that other solutions are also feasible for the conveyor system.

Conveyor dishwashers (conveyor warewashers) are used in the commercial field. In contrast to domestic dishwashers, in which the washware to be cleaned remains stationary in the machine during cleaning, in the case of conveyor dishwashers,

the washware is transported through various treatment zones of the machine. In the case of conveyor dishwashers, the washware is conveyed through a plurality of treatment zones, for example a pre-wash zone or zones, a main-wash zone or zones, a post-wash or pre-rinse zone or zones, a final-rinse zone or zones and a drying zone or zones. A transportation apparatus which generally has compartments for accommodating washware is used to transport the washware through the conveyor dishwasher in a transportation direction. In the case of a flight-type dishwasher, the compartments may be formed by supporting fingers on a transportation belt of the transportation apparatus. In rack-conveyor dishwashers, dish racks in which compartments can be formed for accommodating the washware to be treated serve as the transportation apparatus. It is feasible here for the dish racks to be transported through the rack-conveyor dishwasher by a conveyor device.

DE 196 08 030 C1 describes a system for washing washware having a conveyor dishwasher in which the process parameters of the individual treatment zones (pre-wash zone, main-wash zones and possibly final-rinse zone) can be matched to the respective washware during operation, so that the washware can be cleaned in an effective and economical manner. In the case of this conventional conveyor dishwasher, a total of two different types of washware are taken into consideration, specifically "drinking glasses, plates, trays" on the one hand and "pots and pans, containers, tubs" on the other hand. Furthermore, the degree of soiling of the washware to be treated plays a role when selecting the process parameters.

DE 10 2005 021 101 A1 discloses a system for washing washware having a conveyor dishwasher in which the final-rinse zone has two spray arms which are separate from one another. At least one of the two spray arms is switched on or switched off as required. The additional spray arm in the final-rinse zone is switched on or switched off either as a function of

the transportation speed or as a function of the type of washware, the quantity of washware and the degree of soiling of the washware.

US 6,530,996 B2 relates to a system for washing washware having a conveyor dishwasher, in which a wash and/or final-rinse program is automatically selected as a function of the type of washware. In particular, the transportation speed and the spray time are varied as a function of the type of washware.

The aim of the invention is to achieve the object of developing a system for washing washware of the type mentioned in the introduction such that - in comparison to the dishwashing systems known from the prior art - the consumption of fresh water, chemicals and energy can be further reduced during operation. A further aim is to specify a method for operating a dishwashing system of this type.

The number of units of washware which are fed to the at least one conveyor dishwasher with the aid of the conveyor system per unit time can be determined by virtue of the provision of a washware detector apparatus which detects the presence of washware in a prespecified or prespecifiable region of the conveyor system. In this way, the operating load on the dishwashing system can be detected and the expected degree of utilization of the conveyor dishwasher or dishwashers can be predicted. This permits the operating parameters of the conveyor dishwasher or dishwashers to be matched to the amount of washware in good time, since it is already known in advance how many units of washware will soon have to be treated in the at least one conveyor dishwasher.

The dishwashing system according to the invention accordingly also has a control device which automatically selects a predefined or predefinable (e.g, set or stored in memory of the control device by being preset during machine manufacture

and/or subject to on-site adjustment by a service person or machine operator according to the particular needs of the machine installation) treatment program and sets the process parameters associated with the selected treatment program as a function of the detected number of units of washware which are fed to the at least one conveyor dishwasher with the aid of the conveyor system per unit time for the at least one conveyor dishwasher. Since the number of units of washware which are fed to the conveyor dishwasher per unit time is determined by the washware detector apparatus which detects the presence of washware in a prespecified or prespecifiable region of the conveyor system, the expected degree of utilization of the conveyor dishwasher is already known in advance. A certain lead time is accordingly provided with respect to setting process parameters in the conveyor dishwasher, this lead time possibly being necessary to change or adapt certain process parameters.

This is particularly true when, for example, the quantity of wash liquid sprayed in the at least one wash zone of the conveyor dishwasher per unit time and/or the quantity of final-rinse liquid sprayed in the at least one final-rinse zone per unit time is to be matched to the degree of utilization of the conveyor dishwasher. Under certain circumstances, these process parameters can be changed only with a time delay, since a certain lead term is required so that the spray jets fan out properly in the at least one wash zone or in the at least one final-rinse zone and therefore effective treatment of the washware in the wash zone or in the final-rinse zone can be guaranteed.

Since a predefined or predefinable program sequence is automatically selected and the process parameters associated with the selected program sequence are set for the conveyor dishwasher as a function of the expected degree of utilization of the conveyor dishwasher by means of the solution according to the invention, it is ensured that the

control device can always select and set the optimum operating parameters for treating the washware. The "optimum process parameters" are to be understood to be process parameters with which the washware is treated not only in an effective manner but also in a particularly economical manner in the individual treatment zones of the conveyor dishwasher.

In a preferred embodiment of the solution according to the invention, at least one of the process parameters listed below is automatically set or changed as a function of the detected number of units of washware which are fed to the conveyor dishwasher per unit time:

- the transportation speed at which the washware is transported through the individual treatment zones of the conveyor dishwasher;
- a quantity of wash liquid sprayed in the at least one wash zone of the conveyor dishwasher per unit time;
- a quantity of final-rinse liquid sprayed in the at least one final-rinse zone of the conveyor dishwasher per unit time;
- a temperature value of an air stream used to dry the washware in a drying zone of the conveyor dishwasher; and/or
- a volumetric quantity of a drying-air stream circulating in a drying zone of the conveyor dishwasher for drying the washware per unit time.

In addition or as an alternative to this, it is further preferred when, in this embodiment of the dishwashing system according to the invention, at least one conveyor dishwasher is provided which has a first main-wash zone, with main-wash nozzles, and a second main-wash zone, likewise with main-wash nozzles, which is connected downstream of the first main-wash zone, with the control device being designed to automatically

switch on or switch off either the supply of wash liquid to the main-wash nozzles of the first main-wash zone or the supply of wash liquid to the main-wash nozzles of the second main-wash zone (switch-on and switch-off of wash zones) as a function of the detected number of units of washware which are fed to the at least one conveyor dishwasher per unit time.

Since not only the quantity of wash liquid which is sprayed per unit time or the quantity of final-rinse liquid which is sprayed per unit time, but additionally also the transportation speed, are changed, this can have the effect that the contact time of the washware in the respective treatment zones of the conveyor dishwasher is no longer than would actually be necessary for adequate treatment. Overtreatment of the washware is therefore prevented.

