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(54) **Medicine collection system and method for collecting medicines**

(57) The invention relates to a medicine collection system, comprising:
- a wall with at least one dispensing unit, the dispensing unit comprising a reservoir for accommodating solid medicines such as pills or tablets, the dispensing unit further comprising a dispensing opening, connected to the reservoir, the dispensing opening comprising dosing means for dosing a solid medicine from the reservoir to the dispensing opening;
- a collection area, at least partially surrounded by the wall, the collection area comprising at least one collection column, movable along the wall and the at least one dispensing opening, the collection column comprising at least one receiving opening, wherein the receiving opening is adjacent to the at least one dispensing opening in at least one position of the collection column; and
- a data processing unit, for controlling the movement of the collection column and the dosing means.

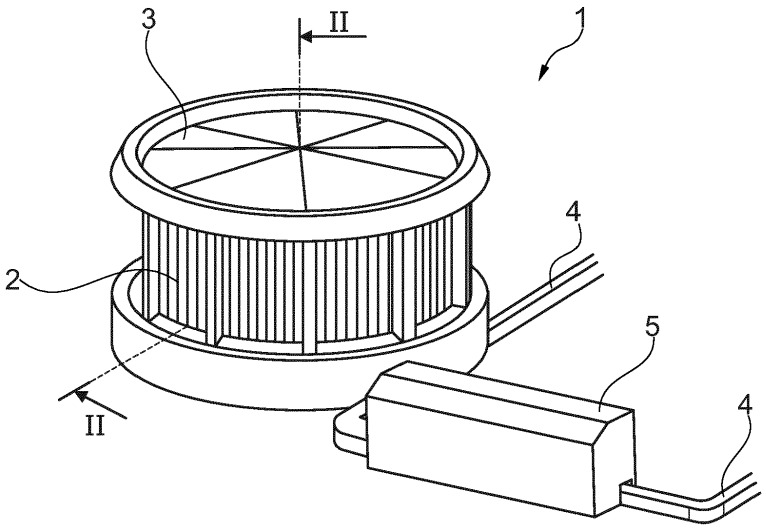

Fig. 1

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Description

[0001] The invention relates to a medicine collection system and a method for collecting medicines with such a medicine collection system.

[0002] Because of their health, many people require one or more types of medicine. As the number and/or types of medicines required increases, it is preferred to pre-pack such medicines, pills in particular, using medicine collection systems to collect the medicines, into medicine packaging system, to pack the collected pills into a package, and optionally to provide such a package with instructions on the use of the medicines inside the package.

[0003] Such medicine collection systems may comprise canisters, the canisters comprising a reservoir of solid medicines, and an opening into the drawer. These drawers are arranged in a frame. These medicine collection systems have a number of disadvantages.

[0004] Pills released from the canisters are released into the drawer and then collected at a central location. Because of such a construction, many pills may be transferred in the medicine collection system along the same path. This may increase the chance of damage to the medicines and clogging of the medicine collection system. In order to resolve the clogging of the system, the system has to be shut down temporarily, and may have to be dismantled which is burdensome and inefficient.

[0005] In addition, in such a medicine collection system, the replacement of an empty canister is burdensome as well since it requires the operator to take out the drawer, search for the canister to be replaced among the other canisters in the drawer and replace the canister, most often again requiring a temporary shutdown of the medicine collection system.

[0006] It is additionally known that, because of the length of the collection path, in many of the currently available medicine collection systems, the pills may finally be delivered into the wrong package, thereby causing further inefficiencies in the first place, and possibly serious health and maybe fatal consequences for the user of the package when taking a medicine by error.

[0007] Altogether, currently available medicine collection systems are error-prone, burdensome, slow and inefficient.

[0008] It is therefore the object of the invention to provide a medicine collection system and a method for collecting medicines using such a medicine collection system in which the above stated drawbacks are reduced or even obviated.

