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(54) **DRYING APPARTUS**

(57) Apparatus for drying objects comprising at least a drying unit (13) configured to blow in drying air, the apparatus comprises a container (21) associated with the drying unit (13).

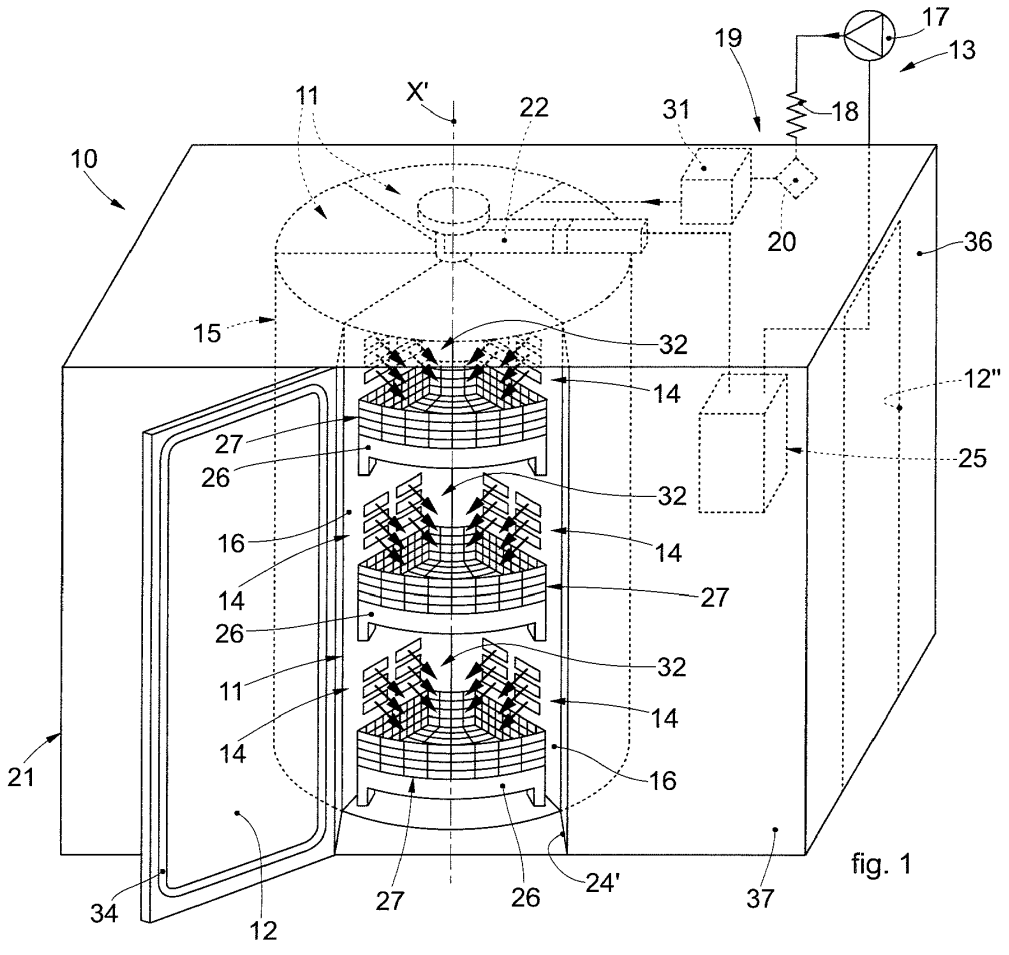


fig. 1

EP 3 312 534 A1

Description

FIELD OF THE INVENTION

[0001] Embodiments described here concern an apparatus for drying objects for health-care, medical, or veterinary use, for example surgical instruments, laboratory instruments, endoscopes, garments, or suchlike.

[0002] The drying apparatus can also be used for storing and preserving objects waiting to be picked up for use.

BACKGROUND OF THE INVENTION

[0003] In the case of treatments in the health-care, medical, or veterinary field, objects are usually dried after at least one of the steps of washing, thermodisinfection and/or sterilization.

[0004] The drying step is usually carried out using a drying apparatus or cabinet comprising at least one internal chamber selectively accessible by means of a sealed door.

[0005] It is known that known drying apparatuses are provided with a drying unit and possibly a filtering and sterilizing unit of the air sent into the chamber.

[0006] The objects located inside the compartment are inserted and removed at a certain frequency and with numerous accesses by users.

[0007] It is also known that there are objects of the type in question which must follow a customized drying cycle based on their characteristics and use, which requires a different drying cycle. Therefore, it is impractical to put objects that require different treatments in the same chamber.

[0008] Furthermore, due to the numerous accesses made by the user to the chamber, and despite the pressure of the air blown inside the chamber being such as to increase when it is opened, contaminations can in any case occur and so the risk is very high.

[0009] Moreover, if the internal chamber is divided into several spaces, in any case when the door is opened the whole chamber is affected and a separated treatment is not possible.

[0010] There is therefore a need to perfect a drying apparatus which can overcome at least one of the disadvantages of the state of the art.

