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- (54) Title: MILKING ARRANGEMENT AND METHOD FOR GUIDING ANIMALS THROUGH A MILKING ARRANGEMENT

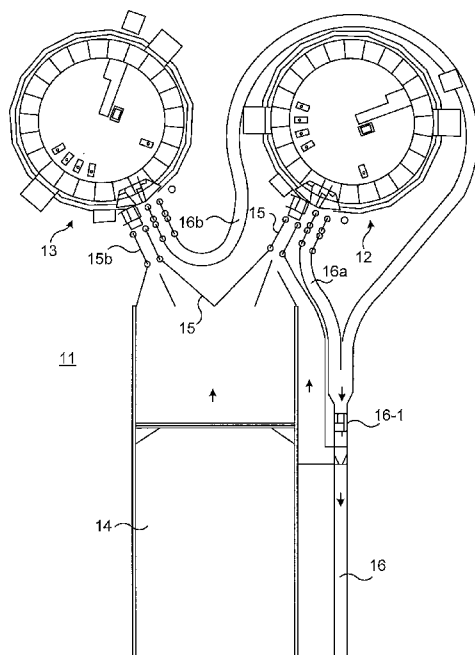


Fig. 1

- (57) Abstract: A milking arrangement (11) comprises at least a first (12) and a second (13) milking system for milking animals, each having an exit lane through which an animal can leave the respective milking system. The exit lanes comprises a smart gate arrangement (16-1) configured to guide all incompletely milked animals exiting from the first and second milking systems to a dedicated one of the first and second milking systems to be milked again therein.



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MILKING ARRANGEMENT AND METHOD FOR GUIDING ANIMALS THROUGH A MILKING ARRANGEMENT

TECHNICAL FIELD

The technical field is directed to dairy farming.

5 RELATED ART

A problem with advanced arrangements for guiding animals, such as cows, in dairy farms such as e.g. pasture or grassland based farms is that there may be many animal crossings, which may cause jams. A similar problem arises in dairy farms with larger herds and milking systems comprising e.g. a plurality of rotating platforms, on which
10 the animals stand while being milked.

Animals may block intersections and they may not always like to move in such conventional traffic patterns. They may become stressed and noisy, which leads to inefficient movement of animals, reduced milk production, and deteriorated animal wellbeing.

15 Another problem with advanced arrangements for guiding animals in larger dairy farms is the trade off between the milking efficiency and the milking accuracy. To have high milking efficiency, cheap and fast milking systems should be provided. While such milking systems provide suitable milking means for the majority of the animals, they may be less suitable for some animals due to e.g. problems with
20 attachment of teat cups, high degree of teat cup kick-offs, etc.

SUMMARY

It is an aim of this document to reveal novel milking arrangements and methods for guiding animals through a milking arrangement, which alleviate or at least mitigate problems of prior art.

25 A first aspect refers to a milking arrangement comprising at least a first and a second milking system for milking animals, each having an exit lane through which an animal can leave the respective milking system. The exit lanes comprises a smart gate arrangement configured to guide all incompletely milked animals exiting from the

first and second milking systems to a dedicated one of the first and second milking systems to be milked again therein.

This is an advantageous solution, wherein the first milking system, which is the dedicated milking system, may be a high accuracy milking system such as e.g. one automatic milking system comprising one or more stationary milking boxes, in each of which one animal is automatically milked at a time, whereas the second milking system may be a high efficiency milking system, such as e.g. an automatic or semi-automatic rotary milking system, which has high throughput, but which may be less suitable for a smaller share of the animals served.

Therefore, all animals which are incompletely milked in the second milking system e.g. due to a failure of attaching teat cups to the teats of the animals or due to teat cups being unintentionally removed from the teats of the milking animals during milking, e.g. due to teat cup kick-offs, are guided to the first milking system, the dedicated milking system, to be milked again therein.

Hereby, all incompletely milked animals are led to the first milking system to be milked again therein. To this end, the first milking system ought to be appropriately designed for this task, e.g. by using a fail-safe and accurate milking technique or by using a milking system with staff to follow and assist in the milking of the incompletely milked animals, while the second milking system ought to be appropriately designed for maximum throughput.

The exit lanes may end into a common exit lane and the smart gate arrangement may be arranged in the common exit lane, whereby only one smart gate can be used for guiding back incompletely milked animals from both milking systems.

The smart gate may comprise an entrance through which animals can enter the smart gate, an animal identifier for identifying each animal having entered or is to enter the smart gate, and at least two separate exits, through which each animal, which has entered the smart gate, can be selectively guided to exit the smart gate after having been identified, to thereby be guided to exit the milking arrangement or be guided to the dedicated milking system to be milked again therein.

