

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
9 December 2010 (09.12.2010)

PCT

(10) International Publication Number
WO 2010/140048 A2

(51) International Patent Classification:
B08B 9/20 (2006.01) **B08B 3/12** (2006.01)

(21) International Application Number:
PCT/IB2010/001319

(22) International Filing Date:
1 June 2010 (01.06.2010)

(25) Filing Language: Italian

(26) Publication Language: English

(30) Priority Data:
UD2009A000113 3 June 2009 (03.06.2009) IT

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(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP,
KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD,
ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI,
NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD,
SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG,
ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished
upon receipt of that report (Rule 48.2(g))

(54) Title: MACHINE AND METHOD FOR TREATING CONTAINERS OF LIQUIDS, AND TREATMENT DEVICE

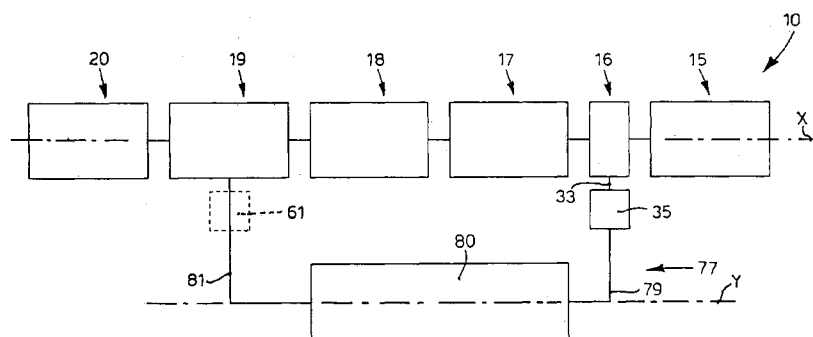


fig. 2

(57) Abstract: Machine (10) and method for treating containers (12) of liquids comprising at least a loading station (15), into which baskets (23) containing the containers (12) to be subjected to the treatment are loaded, each of which containers (12) is associated with a relative lid (11), and a washing station (17), in which the containers (12) are subjected at least to washing. The machine (10) comprises, integrated with it, a treatment device (77) that effects the treatment of dirty lids (11), which is operatively parallel with at least the washing station (17) to provide automatically at exit the treated lids (11) in order to close the washed containers (12).

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“MACHINE AND METHOD FOR TREATING CONTAINERS OF LIQUIDS,
AND TREATMENT DEVICE”

* * * * *

FIELD OF THE INVENTION

5 The present invention concerns a machine and a method for treating in an automated manner containers of liquids, for example, but not exclusively, bottles, feeding bottles, watering troughs or other containers or recipients to feed animals. In particular, with the present invention it is possible to wash, rinse, fill and re-close the containers in a substantially automated manner, and with the minimum
10 manual intervention of an operator.

BACKGROUND OF THE INVENTION

Machines are known which are used for washing containers of liquids, such as but not only, bottles, feeding bottles, watering troughs or others, used for feeding animals, such as for example guinea pigs or laboratory rodents or others.

15 It is known that, before washing, the containers are closed by suitable lids, or capsules; the lids are shaped with a lip to allow the animal to consume the liquid contained in the container, and the containers must be provided at the end of washing closed and filled with new liquid.

It is known to provide machines for washing the containers, which are
20 structured with a support frame provided with a base resting on the ground and with a plurality of operating stations disposed in line with respect to each other, including a loading station for the closed containers, a station for removing the capsules from the containers, or de-lidding station, a washing station, a filling station and one to re-close the containers which have been washed and filled, by
25 means of said capsules.

In the known machines, except for the washing station, in which the containers are closed in a washing chamber and undergo predetermined automated washing and rinsing steps, the remaining stations need considerable manual interventions and attention from the operators, in particular for loading, for positioning the
30 containers in the filling station and for re-closing with the lids the containers which have been washed and filled.

These manual operations entail an increase in the overall times of the whole process of washing and filling the containers, as well as the need to employ

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different operators for the same machine, with a consequent increase in management costs.