[0011] In particular, one purpose of the present invention is to provide a drying apparatus which does not have any risk of contamination when an object is removed, or at least reduces said risk to a minimum.

[0012] Another purpose of the present invention is to provide a drying apparatus which allows to organize the spaces in a manner consistent with the requirements for drying and removing certain types of objects.

[0013] Another purpose of the invention is to provide a drying apparatus in which it is possible to deliver drying air, modulating the pressure thereof, depending on the different operating conditions of the drying apparatus, for example as a function of the fact that the drying apparatus, in certain steps of the process, is in communication with the outside environment or not, so as to further reduce any risk of contamination.

[0014] Another purpose is to organize the drying volumes in accordance with specific drying requirements and possible connected treatment, as well as removal.

[0015] 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

[0016] The present invention is set forth and characterized in the independent claim, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0017] In accordance with the above purposes, embodiments described here concern an apparatus for drying objects for health-care, medical, veterinary or similar use, comprising at least a drying unit configured to blow in drying air.

[0018] According to a characteristic aspect of the present invention, the drying apparatus comprises:

a container associated with said drying unit;
a plurality of chambers are present in the container, able to be selectively opened by at least a door; the chambers are configured mobile in order to be selectively positioned in cooperation with the at least one door;
one or more ventilation mouths positioned in the chambers and suitable to supply drying air sent by the drying unit;

- at least a control unit associated with the drying unit and configured to regulate and modulate, through the ventilation mouths, the pressure of the drying air in the chambers.

[0019] In particular, the chambers can be mobile either one on top of the other and/or one alongside the other.

[0020] The chambers can be divided into compartments, each comprising its own door.

[0021] The container can comprise at least an aperture with which the door is associated; at least a sealing element is positioned between the aperture and the door.

[0022] The chambers can be separated from each other by at least an interspace made between the respective lateral walls.

[0023] According to a first variant, the drying apparatus comprises a single door through which to selectively access a specific one of the at least two chambers that are presented on each occasion with respect to the door.

[0024] According to another variant, the drying apparatus can comprise two distinct doors respectively made to perform operations to load and remove the objects into/from the chambers.

[0025] According to one embodiment, each chamber can comprise its own unit at least to control the drying cycle.

[0026] According to another aspect of the present invention, the container comprises a rotating body in which the chambers are made, insulated from each other and configured to be selectively positioned in a desired position, for example in front of the user, for example for operations to load and remove the objects into/from the drying apparatus.

[0027] According to a variant embodiment, the rotating body has a vertical axis of rotation.

[0028] According to another variant, the rotating body has a horizontal axis of rotation.

[0029] In the case of rotation, but more generally, each chamber is equipped with means to correctly position an instrument so that it does not move or fall.

[0030] According to a variant embodiment, in the case of horizontal rotation, the housing chambers are attached horizontally pivoting to the rotating body, which can have personalized sectors.

[0031] According to a variant embodiment, the housing chambers are hinged to be able to oscillate in correspondence with their axis of rotation, which is eccentric with respect to the center of gravity and parallel to the axis of rotation of the rotating body.

[0032] According to another variant embodiment, the housing chambers oscillating and/or horizontally pivoting have personalized access doors.

[0033] According to one embodiment, the rotating body, whether it has a vertical or horizontal axis, can be associated with a drive member to determine the rotation in a controlled and desired manner.

[0034] According to another embodiment, each chamber can have means to personalize the treatment.

[0035] These and other aspects, characteristics and advantages of the present disclosure will be better understood with reference to the following description, drawings and attached claims. The drawings, which are integrated and form part of the present description, show some forms of embodiment of the present invention, and together with the description, are intended to describe the principles of the disclosure.

[0036] The various aspects and characteristics described in the present description can be applied individually where possible. These individual aspects, for example aspects and characteristics described in the specification, or in the attached dependent claims, can be the object of divisional applications.

[0037] It is understood that any aspect or characteristic that is discovered, during the patenting process, to be already known, shall not be claimed and shall be the object of a disclaimer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0038] These and other characteristics of the present invention will become apparent from the following description of some embodiments, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a perspective view of a drying apparatus in a variant embodiment;
- fig. 2 is a front view of a chamber in a variant embodiment;
- fig. 3 is a perspective view of a drying apparatus in another variant embodiment;
- fig. 4 is a front view of a drying apparatus as in fig. 3;
- fig. 5 is a view of another variant of the present drying apparatus;
- fig. 6 is a plan schematic view of the present drying apparatus;
- fig. 7 is a perspective view of a variant of a rotating body with which the present drying apparatus can be provided.

[0039] To facilitate comprehension, the same reference numbers have been used, where possible, to identify identical common elements in the drawings. It is understood that elements and characteristics of one embodiment can conveniently be incorporated into other embodiments without further clarifications.

DETAILED DESCRIPTION OF SOME EMBODIMENTS

[0040] We shall now refer in detail to the various embodiments of the present invention, of which one or more examples are shown in the attached drawings. Each example is supplied by way of illustration of the invention and shall not be understood as a limitation thereof. For example, the characteristics shown or described insomuch as they are part of one embodiment can be adopted on, or in association with, other embodiments to produce another embodiment. It is understood that the present invention shall comprise all such modifications and variants.