In one embodiment, at least the first milking system is an automatic milking system comprising one or more stationary milking boxes, in each of which one animal is

automatically milked at a time. The second milking system may be a similar automatic milking system with e.g. less staff or with a faster teat attachment algorithm.

5 In one embodiment, at least the second milking system is an automatic or semi-automatic rotary milking system. The first milking system may be a similar rotary milking system but with more staff to take care and follow and/or assist the milking of the incompletely milked animals. Alternatively, the first milking system may be an automatic milking system comprising one or more stationary milking boxes, in each of which one animal is automatically milked at a time. Such milking system has been
10 used for long time and is known to be precise and accurate for milking of also most of these incompletely milked animals.

In one embodiment, the milking arrangement comprises a common entrance lane configured to allow a plurality of animals to enter the milking arrangement and a guiding structure configured to guide each of the plurality of animals to the first or
15 second milking system to be milked therein. At least one of the exit lane of the second milking system and a lane of the guiding structure leading to the entry of the second milking system surrounds, or at least partly surrounds, the first milking system.

This is an advantageous design solution to avoid animal crossings and solutions based on two story structures (e.g. based on bridges or lanes led above other lanes, which are less suitable) while the animals can enter and leave the milking
20 arrangement in common lanes.

In one embodiment, the entries to the first and second milking systems are located adjacent one another, whereas the exit lane of the second milking system surrounds, or at least partly surrounds, the first milking system, such that it can end, together
25 with the exit lane of the first milking system, into the common exit lane without the use of crossings.

In another embodiment, the exit lanes of the first and second milking systems are located adjacent one another, whereas a lane of the guiding structure leading to the entry of the second milking system surrounds, or at least partly surrounds, the first
30 milking system.

A second aspect refers to a method for guiding animals through a milking arrangement comprising at least a first and a second milking system for milking animals, each having an exit lane through which an animal can leave the respective milking system. According to the method, all incompletely milked animals exiting
5 from the first and second milking systems are guided to a dedicated one of the first and second milking systems to be milked again therein.

The embodiments and details described above with respect to the first aspect can, after modifications, be adapted to the second aspect.

By the above aspects and embodiments, an improved animal traffic through a milking
10 arrangement can be obtained, which is more efficient, while the milk production and wellbeing of the animals can be increased.

Animals, which are not appropriately milked, are always returned to the first milking system for a further milking attempt. This means that since no return path to the second milking system is required, a proper and efficient design is facilitated whereby
15 animal crossings can entirely be avoided.

Further, each milking system can be optimized with respect to its tasks. The first milking system should be a high accuracy milking system or a milking system with staff that , while the second milking system should be optimized for maximum milk production, let it be that some animals will not be completely milked. These will be
20 taken care of by the first milking system in a second milking attempt.

Yet further, the design allows for a return path for incompletely milked animals to be arranged further away from the milking systems, thereby optimizing animal traffic and avoiding disturbances between animals that enter the milking arrangement to be milked and animals returned for another milking.

Further characteristics and advantages will be evident from the detailed description of embodiments given hereinafter, and the accompanying Figs. 1-7, which are given by way of illustration only.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1-7 illustrate each, schematically, in top view, a milking arrangement according to a respective embodiment.

DETAILED DESCRIPTION OF EMBODIMENTS

Fig. 1 illustrates, schematically, in top view, a milking arrangement 11 according to an embodiment. The milking arrangement 11 comprises a first 12 and a second 13 rotary based milking system for milking animals, a common entrance lane 14 configured to allow a plurality of animals to enter the milking arrangement, a guiding structure 15 configured to guide each of the plurality of animals to either one of the first and second milking systems to be milked therein, and a common exit lane 16 configured to allow the plurality of animals to leave the milking arrangement after having been milked.

In order to avoid animal crossings, a particular design is desirable. In the embodiment of Fig. 1, the guiding structure 15 comprises walls forming funnel shaped portions leading to entrance lanes 15a, 15b, through which the first 12 and second 13 milking systems can be entered. The first milking system 12 comprises an exit lane 16a, which ends into the nearby located common exit lane 16. The second milking system 13 comprises an exit lane 16b, which also ends into the common exit lane 16. To achieve this, the exit lane 16b of the second milking system 13 may surround the first milking system 12, that is, animals leaving the second milking system 13 are guided around the first milking system 12, in the exit lane 16b, before they can enter the common exit lane 16.