Furthermore, the manual intervention may not always be precise and repeatable and may entail the risk of accidents for the operators.

5 It is also known to dispose and group together a plurality of containers in suitable washing baskets, so as to hold the containers in a desired disposition during all the operating steps of the machine.

It is also known to provide that the baskets define a plurality of containing cells for the containers, conformed to prevent the accidental exit of the containers
10 from the basket, so as to be able to provide the upending of the basket inside the washing chamber, for example to facilitate dripping after the washing and rinsing step.

It is also known that the lids that are removed from the containers in the de-lidding station are collected in suitable containing boxes and taken manually to
15 relative ultrasound washing stations and other washing and rinsing treatments in order to remove the impurities present.

The lids washed with ultrasound are then again transported by hand in proximity with the station for re-closing the containers.

In this known solution, the operations of manual movement of the lids from
20 the removal or de-lidding station to the ultrasound washing station take a relatively long time, however, and can entail waiting times and down times of the washing machine.

One purpose of the present invention is to produce a machine, and perfect a method, which allows to remove the lids or capsules, if they are provided, to
25 wash, fill and to re-close the containers in a simple, economic and efficient way, in a substantially automated manner and reducing to a minimum the manual interventions of the operators.

Another purpose of the present invention is to achieve a device which allows to subject the lids to treatment, in particular but not only, ultrasound washing,
30 without needing any manual transport steps from one station to another.

The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

The present invention is set forth and characterized in the independent claims, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

5 According to one feature of the present invention, a machine for treating containers of liquids comprises, in line along a first direction of washing, at least:

- a loading station, into which the containers to be subjected to treatment are loaded, each of which containers is associated with a relative lid;
- a de-lidding station, disposed downstream of the loading station, in which the
- 10 lids are removed from each of the containers to be subjected to washing;
- a washing station, disposed downstream of the de-lidding station, in which only the containers without the relative lids are subjected at least to washing; and
- a re-closing station, disposed downstream of the washing station, in which the washed containers are re-closed with the relative lids.

15 According to the present invention, the machine comprises a treatment device, able to perform the treatment on dirty lids, which is integrated into the machine for treating containers of liquids and is provided at least with a treatment station for the lids, with first transporter means disposed in connection between the de-lidding station and the treatment station, in order to transport in an automated

20 manner only the lids removed from the containers, and with second transporter means disposed in connection between the treatment station and the re-closing station, in order to transport in an automated manner the treated lids to the re-closing station.

The first transporter means and the second transporter means are suitable to

25 dispose the treatment station along a second direction of washing, disposed operatively parallel to the first direction of washing.

The present invention allows to remove the lids or capsules, to wash, fill and re-close the containers in a simple, economic and efficient way, in a substantially automated manner and reducing to a minimum the manual interventions of the

30 operators.

In particular, the integration and operational automation of the treatment device in the operating washing line of the machine allows to subject the lids to treatment without needing manual transport from one station to another.

According to a variant, the treatment device is configured so as to perform the treatment on the lids in times consistent with, or substantially simultaneously to, the washing of the containers done in the washing station.

One form of embodiment provides that the treatment device is disposed in
5 parallel to an operating washing line for the containers, defined at least from entrance and from exit of said washing station.

A variant provides that the treatment device is disposed at the side of said operating washing line for the containers.

Another embodiment provides that the treatment device is disposed integrated
10 inside a frame that supports and positions at least the loading and washing stations.

Another variant provides that the treatment device is disposed above an operating washing line for the containers defined at least from entrance and from exit of said washing station.

15 If the containers are loaded closed by suitable lids, relative de-lidding and re-closing stations are associated with the loading station and the washing station.

According to a specific embodiment, the treatment device comprises an ultrasound washing station.

An advantageous variant, again for the purpose of complete automation,
20 provides that the re-closing station is provided with first containing means from which lids subjected to treatment can be fed in order to close the containers. The second transporter means are able to move automatically said first containing means from the treatment station toward the re-closing station, and vice versa.