In the dishwashing system according to the invention, in principle only as many resources of water, energy and chemicals are accordingly consumed in the respective treatment zones of the conveyor dishwasher as are actually necessary to ensure adequate processing (cleaning, final-rinsing, drying). In particular, the consumption of fresh water, which is sprayed onto the washware in the final-rinse zone of the conveyor dishwasher in pure form or with further additives added, can be markedly reduced during operation of the dishwashing system.

In one possible embodiment of the dishwashing system according to the invention, it is feasible for the process parameters of a first treatment program, for example the process parameters for partial-load operation, to be automatically set up to a predefined or predefinable number of units of washware which are fed with the aid of the conveyor system per unit time in the conveyor dishwasher, and for the process parameters of a second treatment program, for example the process parameters for full-load operation, to be

automatically set when the predefined or predefinable number of units of washware which are fed with the aid of the conveyor system per unit time in the conveyor dishwasher is exceeded. In this preferred embodiment too, the settable process parameters preferably include at least one of the following parameters: the transportation speed at which the washware is transported through the individual treatment zones of the conveyor dishwasher; the quantity of wash liquid sprayed in the at least one wash zone per unit time; and/or the quantity of final-rinse liquid sprayed in the at least one final-rinse zone per unit time.

It is therefore feasible, in particular, for the transportation speed during partial-load operation, that is to say when the process parameters of the first treatment program are set, to be reduced compared to full-load operation, while at the same time both the quantity of wash liquid which is sprayed in the at least one wash zone of the conveyor dishwasher per unit time and the quantity of final-rinse liquid which is sprayed in the at least one final-rinse zone of the conveyor dishwasher per unit time are likewise reduced compared to full-load operation.

The method according to the invention is a solution for operating a system for washing washware which has at least one conveyor dishwasher and a conveyor system for feeding washware to the at least one conveyor dishwasher. The method according to the invention can be used to reduce the consumption, in particular, of fresh water during operation of a dishwashing system of this type in a manner which is particularly easy to implement but is nevertheless effective.

The invention will be described below on the basis of a preferred embodiment as an example and with reference to the drawings, in which:

Fig 1 schematically shows a plan view of a system for washing washware according to the invention; and

Fig. 2 schematically shows a longitudinal sectional view through a conveyor dishwasher which is used in the system according to Fig. 1.

Fig. 1 schematically shows a plan view of an embodiment of the dishwashing system 100 according to the invention. This is accordingly a semi-automated dishwashing system which has a first conveyor dishwasher 2 for washing dishes, glasses and pots and pans, and also a second conveyor dishwasher 2' for washing trays and items of cutlery. A conveyor system 101 is also provided. The conveyor system 101 extends from a washware-receiving region 103 to the second conveyor dishwasher 2' and serves to convey washware from the washware-receiving region 103 to the inlet region 11' of the second conveyor dishwasher 2'.

The washware is preferably fed to the conveyor dishwasher 2' at a constant rate of advance. Furthermore, the abovementioned first conveyor dishwasher 2 is provided in the outlet region of the conveyor system 101. In the illustrated embodiment, this first conveyor dishwasher 2 serves to wash dishes, for example plates, cups, saucers, bowls and containers and vessels. The design and the manner of operation of the second conveyor dishwasher 2' which is used in the dishwashing system 100 according to Fig. 1 will be described below with reference to the illustration in Fig. 2. The first conveyor dishwasher 2, which serves to wash dishes, glasses and pots and pans, is, in principle, of identical design to the second conveyor dishwasher 2', but with not only one main-wash zone 14', but two main-wash zones 14a, 14b which are arranged one behind the other, being provided here. A single main-wash zone 14' is sufficient in the second conveyor dishwasher 2' since the types of washware to be treated in the second conveyor dishwasher 2' are generally

not heavily soiled and therefore a plurality of main-wash zones are not needed.

Identically acting components are denoted by the same reference numerals in the first conveyor dishwasher 2 and the second conveyor dishwasher 2', with the reference numerals associated with the treatment zones of the second conveyor dishwasher 2' being provided with an apostrophe in order to draw a distinction. The manner of operation of the second conveyor dishwasher 2' will be described below with reference to the illustration according to Fig. 2. These explanations apply in an equivalent sense to the manner of operation of the first conveyor dishwasher 2 too.

The washware which is transported to the two conveyor dishwashers 2, 2' with the aid of the conveyor system 101 is pre-sorted with respect to the type of washware in a pre-sorting region 104. In detail, provision is made here for the washware which is to be treated in the first conveyor dishwasher 2 (glasses and dishes) to be moved manually from the conveyor system 101 onto the transportation apparatus 4 of the first conveyor dishwasher 2 in the pre-sorting region 104. This ensures that only trays and cutlery are fed to the second conveyor dishwasher 2' with the aid of the conveyor system 101.

The dishwashing system 100 according to the present invention is distinguished in that a washware detector apparatus 51 is provided which is designed to detect the presence of washware in a prespecified or prespecifiable region of the conveyor system 101. In the preferred embodiment according to Fig. 1, the conveyor system 101 is designed such that the washware is fed to the two conveyor dishwashers 2, 2' at a predefined or predefinable feed rate. In this way, the washware detector apparatus 51 is also suitable for detecting the number of units of washware which are fed to the conveyor dishwashers

2, 2' with the aid of the conveyor dishwasher 101 per unit time.

The washware detector apparatus 51 preferably has at least one optically, inductively or capacitively operating detector device 51' which is designed to detect the presence of washware in the prespecified or prespecifiable region of the conveyor system 101. It is particularly advantageous when the detector device 51' is designed to detect the presence of individual trays, individual dishes, individual pots and pans, individual glasses, individual items of cutlery and/or individual containers.

In the dishwashing system 100 illustrated in Fig. 1, a control device 50 is also provided, which is designed to automatically select a predefined or predefinable treatment program and set the process parameters associated with the selected treatment program for at least one of the two conveyor dishwashers 2, 2' as a function of the detected number of items of washware fed to the two conveyor dishwashers 2, 2' per unit time.

It is preferred here when the control apparatus 50 is designed to set the process parameters, which are associated with the selected treatment program, with a time delay in the at least one conveyor dishwasher 2, 2', with the time delay depending on the distance of the region of the conveyor system 101 monitored by the detector device 51' from the at least one conveyor dishwasher 2, 2' and on the feed rate at which the washware is fed to the at least one conveyor dishwasher 2, 2'.

The exact manner of operation of the control device 50 is to be described in conjunction with the conveyor dishwasher 2' which is schematically illustrated in Fig. 2.

Fig. 2 schematically shows a longitudinal sectional view through the second conveyor dishwasher 2' which is used to wash trays and cutlery in the dishwashing system according to Fig. 1. The conveyor dishwasher 2' is equipped with a transportation apparatus 4' for transporting washware (not illustrated) through the conveyor dishwasher 2' in a transportation direction 8. The conveyor dishwasher 2' has at least one wash zone, for example as illustrated in Fig. 2, a pre-wash zone 12' and a main-wash zone 14' which is arranged downstream of the pre-wash zone 12' as seen in the transportation direction 8.

