



(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:  
17.01.2024 Bulletin 2024/03

(51) International Patent Classification (IPC):  
B01L 3/00 (2006.01) B01L 9/06 (2006.01)  
B01L 9/00 (2006.01)

(21) Application number: 22184543.1

(52) Cooperative Patent Classification (CPC):  
B01L 9/06; B01L 3/5085; B01L 2200/021;  
B01L 2200/023; B01L 2300/0609; B01L 2300/0829;  
B01L 2300/123

(22) Date of filing: 12.07.2022

(84) Designated Contracting States:  
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB  
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO  
PL PT RO RS SE SI SK SM TR  
Designated Extension States:  
BA ME  
Designated Validation States:  
KH MA MD TN

(72) Inventors:  
• GROOT, Casper  
9444 TJ Grolloo (NL)  
• EBBELAAR, Bastiaan  
3905 NR Veenendaal (NL)  
  
(74) Representative: Simmons & Simmons LLP  
Claude Debussylaan 247  
1082 MC Amsterdam (NL)

(71) Applicant: MolGen B.V.  
3905 NR Veenendaal (NL)

(54) DEVICE FOR HOLDING A CONTAINER, INSERT FOR SUCH DEVICE AND METHOD FOR  
MANUFACTURING SUCH DEVICE AND INSERT

(57) Device (1) for holding a container (2), comprising a body (3) and an opening (4) in said body (3) for receiving the container (2), characterized in that the device (1) also comprises an insert (5) insertable in the opening (4).

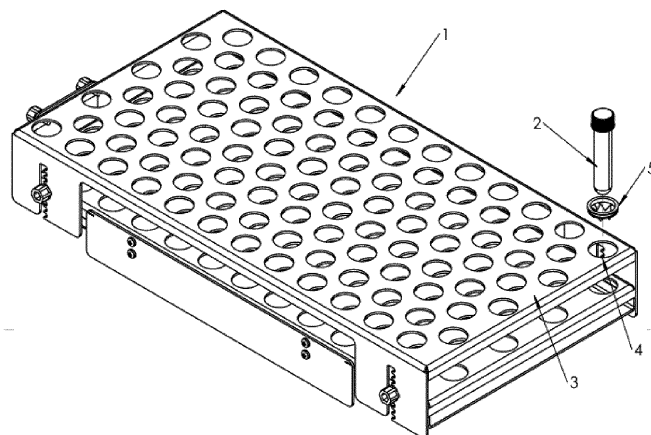


Fig. 1

## Description

**[0001]** The present invention relates to a device for holding a container, as well as to an insert for such device and a method for manufacturing such device and insert.

**[0002]** More particularly, the invention relates to a device of the type which comprises a body and an opening in said body for receiving the container.

**[0003]** Such device is known per se. It has an opening configured to receive a container with a particular size and/or shape. However, when a container with a different size or shape needs to be held by the device, e.g. a smaller or larger container, or a square container instead of a circular container, this device is no longer suitable. A new device has to be manufactured with an opening that is adapted to receive the smaller or larger container, or the square container. Hence, known devices have a limited container compatibility. They are not universally applicable.

**[0004]** It is an objective of the present invention to provide a device that solves the above or other problems with known devices. More particularly, the invention aims to increase the universality of a device for holding a container. For example, the invention seeks to eliminate the need for a specifically configured device to obtain compatibility with a certain container.

**[0005]** Thereto, the present invention according to a first aspect relates to a device of the above-mentioned type, with the characteristic that the device comprises an insert insertable in the opening. The insert may allow to adapt the opening to the container, in particular the size and/or shape of the container. The insert may allow to grip the container, irrespective or substantially irrespective of the size, shape and/or other characteristics of the container. With the insert, the opening is able to receive containers having different characteristics, such as a different size and/or shape. As a result, the device is compatible with a broad range of containers. For example, when smaller or larger containers need to be held, there is no longer a need to manufacture a new device. The device of the present invention is more universal than the known device described above.

**[0006]** Preferably, the insert is flexible. For example, the insert may comprise one or more flexible portions configured to flex when the container is received in the opening. By flexing the insert, the opening can be adapted to the received container, in particular to the size and/or shape of the container. In the context of the present invention, the term "flexing" or "flexible" is used to indicate that something is able to move, deform and/or bend, preferably in an elastic manner.

**[0007]** In a practical embodiment, the insert may comprise a slit or cut pattern. This slit or cut pattern may comprise one or more slits or cuts. The slits or cuts may be intersecting. The one or more slits or cuts may define the one or more flexible portions. The flexibility of the insert may be at least partially obtained due to the provision of the slit or cut pattern, or the one or more slits or

cuts.

**[0008]** The one or more flexible portions may comprise one or more angular segments. The one or more angular segments, or more generally the one or more flexible portions, may be inwardly directed. This means that they are directed to the centre of the opening.

**[0009]** Preferably, the insert comprises between four and eight flexible portions, for example in the form of angular segments. More preferably, the insert comprises between five and seven flexible portions. Most preferably, the insert comprises six flexible portions.

**[0010]** The one or more flexible portions may be oriented horizontally, or substantially horizontally when the insert is free from container, i.e. when no container is introduced in the insert. Such horizontal orientation, where the one or more flexible portions are parallel, or substantially parallel to an upper surface, or main plane of the device, or the body of the device, allows for a compact design of the insert.