Each of the lanes 14, 16, 15a-b, and 16a-b may be delimited by sidewalls or fences.

The common exit lane 16 may comprise a smart gate arrangement 16-1 including an entrance through which animals can enter the smart gate arrangement, an animal identifier for identifying each animal having entered or is to enter the smart gate arrangement 16-1, and at least two separate exits, through which each animal, which has entered the smart gate arrangement 16-1, can be selectively guided to exit the smart gate arrangement 16-1 after having been identified, to thereby be guided to exit the milking arrangement 11 through the common exit lane 16 or be guided to the first milking system 12 to be milked again therein.

The latter possibility may be used if an animal is not appropriately milked in either of the milking systems 12, 13. In such instance, the animal is always led to the first milking system 12 for another milking attempt instead of leading it to exit the milking arrangement 11.

- 5 This is an advantageous solution, wherein the first milking system 12 may be a high accuracy milking system such as e.g. a rotary milking system with high number of staff that can assist in appropriate milking of incompletely milked animals, whereas the second milking system 13 may be a high efficiency milking system, such as e.g. an automatic or less staffed rotary milking system, which has high milk production, but
10 which may be less suitable for a smaller share of the animals served.

Therefore, all animals which are incompletely milked in the second milking system 13 due to a failure of attaching teat cups to the teats of the animals or due to teat cups being unintentionally removed from the teats of the milking animals during milking, e.g. due to teat cup kick-offs, are guided to the first milking system 12 to be milked
15 again therein. Hereby, all incompletely milked animals are led to the first milking system 12 to be milked again therein.

It shall be appreciated that while the milking arrangement 11 according to the embodiment of Fig. 1 comprises a first 12 and a second 13 rotary based milking system, the milking arrangement 11 may instead comprise first 12 and second 13
20 milking systems of any kind. In one particular embodiment, the first milking system 12 may be one automatic milking system comprising one or more stationary milking boxes, in each of which one animal is automatically milked at a time, whereas the second milking system 13 may be, or comprise, a high efficiency milking system, such as e.g. an automatic or semi-automatic rotary milking system, which has high
25 throughput, but which may be less suitable for milking a smaller share of the animals served.

Fig. 2 illustrates, schematically, in top view, a milking arrangement 11 according to an embodiment, which differs from the embodiment of Fig. 1 only with respect to the following.

- 30 The exit lanes 16a, 16b of the milking systems 12, 13 are here arranged adjacent one another and can be arranged to end into the common exit lane 16 without any

detours. However, in the embodiment of Fig. 2, the guiding structure 15 comprises an entrance lane 15b leading to the entry of the second milking system 13, which entrance lane 15b surrounds the second milking system 13. That is, animals guided to the the second milking system 13 are led around the first milking system 12, in the entrance lane 15b, before they can enter the second milking system 13.

It shall be appreciated that while Figs. 1 and 2 illustrate two extremes (with a long exit lane 16b and a long entrance lane 15b, respectively), there exist intermediate solutions wherein the exit lane 16b of the second milking system 13 and the entrance lane 15b of the guiding structure 15 leading to the entry of the second milking system 13 together surrounds the first milking system 12, at least partly.

Fig. 3 illustrates, schematically, in top view, a milking arrangement 11 according to an embodiment, which differs from the embodiment of Fig. 1 only with respect to the following.

As an alternative, or a complement, to the smart gate arrangement 16-1, which may guide an animal to the first milking system 12, the smart gate arrangement 16-1 may selectively guide an animal in the common exit lane 16 (i) to exit the milking arrangement 11 through the common exit lane 16 or (ii) to a robot based automatic milking system 16-3, which is capable of milking the animal entering the robot based automatic milking system 16-3 in an entirely automatic manner.

Fig. 4 illustrates, schematically, in top view, a milking arrangement 11 according to an embodiment, which, in addition to the embodiment of Fig. 1, comprises a third milking system 31 including an exit lane 16c, which ends into the common exit lane 16.

The guiding structure 15 is here configured to guide each of the plurality of animals to either one of the first, second, and third milking systems 12, 13, 31 to be milked therein, and the exit lane 16c of the third milking system 31 and/or a lane 15c of the guiding structure 15 leading to the entry of the third milking system 31 at least partly surrounds the second milking system 13.

Fig. 5 illustrates, schematically, in top view, a milking arrangement 11 according to an embodiment, which, in addition to the embodiment of Fig. 4, comprises a fourth

and a fifth 42 milking system, each including a respective exit lane 16d, 16e, which ends into the common exit lane 16.