A post-wash zone 16' is arranged downstream of the at least one wash zone 12', 14' as seen in the transportation direction 8, and at least one final-rinse zone, for example only a single final-rinse zone 18' as illustrated, is arranged downstream of the post-wash zone 16'. In the conveyor dishwasher 2' illustrated in Fig. 2, a drying zone 40' follows the final-rinse zone 18' in the transportation direction 8 of the washware. The respective zones 12', 14', 16', 18', 40' of the conveyor dishwasher 2' can be separated from one another by means of separating curtains 47. In the embodiment illustrated in Fig. 2, the inlet tunnel 10' itself is also separated from the inlet 11' by means of a separating curtain 47. Wash liquid and final-rinse liquid are prevented from splashing over and vapours are prevented from escaping from the conveyor dishwasher 2' by virtue of the provision of the separating curtains 47.

Spray nozzles 20, 22, 24, 26, 28, 30 are associated with the said treatment zones 12', 14', 16', 18' of the conveyor dishwasher 2'. These spray nozzles 20, 22, 24, 26, 28, 30 serve to spray liquid onto the washware when the said washware is transported through the respective treatment zones 12', 14', 16', 18' by the transportation apparatus 4'. The individual spray systems of the treatment zones 12', 14',

16', 18' ensure that the washware to be treated is sprayed both from above and from below.

However, in the conveyor dishwasher 2' which is schematically illustrated in Fig. 2, the final-rinse zone 18' not only has downwardly directed upper spray nozzles 20 and upwardly directed lower spray nozzles 22, but also transversely directed lateral spray nozzles 24 on each side of the transportation apparatus 4'. The use of lateral spray nozzles 24 permits targeted spraying of areas of the washware with a final-rinse liquid in shadow zones too. The use of lateral spray nozzles 24 in the final-rinse zone 18' has a clear advantage in terms of the final-rinse result (effective rinsing of detergent residues from surfaces of the washware in shadow zones too) over systems in which only upper and lower spray nozzles 20, 22, and no transversely directed lateral spray nozzles 24, are provided in the final-rinse zone 18', specifically when the transportation system is fully loaded, that is to say, for example, when the tray carrier is loaded with one tray next to another.

The post-wash zone 16', main-wash zone 14' and pre-wash zone 12' also have associated tanks (post-wash tank 32, main-wash tank 34, pre-wash tank 36) for accommodating sprayed liquid and/or for providing liquid for the spray nozzles 26, 28, 30 of the relevant treatment zones 14', 16', 18'.

As already mentioned, the first conveyor dishwasher 2, in the dishwashing system 100 illustrated in Fig. 1, likewise has a transportation apparatus 4 for transporting washware (not illustrated) through the conveyor dishwasher 2 in the transportation direction 8. The first conveyor dishwasher 2 also has a pre-wash zone 12 and a (first) main-wash zone 14a, which is arranged downstream of the pre-wash zone 12 as seen in the transportation direction 8, downstream of an inlet tunnel 10 as seen in the transportation direction 8. In contrast to the second conveyor dishwasher 2' according to

Fig. 2, a further (second) main-wash zone 14b is provided downstream of the (first) main-wash zone 14a as seen in the transportation direction 8 in the first conveyor dishwasher 2. A post-wash zone 16 is arranged downstream of the second main-wash zone 14b as seen in the transportation direction 8, and at least one final-rinse zone, for example only a single final-rinse zone 18 as illustrated, is arranged downstream of the post-wash zone 16. In the first conveyor dishwasher 2 which is illustrated in plan view only in Fig. 1, a drying zone 40 follows the final-rinse zone 18 in the transportation direction 8 of the washware.

The treatment zones 10, 12, 14a, 14b, 16 and 18 of the first conveyor dishwasher 2 are identical to the corresponding treatment zones 10', 12', 14', 16' and 18' in terms of function and structure, and so the treatment zones 10, 12, 14a, 14b, 16 and 18 of the first conveyor dishwasher 2 are not described in detail.

As already indicated, final-rinse liquid, which comprises fresh water together with rinse aid which is added in a metered manner, is sprayed onto the washware (not illustrated) via the spray nozzles 20, 22, 24 of the final-rinse zone 18', which spray zones are arranged above and below the transportation apparatus 4' and also laterally, in the second conveyor dishwasher 2' illustrated in Fig. 2. Some of the sprayed final-rinse liquid is transported from treatment zone to treatment zone, counter to the transportation direction 8 of the washware, by means of a cascade system. The remainder of the final-rinse liquid which is sprayed in the final-rinse zone 18' is conducted directly into the pre-wash tank 36 which is associated with the pre-washed zone 12' via a valve V1 and a bypass line 38.

In the cascade system, the final-rinse liquid which is sprayed by the final-rinse nozzles 20, 22, 24 flows from the final-rinse zone 18' into the post-wash tank 32, which is

associated with the post-wash zone 16', due to the force of gravity. The final-rinse liquid which is sprayed in the final-rinse zone 18' and collected by the post-wash tank 32 is then conveyed to the spray nozzles (post-wash nozzles 26) of the post-wash zone 16' with the aid of a post-wash pump 45.

Wash liquid is rinsed off from the washware in the post-wash zone 16'. The liquid produced in the process (post-wash liquid) flows into the main-wash tank 34, which is associated with the main-wash zone 14', due to the force of gravity. An outflow element 39, for example an outflow base or a baffle plate which conducts the post-wash liquid, which is sprayed by the post-wash nozzles 26, into the main-wash tank 34, is preferably provided for this purpose. According to another embodiment (not shown), the outflow element 39 can be dispensed with when the main-wash tank 34 extends as far as beneath the post-wash nozzles 26 of the post-wash zone 16'.

The liquid accommodated by the main-wash tank 34 of the main-wash zone 14' is usually provided with a detergent and is sprayed onto the washware via the spray nozzles (main-wash nozzles 28) of the main-wash zone 14' with the aid of a main-wash pump 35. The wash liquid sprayed by the main-wash nozzles 28 flows back into the main-wash tank 34 due to the force of gravity.

The main-wash tank 34 forms a fluid connection with the pre-wash tank 36, which is associated with the pre-wash zone 12', via an overflow line 37. The wash liquid which is sprayed in the main-wash zone 14' enters the pre-wash tank 36 via this overflow line 37 when a sufficient quantity of wash liquid is accommodated in the main-wash tank 34.