According to a variant machine which also provides de-lidding, the treatment
25 device is operatively connected to a de-lidding station upstream of the washing station, in which the lids are automatically removed from each of the containers to be subjected to washing.

Advantageously, the first transporter means are conformed so as to achieve the automatic transport of the lids from the de-lidding station to the treatment station.

30 Advantageously, the de-lidding station comprises second containing means in which the dirty lids are contained, said first transporter means being associated with said second container means in order to transport them automatically toward the treatment station.

Another feature of the present invention concerns a treatment device able to perform the treatment of dirty lids of containers in a machine for the treatment of containers of liquids in a relative washing station along a first direction of washing. The device according to the present invention is integrated into the machine for the treatment of containers of liquids and is provided at least with a station for treating the lids, with first transporter means disposed in connection between a de-lidding station of the machine and the treatment station, in order to transport in an automated manner only the lids, and with second transporter means disposed in connection between the treatment station and a re-closing station of the machine, in order to transport in an automated manner the lids treated in the re-closing station.

The first transporter means and the second transporter means are suitable to dispose the treatment station along a second direction of washing disposed operatively in parallel to the first direction of washing.

Another feature of the present invention concerns a method for treating containers of liquids comprising a first washing sequence which provides at least:

- a first step in which baskets containing the containers to be subjected to treatment are loaded, each of which containers is associated with a relative lid;
- a second step in which the lids are removed from each of the containers to be subjected to washing;
- a third step in which only the containers without lids are subjected at least to washing; and
- a fourth step in which the washed containers are re-closed with the relative lids.

The method also comprises a second washing sequence, substantially parallel to the first washing sequence, which provides at least a step of treating the dirty lids, by means of a treatment station, in which first transporter means are able to transport in an automated manner the dirty lids separated from the containers in the second step, toward the treatment station, and second transporter means able to transport in an automated manner the lids treated in the treatment device, sending them to the fourth step.

Advantageously, the treatment step of the lids is performed in times consistent with, that is, substantially simultaneously to, the washing of the containers performed in the second step.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- 5 - fig. 1 shows schematically a lateral view of a machine for treating containers of liquids according to the present invention;
- fig. 2 shows schematically a plane view of the machine in fig. 1.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

10 With reference to the attached drawings, a machine 10 according to the present invention can be used for the treatment of feeding bottles 12 in order to feed small animals, such as guinea pigs, mice, hamsters and others, used for example in pharmaceutical research laboratories.

The feeding bottles 12 are normally closed at the top by means of relative lids 15 11, or capsules, made of metal and conformed to define a lip 11a from which the animal consumes the liquid contained therein.

In particular the machine 10 according to the present invention allows to de-lid, wash, fill and re-close the feeding bottle 12 in an automated way.

The treatment machine 10 comprises a frame 13, with respect to which a 20 loading station 15, a de-lidding station 16, a washing station 17, a filling station 18, a re-closing station 19 and an unloading station 20 are disposed in sequence along a first direction of washing X.

The movement of the feeding bottles 12 between the aforesaid stations 15, 16, 17, 18, 19 and 20 along the first direction of washing X occurs by means of two 25 conveyor belts, respectively a first 21 and a second 22, disposed one after the other along a determinate direction of feed.

In particular the first belt 21 allows the movement of the feeding bottles 12 between the loading station 15, the de-lidding station 16 up to the exit from the washing station 17, while the second conveyor belt 22 moves the feeding bottles 30 12 between the filling station 18, the re-closing station 19 and the unloading station 20.

In this case the feeding bottles 12 are disposed inside relative containing baskets 23, which are typically provided with a plurality of cells 25: the cells 25

have a desired ordered disposition, for example in rows or columns. Each cell 25 is conformed to house a relative feeding bottle 12 and hold it in a determinate ordered position with respect to the other feeding bottles 12.

5 In this case the cells 25 are conformed to allow the positioning of the feeding bottles 12 and to prevent them from accidentally coming out, in particular in an upended condition at 180° of the containing basket 23.