**[0011]** Preferably, the one or more flexible portions have a thickness lying between 0.3 millimetres (mm) and 1mm, between 0.4mm and 0.9mm, between 0.5mm and 0.8mm, or between 0.6mm and 0.7mm. The inventors have found that such thickness provides a flexibility that is most compatible with a broad range of containers.

**[0012]** The insert may comprise guiding means or guiding parts to guide the container in the opening. For example, the insert may have oblique walls forming said guiding means or guiding parts. The insert may also form a funnel. In a particular embodiment, at least one and preferably all of the one or more flexible portions of the insert may be directed downwards, when the insert is free from container, i.e. when no container is introduced in the insert. Such downward orientation assists in guiding the container in the opening and thus acts as guiding means or guiding parts. The at least one flexible portion may be directed downwards slightly, such as between 1 and 15 degrees with respect to a horizontal plane, or an upper surface or a main plane of the device, or the body of the device, or between 1 and 10 degrees, or between 1 and 5 degrees.

**[0013]** Preferably, the insert is configured to grip the container when the container is received in the opening. With this gripping action, the container can be held firmly in position by the device, and a risk of the container falling out of the device can be reduced or even eliminated. For example, said gripping action may be provided by the one or more flexible portions willing to return to their initial rest position due to an elastic restoring force.

**[0014]** The insert may be fixedly insertable in the opening. In this way, it is prevented or at least counteracted that the insert comes loose from the opening, for example when moving the container out of the opening. For example, the insert may be snappable or clickable in the opening.

**[0015]** Preferably, the insert is shaped so as to conform to the opening. For example, the insert may be circular, or substantially circular. In general, the insert may have

any shape or size.

**[0016]** The insert can be made of any material. For example, it can be made of a polymer material, a plastic material or a rubber material. Preferably, it is made of a thermoplastic elastomer (TPE). A thermoplastic elastomer (TPE) is also called a thermoplastic rubber. It is a class of copolymers that comprise materials with both thermoplastic and elastomeric properties. Such type of materials is flexible so as to allow the insert to flex easily, and also does not result into too much friction allowing the container to slide along the insert easily. Any type of TPE can be used. Preferably, the Shore D hardness lies between 22D and 32D, more preferably between 24D and 30D, most preferably is about 27D. Preferably, the Shore A hardness lies between 80A and 90A, more preferably between 82A and 88A, most preferably is about 85A.

**[0017]** The insert can be made using any type of manufacturing technique. Preferably, the insert is made using extrusion or injection moulding. This is a suitable technique, especially when the insert is made of a plastic material, a polymer material or a rubber material.

**[0018]** The body of the device may be made of any material. For example, the body of the device can be made of steel, a plastic material, a polymer material, a rubber material or aluminium. Preferably, the body of the device is made of aluminium, because it is strong but also relatively light in weight.

**[0019]** The device may be height-adjustable. In particular, the height of the opening may be adjustable. In this way, the device can be compatible not only with containers of different sizes and/or shapes, but also with containers of different heights.

**[0020]** The body of the device may be formed by a frame.

**[0021]** In a particular embodiment, the body of the device may contain a first body layer containing the opening and a second body layer below the first body layer, the second body layer containing a second opening. The second opening may be aligned with the opening of the first body layer, so that they are intended to receive the same container. More particularly in the embodiment where the device is height-adjustable, such body configuration may be advantageous. In particular, the height may be adjusted by adjusting the relative distance between the first body layer and the second body layer, such as by increasing or decreasing said distance.

**[0022]** The device may be configured to hold multiple containers. In such case, the device may comprise multiple openings to receive the respective containers. For example, the device may be configured to hold ninety-six containers, such as ninety-six tubes or sample storage tubes, and hereto may comprise ninety-six openings in the body to receive the respective containers.

**[0023]** In the case of multiple openings, these openings may be positioned in rows, such as staggered rows. In such staggered configuration, the containers that are held by the device may be easily gripped by automatic

or robotic grippers, which are typically three-armed. The invention is not limited to such staggered configuration. Any configuration may be used.

**[0024]** In the situation where the device is configured to hold multiple containers and hereto comprises multiple openings, the device may comprise multiple inserts as described herein which are insertable in the respective openings. Then, each insert may be sized or shaped to be inserted into one opening, or to fit in one opening. In an alternative embodiment, an insert may be provided that is shaped or sized to cooperate with, or be insertable in more than one of the multiple openings. In such case, instead of multiple separate inserts, one insert may be provided that cooperates with a plurality of openings. More particularly, the insert may comprise one or more flexible portions at locations where a cooperating opening is present.

**[0025]** According to the first aspect of the present invention, an insert is provided. The insert may be a separate piece. The insert may be made of a different material than the body of the device. This is advantageous, because the body and the insert may each be made from a material that is suitable for the intended purpose. The body needs to provide sufficient strength, because it has to carry the container, or multiple containers. Therefore, it is preferably made of steel or, more preferably, aluminium. The insert may be flexible. Therefore, it is preferably made of a plastic material, a polymer material or a rubber material or, more preferably, a thermoplastic elastomer. In an alternative aspect of the present invention, the parts or portions of the insert may be made in one piece with the body of the device. Accordingly, the present invention according to a second aspect relates to a device for holding a container, comprising a body and an opening in the body for receiving the container, with the characteristic that the opening is adaptable, more particularly adaptable to the size and/or shape of the container. Preferably, the opening is provided with one or more flexible portions configured to flex when the container is received in the opening. The device according to the second aspect may show one or more features described in relation to the device according to the first aspect, without being limited to an insert. All features described in relation to the insert of the device of the first aspect may be applied, individually or in any combination, to the device according to the second aspect, but then in a one-piece configuration, such as in one piece with the device, or the body of the device.