The liquid accommodated in the pre-wash tank 36 of the pre-wash zone 12' is then sprayed onto the washware via the spray nozzles (pre-wash nozzles 30) of the pre-wash zone 12' with

the aid of a pre-wash pump 33, in order to remove coarse particles of dirt from the washware. The wash liquid which is sprayed by the pre-wash nozzles 30 flows back into the pre-wash tank 36 due to the force of gravity.

The pre-wash tank 36 is provided with an overflow line 31 which serves to feed the excess quantity of liquid to a wastewater system when a liquid level in the pre-wash tank 36 is exceeded.

As already indicated, the liquid which is sprayed in the main-wash zone 14' and in the pre-wash zone 12' preferably contains detergent which is added in a metered manner, for example, to the liquid which is accommodated in the main-wash tank 34 of the main-wash zone 14' with the aid of a detergent-metering apparatus (not shown in the drawings).

As already mentioned, the drying zone 40' follows the final-rinse zone 18' in the transportation direction 8. The washware is dried with dry and heated air in the drying zone 40', in order to blow off or dry off the moisture on the washware. In order to keep the moisture content of the air in a range which is favourable for drying purposes, it is feasible, for example, to feed ambient air from the outside to the drying zone 40' via an opening, for example through the outlet opening for the washware.

The warm and moist air in the drying zone 40' is then drawn out of the drying zone 40' via a further opening with the aid of a fan 41, for example. In this case, it is advantageous when the discharge-air stream out of the drying zone 40' passes a heat-recovery device 42 in which a condenser may be provided, for example. The heat-recovery device 42 serves to recover at least some of the thermal energy contained in the discharge air.

The first conveyor dishwasher 2 has a drying zone 40 which corresponds to the drying zone 40'.

If the tanks (pre-wash tank 36, main-wash tank 34, post-wash tank 32) which are associated with the wash zones 12', 14' and 16' are empty or only inadequately filled before the conveyor dishwasher 2' is first started, the said tanks first have to be filled via a fresh-water line 90 and/or by spraying final-rinse liquid into the final-rinse zone 18'. The fresh-water line 90 can be connected to a fresh-water supply system via a controllable valve V3. The quantity of wash liquid available in the main-wash zone 14' and in the pre-wash zone 12' can in each case be monitored with the aid of a level sensor which is provided in the main-wash tank 34 and respectively with the aid of a level sensor which is provided in the pre-wash tank 36, and reported to a control apparatus 50.

The final-rinse zone 18' can - as illustrated in Fig 2 - have an associated fresh-water container 30 for buffer-storing at least some of the fresh water provided for final rinsing. The fresh-water container 30 is provided at one end with a fresh-water connection, which can be connected to a fresh-water supply system via a controllable fresh-water feed valve V2, and at the other end to the intake side of a final-rinse pump 43. However, it goes without saying that it is also feasible to dispense with a fresh-water container 30 for buffer-storing at least some of the fresh water provided for final rinsing, and to connect the fresh-water feed valve V2 directly to the intake side of the final-rinse pump 43.

The pressure side of the final-rinse pump 43 is connected to a water heater 9 (boiler) via a line system. In this case, the line system is designed in such a way that the liquid conveyed to the spray nozzles 20, 22, 24 of the final-rinse zone 18' by the final-rinse pump 43 passes the heat-recovery device 42 before it reaches the water heater 9. In this way,

it is possible to make use of at least some of the thermal energy of the discharged discharge air to heat the liquid fed to the spray nozzles 20, 22, 24 of the final-rinse zone 18'.

Rinse aid is added in a metered manner to the fresh water, which is fed to the final-rinse pump 43 either directly by the fresh-water feed valve V2 or by the fresh-water container 30, with the aid of a rinse aid-metering apparatus (not explicitly illustrated in Fig. 2).

The control device 50, which has already been described in conjunction with the dishwashing system 100 illustrated in Fig. 1, is schematically illustrated in the second conveyor dishwasher 2' illustrated in Fig. 2. The control device 50 is designed to automatically set specific process parameters as a function of the number of units of washware which are fed to the conveyor dishwashers 2, 2' with the aid of the conveyor system 101 per unit time, the said number of units of washware being detected with the aid of the washware detector apparatus 51. The control device 50 is preferably designed to control the different controllable components of the conveyor dishwashers 2, 2', for example the respective pumps and valves, in accordance with a predefined or predefinable program sequence, in order to thus be able to set the process parameters in the individual treatment zones 12, 14a, 14b, 16, 18 or 12', 14', 16', 18' of the conveyor dishwasher 2 or 2' and also the transportation speed of the transportation apparatus 4 or 4'.

The control device 50 is preferably designed to automatically set the transportation speed, at which the washware is transported through the individual treatment zones 12, 14a, 14b, 16, 18 or 12', 14', 16', 18' of the conveyor dishwasher 2 or 2', to a predefined or predefinable value as a function of the detected number of units of washware which are fed to the conveyor dishwashers 2, 2' per unit time; and/or to automatically set a quantity of wash liquid sprayed in the at

least one wash zone 12, 14a, 14b or 12', 14' per unit time to a predefined or predefinable value as a function of the detected number of units of washware which are fed to the conveyor dishwashers 2, 2' per unit time; and/or to automatically set a quantity of final-rinse liquid sprayed in the final-rinse zone 18 or 18' of the conveyor dishwasher(s) 2 or 2' per unit time to a predefined or predefinable value as a function of the detected number of units of washware which are fed to the conveyor dishwashers 2, 2' per unit time.

As an alternative or in addition to this, it is preferred when the control device 50 is designed to automatically select a predefined or predefinable program sequence in the drying zone 40, 40' of at least one of the conveyor dishwashers 2, 2' and set the process parameters associated with the selected program sequence as a function of the detected number of units of washware which are fed to the conveyor dishwashers 2, 2' per unit time. It is feasible here, in particular, for the control device 50 to be designed to automatically select a predefined or predefinable temperature value of an air stream used in the drying zone 40, 40' of at least one of the conveyor dishwashers 2, 2' to dry the washware and set the temperature of the air stream used for drying purposes to the selected value as a function of the detected number of units of washware which are fed to the conveyor dishwashers 2, 2' per unit time.

As an alternative or in addition to this, it is also feasible for the control device 50 to be designed to automatically select a predefined or predefinable value of a volumetric quantity of a drying-air stream circulating in the drying zone 40, 40' of at least one of the conveyor dishwashers 2, 2' for drying the washware per unit time and set the volumetric quantity circulating per unit time to the selected value as a function of the detected number of units of

washware which are fed to the conveyor dishwashers 2, 2' per unit time.