The guiding structure 15 is here configured to guide each of the plurality of animals to either one of the first, second, third, fourth, and fifth milking systems 12, 13, 31, 41, 42 to be milked therein.

The exit lane 16d of the fourth milking system 41 and/or a lane 15d of the guiding structure 15 leading to the entry of the fourth milking system 41 at least partly surrounds the third milking system 31, and the exit lane 16e of the fifth milking system 42 or a lane 15e of the guiding structure 15 leading to the entry of the fifth milking system 42 at least partly surrounds the fourth milking system 41.

It shall be appreciated that the smart gate arrangement 16-1 may be heavily loaded as animals from five milking systems have to pass through it. Therefore, in order to lessen the burden of the smart gate arrangement 16-1, a modified design may be used.

Fig. 6 illustrates, schematically, in top view, a milking arrangement 11 according to such a modified design. The exit lanes 16c, 16d, 16e of the third to fifth milking systems 31, 41, 42 may lead to a first smart gate arrangement 51 of the kind disclosed above. Animals, which are to be led out of the milking arrangement 11, are guided through an exit lane 16f, which ends into the common exit lane 16. Animals, which are to be milked again, are guided through a lane 16g, into which the exit lanes 16a, 16b of the first and second milking systems end. At the end of the lane 16g there is a second smart gate arrangement 52 of the kind disclosed above. Animals, which are to be led out of the milking arrangement 11, are guided into the common exit lane 16, whereas animals, which are to be milked again, are guided to the first milking system 12 via a lane 53.

Fig. 7 illustrates, schematically, in top view, a milking arrangement 11 according to an embodiment, which differs from the embodiment of Fig. 1 with respect to the following.

The first milking system 12 is not a rotary milking system, but a robot based automatic milking system comprising between one and four stationary milking boxes 12a-d, which are each capable of milking one animal therein at a time in an entirely automatic manner.

The guiding structure 15 comprises a smart gate arrangement 61 and a buffer area 62 comprising a first 62a and a second 62 buffer pen separated by a movable partition wall 63.

5 By the smart gate arrangement 61 animals can be selectively guided to the first buffer pen 62a, to the second buffer pen 62b, or to the common exit lane 16.

Animals in the first buffer pen 62a can enter the first milking system 12, which comprises three stationary milking boxes 12a-c, through respective lanes 15a.

10 Animals in the second buffer pen 62b can enter the second milking system 13, which comprises one stationary milking box 12d and a rotary milking system 13a, through respective entrance lanes 15b.

It shall be appreciated that the partition wall 63 is movable such that the number of stationary milking boxes belonging first milking system 12 can be altered. Moving the partition wall counter clock wise, prevents access from the first buffer pen 62a to the stationary milking boxes 12c, 12b, and 12a in that order. As soon as access to a
15 stationary milking box 12c, 12b, and 12a is lost from the first buffer pen 62a, the same access is gained from the second buffer pen 62b. By such functionality, the sizes, and thereby capacities, of the first 12 and second 13 milking systems can be altered.

Animals milked in the first milking system 12 leave the first milking system 12 via the exit lane 16a, which ends into the common exit lane 16. Animals milked in the second
20 milking system 13 leave the second milking system 13 via the exit lane 16b, which ends into the exit lane of the first milking system. The exit lanes 16a, 16b surround, at least partly, the first milking system in a similar manner as disclosed in previous embodiments. This means than animals leaving the second milking system has to be guided around the first milking system 12 to reach the common exit lane 16.

25 While embodiments have been disclosed in detail above, the scope of protection is given by the appended claims.

CLAIMS

1. A milking arrangement (11) comprising

- at least a first (12) and a second (13) milking system for milking animals, each having an exit lane (16a-b) through which an animal can leave the respective milking system, **characterized in** that

- the exit lanes comprises a smart gate arrangement (16-1) configured to guide all incompletely milked animals exiting from the first and second milking systems to a dedicated one of the first and second milking systems to be milked again therein.

2. The milking arrangement of claim 1 wherein incompletely milked animals are animals, which have not been milked sufficiently due to a failure of attaching teat cups to the teats of the animals or due to teat cups being unintentionally removed from the teats of the milking animals during milking, e.g. due to teat cup kick-offs.

3. The milking arrangement of claim 1 or 2 wherein the exit lanes end into a common exit lane and the smart gate arrangement is arranged in the common exit lane.