**[0026]** The present invention may be advantageously used to devices such as racks, tube racks, plate carriers or multi-well plates. These devices may be used for the purpose of automated or robotic handling systems, such as automated or robotic liquid handling systems. The present invention may be applied in the area of molecular diagnostics, such as in the area of extraction DNA/RNA isolation technology. The present invention is however not limited to such application and may be applied in any context.

**[0027]** The container may be a tube, such as a sample storage tube. The container may be filled or fillable with a liquid, a sample or other reagent.

**[0028]** The device may be equipped with a barcode.

**[0029]** The present invention also relates to an insert for a device as described herein, including a device according to the first aspect or second aspect of the present invention. The present invention also relates to the use of an insert in a device as described herein, including a device according to the first aspect or second aspect of the present invention.

**[0030]** Furthermore, the present invention relates to a method comprising the step of manufacturing a device or insert as described herein.

**[0031]** It is noted that intervals defined herein include the end points of the interval.

**[0032]** To better illustrate the features of the invention, certain preferred embodiments are described below, as examples that are not to be understood restrictively, with reference to the accompanying drawings, wherein:

- figure 1 shows a device according to the present invention in exploded view;
- figure 2a shows the device of figure 1 in non-exploded view;
- figure 2b shows a top view of the device of figure 2a;
- figure 3a shows the insert of the device of figure 1;
- figure 3b shows a top view of the insert of figure 3a;
- figure 4 shows a side view of the device of figure 1; and
- figure 5 also shows a side view of the device of figure 1, but height-adjusted compared to figure 4.

**[0033]** Figure 1 shows a device 1 according to the invention. It is configured to hold multiple containers 2, but only one container is shown.

**[0034]** In this example, the device 1 is a tube rack and the containers 2 are sample storage tubes. The containers 2 may store a liquid or other sample or reagent.

**[0035]** The device 1 may be used to hold containers 2 in automated or robotic handling systems, such as automated or robotic liquid handling systems. In such systems, containers or their content may be transferred using robotic grippers, robotic pipetting systems or other handling mechanisms. Automated or robotic handling systems may use automated or robotic instruments that run analyses or assays. They are "automatic", because they do not require input or substantial input from a lab technician.

**[0036]** More particularly, the device 1 may be applied in the area of molecular diagnostics, such as in the area of extraction DNA/RNA isolation technology.

**[0037]** The device 1 comprises a body 3, such as a frame. In the example, the body 3 is made of aluminium.

**[0038]** Furthermore, the device 1 comprises multiple openings 4 in the body 3 to receive the respective containers 2. The openings 4 are circular, but may have any shape.

**[0039]** More particularly, the device 1 is configured to hold ninety-six containers 2. Thereto, the device 1 comprises ninety-six openings 4 to receive the respective containers 2. The multiple openings 4 are arranged in eight rows, each row containing twelve openings 4. The rows of openings 4 are positioned in a staggered relationship. Such positioning allows for easy gripping of the containers 2 by a robotic gripper, which is typically three-armed. The device 1 may contain a marking indicative of the position of the container 2. Such marking may be provided adjacent to each opening 4. The marking is not shown in the figure.

**[0040]** The device 1 also comprises an insert 5 insertable in the opening 4. The insert 5 conforms to the shape of the opening 4 and is circular, but in general may have any shape. In this example, the device 1 comprises multiple inserts 5 to insert in the respective openings 4, but only one insert is shown in figure 1.

**[0041]** The insert 5 may be fixedly insertable in the opening 4. For example, the insert 5 may be snappable or clickable in the opening 4.

**[0042]** The insert 5 allows to adapt the opening 4, more particularly to the size and/or shape of the container 2 receivable in the opening 4. It allows the opening 4 to hold the container 2 firmly, irrespective or substantially irrespective of the size and/or shape of the container 2. The working principle of the insert 5 is explained in more detail in relation to figures 3a and 3b.

**[0043]** Figure 1 shows the device 1 in exploded view. The container 2 and the insert 5 are in a non-inserted condition.

**[0044]** Figure 2a shows the device 1 in non-exploded view. The insert 5 is inserted in the opening 4. More particularly, multiple inserts 5 are shown inserted in the respective openings 4. The containers 2 are not shown.

**[0045]** Figure 2b shows the device 1 of figure 2a, but in a top view.

**[0046]** Figure 3a shows the insert 5 of the device 1. The insert 5 is shown in a non-inserted condition, i.e. it is not inserted in the opening 4. Also, the container 2 is not inserted in the insert 5. The insert 5 is shown in a relaxed or rest condition.

**[0047]** In this example, the insert 5 is made of a thermoplastic elastomer (TPE). It may be manufactured using extrusion, injection moulding or any other suitable technique.

**[0048]** The insert 5 is provided with a slit or cut pattern 6. The slit or cut pattern 6 includes more than one slit or cut 7, which in the example are intersecting. The slit or cut pattern 6 defines more than one flexible portion 8, in this case six flexible portions 8. The flexible portions 8 are inwardly directed. This means that they are directed to the centre of the opening 4. They form angular segments.