In the conveyor dishwasher (second conveyor dishwasher 2') illustrated in Fig. 2, it is feasible, in particular, for the control device 50 to be designed to automatically switch on or switch off the supply of wash liquid to the pre-wash nozzles 30 of the pre-wash zone 12 or 12' as a function of the detected number of units of washware which are fed to the conveyor dishwashers 2, 2' per unit time; and/or to automatically switch on or switch off the supply of wash liquid to the main-wash nozzles 28 of the main-wash zone(s) 14a, 14b or 14' as a function of the detected number of units of washware which are fed to the conveyor dishwashers 2, 2' per unit time.

The control apparatus 50 is connected to the washware detector apparatus 51 via a suitable communications connection in order to check the type of washware which is fed to the conveyor dishwasher 2 and detected by the washware detector apparatus 51 continuously or at prespecified times or events.

The dishwashing system 100 according to the invention is therefore also suitable for carrying out a method for washing washware, with the following method steps being executed:

a) the number of units of washware which are fed to the conveyor dishwasher(s) 2, 2' with the aid of the conveyor system 101 per unit time is detected with the aid of the washware detector apparatus 51 in the prespecified or prespecifiable region of the conveyor system 101; and
b) a predefined or predefinable treatment program is automatically selected and the process parameters associated with the selected treatment program are set in the conveyor dishwasher 2, 2' as a function of the detected number of units of washware which are

fed to the conveyor dishwasher(s) 2, 2' per unit time.

The process parameters of a first treatment program are preferably automatically set here up to a predefined or predefinable number of units of washware which are fed with the aid of the conveyor system 101 per unit time in the conveyor dishwasher 2 or 2', with the process parameters of a second treatment program being automatically set when the predefined or predefinable number of units of washware which are fed with the aid of the conveyor system 101 per unit time in the conveyor dishwasher 2 or 2' is exceeded. The settable process parameters include at least one of the following parameters: the transportation speed at which the washware is transported through the individual treatment zones 12, 14a, 14b, 16, 18 or 12', 14', 16', 18' of the conveyor dishwasher 2 or 2'; the quantity of wash liquid sprayed in the at least one wash zone 12, 14a, 14b or 12', 14' per unit time; the quantity of final-rinse liquid sprayed in the at least one final-rinse zone 18 or 18' per unit time; the temperature value of an air stream used to dry the washware in the drying zone 40 or 40'; and/or the volumetric quantity of a drying-air stream circulating in the drying zone 40, 40' for drying the washware per unit time.

In a preferred further development of the method according to the invention, the transportation speed at which the washware is transported through the individual treatment zones 12, 14a, 14b, 16, 18 or 12', 14', 16', 18' of the conveyor dishwasher 2 or 2', the quantity of wash liquid sprayed in the at least one wash zone 12, 14a, 14b or 12', 14' per unit time, and the quantity of final-rinse liquid sprayed in the at least one final-rinse zone 18 or 18' per unit time are in each case automatically increased when a predefined or predefinable number of units of washware which are fed with the aid of the conveyor system 101 per unit time is exceeded in the conveyor dishwasher 2 or 2'.

In particular, it is feasible for the temperature of the drying-air stream to be set to an average value of, for example, 55 to 65°C at an average transportation speed in the drying zone 40, 40' of the at least one conveyor dishwasher 2, 2', and/or for the volumetric quantity of drying air circulating per unit time to be set to an average value of, for example, 1500 to 2500 m^3/h.

The invention is not restricted to the embodiments of Fig. 1 and Fig. 2 shown by way of example in the drawings. Rather, the invention can be gathered from an overall expert view of the patent claims and of the description of the exemplary embodiment.

It is therefore feasible, for example, for only one of the two conveyor dishwashers 2, 2' to be controlled with the aid of the control device 50 as a function of the number of units of washware which are fed by the conveyor system 101 per unit time.

It is also feasible for the control device 50 to be designed to selectively automatically select a predefined or predefinable treatment program for at least one conveyor dishwasher 2, 2' and set the process parameters associated with the selected treatment program in the at least one conveyor dishwasher 2, 2' as a function of the detected number of units of washware which are fed per unit time.

With regard to the first conveyor dishwasher 2 which has the first main-wash zone 14a, with main-wash nozzles 28, and the second main-wash zone 14b, likewise with main-wash nozzles 28, which is connected downstream of the first main-wash zone 14a, it is finally also feasible for the control device 50 to be designed to automatically switch on or switch off either the supply of wash liquid to the main-wash nozzles 28 of the first main-wash zone 14a or the supply of wash liquid to the

main-wash nozzles 28 of the second main-wash zone 14b as a function of the detected number of units of washware which are fed to the at least one conveyor dishwasher 2 per unit time (e.g., the control device may be set so that wash liquid supply to only one of the main wash zones 14a and 14b is switched on or off and the other is not).

Patent claims

1. System (100) for washing washware, with the system (100) having the following:
- at least one conveyor dishwasher (2, 2') which has at least one wash zone (12, 14a, 14b; 12', 14'), at least one final-rinse zone (18; 18') and a transportation apparatus (4; 4') for conveying washware through the individual treatment zones (12, 14a, 14b, 16, 18; 12', 14', 16', 18') of the conveyor dishwasher (2, 2'); and
- a conveyor system (101) for feeding washware to the at least one conveyor dishwasher (2, 2'),

characterized in that a washware detector apparatus (51) is provided, which is designed to detect the number of units of washware, which are fed to the at least one conveyor dishwasher (2, 2') with the aid of the conveyor system (101) per unit time, in a prespecified or prespecifiable region of the conveyor system (101), and

in that a control device (50) is provided, which is designed to automatically select a predefined or predefinable treatment program and set the process parameters associated with the selected treatment program as a function of the detected number of units of washware which are fed to the at least one conveyor dishwasher (2, 2') per unit time for the at least one conveyor dishwasher (2, 2').

2. System according to Claim 1, with the washware detector apparatus (51) having at least one preferably optically, inductively or capacitively operating detector device (51') which is designed to detect the presence of washware in the prespecified or prespecifiable region of the conveyor system (101), and with the conveyor system (101) being designed to feed the washware to at least one conveyor dishwasher (2, 2') at a predefined or predefinable feed rate.

3. System according to Claim 2, with the at least one detector device (51') being designed to detect the presence

of individual trays, individual dishes, individual pots and pans, individual glasses, individual items of cutlery and/or individual containers.

4. System according to Claim 2 or 3, with the control device (50) being designed to set the process parameters, which are associated with the selected treatment program, with a time delay in the at least one conveyor dishwasher (2, 2'), with the time delay depending on the distance of the region of the conveyor system (101) monitored by the detector device (51') from the at least one conveyor dishwasher (2, 2') and on the feed rate at which the washware is fed to the at least one conveyor dishwasher (2, 2').