[0009] This object is achieved with a medicine collection system, comprising:

- a wall with at least one dispensing unit, the dispensing unit comprising a reservoir for accommodating solid medicines such as pills or tablets, the dispensing unit further comprising a dispensing opening, connected to the reservoir, the dispensing opening comprising dosing means for dosing a solid medicine from the reservoir to the dispensing opening;
- a collection area, at least partially surrounded by the wall, the collection area comprising at least one collection column, movable along the wall and the at least one dispensing opening, the collection column comprising at least one receiving opening, wherein the receiving opening is adjacent to the at least one dispensing opening in at least one position of the collection column; and
- a data processing unit, for controlling the movement of the collection column and the dosing means.

[0010] The medicine collection system comprises at least one dispensing unit with a reservoir from which solid medicines are dispensed into a dispensing opening by the dosing means. The dispensing opening opens out to a collection area, in which at least one collection column is movable along the wall, such that a receiving opening of the collection column may be placed adjacent to the dispensing opening of the dispensing unit.

[0011] The dosing means may for instance comprise a plate covering the dispensing opening in a closed position, but may also or alternatively have an appearance such as for instance disclosed in one of the preferred embodiments below.

[0012] The data processing unit is used to allocate at least one collection column to one order for one patient, and accordingly to synchronize the movement of a collection column along the wall with the movement of the dosing means such that a receiving opening of the allocated collection column is adjacent to the dispensing opening when dispensing the medicine in the order for the patient.

[0013] While the medicine collection system may have only one collection column, the efficiency of the system is further improved if more than one collection column is provided, because it allows simultaneous processing of multiple orders. It may also allow faster processing of one order, since the collection time of one order is decreased. When more collection columns are provided, this also provides the advantage that individual collection columns may be temporarily removed from the system for cleaning without requiring temporary shutdown of the complete system. Preferably, in such a case, the collection columns have different colors in order to ease scheduling alternating maintenance to the collection columns.

[0014] Preferably, the medicine collection system comprises more than one dispensing unit which may be stacked on top of each other. The height of dispensing units stacked on top of each other is preferably no larger than the height of an average person, such that an operator may be able to maintain all dispensing units without requiring additional tools such as ladders, thereby increasing the speed of maintenance. For the most common dispensing units, this means that the number of stacked dispensing units on top of each other is preferably no larger than five.

[0015] The increase of the number of dispensing units will also in general, provide a possibility to provide backup units of a dispensing unit in the medicine collection system with a type of pill to use when the main dispensing unit with the same type of pill is empty, although the system may also give timely warnings to an operator to maintain the dispensing unit when the amount of pills in a dispensing unit is low.

[0016] The medicine collection system according to the invention is most preferably connected to one or more other medicine collection systems, which may be a medicine collection system according to the invention. Preferably, the data processing units of the individual systems may be connected to each other in order to allow for coordination in the processing of an order. Even more preferably, the medicine collection system or the set of medicine collection systems is connected to a medicine packaging system, such as for instance the medicine packaging system disclosed in the application filed by the applicant on the same date as the current application. It has been shown that connection of at least one medicine collection system(s) according to the invention to such a medicine packaging system may allow for packaging rates down to 0.5 seconds per package. Most preferably, the arrangement of the medicine collection systems is such that an operator may easily walk around all parts of the arrangement for increasing the ease of maintenance.

[0017] In a preferred embodiment of the medicine collection system according to the invention, the reservoir comprises a reservoir opening connected to a first end of the dosing means, wherein the dispensing opening is connected to the other end of the dosing means, and wherein the dosing means comprises a rotor with at least one cavity for a medicine, wherein the rotor is at least rotatable between a position with the cavity aligned with the reservoir opening and a position with the cavity aligned with the dispensing opening.

[0018] In this embodiment, the dosing means, comprising a rotor, is arranged between the reservoir and the dispensing opening of the dispensing unit, such to control the process of dispensing by the rotor. The rotor may be controlled by the data processing unit of the medicine collection system such to ensure that a pill of an order is in the cavity aligned with the dispensing opening when the receiving opening of the collection column allocated to the order is adjacent to the dispensing opening. The dimensions of the cavity are suitable for transferring the medicine in the reservoir to the dispensing opening into the collection column.

[0019] Preferably, the rotor is provided more than one cavity rotatable between a position with the cavity aligned with the reservoir opening and a position with the cavity aligned with the dispensing opening. An increased amount of such cavities increases the speed of release, since the rotor may not require a full rotation for a pill to be dispensed into the collection column.

