Abstract: Holding device (10) for lids (1 la) of containers (12) of liquids having an exit nozzle (1 la) for a liquid. The device (10) comprises a housing pipe (17) fabricated in cooperation with the housing pipe (17), in order to temporarily and selectively allow or impede the movement of the nozzle (1 la) through the housing pipe (17) and to selectively hold the lid (1 la) with respect to the holding member (15). The device (10) comprises a single actuator element (19) for the holding members (15), and kinematically connected to each clamping member (30) so as to selectively and simultaneously move the latter between a clamping operating condition, in which it contacts the nozzle (1 la) and impedes its movement inside the housing pipe (17), and a release operating position in which it is separated from the nozzle (1 la) and allows the movement thereof inside the housing pipe (17).
"HOLDING DEVICE AND METHOD FOR HOLDING LIDS OF CONTAINERS OF LIQUIDS"

FIELD OF THE INVENTION

The present invention concerns a device and the relative method to hold lids of containers for liquids, for example but not exclusively feeding bottles, feeders, drinking troughs or other containers or receptacles, for feeding animals. In particular, with the present invention it is possible to hold and move the lids during the steps of opening and/or re-stopping the containers, for example but not only in at least partly automated washing, sterilizing and/or refilling plants.

BACKGROUND OF THE INVENTION

Plants are known, at least partly automated or manual, used for washing containers for liquids, for example but not only feeding bottles, feeders, drinking troughs or others, used for feeding animals such as for example laboratory guinea pigs or rodents or others.

It is known that, before washing, the containers arrive closed by means of suitable lids or caps, which are shaped with a nozzle to allow the animal to take the liquid contained in the containers, and which must be supplied at the end of the washing cycle, closed and filled with a new liquid.

Such washing plants are structured with several operating stations disposed in line, including a station for loading the closed containers, a station for removing the caps from the containers, or de-lidding station, a washing station, a filling station and a station for closing the washed and filled containers, using said caps.

It is also known to dispose and group together a plurality of containers in suitable washing baskets, provided with relative containing cells, so as to keep the containers with a desired disposition during the operating steps of the machine.

It is also known to provide a single treatment of the containers, or in unordered or non-homogeneous groups, for example in plants that are mainly manual and have a limited capacity.

The lids are normally constrained in watertight manner to the containers. In known solutions that provide the removal station, the closed containers are opened by removing the lids by a remover.
In general, both in the removal station and in the closing station, devices for holding the lids are provided, which are particularly complex and difficult to manage, requiring a high and complex manual intervention.

Furthermore, known holding devices, whether they are intended for manual or automated solutions, have considerable limits in guaranteeing that the lids are held correctly and lastingly during the steps when they are distanced or brought near the relative container.

Indeed, in manual solutions, the lid is held mechanically, but these solutions provide to hold one lid at a time, reducing the level of automation of the plant and increasing times and operating costs.

In automated solutions, on the contrary, the lid is held pneumatically, but this solution not only has many disadvantages in managing the losses of load in order to guarantee that several lids are held simultaneously, but also has a limited holding capacity, with the risk of the lids accidentally falling, with consequent interruptions to the production of the line.

Purpose of the present invention is to achieve a device and to perfect a method which allow to open and hold even several lids at the same time, simply, economically and efficiently, and which overcome the disadvantages of the state of the art.

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.

In accordance with the above purpose, a holding device according to the present invention is applied for example in an at least partly automated plant for treating containers of liquids, in order to hold relative lids or caps equipped with a holed nozzle from which the liquid comes out.

The invention is applied particularly, advantageously but not exclusively, to remove or reposition simultaneously a plurality of lids of containers that are adjacent to each other, for example disposed in a basket or suchlike.
The holding device comprises a plurality of holding members, each provided with a housing pipe conformed so as to allow it to house at least part of the nozzle of the lid.

Each holding member also comprises a clamping member disposed in cooperation with the housing pipe of the nozzle, and able to temporarily and selectively allow or impede the movement of the nozzle through the housing pipe and therefore to selectively guarantee that the lid is held with respect to the relative holding member.

According to the present invention, the device comprises an actuator element, one only for all the holding members, and kinematically connected to each clamping member so as to selectively and simultaneously move each clamping member between a clamping operating condition, in which it contacts the nozzle and prevents it from moving inside the housing pipe by holding it, and a release operating condition in which it is separated from the nozzle and allows it to move inside the housing pipe, releasing it.

In this way, with a single actuator element, all the holding members provided selectively and simultaneously modify their operating condition, determining a univocal and common holding or release condition of the lids.

With the present invention it is thus possible to simultaneously manage the constraint or release of a plurality of lids in an at least partly automated manner.

Furthermore, since the actuator element is kinematically connected to each clamping member, the management and coordination of the command transmission is extremely simple and precise compared with the pneumatic solutions normally provided in current automated solutions.

Therefore, the solution according to the present invention is able to guarantee, simply and economically, an effective and uniform automated holding of a plurality of lids.