5. The system according to one of the preceding claims, with a pre-cleaning and/or pre-sorting station (104) further being provided between the conveyor system (101) and the at least one conveyor dishwasher (2, 2') for the purpose of manually pre-clearing and/or pre-sorting washware which is fed by the conveyor system (101).

6. System according to one of the preceding claims, with the control device (50) being designed to automatically set the transportation speed, at which the washware is transported through the individual treatment zones (12, 14a, 14b, 16, 18; 12', 14', 16', 18') of the at least one conveyor dishwasher (2, 2'), to a predefined or predefinable value as a function of the detected number of units of washware which are fed to the at least one conveyor dishwasher (2, 2') per unit time; and/or
the control device (50) being designed to automatically set a quantity of wash liquid sprayed in the at least one wash zone (12, 14a, 14b; 12', 14') per unit time to a predefined or predefinable value as a function of the detected number of units of washware which are fed to the at least one conveyor dishwasher (2, 2') per unit time; and/or

the control device (50) being designed to automatically set a quantity of final-rinse liquid sprayed in the final-rinse zone (18; 18') of the at least one conveyor dishwasher (2, 2') per unit time to a predefined or predefinable value as a function of the detected number of units of washware which are fed to the at least one conveyor dishwasher (2, 2') per unit time.

7. System according to one of the preceding claims, with the at least one conveyor dishwasher (2, 2') having a pre-wash zone (12; 12') with pre-wash nozzles (30), and at least one main-wash zone (14a, 14b; 14') which is connected downstream of the pre-wash zone (12; 12') and has main-wash nozzles (28);
with the control device (50) being designed to automatically switch on or switch off the supply of wash liquid to the pre-wash nozzles (30) of the pre-wash zone (12; 12') as a function of the detected number of units of washware which are fed to the at least one conveyor dishwasher (2, 2') per unit time; and/or
with the control device (50) being designed to automatically switch on or switch off the supply of wash liquid to the main-wash nozzles (28) of the at least one main-wash zone (14a, 14b; 14') as a function of the detected number of units of washware which are fed to the at least one conveyor dishwasher (2, 2') per unit time.

8. System according to one of the preceding claims, with the at least one conveyor dishwasher (2, 2') having a drying zone (40, 40'), and
with the control device (50) being designed to automatically select a predefined or predefinable temperature value of an air stream used in the drying zone (40, 40') to dry the washware and set the temperature of the air stream used for drying purposes to the selected value as a function of the detected number of units of washware which are fed to the at least one conveyor dishwasher (2, 2') per unit time; and/or

with the control device (50) being designed to automatically select a predefined or predefinable value of a volumetric quantity of a drying-air stream circulating in the drying zone (40, 40') for drying the washware per unit time and set the volumetric quantity circulating per unit time to the selected value as a function of the detected number of units of washware which are fed to the at least one conveyor dishwasher (2, 2') per unit time.

9. System according to one of the preceding claims, with the at least one conveyor dishwasher (2) having a first main-wash zone (14a), with main-wash nozzles (28), and a second main-wash zone (14b), likewise with main-wash nozzles (28), which is connected downstream of the first main-wash zone (14a); and with the control device (50) being designed to automatically switch on or switch off either the supply of wash liquid to the main-wash nozzles (28) of the first main-wash zone (14a) or the supply of wash liquid to the main-wash nozzles (28) of the second main-wash zone (14b) as a function of the detected number of units of washware which are fed to the at least one conveyor dishwasher (2) per unit time.

10. System according to one of the preceding claims, with a first conveyor dishwasher (2) being provided for washing dishes, pots and pans, glasses and containers, and a second conveyor dishwasher (2') being provided for washing trays and items of cutlery.

11. System according to Claim 10, with the control device (50) being designed to automatically select a predefined or predefinable treatment program and set the process parameters associated with the selected treatment program in the at least one conveyor dishwasher (2, 2') as a function of the detected number of units of washware which are fed per unit time for at least one of the two conveyor dishwashers (2, 2').

12. System according to one of the preceding claims, with the control device (50) being designed to selectively automatically select a predefined or predefinable treatment program for at least one conveyor dishwasher (2, 2') and set the process parameters associated with the selected treatment program in the at least one conveyor dishwasher (2, 2') as a function of the detected number of units of washware which are fed per unit time.

13. Method for washing washware, in which method washware is conveyed to a conveyor dishwasher (2, 2), which is designed particularly in the form of a rack-conveyor dishwasher or flight-type dishwasher (2, 2'), with the aid of a conveyor system (101), with the conveyor dishwasher (2, 2') having at least one wash zone (12, 14a, 14b; 12', 14'), at least one final-rinse zone (18; 18') and a transportation apparatus (4; 4') with which the washware is conveyed through the individual treatment zones (12, 14a, 14b, 16, 18; 12', 14', 16', 18') of the conveyor dishwasher (2, 2'),
characterized
in that the method has the following methods steps:

a) the number of units of washware which are fed to the conveyor dishwasher (2, 2') with the aid of the conveyor system (101) per unit time is detected with the aid of a washware detector apparatus (51) in a prespecified or prespecifiable region of the conveyor system (101); and
b) a predefined or predefinable treatment program is automatically selected and the process parameters associated with the selected treatment program are set in the conveyor dishwasher (2, 2') as a function of the detected number of units of washware which are fed to the conveyor dishwasher (2, 2') per unit time.

14. Method according to Claim 13,
with the transportation speed at which the washware is transported through the individual treatment zones (12, 14a, 14b, 16, 18; 12', 14', 16', 18') of the conveyor dishwasher