[0020] The cavity may comprise a channel which is aligned with the reservoir opening at all positions of the rotor, but which is only aligned with the dispensing opening in a reduced number of positions of the rotor.

[0021] In another preferred embodiment of the medicine collection system according to the invention, the dispensing units are arranged next to each other along the circumference of the collection area.

[0022] The at least partial arrangement of the dispensing units next to each other increases the amount of dispensing units arranged in the medicine collection system and therefore increases the types of pills distributed from the system.

[0023] In even another preferred embodiment of the medicine collection system according to the invention, the collection area is cylindrical and wherein the at least one collection column is arranged to a rotating axis axially arranged in the cylindrical collection area.

[0024] The arrangement of the wall of dispensing units around a cylindrical collection area with the at least one collection column travelling along the circumference of the cylindrical collection are along the wall of dispensing units, the at least one collection column arranged to a rotating axis axially arranged in the collection area allows for easy movement of the collection columns in the collection process, since the movement takes place by simply rotating the rotating axis. As a consequence, chains or rails along the circumference of the collection area are therefore only optional. The use of a rotating axis to drive the collection columns may also reduce the amount of maintenance required to the medicine collection system and may also reduce power consumption.

[0025] In again another preferred embodiment of the medicine collection system according to the invention, the collection column comprises closing means arranged on the bottom of the collection column.

[0026] By attaching closing means on the bottom of the collection column, the medicine distribution system is able to at least temporarily hold the medicines collected in a closed state. When the transfer of the medicines to a secondary system is required, such as a transport system to further process the order, the closing means are moved to an open state.

[0027] Preferably, the closing means is a diaphragm shutter.

[0028] A diaphragm shutter is a closing means which comprises a number of blades connected to each other, closing an opening in the bottom of the collection column in its closed state, and which may be set into its open state by rotation of the individual blades along individual blade axes, which blade axes are preferably perpendicular to the longitudinal direction of the collection column. Such a closing means may be easily and reliably switched between the closed and the open state and therefore prevents misalignments of the collecting column and the secondary system.

[0029] Most preferably, the closing means are controlled by the data processing unit.

[0030] The data processing unit preferably synchroniz-

es the movement of the secondary system and the collection column allocated to one order. The control of the closing means of the collection column by the data processing unit allows the allocated collection column and the allocated location in a secondary system in such a process to approach each other in a closed position of the collection column, and quick release of the contents of the collection column into the secondary system when the allocated position of the secondary system is adjacent to the bottom of the collection column. This reduces the chance of an erroneous dosage, such as dosage in a wrong position on the secondary system.

[0031] In a preferred embodiment of the medicine collection system according to the invention, the dispensing units are removably attached to the wall.

[0032] Removable attachment of the dispensing units to the wall allows for more thorough maintenance of the dispensing units and the system and also increases the ease of refilling of the dispensing units when they are empty.

[0033] In another preferred embodiment of the medicine collection system according to the invention, the dispensing units comprises a tag, and a sensor for reading the tag of the dispensing unit is arranged to the wall, the sensor being connected to the data processing unit.

[0034] Tags on a dispensing units, such as for instance RFID-tags, may be provided with information on the type and number of pills in the dispensing units. Such information may be read by a sensor in the medicine collection system and allows the data processing unit to determine the type and number of pills available at each position in the wall of dispensing units and therefore allows for easy processing of an order to the system. It also allows the data processing unit to issue a warning to an operator when a dispensing unit is almost or completely empty.

[0035] The tag may be overwritten by the operator with the type and number of pills in the reservoir of the dispensing unit, or the number of pills added during refilling. When the operator is instructed to completely fill the reservoir upon removal with the same type of pill as before removal from the wall, the number of pills may also be calculated with a reasonable safety margin and the tag may be automatically reset to the number calculated upon removal from the wall.

[0036] According to another preferred embodiment of the medicine collection system according to the invention, the medicine collection system further comprises a transporting means with at least one receptacle, moveable by the transporting means, wherein the top of the receptacle is adjacent to the bottom of the collection column in at least one position of the collection column and at least one position of the receptacle in the transporting means.