[0041] Before describing these embodiments, we must also clarify that the present description is not limited in its application to details of the construction and disposition of the components as described in the following description using the attached drawings. The present description can provide other embodiments and can be obtained or executed in various other ways. We must also clarify that the phraseology and terminology used here is for the purposes of description only, and cannot be considered as limitative.

[0042] Embodiments described here, using the attached drawings figs. 1-4 refer to a drying apparatus, or a drying cabinet, 10. For example, the drying apparatus 10 can be used for drying objects such as surgical instruments, anesthesia tubes, endoscopes, or also clothing to be used for medical, health-care, or veterinary use.

[0043] Furthermore, the drying apparatus 10 can also be used for storing and preserving the objects waiting to be removed by a user. In this way, objects do not risk

being contaminated and can remain in a sterile atmosphere until they are actually used.

[0044] The drying apparatus 10 comprises a drying unit 13 configured to blow in drying air.

[0045] Furthermore, the drying apparatus 10 comprises a container 21 associated with the drying unit 13. In the container 21 there are at least two chambers 11 which can be selectively opened by at least one specific door 12 associated with the container 21.

[0046] The door 12 is able to open or close an aperture 24 accessing the chamber 11 facing toward the same.

[0047] The at least two chambers 11 are configured mobile, to be selectively put in cooperation with the at least one specific door 12.

[0048] In this way, the chambers 11 can be moved one on top of the other and/or one alongside the other.

[0049] The at least two chambers 11 are configured to accommodate the objects to be subjected to the drying treatment.

[0050] Each of the chambers 11 can be divided into several compartments 32, for example, see the three compartments 32 in fig. 1. Naturally, the number of compartments 32 can be different from the one shown.

[0051] The compartments 32 can also be separated from each other by suitable divisions 33, for example see fig. 5 and fig. 7.

[0052] The compartments 32 can therefore be made independent of each other and, optionally, can each be associated with a specific door 12a, 12b, 12c of the container 21, see fig. 5.

[0053] In this way, advantageously, it is possible to diversify the drying treatment in each compartment 32 of a given chamber 11 and possibly not contaminate a particular compartment 32 following the opening of the adjacent compartment 32.

[0054] For example, in the situation in fig. 5, the objects treated in the upper and lower compartments 32 could be ready for removal, while the objects in the intermediate compartment 32 could still be under treatment, so the door 12b of the compartment 32 still remains closed, while the doors 12a and 12c of the upper and lower compartments 32 are opened.

[0055] In accordance with a possible embodiment, the drying apparatus 10 can be provided with means 19 for sanitizing the drying air.

[0056] In a possible implementation, the sanitizing means 19 can comprise a sterilization element 31 for performing a sterilization step of the drying air prior to entry into the chambers 11. For example, the sterilization element 31 can be a UV lamp.

[0057] According to another implementation, the sanitizing means 19 can comprise, exclusively or in combination with the sterilization element 31, a filter element 20 to filter the air from impurities before entering into each chamber 11. For example, the filter element 20 can be a HEPA filter.

[0058] The drying unit 13 comprises at least one ventilation element 17, which takes in air from the outside and sends it inside each chamber 11, and an heating element 18 of the air, before it enters inside the chamber 11.

[0059] The heating device 18 allows to heat the air up to a temperature of about 80°C and above. Furthermore, the heating device 18 can also heat to lower temperatures, for example, from about 45 ° C to about 50°C for drying different types of objects.

[0060] According to possible embodiments, the container 21 can be configured to accommodate inside it also at least the drying unit 13 to send pressurized air inside the chambers 11.

[0061] According to one embodiment, the pressurized air can enter into the chambers 11 by means of a plurality of ventilation mouths 14, shown by way of example in fig. 1, and connected at least to the drying unit 13.

[0062] According to a variant embodiment, the drying apparatus 10 can comprise a single door 12 through which to selectively access a specific one of the chambers 11 which is presented on each occasion with respect to door 12.

[0063] According to another variant embodiment, the container 21 of the drying apparatus 10 could comprise two distinct doors 12in which to perform, for example, an operation to load the objects inside the chamber 11 positioned in front of a first door 12, and an operation to remove objects from the chamber 11 positioned in front of a second door 12" disposed for the purpose, see fig. 1 for example.

[0064] The door 12" will be disposed on a lateral wall 36 of the container 21 other than the lateral wall 37 where the first door 12 is positioned.

[0065] The lateral wall 37 could be, for example, adjacent to the lateral wall 36, but also opposite it.

[0066] By way of example only, the one or more doors 12 can be installed in correspondence with a respective aperture 24' made on one side of the container 21 as shown in fig. 1.

[0067] The door 12 can be made at least partly of a transparent material to allow a user to control the contents of each chamber 11.

[0068] The door 12 can comprise around its edge a sealing element 34, for example a gasket that contacts the perimeter of the aperture 24, 24' of the container 21, to prevent dust, air and/or contaminants from entering and to maintain a controlled atmosphere inside each chamber 11.