**[0049]** As shown in figure 3a, when the insert 5 is free from the container 2, the flexible portions 8 are oriented horizontally, or substantially horizontally. This means that the flexible portions are parallel, or substantially par-

allel to the upper surface of the body 3. This allows for a compact design of the insert 5.

**[0050]** In an alternative embodiment, the flexible portions 8 may be directed downwards, i.e. towards the bottom of the device 1. They may be directed downwards slightly, such as between 1 and 15 degrees with respect to a horizontal plane, or between 1 and 10 degrees, or between 1 and 5 degrees. Such orientation acts as a guiding means or guiding parts, guiding the container 2 in the opening 4.

**[0051]** The flexible portions 8 are configured to flex when the container 2 is received in the opening 4. For example, they may move, bend and/or deform, preferably in an elastic manner. In this example, the flexible portions 8 will bend downwards elastically, as shown in figures 4 and 5. With this bending action, the opening 4 is adapted to the size and/or shape of the container 2. For example, the larger the container 2 in width, the more the flexible portions 8 will bend.

**[0052]** With the bending action, the flexible portions 8 also hold the container 2 firmly. They grip the container 2. More particularly, the flexible portions 8 want to return to their original rest position or orientation. This is due to the elastic restoring force. Thereby, they exert a force on the container 2, preferably clamping the container 2. In a particular embodiment, one or more flexible portions 8 may be coated with a frictional enhancement material, such as an adhesive, to increase their tackiness.

**[0053]** In this example, the insert 5 also comprises an upstanding rim 9 along its circumference.

**[0054]** Figure 3b shows the insert 5 of figure 3a, but in a top view.

**[0055]** Figure 4 shows the device 1 of figure 1 in a side view. The device 1 is shown in a condition where the insert 5 is inserted in the opening 4, and the container 2 is received in the opening 4.

**[0056]** In this example, the body 3 of the device 1 comprises a first body layer containing the openings 4, and a second body layer containing openings 10. The openings 10 are located below and aligned with the respective openings 4. The device 1 also comprises multiple inserts 11 insertable into the respective openings 10. The inserts 11 are identical to the inserts 5.

**[0057]** The first body layer is located at a distance H1 from the second body layer. This distance is adjustable, by which the device 1 is height-adjustable. More particularly, the first body layer can be displaced in a height direction. For example, figure 5 also shows a side view of the device of figure 1, but with the first body layer lying at a larger distance H2 from the second body layer. In this configuration, the device 1 can hold larger containers in length.

**[0058]** Figures 4 and 5 also show a closer view of the insert 5 in a condition where it receives the container 2. As shown in these figures, the flexible portions 8 are bent downwards in this condition.

**[0059]** In this example, the flexible portions 8 have a thickness T lying between 0.6 and 0.7mm.

**[0060]** The present invention is in no way limited to the embodiments described above, but such devices, inserts and methods may be realised of different variants without going beyond the scope of the present invention.

## Claims

1. Device (1) for holding a container (2), comprising a body (3) and an opening (4) in said body (3) for receiving the container (2), **characterized in that** the device (1) also comprises an insert (5) insertable in the opening (4).
2. Device according to claim 1, wherein the insert (5) comprises one or more flexible portions (8) configured to flex when the container (2) is received in the opening (4).
3. Device according to claim 2, wherein the insert (5) comprises one or more slits or cuts (7) defining said one or more flexible portions (8).
4. Device according to claim 2 or 3, wherein the one or more flexible portions (8) comprise one or more angular segments.
5. Device according to any of claims 2 to 4, wherein the insert (5) comprises six flexible portions (8).
6. Device according to any of claims 2 to 5, wherein the one or more flexible portions (8) have a thickness (T) of between 0.3mm and 1mm, preferably between 0.4mm and 0.9mm, more preferably between 0.5mm and 0.8mm, most preferably between 0.6mm and 0.7mm.
7. Device according to any of claims 1 to 6, wherein the insert (5) comprises guiding means or guiding parts to guide the container (2) in the opening (4).
8. Device according to any of claims 1 to 7, wherein the insert (5) is fixedly insertable in the opening (4), preferably by being snappable or clickable in the opening (4).
9. Device according to any of claims 1 to 8, wherein the insert (5) is made of a thermoplastic elastomer (TPE).
10. Device according to any of claims 1 to 9, wherein the body (3) of the device (1) is made of aluminium.
11. Device according to any of claims 1 to 10, wherein the device (1) is height-adjustable.
12. Device according to any of claims 1 to 11, wherein the device (1) is configured to hold multiple contain-

ers (2) and comprises multiple openings (4) in the body (3) to receive the respective containers (2); and wherein the device (1) comprises multiple such inserts (5) insertable in the respective openings (4).

5

- 13.** Device according to any of claims 1 to 12, wherein the device (1) is a rack, a tube rack, a plate carrier or a multi-well plate.

- 14.** Device according to any of claims 1 to 13, wherein the container (2) is a tube, such as a sample storage tube.

10

- 15.** Insert (5) for a device (1) according to any of claims 1 to 14.