[0037] The secondary system preferably comprises a transporting means with at least one receptacle, wherein the at least one receptacle is alignable with the bottom of the collection column. This allows easy transfer of the contents of an allocated collection column to a receptacle on the transporting means processing the same order and allows the contents of the collection column to be joined with the contents of other collection columns, which may be in another medicine collection system, or may allow transfer to a packaging system.

[0038] The object of the invention is further achieved with a method for collecting medicines, comprising the steps of:

- moving the at least one collection column from a medicine distribution system according to the invention along the circumference of the collection area and,
- while moving, collecting medicines in the at least one collection column from the dispensing opening of the dispensing units adjacent to the collection column.

[0039] Movement of the at least one collection column of the medicine distribution system allows medicines in the wall to be collected in a central location before further processing, such as in a secondary system. The medicines are released from the dispensing unit when the dispensing opening of the dispensing unit is aligned to the receiving opening of the collecting column.

[0040] In a preferred embodiment of the method for collecting medicines, the method comprises the steps of:

- providing the data processing unit with at least one order comprising the number and type of pills requested for a patient;
- allocating a collection column to the order provided by the data processing unit;
- determining at least one dispensing unit provided with pills in the medicine collection system from information in a memory by the data processing unit; and
- moving the allocated collection column by the data processing unit along the determined at least one dispensing unit to align the receiving opening of the allocated collection column with the dispensing opening of the dispensing unit; and
- controlling the dosing means by the data processing unit to dose a medicine via the dispensing opening.

[0041] It is provide the data processing unit with at least one order comprising the number and type of pills required in the order and to use the data processing unit to coordinate the movement of the elements of the medicine collection system, such as the collection column or columns allocated to the order, the dosing means of a dispensing unit and maybe possible closing means or links to secondary systems, such to increase the efficiency of collection.

[0042] The data processing unit may for instance determine the shortest route along the dispensing units, based on the contents of the order, and may accordingly synchronize the process of collection with the secondary system, and may accordingly release the collected med-

icines when appropriate.

[0043] These and other elements of the invention will be further elucidated in the following figures.

Figure 1 shows a perspective overview of an embodiment of a medicine collection system according to the invention.

Figure 2 shows a cross sectional view of a detail of the embodiment of figure 1.

Figure 3 shows a further detail in cross sectional view of figure 2.

Figure 4 shows a perspective view of a detail of figure 3.

Figure 1 shows a perspective overview of an embodiment 1 of a medicine collection system according to the invention.

[0044] The medicine collection system 1 has a cylindrical wall 2, in which a carousel 3 rotates. A transport system 4 is provided to transport medicines, collected by the collection system 1 to for example a packaging station 5, in which the medicines are packaged in plastic bags and labeled.

[0045] Figure 2 shows a cross sectional view of a detail of the embodiment 1 of figure 1. On the outside of the wall 2 a number of dispensing units 6 are arranged underneath each other. Each dispensing unit has a drive mechanism 7 on which a canister or reservoir 8 is arranged. The drive mechanism 7 is coupled to the canister 8. By driving the canister 8, one item of the medicine is dispensed via a dispensing opening 9, which debouches through the wall 2.

[0046] On the inside of the wall 2 a carousel 3 is arranged with a central axis 10 and a number of arms 11 on which outer end collection columns 12 are arranged. Preferably the collection columns 12 are arranged side by side along the full periphery of the carousel 3.

[0047] Each collection column 12 has a number of receiving openings or funnels 13 corresponding to the dispensing openings 9 of a column of dispensing units 6. At the bottom of each collection column 12 a closure 14 is provided, via which collected medicines can be discharged into a receptacle, which is then transported via transport system 4.

[0048] Figure 3 shows a further detail in cross sectional view of figure 2.

[0049] The dispensing unit 6 has a reservoir 8 with a sloping bottom wall 15. In the bottom 15 a dosing rotor 16 is provided, which is driven by a motor 17 of the drive mechanism. By rotating the dosing rotor 16, pills 18 are separated and can be fed to the dispensing opening 9 one by one.

[0050] A counter can be provided to count the number of pills dispensed via the dispensing opening 9, to make sure, that the correct number of pills is dispensed.

[0051] A dispensed pill 18 will fall via the dispensing opening, through the wall 2, the funnel 13 into the collection column 12.