4. The milking arrangement of claim 3 wherein the smart gate arrangement comprises an entrance through which animals can enter the smart gate arrangement, an animal identifier for identifying each animal having entered or is to enter the smart gate arrangement, and at least two separate exits, through which each animal, which has entered the smart gate arrangement, can be selectively guided to exit the smart gate arrangement after having been identified, to thereby be guided to exit the milking arrangement or be guided to said dedicated one of the first and second milking systems to be milked again therein.

5. The milking arrangement of claim 3 or 4, further comprising:

- a common entrance lane (14) configured to allow a plurality of animals to enter the milking arrangement; and

- a guiding structure (15) configured to guide each of the plurality of animals to either one of the first and second milking systems to be milked therein, wherein

- at least one of the exit lane (16b) of the second milking system and a lane (15b) of the guiding structure leading to the entry of the second milking system surrounds, or at least partly surrounds, the first milking system.

5 6. The milking arrangement of any of claims 1-5 wherein at least one of the first and second milking systems is a rotary milking system.

7. The milking arrangement of claim 6 wherein each of the first and second milking systems is a rotary milking system.

10 8. The milking arrangement of any of claims 1-6 wherein at least one of the first and second milking systems is an automatic milking system comprising one or more stationary milking boxes, in each of which one animal is automatically milked at a time.

9. The milking arrangement of claim 8 wherein first milking system is an automatic milking system comprising one or more stationary milking boxes, in each of which one animal is automatically milked at a time.

15 10. The milking arrangement of any of claims 1-9 wherein said dedicated one of the first and second milking systems is the first milking system.

20 11. A method for guiding animals through a milking arrangement (11) comprising at least a first (12) and a second (13) milking system for milking animals, each having an exit lane through which an animal can leave the respective milking system, **characterized by** the step of:

- guiding all incompletely milked animals exiting from the first and second milking systems to a dedicated one of the first and second milking systems to be milked again therein.

25 12. The method of claim 11 wherein incompletely milked animals are animals, which have not been milked sufficiently due to a failure of attaching teat cups to the teats of the animals or due to teat cups being unintentionally removed from the teats of the milking animals during milking, e.g. due to teat cup kick-offs.

13. The method of claim 11 or 12 wherein animals leaving the first and second milking system through the exit lanes are brought together into a common exit lane and the

guiding of all incompletely milked animals to said dedicated one of the first and second milking systems to be milked again therein is made from the common exit lane.

14. The method of claim 13 wherein the guiding of all incompletely milked animals to said dedicated one of the first and second milking systems to be milked again therein is made by a smart gate arrangement comprising an entrance through which animals can enter the smart gate arrangement, an animal identifier for identifying each animal having entered or is to enter the smart gate arrangement, and at least two separate exits, through which each animal, which has entered the smart gate arrangement, can be selectively guided to exit the smart gate arrangement after having been identified, to thereby be guided to exit the milking arrangement or be guided to said dedicated one of the first and second milking systems to be milked again therein.

15. The method of claim 13 or 14 wherein

- animals are allowed to enter the milking arrangement via a common entrance lane (14); and

- each of the animals is guided to the first or the second milking system to be milked therein, wherein

- each of the animals guided to the milking system other than said dedicated milking system is guided in the exit lane (16b) of that milking system and/or a lane (15b) leading to the entry of that milking system around, or at least partly around, said dedicated milking system.

16. The method of any of claims 11-15 wherein at least one of the first and second milking systems is a rotary milking system.

17. The method of claim 16 wherein each of the first and second milking systems is a rotary milking system.

18. The method of any of claims 1-16 wherein at least one of the first and second milking systems is an automatic milking system comprising one or more stationary milking boxes, in each of which one animal is automatically milked at a time.

19. The method of claim 18 wherein first milking system is an automatic milking system comprising one or more stationary milking boxes, in each of which one animal is automatically milked at a time.

20. The method any of claims 11-19 wherein said dedicated one of the first and second
5 milking systems is the first milking system.