In fact, during the washing of the feeding bottles 12, the containing basket 23 is rotated, as will be explained hereafter in more detail, between two rotated positions one at 180° with respect to the other.

10 The loading station 15 comprises a loading plane 26 on which the baskets 23 containing the feeding bottles 12, dirty and closed with the lid 11, are disposed.

The progressive positioning of the baskets 23 on the loading plane 26 is carried out in an automated way by means of an anthropomorphic robot 27.

15 The de-lidding station 16 is downstream of the loading station 15 and comprises a member 29 to extract the lids 11, and an upending device 30 to upend the baskets 23.

In this case, the extractor member 29 comprises a plurality of extraction heads 31 of the pneumatic type and movable vertically by means of a linear actuator 32; the extraction heads 31 cooperate with the lips of each lid 11 in order to blow in
20 pressurized air into the feeding bottles 12 and cause the release of the lids 11 from the relative feeding bottles 12. The extraction heads 31 are provided singly or in groups and act automatically on the lips 11a of the lids 11 according to the positioning pattern of the feeding bottles 12 in the basket 23.

The upending device 30 rotates the basket 23 through 180° after the release of
25 the lids 11, so that in an upturned condition of the feeding bottles 12, that is, with the relative aperture open toward the bottom, the lids 11 fall due to gravity onto a slide 33 provided on a lower part of the frame 13.

The lids 11 are directed along this slide 33 and collected in relative containing boxes 35, provided, in this case, to limit the bulk, below the loading plane 26.

30 The upended baskets 23 are progressively moved by the first belt 21 to reach the washing station 17. During this movement, facilitated by the upended position, the residual liquids in the feeding bottles 12 tend to exit due to gravity.

The washing station 17 comprises a first chamber 36 and a second chamber

37, in this case separated from each other.

It is not excluded that according to some variants, the first chamber 36 and the second chamber 37 can be integrated into one single chamber, just as two washing chambers can be provided.

5 Both inside the first chamber 36 and also inside the second chamber 37 a plurality of first nozzles 38 and second nozzles 39 are disposed, on opposite sides with respect to the first belt 21.

10 In this case the first nozzles 38 are able to deliver a washing liquid toward the feeding bottles 12, while the second nozzles 39 are able to deliver a rinsing liquid toward the feeding bottles 12.

In a solution in which in each chamber 36 and 37 both types of nozzles 38 and 39 are provided, the feeding bottles 12 contained in each basket 23 substantially are subjected to two repeated cycles of washing and rinsing.

15 In an alternative solution in which only first nozzles 38 are provided in the first chamber 36 and only second nozzles 39 are provided in the second chamber 37, the feeding bottles 12 contained in each basket 23 are subjected to only one washing cycle which has longer and more intense steps.

20 One, the other or both these operating solutions can be chosen on each occasion depending on the type of washing to be carried out and/or other operating parameters.

In this case, the de-lidding station 16 and the washing station 17 are included and contained inside a single closed cabin 40, which isolates said stations 16 and 17 from the outside environment in order to prevent the spilling of liquids and contamination of the work environment.

25 Outside the cabin 40, between the washing station 17 and the filling station 18, substantially in correspondence with the zone in which the first belt 21 and the second belt 22 meet, a manipulator device 41 to manipulate the baskets 23 is provided. The manipulator device 41 is suitable to automatically rotate the baskets 23 exiting from the washing station 17 by 180°, in order to return the
30 feeding bottles 12 contained therein with their relative apertures open toward the top.

The upended baskets 23 are positioned by the manipulator device 41 on the second belt 22, which positions them in correspondence with the filling station

18.

The filling station 18 comprises a plurality of filling nozzles 59, which are disposed in suspension above the belt 22 at a height which is higher than that of the baskets 23.

5 In particular the filling nozzles 59 are assembled on a frame 60, which is also conformed so as to dispose the filling nozzles 59 according to the positioning pattern of the feeding bottles 12 inside the baskets 23.