[0052] Typically, the carousel 3 will rotate at a constant speed and a controller will control the dispensing units 6 such that the correct medicines for a batch are dispensed in the correct collection column. This ensures that after a full revolution of a collection column in the carousel all required medicines for a specific order are collected in the collection column and the collected medicines can be discharged via the closure 14 into a receptacle in the transport system 4.

[0053] Figure 4 shows a perspective view of the closure 14. The closure 14 is a diaphragm shutter with a number of blades 19, which can be rotated radially out by operating a cam 20 of a shutter mechanism, such that an opening is created in the center. This has the advantage, that the collected medicines fall straight down and are not damaged by the closure 14.

Claims

1. Medicine collection system, comprising:

   - a wall with at least one dispensing unit, the dispensing unit comprising a reservoir for accommodating solid medicines such as pills or tablets, the dispensing unit further comprising a dispensing opening, connected to the reservoir, the dispensing opening comprising dosing means for dosing a solid medicine from the reservoir to the dispensing opening;
   - a collection area, at least partially surrounded by the wall, the collection area comprising at least one collection column, movable along the wall and the at least one dispensing opening, the collection column comprising at least one receiving opening, wherein the receiving opening is adjacent to the at least one dispensing opening in at least one position of the collection column; and
   - a data processing unit, for controlling the movement of the collection column and the dosing means.

2. Medicine collection system according to claim 1, wherein the reservoir comprises a reservoir opening connected to a first end of the dosing means, wherein the dispensing opening is connected to the other end of the dosing means, and wherein the dosing means comprises a rotor with at least one cavity for a medicine, wherein the rotor is at least rotatable between a position with the cavity aligned with the reservoir opening and a position with the cavity aligned with the dispensing opening.

3. Medicine collection system according to claim 1 or 2, wherein the dispensing units are arranged next to each other along the circumference of the collection area.

4. Medicine collection system according to any of the preceding claims, wherein the collection area is cylindrical and wherein the at least one collection column is arranged to a rotating axis axially arranged in the cylindrical collection area.

5. Medicine collection system according to any of the preceding claims, wherein the collection column comprises closing means arranged on the bottom of the collection column.

6. Medicine collection system according to claim 5, wherein the closing means is a diaphragm shutter.

7. Medicine collection system according to any of the claims 5 or 6, wherein the closing means are controlled by the data processing unit.

8. Medicine collection system according to any of the preceding claims, wherein the dispensing units are removably attached to the wall.

9. Medicine collection system according to any of the preceding claims, wherein the dispensing units comprises a tag, and wherein a sensor for reading the tag of the dispensing unit is arranged to the wall, the sensor being connected to the data processing unit.

10. Medicine collecting system according to any of the preceding claims, further comprising a transporting means with at least one receptacle, moveable by the transporting means, wherein the top of the receptacle is adjacent to the bottom of the collection column in at least one position of the collection column and at least one position of the receptacle in the transporting means.

11. Method for collecting medicines, comprising the steps of:

- moving the at least one collection column from a medicine distribution system according to any of the preceding claims along the circumference of the collection area and,
- while moving, collecting medicines in the at least one collection column from the dispensing opening of the dispensing units adjacent to the collection column.

12. Method for collecting medicines according to claim 11, comprising the steps of:

- providing the data processing unit with at least one order comprising the number and type of pills requested for a patient;
- allocating a collection column to the order provided by the data processing unit;
- determining at least one dispensing unit provided with pills in the medicine collection system from information in a memory by the data processing unit; and
- moving the allocated collection column by the data processing unit along the determined at least one dispensing unit to align the receiving opening of the allocated collection column with the dispensing opening of the dispensing unit; and
- controlling the dosing means by the data processing unit to dose a medicine via the dispensing opening.