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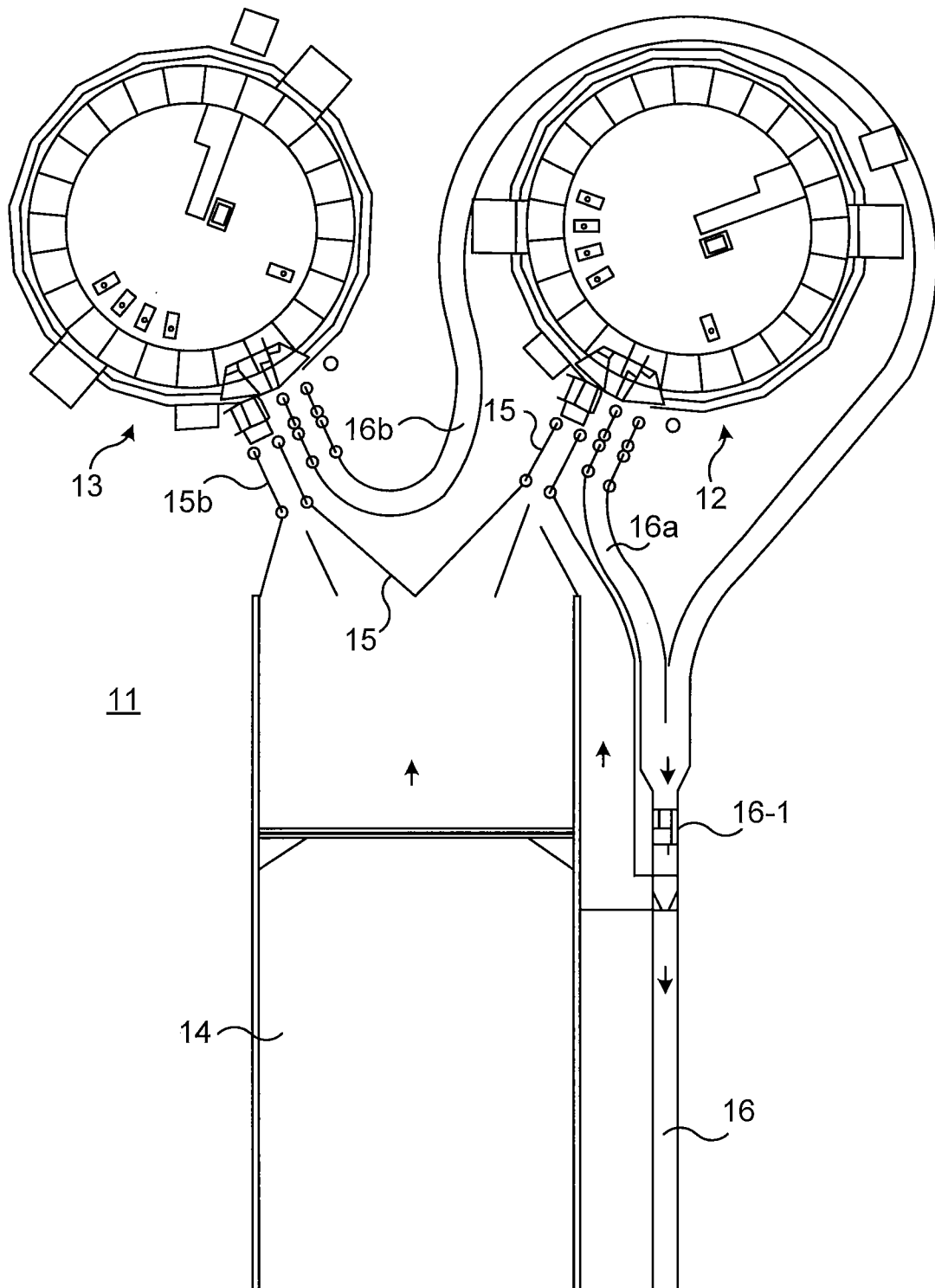