15

20

25

30

35

40

45

50

55

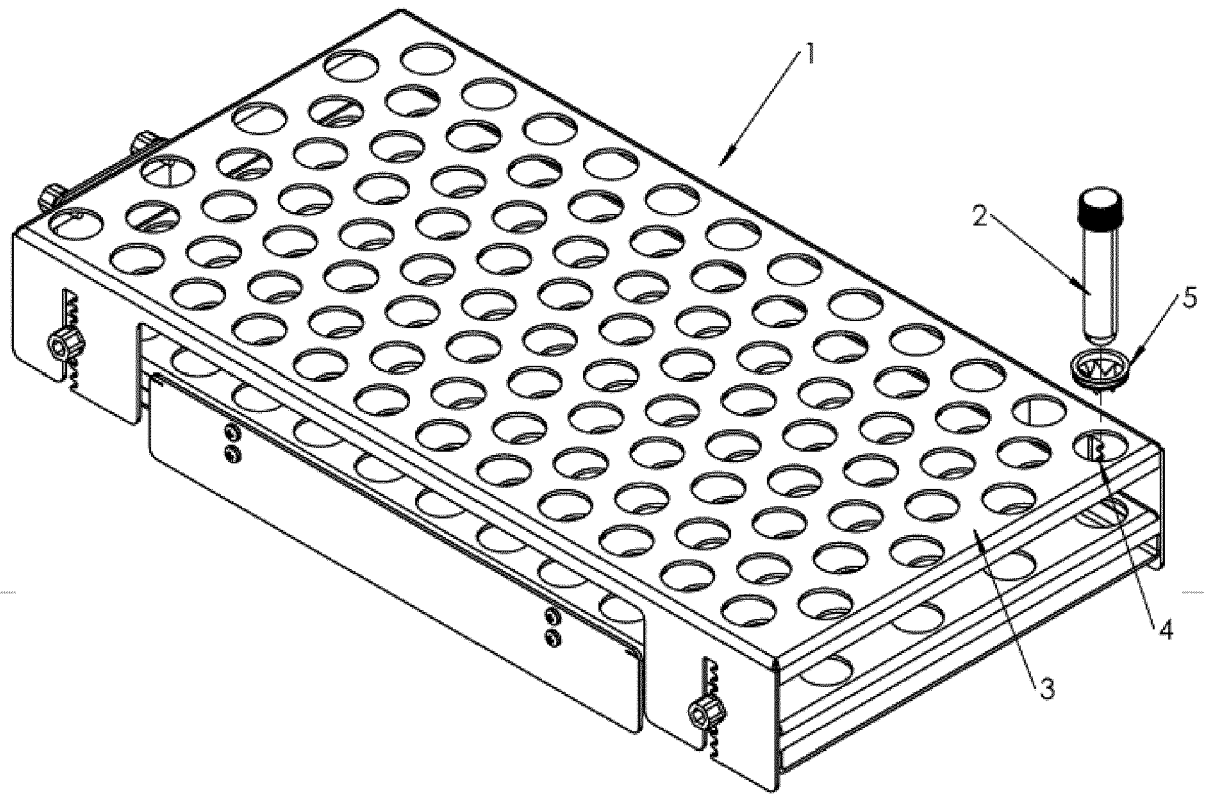


Fig. 1

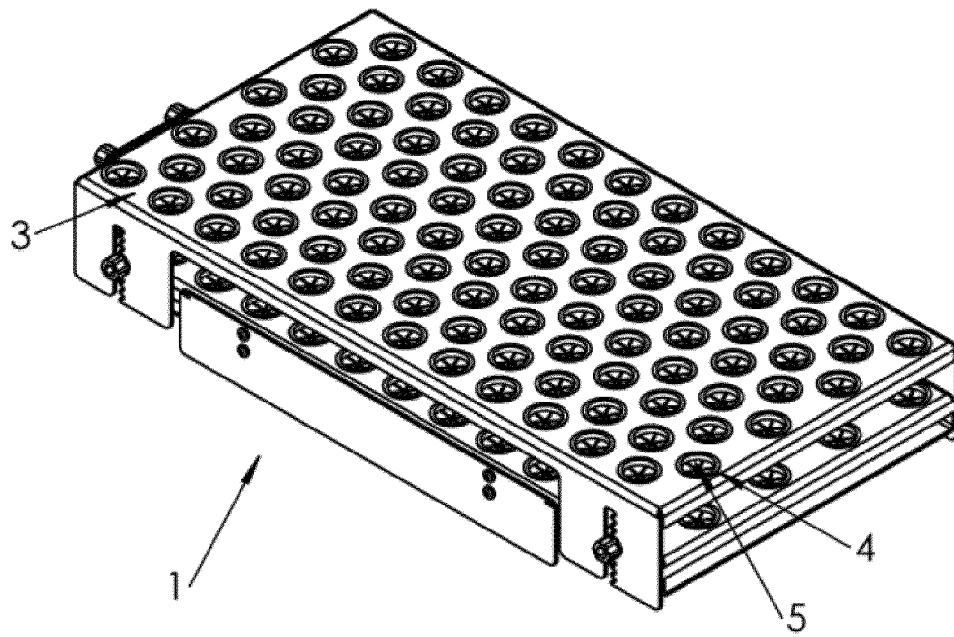


Fig. 2a

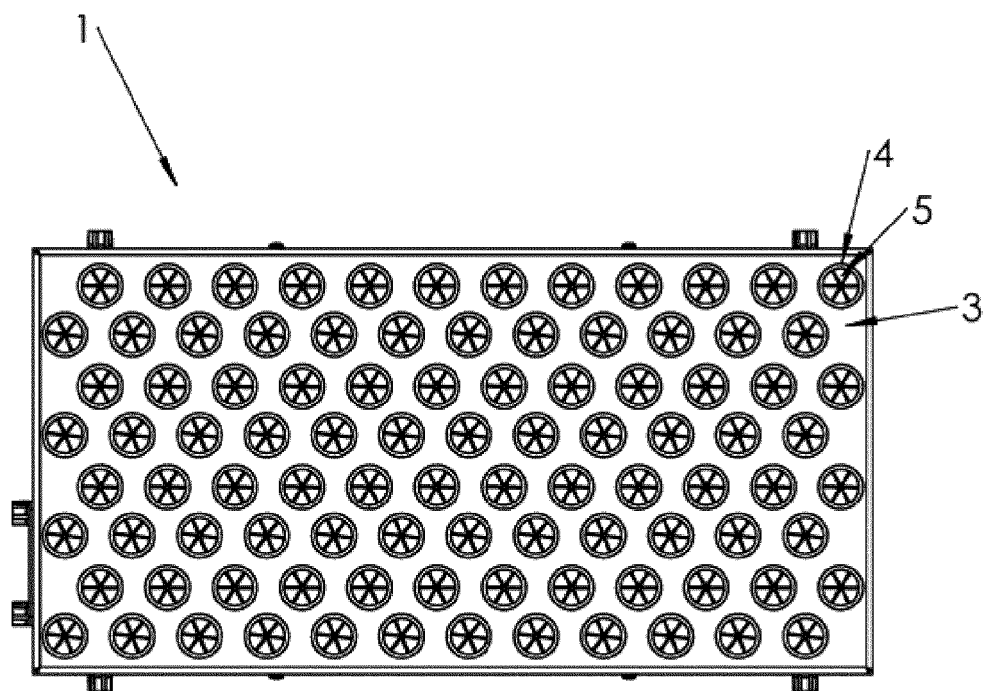


Fig. 2b

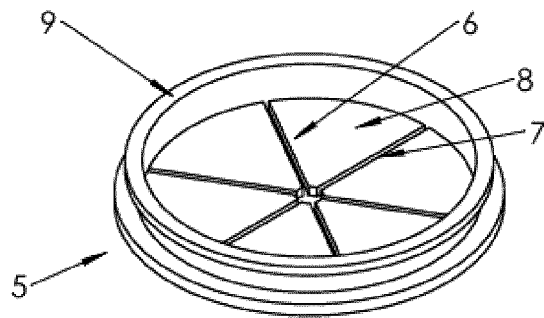


Fig. 3a

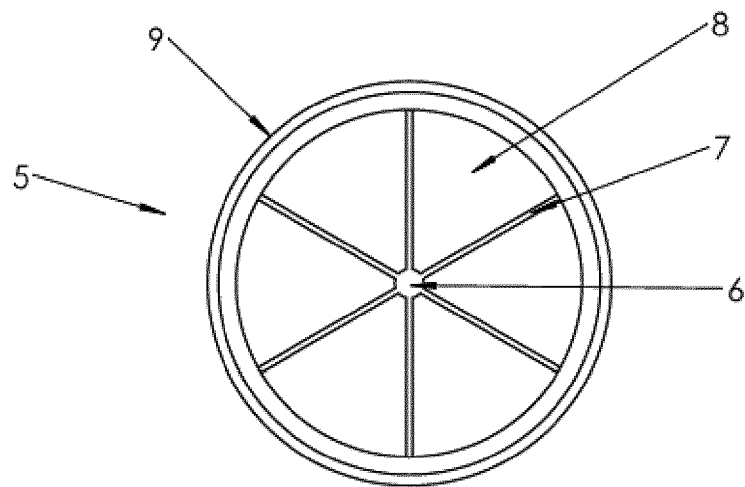


Fig. 3b

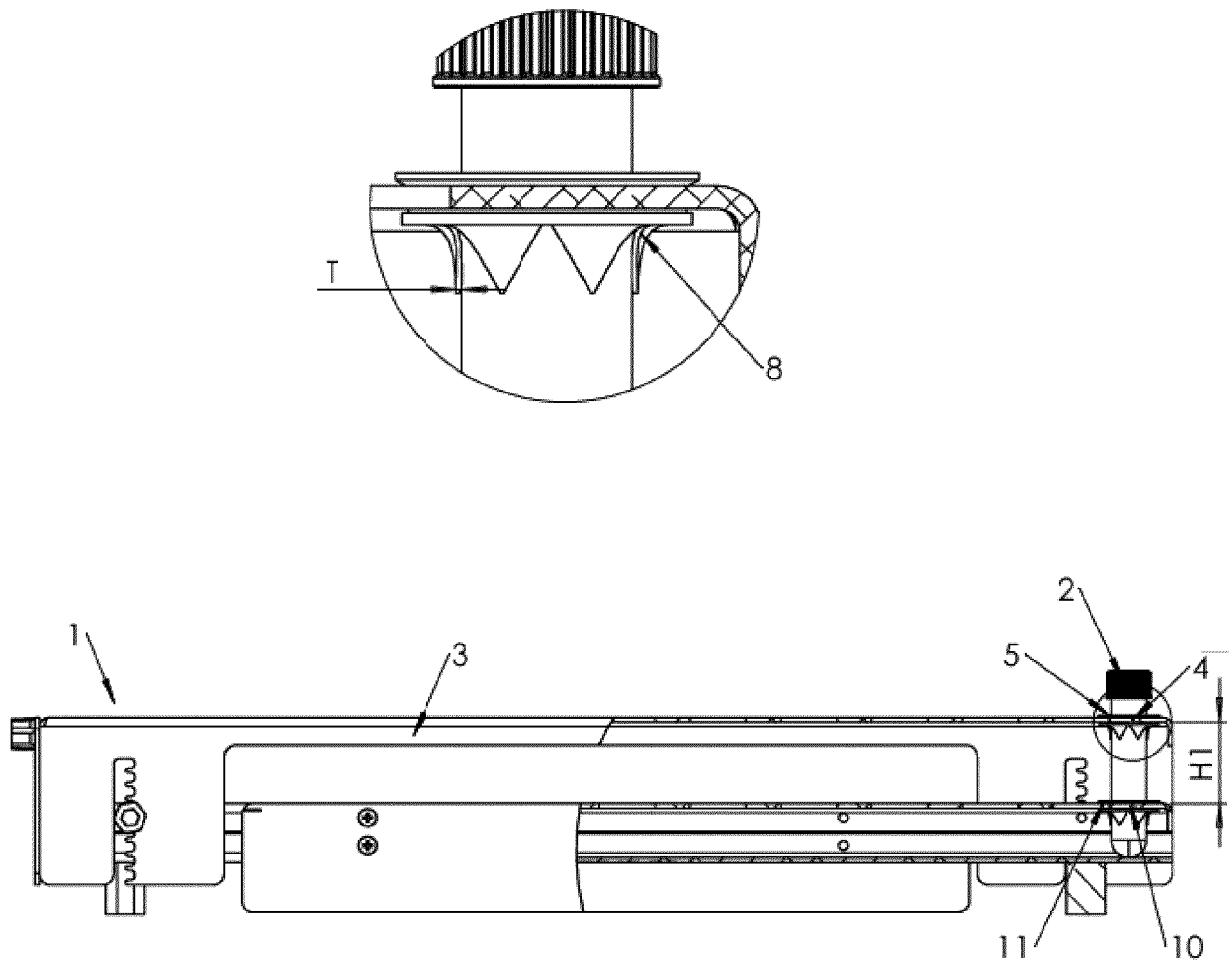


Fig. 4

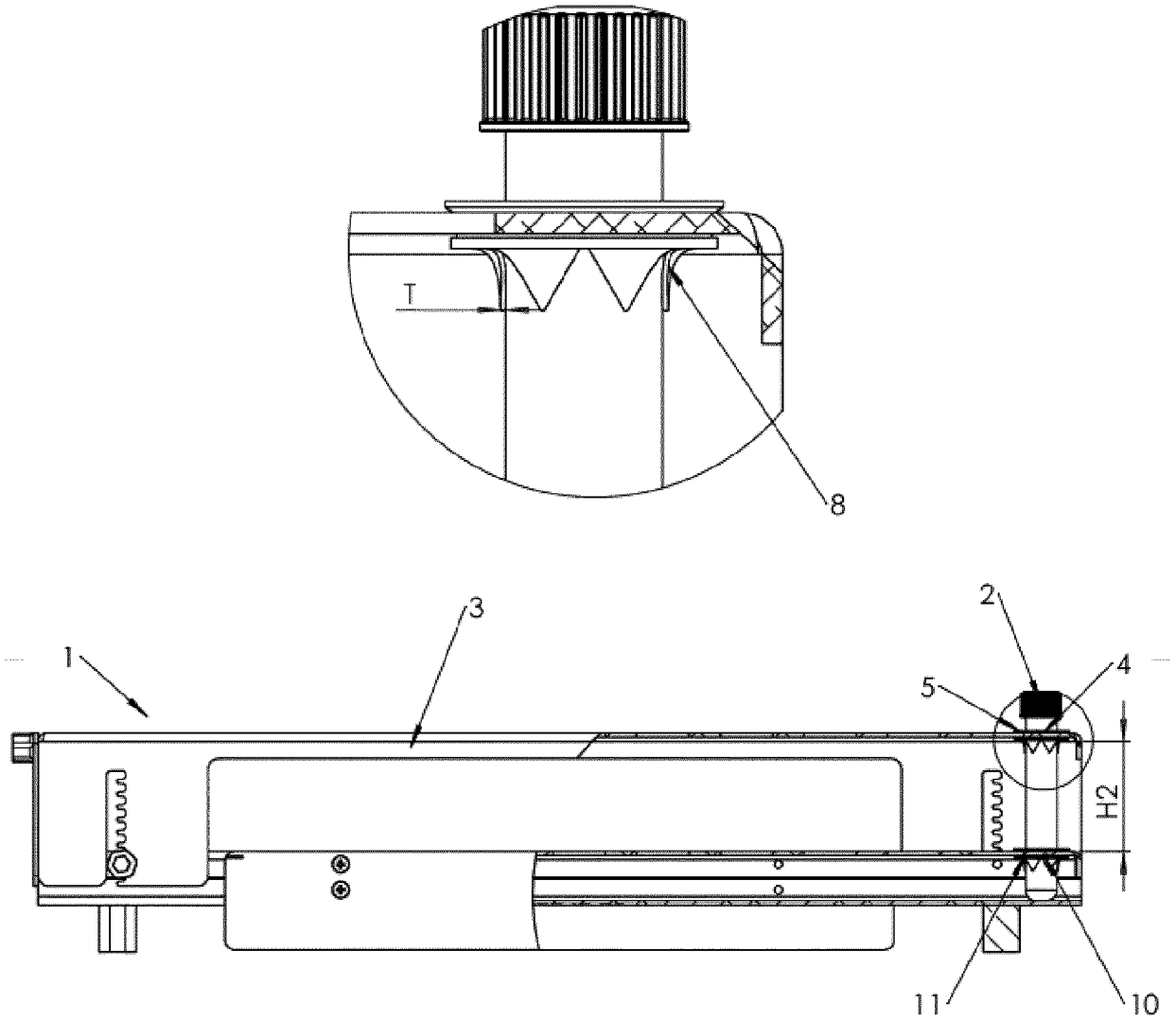


Fig. 5



## EUROPEAN SEARCH REPORT

Application Number

EP 22 18 4543

5

10

15

20

25

30

35

40

45

50

55

1

EPO FORM 1503 03.82 (P04C01)

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                    |                                                                                                                                                         |                                                                                                                                                                                                                                                                                       |                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| Category                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                                                                           | Relevant to claim                                                                                                                                                                                                                                                                     | CLASSIFICATION OF THE APPLICATION (IPC)        |
| X                                                                                                                                                                                                                                                      | US 2019/336978 A1 (LEJAY FABRICE [FR])<br>7 November 2019 (2019-11-07)                                                                                  | 1-10,<br>12-15                                                                                                                                                                                                                                                                        | INV.<br>B01L3/00                               |