In this way, each feeding bottle 12 is filled from above, with precision, substantially without any liquid being wasted and guaranteeing great precision,
10 uniformity and completeness in the filling.

Advantageously the filling nozzles 59 are operatively associated with timer and/or flow control means, of the substantially known type and not shown in the drawings, which allow to carry out a filling of the feeding bottles 12 with a predetermined quantity of filling liquid. This solution allows to completely
15 automate the filling steps, preventing overflowing of the feeding bottles 12.

The filled feeding bottles 12 are brought to the re-closing station 19 which, in an automated manner, repositions the lids 11 on the relative feeding bottles 12 and hermetically attaches them.

Once the steps of closing all the feeding bottles 12 contained in a basket 23
20 have finished, the second belt 22 transports the basket 23 toward the unloading station 30, positioning it on a relative unloading plane 75.

The baskets 23, thus positioned, are picked up by the anthropomorphic robot 27 and positioned in relative discharge sliders, of a known type and not shown.

The anthropomorphic robot 27 is mounted movable on a track 76 disposed
25 above the operating stations 15, 16, 17, 18, 19 and 20, and extending for the whole length of the frame 13, in order to carry out both the operations of loading the baskets 23 with the feeding bottles 12 to be washed and filled, and also the unloading of the feeding bottles 12 which have been washed and filled.

According to a variant, two anthropomorphic robots 27 are provided,
30 respectively, one for loading the baskets 23 with the feeding bottles 12 to be washed and filled, and one for unloading the baskets 23 with the feeding bottles 12 which have been washed and filled.

With particular reference to the drawing in fig. 2, the machine 10 also

comprises a treatment device, suitable to treat the lids 11.

By treatment we mean one or more of the operations such as ultrasound washing, pre-washing, washing in cold water, washing in hot water, washing with chemical detergents and rinsing.

5 In the case described here, in which for example the ultrasound treatment is provided, the treatment device is an ultrasound washing device 77.

The ultrasound washing device 77 comprises a first transporter 79, an ultrasound washing station 80 of a substantially known type, and a second transporter 81.

10 The first transporter 79 is suitable to transport in an automated manner the box 35 with the dirty lids 11 separated from the feeding bottles 12, from the de-lidding station 16 to the ultrasound washing station 80.

The second transporter 81, on the contrary, is suitable to transport in an automated manner the lids 11 washed by ultrasound and to take them into
15 correspondence with the re-closing station 19.

The first transporter 79 and the second transporter 81 are suitable to keep the ultrasound washing station 80 along a second operating direction Y, substantially parallel to the first direction of washing X.

In this way, the ultrasound washing station 80 is parallel both physically and
20 operatively with respect to the washing station 17.

In a variant where the re-closing station 19 is provided with a hopper 61, shown in a line of dashes in fig. 2, in which the lids 11 are collected together before being attached to the feeding bottles 12, the second transporter 81 is suitable to move the hopper 61 from the ultrasound washing station 80 to the re-
25 closing station 19.

In this way an automated operating line of ultrasound washing, or treatment in general, is defined for the lids 11, parallel to the operating line for washing and filling the feeding bottles 12.

In the form of embodiment schematized in fig. 2, the ultrasound washing
30 device 77 is disposed at the side of the washing 17 and filling stations 18 of the feeding bottles 12, but it is not excluded that said operating line can be equipped inside the frame 13 of the machine 10 in a position below the two belts 21 and 22, just as it may be provided that the frame 13 comprises a bridge structure

disposed above, at least, the washing 17 and filling stations 18.

In the case of various types of treatment in addition to and/or instead of the ultrasound treatment, the treatment device can also comprise one or more stations chosen from among pre-washing, cold water washing, hot water washing, washing with chemical detergents and rinsing stations. In this case, the first transporters 79 and the second transporters 81 are able, respectively, to transport the dirty lids 11, advantageously contained in the box 35, from the de-lidding station 16 toward the various treatment stations, and to transport the lids 11 subjected to treatment, advantageously contained in the hopper 61, toward the re-closing station 19.