According to a variant, the housing pipe is made in such a manner that the nozzle enters into the pipe until it reaches a clamping segment in which it assumes a condition of cooperation with the clamping member.

According to a variant, each clamping member comprises a clamping element disposed in cooperation with the clamping segment to act radially against the nozzle of the lid.
According to another variant, the clamping member cooperates with an elastic member so as to automatically keep the clamping element in a clamping operating condition when the holding member and the nozzle of the lid are coupled.

In this clamping operating condition, the clamping member allows to hold the nozzle as soon as the latter is inserted inside the housing pipe, thus guaranteeing, immediately, that it is correctly held.

According to another variant, the holding device according to the present invention comprises one or more connection levers suitably constrained with each other and with the clamping members, to define the kinematic connection of the actuator element and the clamping members.

**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:

- **fig. 1** is a schematic lateral view, partly in section, of a holding device for lids of containers of liquids according to the present invention, in a first operating condition;
- **fig. 2** is a schematic lateral view, partly in section, of the holding device in **fig. 1**, in a second operating condition.

To facilitate comprehension, the same reference numbers have been used, where possible, to identify common elements in the drawings that are substantially identical. It is understood that elements and characteristics of one form of embodiment can conveniently be incorporated into other forms of embodiment without further clarifications.

**DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT**

With reference to the attached drawings, a holding device 10 according to the present invention is used to hold feeding bottles 12, for feeding small animals such as guinea pigs, mice, hamsters and others, for example used in laboratories for pharmaceutical research.

The feeding bottles 12 are normally closed at the top by means of relative metal lids 11 or caps, conformed to define a nozzle 11a with a through hole from
which the animal drinks the liquid contained therein.

In this case, each bottle 12 has a closing neck on which a packing 14 is disposed, annularly and externally, able to define the watertight seal once disposed to close the lid 11 on the bottle 12.

In particular, the holding device 10 according to the present invention allows to hold simultaneously a plurality of lids 11 in a simply and automated manner, and to move them towards and/or away from the bottles 12 during the automated steps of opening and closing the bottles 12.

In the form of embodiment shown, the bottles 12 are disposed inside relative containing baskets, not shown, which typically keep the bottles 12 according to a desired ordered disposition, for example in rows and columns.

The holding device 10 can be mounted suspended over a bridge structure (not shown), above the baskets, and consists of a plurality of holding heads 15, disposed geometrically coherently with the disposition of the bottles 12 in the baskets.

The holding heads 15 are suitable to be taken into cooperation with the relative nozzles 11a of each lid 11, in order to hold them and operate to at least partly constrain and/or release the lids with respect to the neck of the relative bottles 12.

Each holding head 15 has a substantially cylindrical conformation and comprises inside itself a housing pipe 17, having a conformation and size correlated to the nozzles 11a of the lids 11.

In particular, each housing pipe 17 is open toward the outside through a mouth 17a having an increased diameter, and comprises a clamping segment 18 in which the nozzle 11a remains clamped with respect to the housing pipe 17.

Each holding head 15 also comprises a clamping member 30 of the mechanical type, disposed in selective cooperation with the clamping segment 18 of the housing pipe 17, to temporarily hold the nozzle 11a inside the housing pipe 17.

The clamping member 30 comprises a lever 25 pivoted to the lateral wall of the holding head 15 by means of a pin 26 which allows it to make a movement toward/way from the holding head 15.

The clamping member 30 also comprises a peg 27 attached to the lower end portion of the lever 25.
The peg 27 is selectively movable linearly inside a transverse hole made on the lateral wall of the holding head 15, in correspondence with the clamping segment 18.

The peg 27 thus has a radial movement with respect to the clamping segment 18, and to the nozzle 11a possibly disposed inside it.

Furthermore, the clamping member 30 cooperates with an elastic ring 29, for example made of elastomer material, disposed outside the holding head 15, in cooperation with the lever 25 and in correspondence with the axis of movement of the peg 27.

The elastic ring 29 is suitable to keep the lever 25 normally thrusting against the peg 27.

In this condition, the peg 27 is held elastically against the nozzle 11a, possibly disposed inside the clamping segment 18.

The holding device 10 also comprises a double rod linear actuator 19, which is kinematically connected to each of the levers 25 of the clamping members 30 of the holding heads 15.

In particular, the linear actuator 19 is suitable to overcome the elastic resistance of the elastic rings 29 and to move each clamping member 30 selectively and simultaneously between a clamping operating condition, in which the peg 27 is kept under pressure inside the clamping segment 18 and insists radially on the nozzle 11a to hold it inside the housing pipe 17, and a release operating condition, in which the force of the elastic ring is overcome and the peg 27 is held detached from the nozzle 11a, allowing the latter to be released from the housing pipe 17.

In this case, three holding heads 15 are provided, disposed adjacent to each other, in order to simultaneously hold three lids 11.

In this form of embodiment, the linear actuator 19 is constrained directly to the two levers 25 of the clamping members 30 of the two external holding heads 15.

The lever 25 of the clamping member 30 is kinematically connected to a lever 25 of one of the other two clamping members 30, the one on the right in the attached drawings, by means of a connection lever 31.