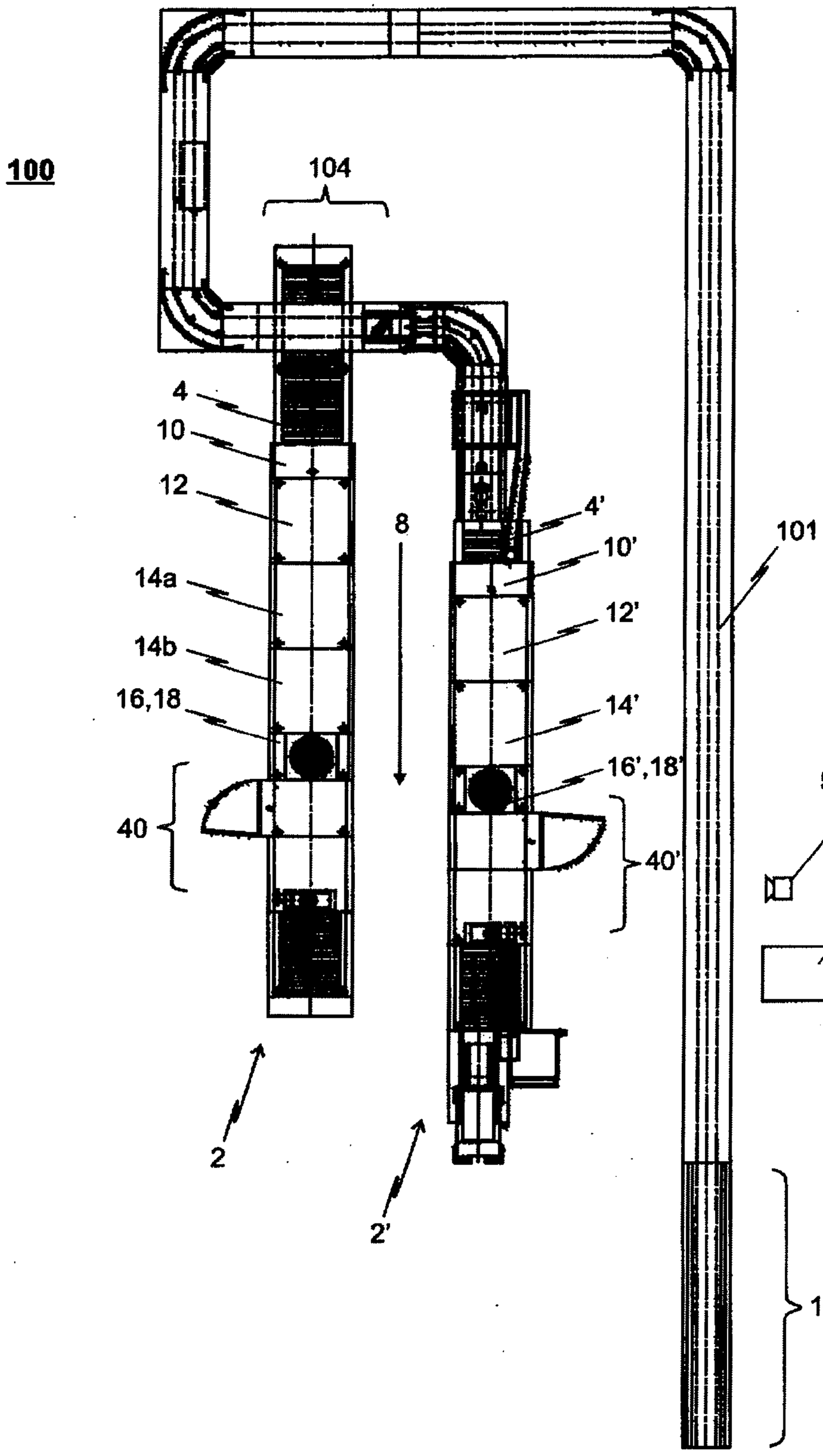
(2, 2') being automatically set to a predefined or predefinable value as a function of a predefined or predefinable number of units of washware which are fed to the conveyor dishwasher (2, 2') with the aid of the conveyor system (101) per unit time; and/or
with a quantity of wash liquid which is sprayed in the at least one wash zone (12, 14a, 14b; 12', 14') per unit time being automatically set to a predefined or predefinable value as a function of a predefined or predefinable number of units of washware which are fed to the conveyor dishwasher (2, 2') with the aid of the conveyor system (101) per unit time; and/or
with a quantity of final-rinse liquid which is sprayed in the final-rinse zone (18; 18') of the at least one conveyor dishwasher (2, 2') per unit time being automatically set to a predefined or predefinable value as a function of a predefined or predefinable number of units of washware which are fed to the conveyor dishwasher (2, 2') with the aid of the conveyor system (101) per unit time.

15. Method according to Claim 13 or 14, with the process parameters of a first treatment program being automatically set up to a predefined or predefinable number of units of washware which are fed with the aid of the conveyor system (101) per unit time in the conveyor dishwasher (2, 2'); and with the process parameters of a second treatment program being automatically set when the predefined or predefinable number of units of washware which are fed with the aid of the conveyor system (101) per unit time in the conveyor dishwasher (2, 2') is exceeded.

16. Method according to Claim 15, with the settable process parameters including at least one of the following parameters: the transportation speed at which the washware is transported through the individual treatment zones (12, 14a, 14b, 16, 18; 12', 14', 16', 18') of the conveyor dishwasher (2, 2'); the quantity of wash liquid sprayed in the at least

one wash zone (12, 14a, 14b; 12', 14') per unit time; the quantity of final-rinse liquid sprayed in the at least one final-rinse zone (18; 18') per unit time; the temperature value of an air stream used to dry the washware in a drying zone (40, 40') of the at least one conveyor dishwasher (2, 2'); and the volumetric quantity of a drying-air stream circulating in a drying zone (40, 40') of the at least one conveyor dishwasher (2, 2') for drying the washware per unit time.