It is clear that modifications and/or additions of parts or steps may be made to the treatment machine 10, to the method and to the treatment device 77 as described heretofore, without departing from the field and scope of the present invention.

For example it comes within the scope of the present invention to provide a control and command unit of the programmed and programmable type, which is electronically connected to each of the operating stations 15, 16, 17, 18, 19, 20 and 80, and/or to the remaining command members provided, in order to selectively coordinate the different functioning cycles of the machine 10, actuating a sequence which is substantially continuous.

It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of machine and method for the treatment of containers of liquids, and treatment device, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

CLAIMS

1. Machine for treating containers (12) of liquids comprising in line along a first direction of washing (X) at least:
- a loading station (15), into which baskets (23) containing the containers (12) to be subjected to the treatment are loaded, each of which containers (12) is associated with a relative lid (11);
 - a de-lidding station (16), disposed downstream of the loading station (17), in which the lids (11) are removed from each of the containers (12) to be subjected to washing;
 - a washing station (17) disposed downstream of the de-lidding station (16), in which only the containers (12) without the relative lids (11) are subjected at least to washing; and
 - a re-closing station (19) disposed downstream of the washing station, in which said washed containers (12) are re-closed with the relative lids (11);
- characterized in that** it comprises a treatment device (77) able to effect the treatment of dirty lids (11), which is integrated into said machine for treating containers (12) of liquids, and is provided at least with a treatment station (80) for said lids (11), with first transporter means (79) disposed in connection between said de-lidding station (16) and said treatment station (80), in order to transport in an automated manner only the lids (11) removed from the containers (12), and with second transporter means (81) disposed in connection between said treatment station (80) and said re-closing station (19), in order to transport in an automated manner the lids (11) treated in said re-closing station (19), said first transporter means (79) and said second transporter means (81) being suitable to dispose the treatment station (80) along a second direction of washing (Y) disposed operatively in parallel to said first direction of washing (X).
2. Machine as in claim 1, **characterized in that** the treatment device (77) is configured to effect the treatment of the lids (11) in times consistent with the washing of the containers (12) performed in the washing station (17).
3. Machine as in claim 1 or 2, **characterized in that** the treatment device (77) is disposed in parallel with an operating washing line of the containers (12) defined at least by the entrance and exit of said washing station (17).
4. Machine as in claim 3, **characterized in that** the treatment device (77) is

disposed at the side of said operating washing line of the containers (12).

5. Machine as in claim 1 or 2, comprising a frame (13) that supports and positions at least the loading station (15) and washing station (17), **characterized in that** the treatment device (77) is disposed integrated inside said frame (13).

5 6. Machine as in claim 1 or 2, **characterized in that** the treatment device (77) is disposed above an operating washing line of the containers (12) defined at least by the entrance and exit of said washing station (17).

7. Machine as in claim 1, **characterized in that** the treatment station comprises an ultrasound washing station (80).

10 8. Machine as in claim 1 or 7, **characterized in that** the re-closing station (19) is provided with first containing means (61) from which lids (11) subjected to treatment are fed to close the containers (12), said second transporter means (81) being able to move said first containing means (61) automatically from the treatment station (80) toward the re-closing station (19), and vice versa.

15 9. Machine as in claim 8, **characterized in that** the first transporter means (79) are conformed so as to realize the automatic transport of the lids (11) from the de-lidding station (16) to the treatment station (80).

10. Machine as in claim 8 or 9, **characterized in that** the de-lidding station (16) comprises second containing means (35) in which the dirty lids (11) are
20 contained, said first transporter means (79) being associated with said second containing means (35) in order to transport them automatically toward the treatment station (80).