| Y                                                                                                                                                                                                                                                      | * paragraphs [0043], [0045] - [0047],<br>[0049], [0051] - [0053], [0061] *<br>* figures 1-7, 9 *                                                        | 11                                                                                                                                                                                                                                                                                    | B01L9/06<br>B01L9/00                           |
| X                                                                                                                                                                                                                                                      | US 2005/029914 A1 (WANG ZHENMING [US])<br>10 February 2005 (2005-02-10)                                                                                 | 1-3,<br>5-10,<br>12-15                                                                                                                                                                                                                                                                |                                                |
| Y                                                                                                                                                                                                                                                      | * paragraphs [0020], [0024], [0026],<br>[0030], [0032] *<br>* figures 3, 5d, 6, 7 *                                                                     | 11                                                                                                                                                                                                                                                                                    |                                                |
| X                                                                                                                                                                                                                                                      | EP 3 136 109 A1 (HOFFMANN LA ROCHE [CH];<br>ROCHE DIAGNOSTICS GMBH [DE])<br>1 March 2017 (2017-03-01)                                                   | 1-3,<br>5-10,<br>12-15                                                                                                                                                                                                                                                                |                                                |
| Y                                                                                                                                                                                                                                                      | * paragraphs [0094], [0105], [0128],<br>[0134], [0148], [0177] - [0179] *<br>* figures 1, 2, 3, 4, 11, 12, 13 *                                         | 11                                                                                                                                                                                                                                                                                    |                                                |
| Y                                                                                                                                                                                                                                                      | EP 2 898 953 A1 (THERMO FISHER SCIENT<br>ASHEVILLE [US]) 29 July 2015 (2015-07-29)<br>* paragraph [0011] - paragraph [0013] *<br>* figures 1, 2, 3, 4 * | 11                                                                                                                                                                                                                                                                                    | TECHNICAL FIELDS<br>SEARCHED (IPC)<br><br>B01L |
| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                                                                         |                                                                                                                                                                                                                                                                                       |                                                |