[0069] The sealing element 34 could be installed, also or alternatively, on the edge of the aperture 24, 24' in a suitable position.

[0070] The sealing element 34 therefore is advantageously interposed between the door 12 and the corresponding aperture 24, 24', irrespective of whether it is positioned on the door 12 or the aperture 24, 24'.

[0071] According to another variant embodiment, the container 21 comprises a rotating body 15 in which the at least two chambers 11 are made, insulated from each other and configured to be selectively positioned in a de-

sired position correlated to the specific door 12.

[0072] The rotating body 15 is positioned inside the container 21 which in this case substantially functions as a containing structure.

[0073] According to a variant embodiment, the rotating body 15 is configured to present the chambers 11 facing a single door 12.

[0074] In the case of the variant embodiment of the drying apparatus 10 having two distinct doors 12, respectively for loading and unloading objects, the rotating body 15 is configured to rotate in a coordinated manner with respect to the position of the two distinct doors 12.

[0075] According to another variant embodiment, each chamber 11 of the rotating body 15 could have at least one specific door 12 able to be selectively put in front of the user.

[0076] According to a variant embodiment, the rotating body 15 can be associated with a drive member 22 to make it rotate and to selectively position a specific chamber 11 in front of a user.

[0077] According to a preferred embodiment, the rotating body 15 is configured to assume a substantially cylindrical shape.

[0078] In this way it is possible to obtain a plurality of chambers 11 made by dividing the rotating body 15 into sectors.

[0079] For example, each sector can be made with an angle of around 90°, having a total of four chambers 11, or with an angle of around 60°, as shown by way of non-restrictive example in figs. 1 and 6, or with an angle of around 45° with a total of eight chambers 11, or others.

[0080] According to one embodiment, if each chamber 11 of the rotating body 15 is divided into multiple compartments 32, each compartment 32 can have its own specific door 12a', 12b', 12c', see fig. 7.

[0081] Between each of the doors and the aperture of the corresponding compartment 32, sealing elements 34' will be provided.

[0082] The sealing elements 34' will also be provided for opening and closing the doors 12a, 12b, 12c of the container 21, see fig. 5.

[0083] According to a variant embodiment shown by way of example in fig. 1, the rotating body 15 has a vertical axis of rotation X', that is, substantially orthogonal to a support plane of the drying apparatus 10.

[0084] According to one embodiment, adjacent chambers 11 are insulated and can be divided by a single lateral wall 16.

[0085] According to another embodiment, each chamber 11 is defined by its own lateral wall 16, in this specific case two lateral walls 16, and between lateral walls 16 of two adjacent chambers 11 an interspace 35 can be made in which, for example, to install the pipes to send the air into each chamber 11.

[0086] According to this embodiment, the ventilation mouths 14 can be disposed in correspondence with each lateral wall 16 in an order and disposition consistent for treating the objects inside each chamber 11.

[0087] According to another embodiment, the ventilation mouths 14 can be disposed in correspondence with the upper wall and/or lower wall of each chamber 11.

[0088] According to another variant embodiment shown by way of example in figs. 3 and 4, the rotating body 15 has a horizontal axis of rotation X, that is, substantially parallel to a support plane of the drying apparatus 10.

[0089] In this way, the chambers 11 are oscillating and/or horizontally pivoting and hence can be hinged so that the axis of rotation Y of each chamber 11 is eccentric to the center of gravity.

[0090] Moreover, the axis of rotation Y of each chamber 11 is parallel to the axis of rotation X of the rotating body 15.

[0091] In the embodiment with a horizontal axis of rotation X, each chamber 11 can be attached in correspondence with its two opposite ends to spokes 23, fixedly connected to the rotating body 15.

[0092] According to one embodiment, each chamber 11 can be individually connected to the drying unit 13 by means of a specific connection pipe provided for the purpose.

[0093] For example, the connection pipe can be installed in correspondence with at least one spoke 23 of each oscillating and/or horizontally pivoting chamber 11.

[0094] Furthermore, the ventilation mouths 14 can be disposed in correspondence with a desired wall inside the chamber 11.

[0095] The containing structure 21 can have the aperture 24 in correspondence with which the specific oscillating and/or horizontally pivoting chamber 11 is positioned for the user to remove objects.

[0096] By way of example, in this case, each of the chambers 11 of the rotating body 15 is associated with a single door 12'.

[0097] Naturally, one or more chambers 11 of fig. 1 could be provided with a similar single door 12' associated with the rotating body 15.

[0098] The drying apparatus 10 can comprise a control and command unit 25 configured to receive commands from a user and to send input signals to the drive member 22 and/or to the drying unit 13.

[0099] The control and command unit 25 is also configured to detect the opening/ closing of each door 12 to send signals to the drying unit 13 to regulate the flow of air inside each chamber 11.

[0100] For example, when a door 12 is opened, the control and command unit 25 sends a signal to the drying unit 13 to increase the air delivery pressure inside the specific chamber 11.

[0101] The air pressure inside the chambers 11 is therefore modulated by the control and command unit 25 depending on the opening or closing of the door 12.