11. Treatment device able to effect the treatment of dirty lids (11) of containers (12) in a machine for treating containers (12) of liquids in a relative washing
25 station (17) along a first direction of washing (X), **characterized in that** it is integrated into said machine for treating containers (12) of liquids and is provided at least with a treatment station (80) for said lids (11), with first transporter means (79) disposed in connection between a de-lidding station (16) of the machine and said treatment station (80), in order to transport in an
30 automated manner only the lids (11), and with second transporter means (81) disposed in connection between said treatment station (80) and a re-closing station (19) of the machine, in order to transport in an automated manner the lids (11) treated in said re-closing station (19), said first transporter means (79) and

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said second transporter means (81) being suitable to dispose the treatment station (80) along a second direction of washing (Y) disposed operatively in parallel to said first direction of washing (X).

12. Method for treating containers (12) of liquids comprising a first washing sequence which provides at least the following:
- a first step in which baskets (23) containing the containers (12) to be subjected to the treatment are loaded, each of which containers (12) is associated with a relative lid (11);
 - a second step in which said lids (11) are removed from each of said containers (12) to be subjected to washing;
 - a third step in which only the containers (12) without the relative lids (11) are subjected at least to washing; and
 - a fourth step in which said washed containers (12) are re-closed with the relative lids (11);
- 15 **characterized in that** it comprises a second washing sequence, substantially parallel to the first washing sequence, which provides at least a step of treating the dirty lids (11), by means of a treatment station (80), in which first transporter means (79) are able to transport in an automated manner the dirty lids (11), separated from the containers (12) in said second step, toward said treatment station (80), and second transporter means (81) able to transport in an automated manner the lids (11) treated in said treatment station (80), sending them to said fourth step.

13. Method as in claim 12, **characterized in that** the step of treating the lids (11) is performed in times consistent with the washing of the containers (12) performed in the second step.