Fig. 1

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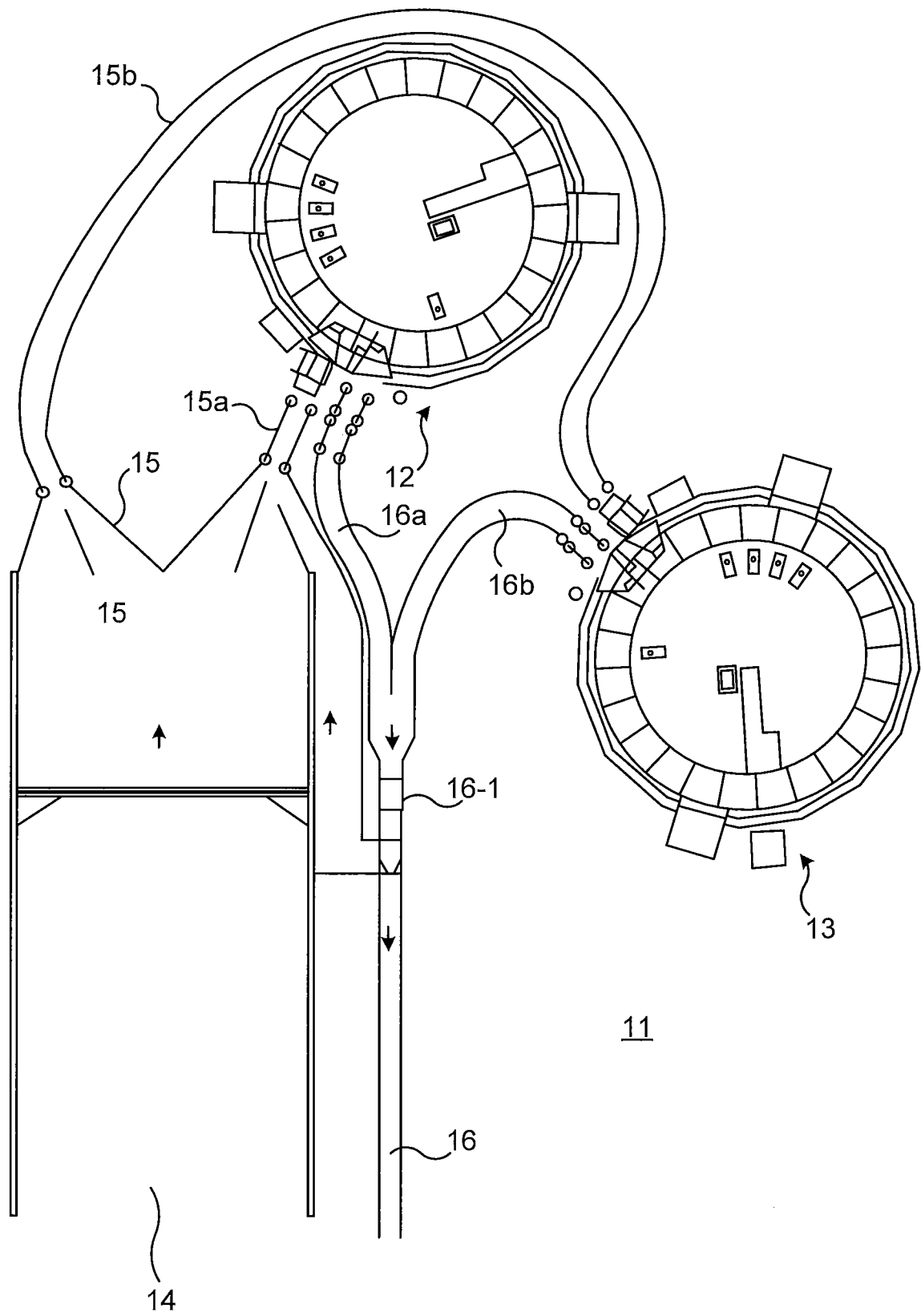