[0102] The control and command unit 25 can be configured to process specific drying programs, defining for example cycle duration, air temperature, air outlet pressure, humidity, for the type of object to be dried.

[0103] Furthermore, the control and command unit 25 can be configured to coordinate the rotating body 15 in its rotation with respect to the position, for example angular in the case of the cylindrical rotating body 15, of the one or more doors 12.

[0104] Each chamber 11, or each compartment 32, can have a plurality of shelves 26 inside it, on which the containing devices 27 of the objects to be dried can be positioned.

[0105] There is nothing to exclude the objects from being directly positioned on the shelf 26.

[0106] According to one embodiment, a compartment can correspond to each shelf 26 and can provide a specific door 12.

[0107] According to a variant embodiment, the containing devices 27 can be open at the top and be made by a metal net structure having meshes sized to prevent objects from falling.

[0108] In this way, the objects can easily be lapped by the hot air coming out of the ventilation mouths 14.

[0109] According to another variant embodiment, the containing devices 27 can be selectively closed at the top by a lid.

[0110] Furthermore, the walls of each containing device 27 can be continuous and have at least one through hole configured to connect to a quick connector.

[0111] The quick connector can advantageously be used to be connected to possible devices of the chamber 11, for example, pipes or connectors that blow in hot air for the purpose of drying the object, such as an endoscope 30.

[0112] According to another variant embodiment shown by way of example in fig. 2, each chamber 11, or each compartment 32, can have means for positioning an object to be dried.

[0113] For example, said means can be at least one hook 28 and a plurality of pins 29 disposed staggered so as to position, for example, the endoscope 30.

[0114] According to another variant embodiment, each chamber 11 can be provided with at least one connector configured to be associated with the end of the endoscope 30 to allow it to be dried internally as well.

[0115] An example of a connector, in combination with the variant embodiment described above, is described in WO-A-2015/068131 filed in the name of the Applicant.

[0116] It is clear that modifications and/or additions of parts can be made to the drying apparatus 10 as described heretofore, without departing from the field and scope of the present invention.

[0117] 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 drying apparatus 10, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

[0118] In the following claims, the sole purpose of the references in brackets is to facilitate reading: they must not be considered as restrictive factors with regard to the field of protection claimed in the specific claims.

Claims

1. Apparatus for drying objects for health-care, medical, veterinary or similar use, comprising at least a drying unit (13) configured to blow in drying air, said apparatus being **characterized in that** it comprises:

   - a container (21) associated with said drying unit (13);
   - a plurality of chambers (11) positioned in said container (21), able to be selectively opened by at least a door (12, 12', 12a-c, 12a'-c'), said chambers (11) being configured mobile in order to be selectively positioned in cooperation with said at least one door (12, 12', 12a-c, 12a'-c');
   - one or more ventilation mouths (14) positioned in said chambers (11) and suitable to supply drying air sent from said drying unit (13),
   - at least a control unit (25) associated with said drying unit (13) and configured to regulate and modulate, through said one or more ventilation mouths (14), the pressure of the drying air in said chambers (11).

2. Drying apparatus as in claim 1, **characterized in that** said chambers (11) are divided into compartments (32), each comprising its own door (12a-c, 12a'-c').

3. Drying apparatus as in claim 1 or 2, **characterized in that** said container (21) comprises at least an aperture (24, 24') with which said door (12, 12', 12a-c, 12a'-c') is associated, at least a holding element (34, 34') being positioned between said aperture (24, 24') and said door (12, 12', 12a-c, 12a'-c').

4. Drying apparatus as in claim 1, **characterized in that** said chambers (11) are separated from each other by at least an interspace (35) made between the respective lateral walls (16).

5. Drying apparatus as in claim 1, **characterized in that** it comprises a single door (12) through which to selectively access a specific one of said chambers (11) that are presented on each occasion with respect to said door (12).

6. Drying apparatus as in any claim hereinbefore, **characterized in that** said container (21) comprises a rotating body (15) in which said chambers (11) are made, insulated from each other and configured to be selectively positioned in a desired position, such as a loading and/or unloading position of the objects from the drying apparatus.

7. Drying apparatus as in claim 6, **characterized in that** said rotating body (15) is associated with a drive member (22) in order to make said rotating body (15) rotate and to selectively position at least one specific chamber (11).

8. Drying apparatus as in claim 6, **characterized in that** said rotating body (15) has a vertical axis of rotation (X').

9. Drying apparatus as in claim 6, **characterized in that** said rotating body (15) has a horizontal axis of rotation (X).

10. Drying apparatus as in claim 6, **characterized in that** said plurality of chambers (11) are made by dividing said rotating body (15) into sectors.

11. Drying apparatus as in claim 9, **characterized in that** said chambers (11) are horizontally pivoting and hinged so that an axis of rotation (Y) of each chamber (11) is eccentric with respect to the center of gravity, said axis of rotation (Y) of each chamber (11) being parallel to said horizontal axis of rotation (X) of said rotating body (15).

12. Drying apparatus as in any claim hereinbefore, **characterized in that** each chamber (11) has a plurality of shelves (26) for the direct positioning of the objects and/or in order to position containing devices (27) for said objects.