17. Method according to one of Claims 13 to 16, with the transportation speed at which the washware is transported through the individual treatment zones (12, 14a, 14b, 16, 18; 12', 14', 16', 18') of the conveyor dishwasher (2, 2'), the quantity of wash liquid sprayed in the at least one wash zone (12, 14a, 14b; 12', 14') per unit time, and the quantity of final-rinse liquid sprayed in the at least one final-rinse zone (18; 18') per unit time are in each case automatically increased when a predefined or predefinable number of units of washware which are fed with the aid of the conveyor system (101) per unit time is exceeded in the conveyor dishwasher (2, 2').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12
8
4'
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101
14a
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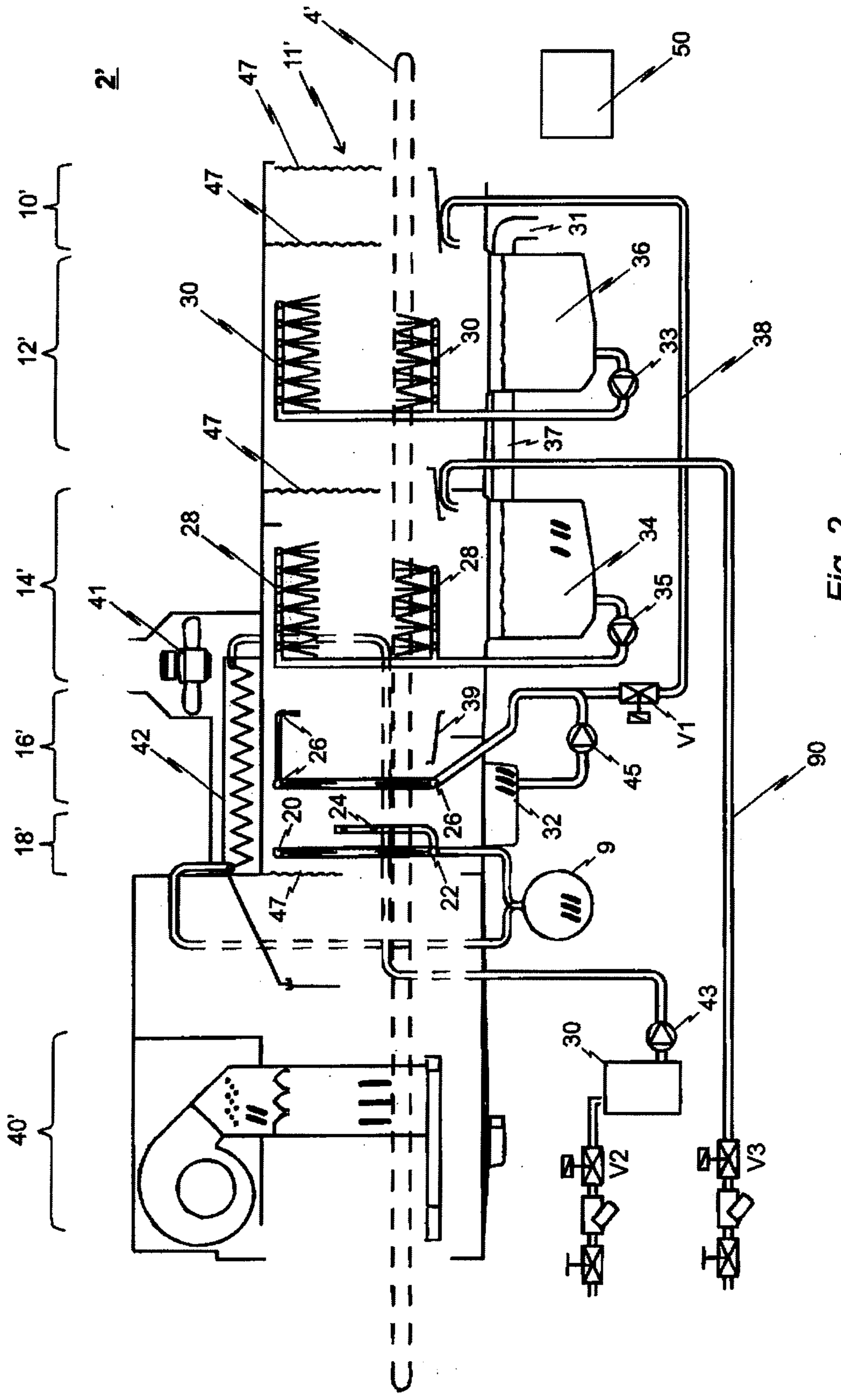
14b
16,18
14'
16',18'
51, 51'
40
40'
50
2
2'
103

Fig. 1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24
22
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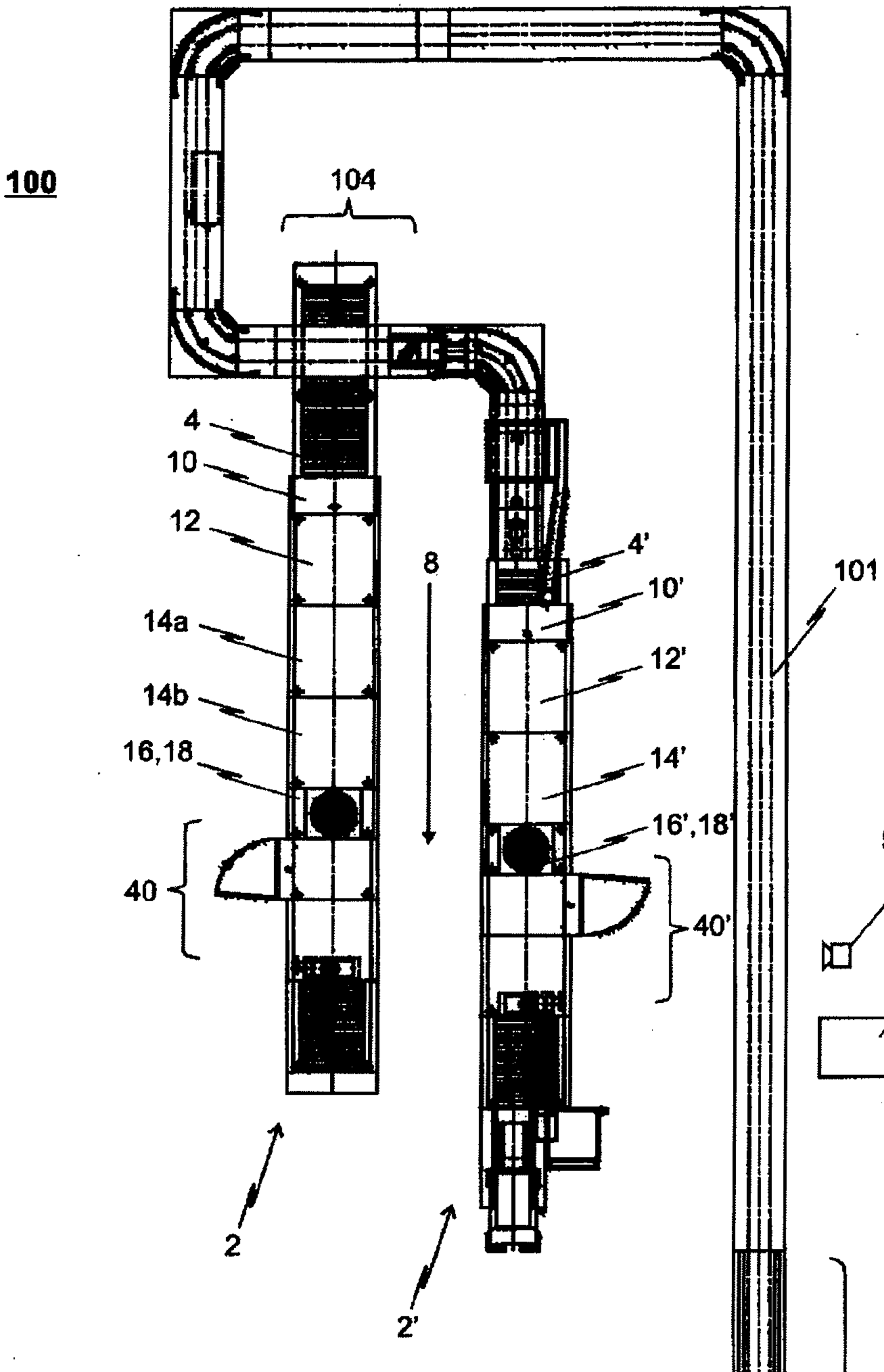
V2
V3

Fig. 2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40'
101
51, 51'
50
103

Fig. 1