| Place of search<br><b>The Hague</b>                                                                                                                                                                                                                    |                                                                                                                                                         | Date of completion of the search<br><b>8 September 2022</b>                                                                                                                                                                                                                           | Examiner<br><b>Bischoff, Laura</b>             |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                                                                                                         | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |                                                |

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 22 18 4543

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

08-09-2022

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|---------------------|----------------------------|---------------------|
| <b>US 2019336978 A1</b>                   | <b>07-11-2019</b>   | <b>CN 110449199 A</b>      | <b>15-11-2019</b>   |
|                                           |                     | <b>FR 3080784 A1</b>       | <b>08-11-2019</b>   |
|                                           |                     | <b>JP 2019197050 A</b>     | <b>14-11-2019</b>   |
|                                           |                     | <b>US 2019336978 A1</b>    | <b>07-11-2019</b>   |
| -----                                     |                     |                            |                     |
| <b>US 2005029914 A1</b>                   | <b>10-02-2005</b>   | <b>NONE</b>                |                     |
| -----                                     |                     |                            |                     |
| <b>EP 3136109 A1</b>                      | <b>01-03-2017</b>   | <b>NONE</b>                |                     |
| -----                                     |                     |                            |                     |
| <b>EP 2898953 A1</b>                      | <b>29-07-2015</b>   | <b>CN 204911558 U</b>      | <b>30-12-2015</b>   |
|                                           |                     | <b>EP 2898953 A1</b>       | <b>29-07-2015</b>   |
|                                           |                     | <b>US 2015209788 A1</b>    | <b>30-07-2015</b>   |
| -----                                     |                     |                            |                     |