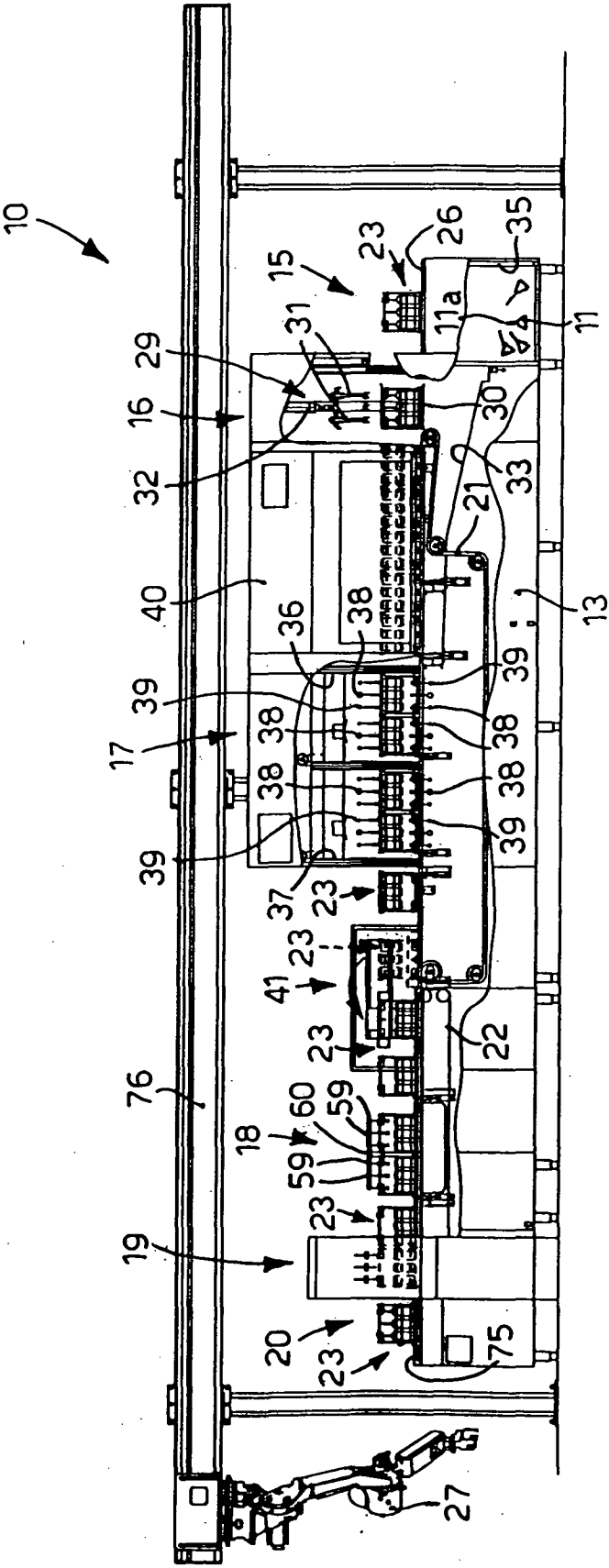


fig.1

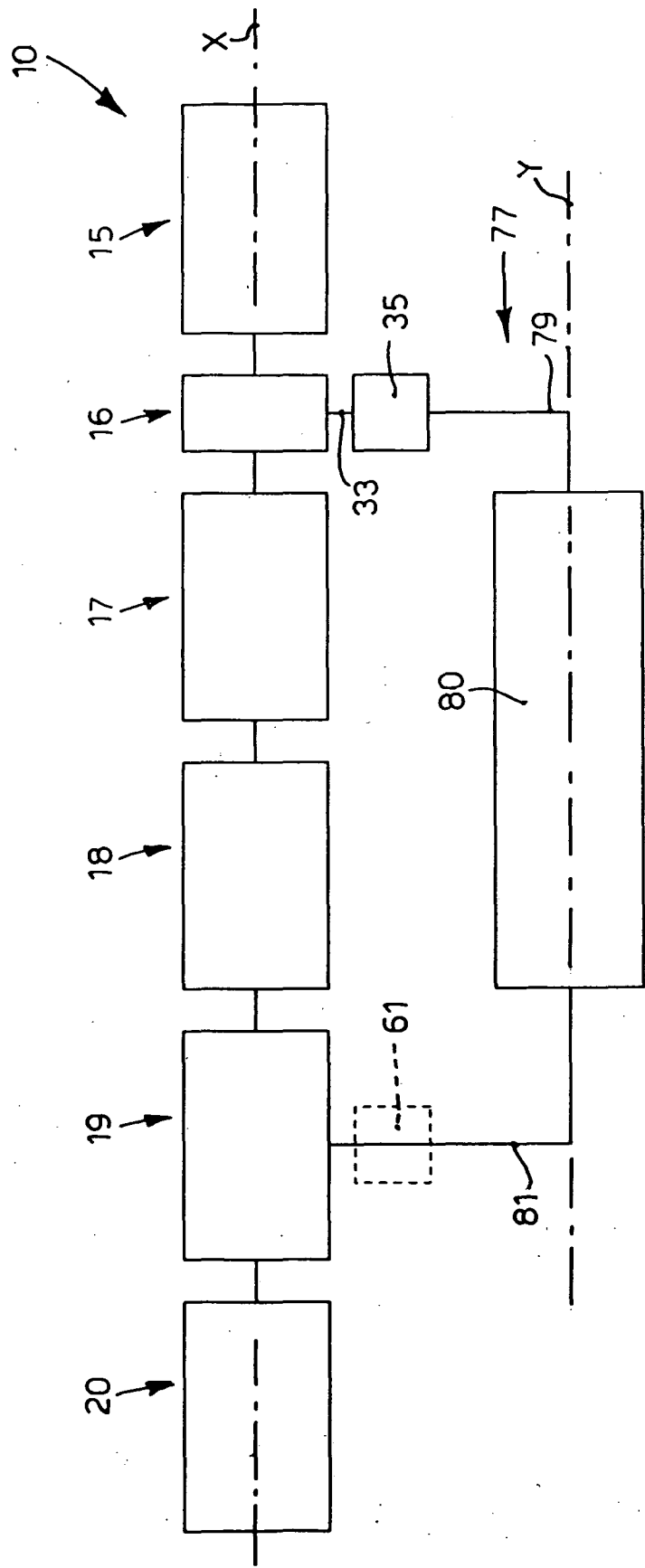


fig. 2