13. Drying apparatus as in any claim hereinbefore, **characterized in that** each chamber (11) has means (28, 29) to position an object to be dried.

14. Drying apparatus as in any claim hereinbefore, **characterized in that** said apparatus comprises means (19) for sanitizing the drying air.

15. Drying apparatus as in any claim hereinbefore, **characterized in that** it comprises a first door (12) for the insertion of the objects to be dried and at least a second door (12") for the extraction of the dried objects.

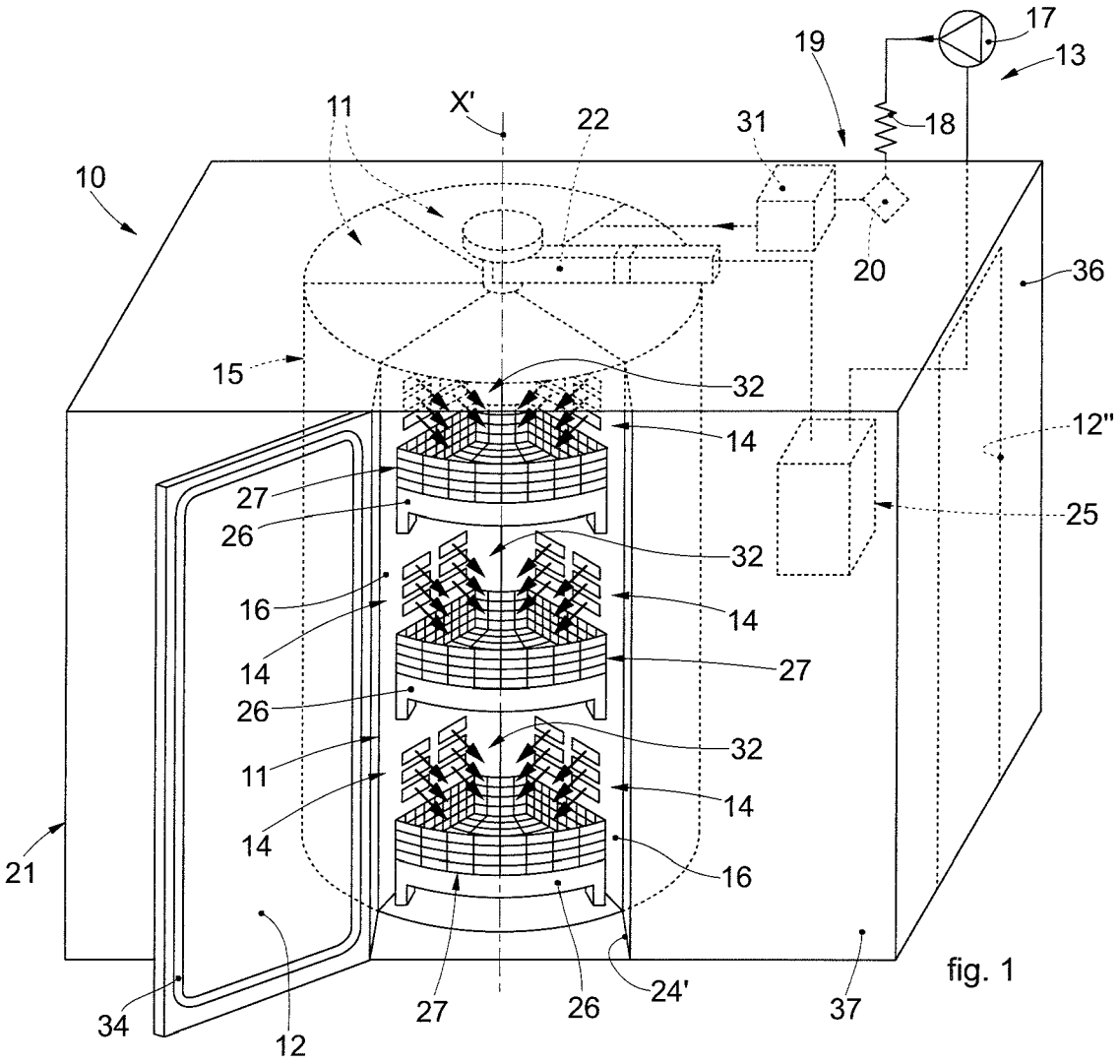

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fig. 1