In this way, the rotation of the lever 25 directly connected to the linear actuator 19 also determines the coordinated rotation of the lever 25 of the holding
head 15.

The holding device 10 as described heretofore functions as follows.

In a holding step, in which the nozzle 11a is partly inserted inside the clamping segment 18, the peg 27 contacts the nozzle 11a, due to the elastic effect of the elastic ring 29, and holds it inside the housing pipe 17.

On the contrary, if the lids 11 have to be picked up or released, the linear actuator 19 is activated, which moves simultaneously the two levers 25 of the clamping members 30 of the two lateral holding heads 15 and, by means of the connection lever 31, also the remaining lever 25 of the clamping member 30 of the central holding head 15.

As we said, this movement overcomes the elastic resistance of the elastic ring 29 and allows the peg 27 to move to a position such that it does not contact the nozzle 11a, when it is inside the clamping segment 18.

It is clear that modifications and/or additions of parts or steps may be made to the holding device 10 and the relative method 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 that a relative movement actuator is associated with each holding head 15, in order to impart on each holding head 15 an independent linear movement.

According to a variant, instead of the elastic ring 29 a helical spring is provided, interposed between the lever 25 and the external surface of the holding head 15.

It also comes within the scope of the present invention to provide that pneumatic means are associated with each holding head 15, to assist the holding of the lid 11, or to promote the detachment of the lid 11 from the bottle 12, according to known systems.

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 device and method for holding lids of containers of liquids, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.
CLAIMS

1. Holding device for lids (11) of containers (12) of liquids equipped with an exit nozzle (11a) for the liquid, said device comprising a plurality of holding members (15) each provided with a housing pipe (17) conformed so as to allow the housing of at least part of said nozzle (11a) and comprising a clamping member (30) disposed in cooperation with said housing pipe (17), and able to temporarily and selectively allow or impede the movement of said nozzle (11a) through said housing pipe (17) so as to selectively hold said lid (11) with respect to the relative holding member (15), characterized in that it comprises a single actuator element (19) for all said holding members (15), and kinematically connected to each clamping member (30) so as to selectively and simultaneously move each clamping member (30) between a clamping operating condition, in which it contacts the nozzle (11a) and impedes its movement inside said housing pipe (17), and a release operating position in which it is separated from said nozzle (11a) and allows the movement thereof inside said housing pipe (17).

2. Device as in claim 1, characterized in that the housing pipe (17) comprises a clamping segment (18) in which the nozzle (11a) is able to be disposed in order to cooperate with the clamping member (30).

3. Device as in claim 2, characterized in that each clamping member (30) comprises a clamping element (27) disposed in cooperation with the clamping segment (18) in order to act radially against the nozzle (11a).

4. Device as in any claim hereinbefore, characterized in that the clamping member (30) cooperates with an elastic member (29) conformed so as to automatically keep said clamping element (30) in a clamping operating condition.

5. Device as in any claim hereinbefore, characterized in that it comprises one or more connection levers (31) suitably constrained with respect to each other and to the clamping members (30), so as to define the kinetic connection between the actuator element (19) and said clamping members (30).

6. Method for holding the lids (11) of containers (12) of liquids equipped with an exit nozzle (11a) for the liquid, said method providing to use a device provided with a plurality of holding members (15) each provided with a housing pipe (17) conformed so as to allow the housing of at least part of said nozzle (11a) and comprising a clamping member (30) disposed in cooperation with said housing pipe (17), and able to temporarily and selectively allow or impede the movement of said nozzle (11a) through said housing pipe (17) so as to selectively hold said lid (11) with respect to the relative holding member (15), characterized in that it comprises a single actuator element (19) for all said holding members (15), and kinematically connected to each clamping member (30) so as to selectively and simultaneously move each clamping member (30) between a clamping operating condition, in which it contacts the nozzle (11a) and impedes its movement inside said housing pipe (17), and a release operating position in which it is separated from said nozzle (11a) and allows the movement thereof inside said housing pipe (17).
pipe (17), and able to temporarily and selectively allow or impede the movement of said nozzle (11a) through said housing pipe (17) so as to selectively hold said lid (11) with respect to the relative holding member (15), characterized in that it provides a step of selective and simultaneous movement, in which by means of a single actuator element (19) for all said holding members (15), kinematically connected to each clamping member (30), each clamping member (30) is moved selectively and simultaneously between a clamping operating condition, in which it contacts the nozzle (11a) and impedes its movement inside said housing pipe (17), and a release operating position in which it is separated from said nozzle (11a) and allows the movement thereof inside said housing pipe (17).
**INTERNATIONAL SEARCH REPORT**

**International application No**

PCT/IB2011/00954

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. B67B3/00 B67B7/00

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)

B67B B65B

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 practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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Further documents are listed in the continuation of Box C. See patent family annex.

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**Date of the actual completion of the international search**

10 October 2011

**Date of mailing of the international search report**

18/10/2011

**Name and mailing address of the ISA/**

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**Authorized officer**

Wartenhorst, Frank

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