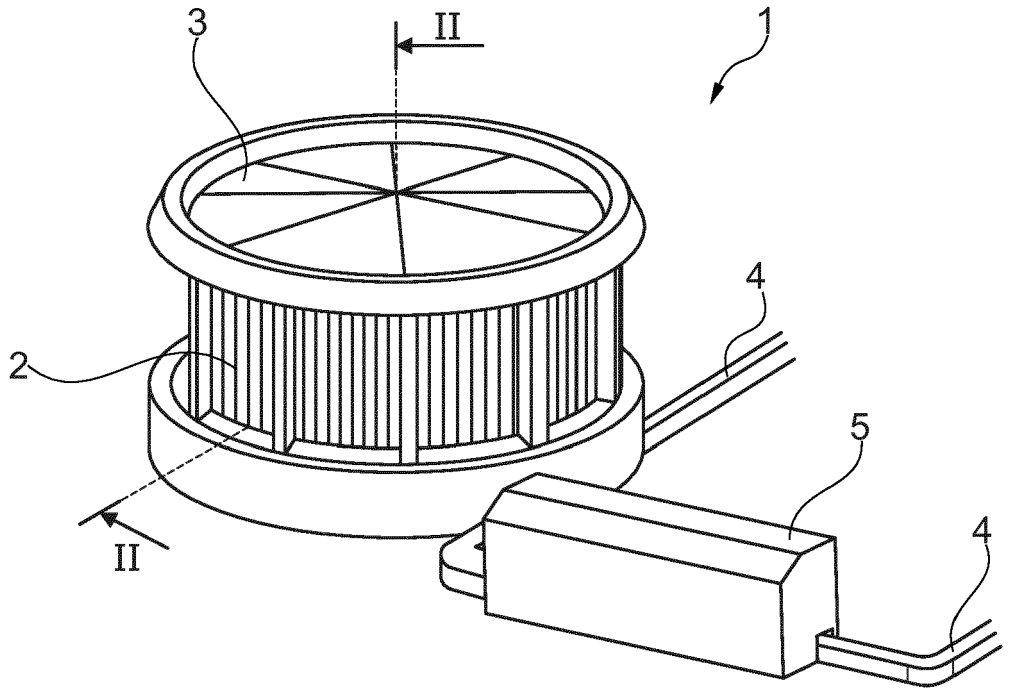

Fig. 1

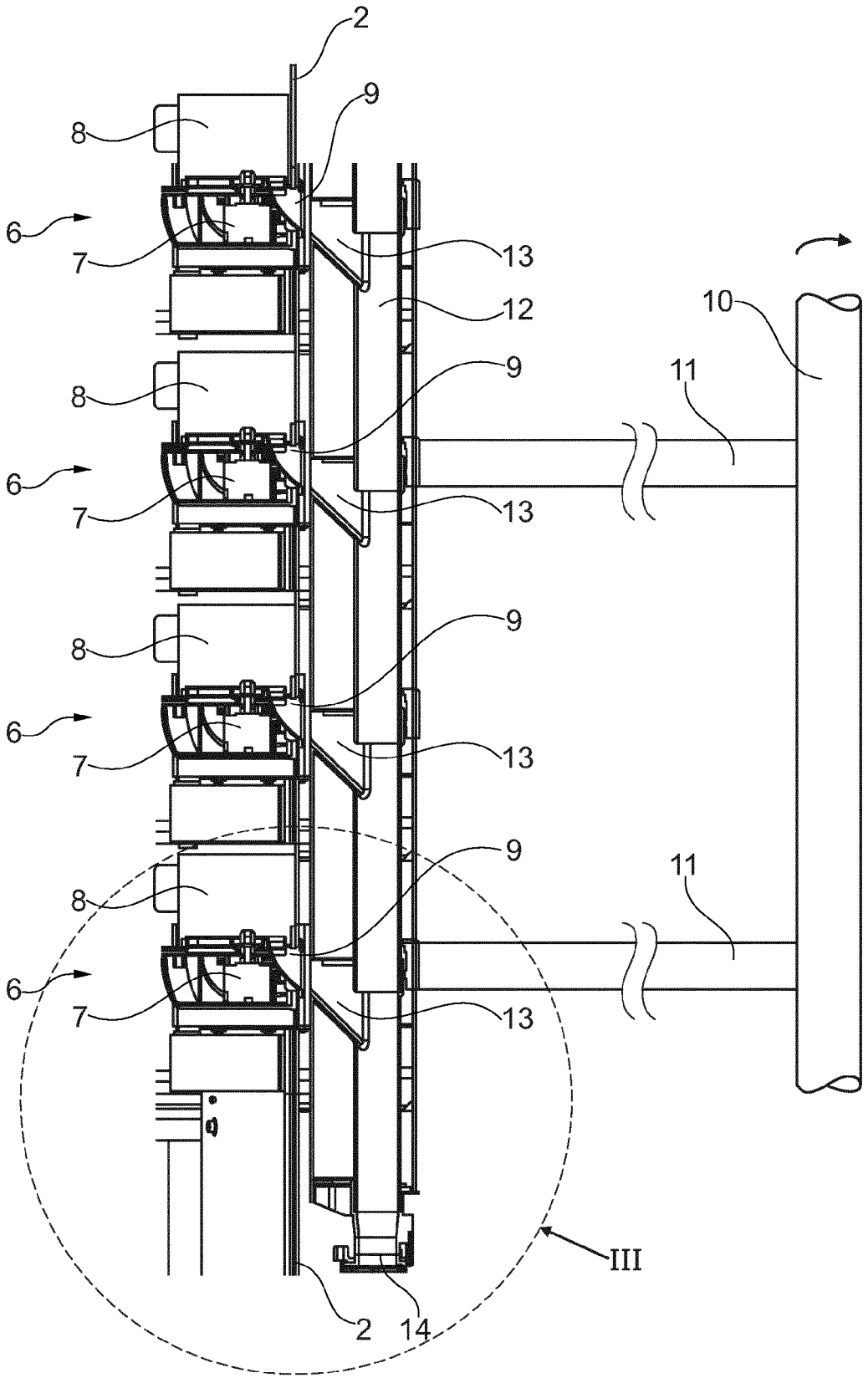

Fig. 2

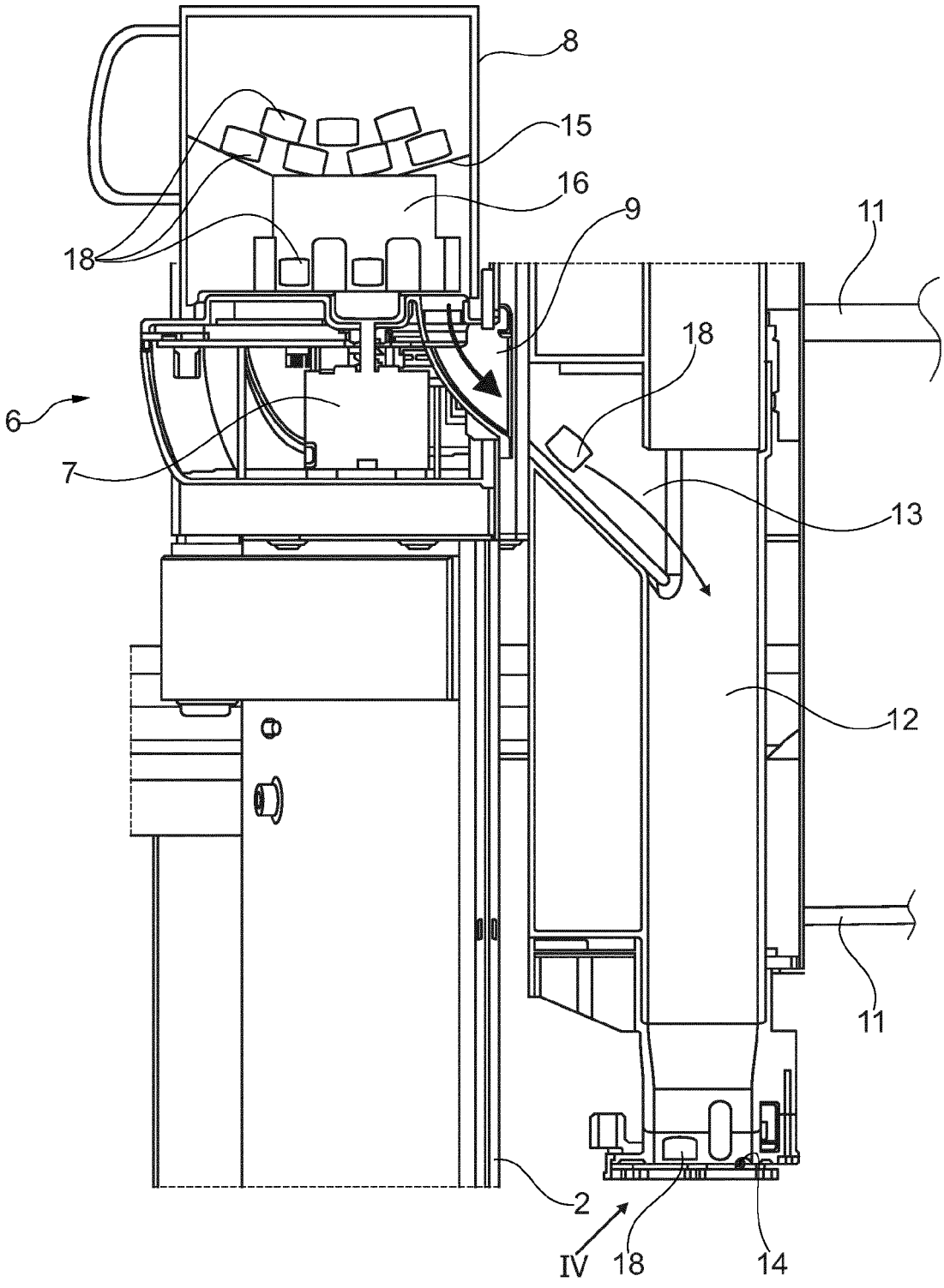

Fig. 3

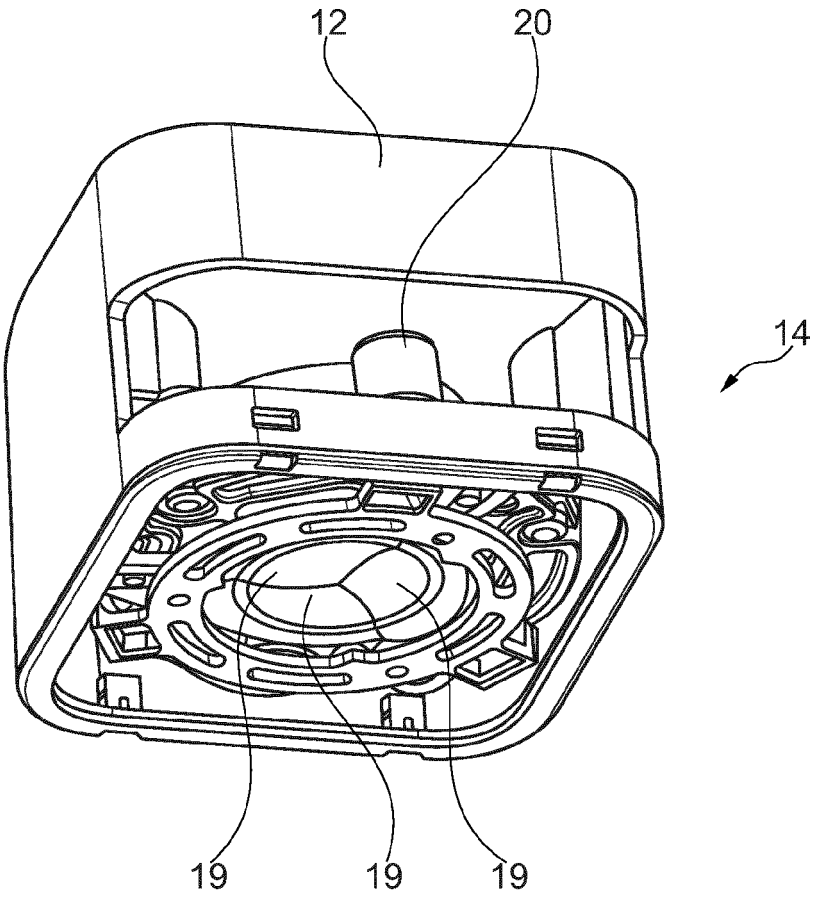

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 14 18 9086

DOCUMENTS CONSIDERED TO BE RELEVANT

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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	20 March 2015	Guenov, Mihail

CATEGORY OF CITED DOCUMENTS

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