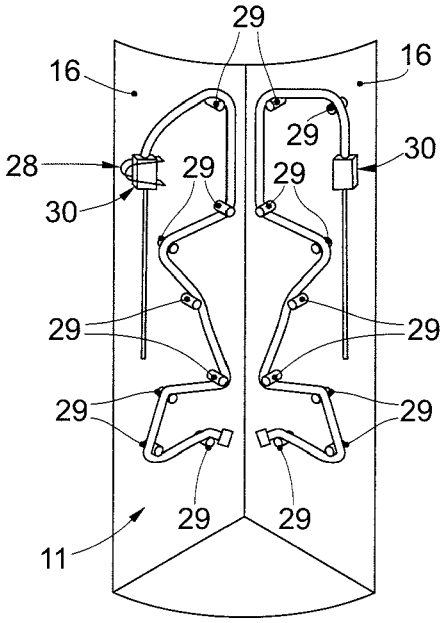

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fig. 2

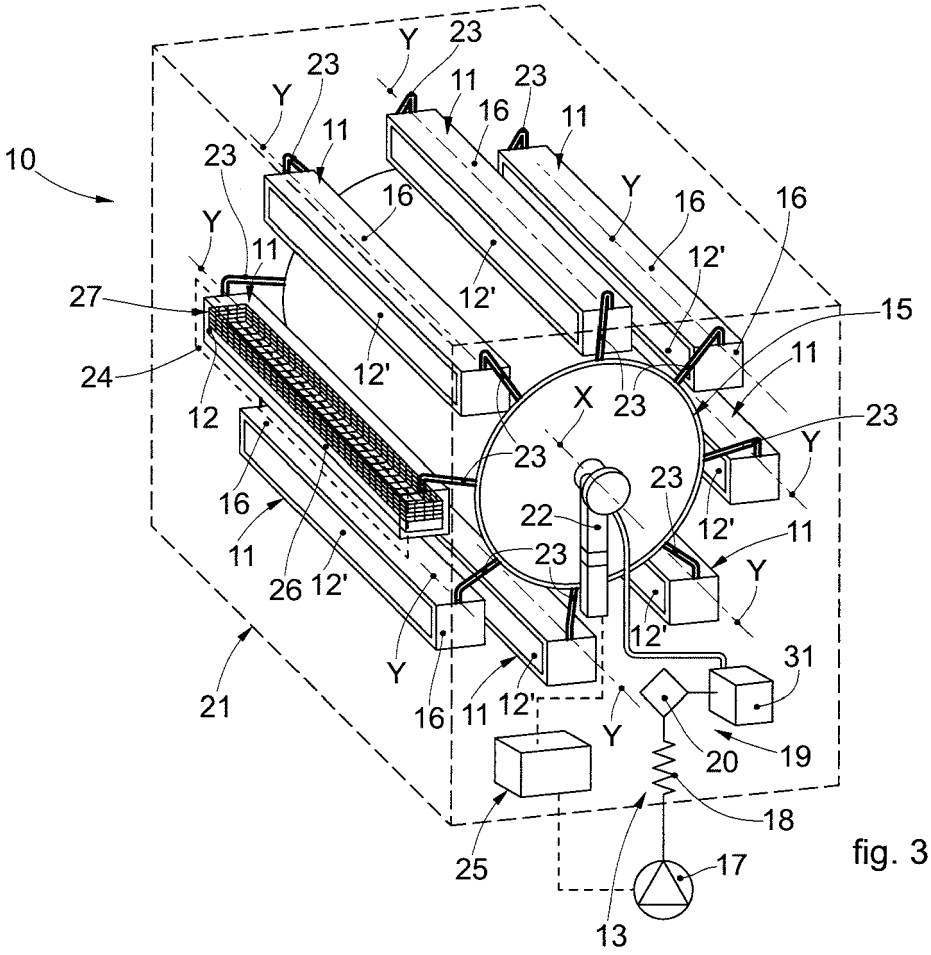

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fig. 3

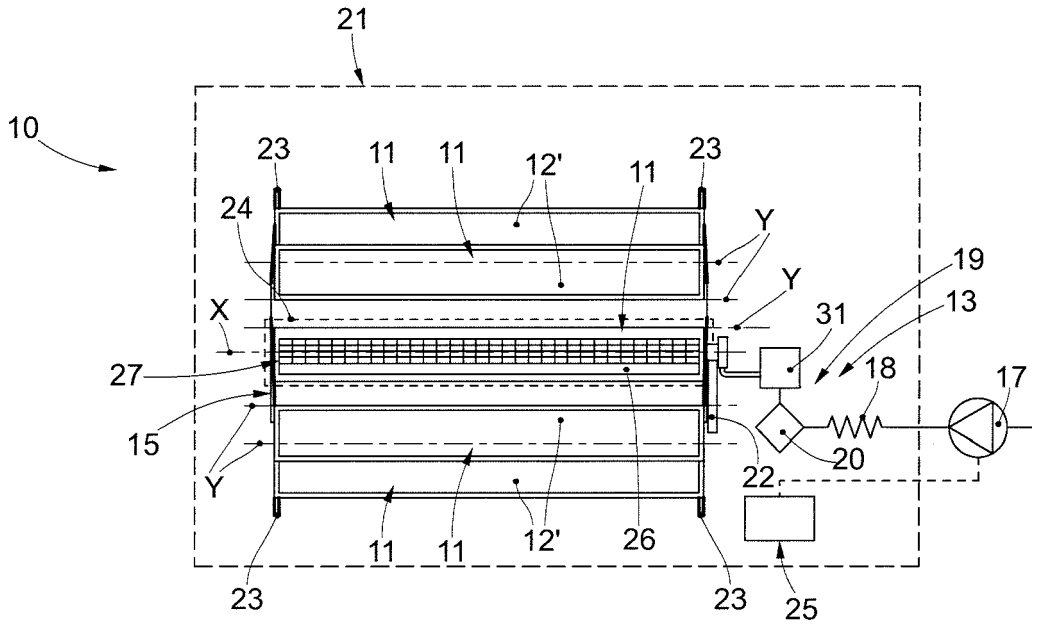

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fig. 4

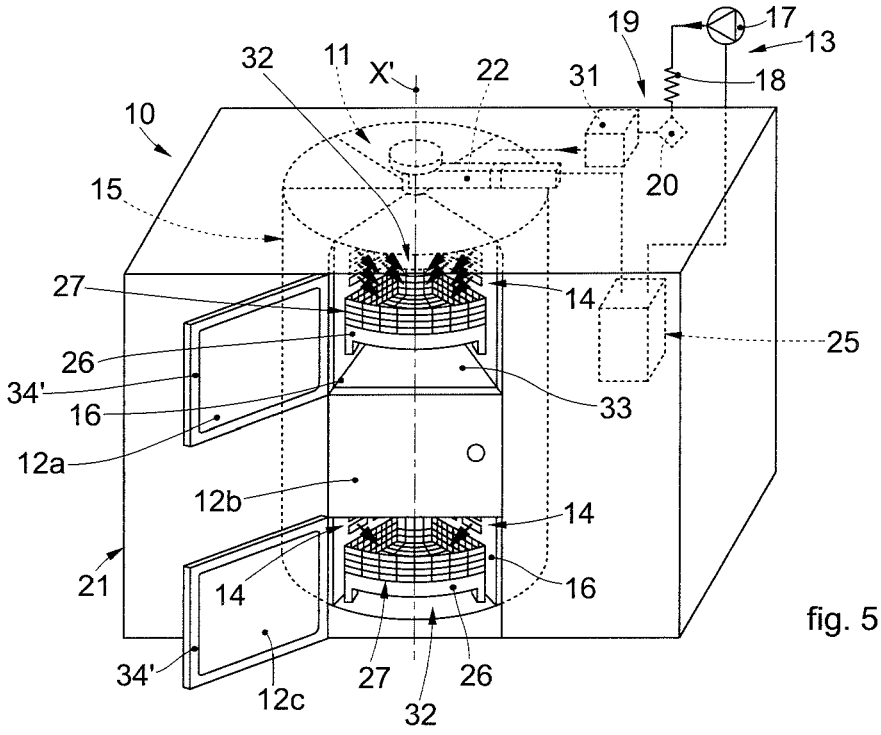


fig. 5

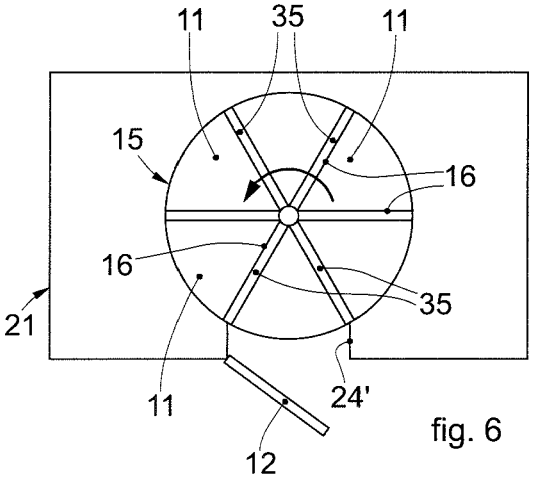


fig. 6

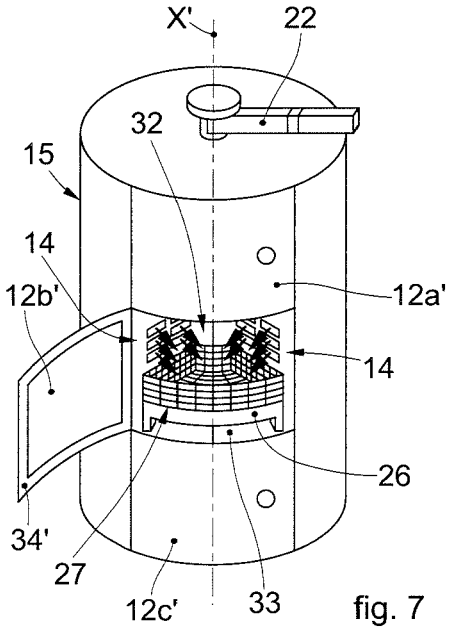


fig. 7

Europäisches Patentamt
European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 17 19 7409

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	FR 941 159 A (ANCIENS ATELIERS VICTOR CHARPE) 4 January 1949 (1949-01-04) * the whole document *	1-15	INV. F26B11/18 F26B21/12 F26B25/12
Y	US 19635 A (WILLIAM HEATON [US]) 16 March 1858 (1858-03-16) * the whole document *	1-15	
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A	DE 202 00 186 U1 (HEINDL ALBERT GEORG WALTER [DE]; HEINDL ALBERT JOHANN [DE]) 2 May 2002 (2002-05-02) * the whole document *	1-15	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	5 March 2018	Villar Fernández, R

CATEGORY OF CITED DOCUMENTS

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