Fig. 2

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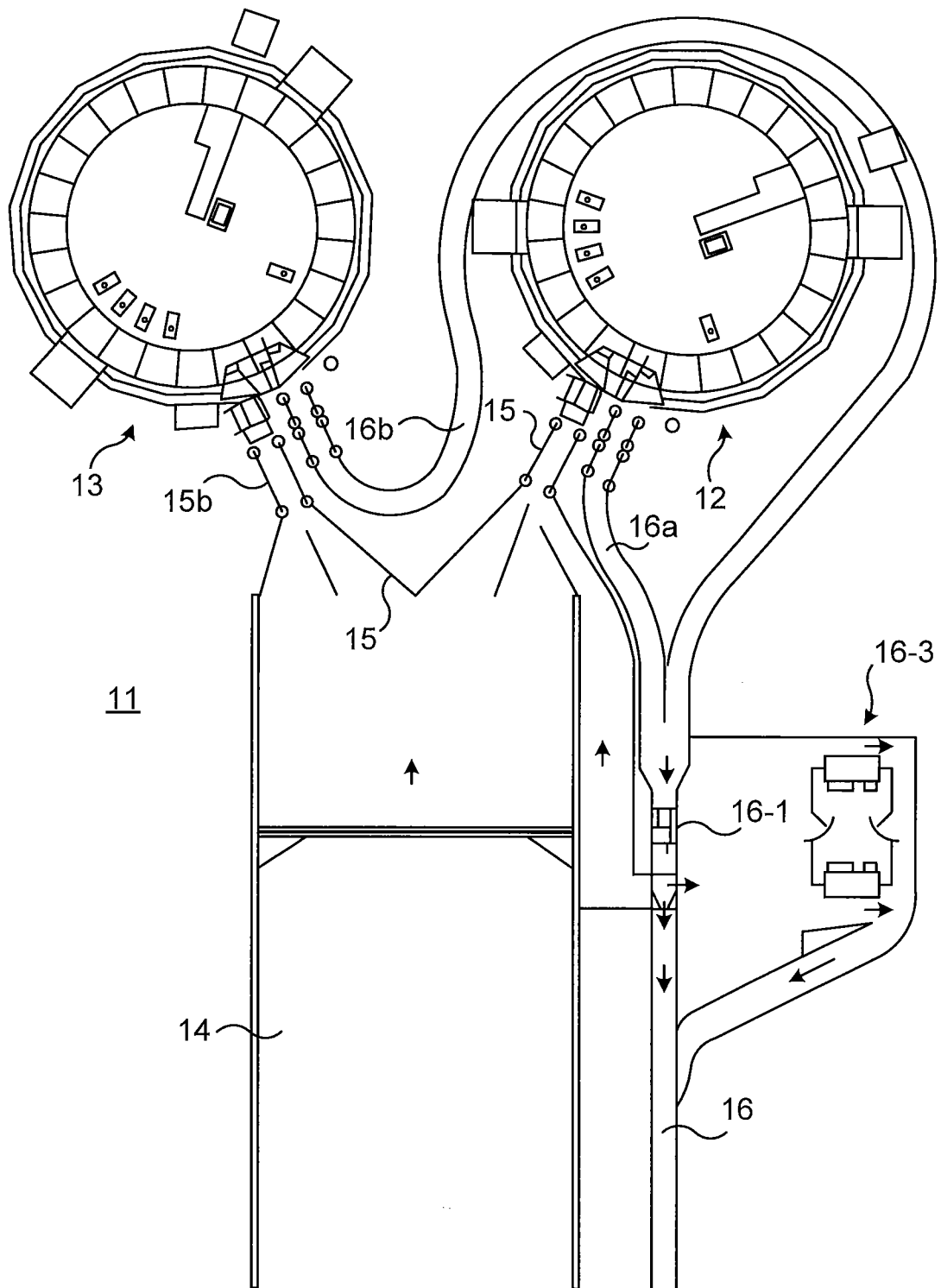
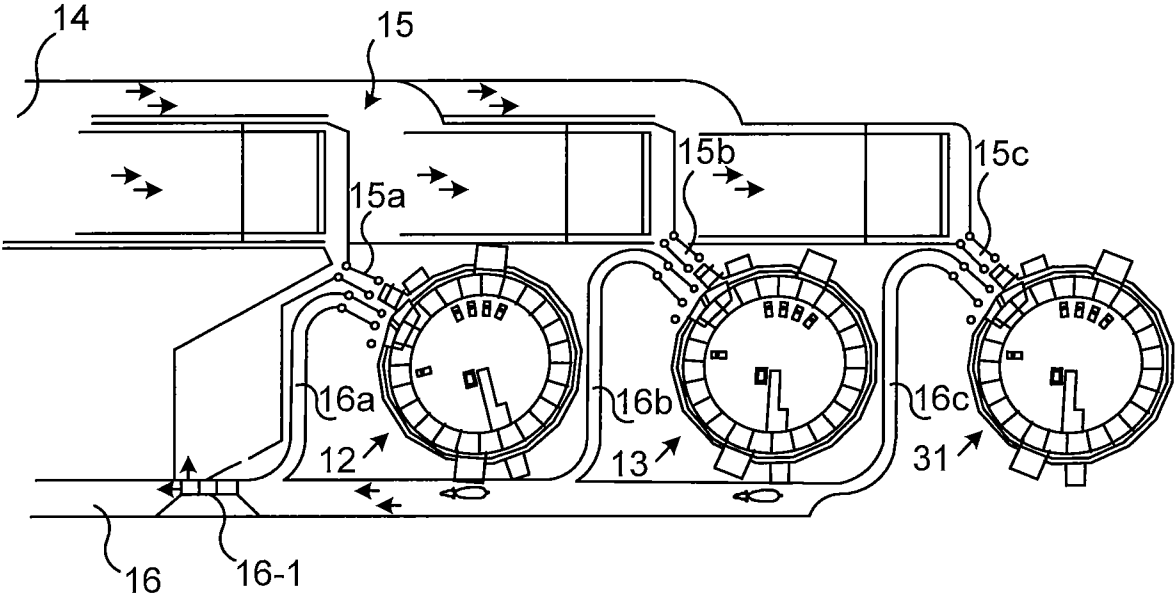


Fig. 3



11

Fig. 4

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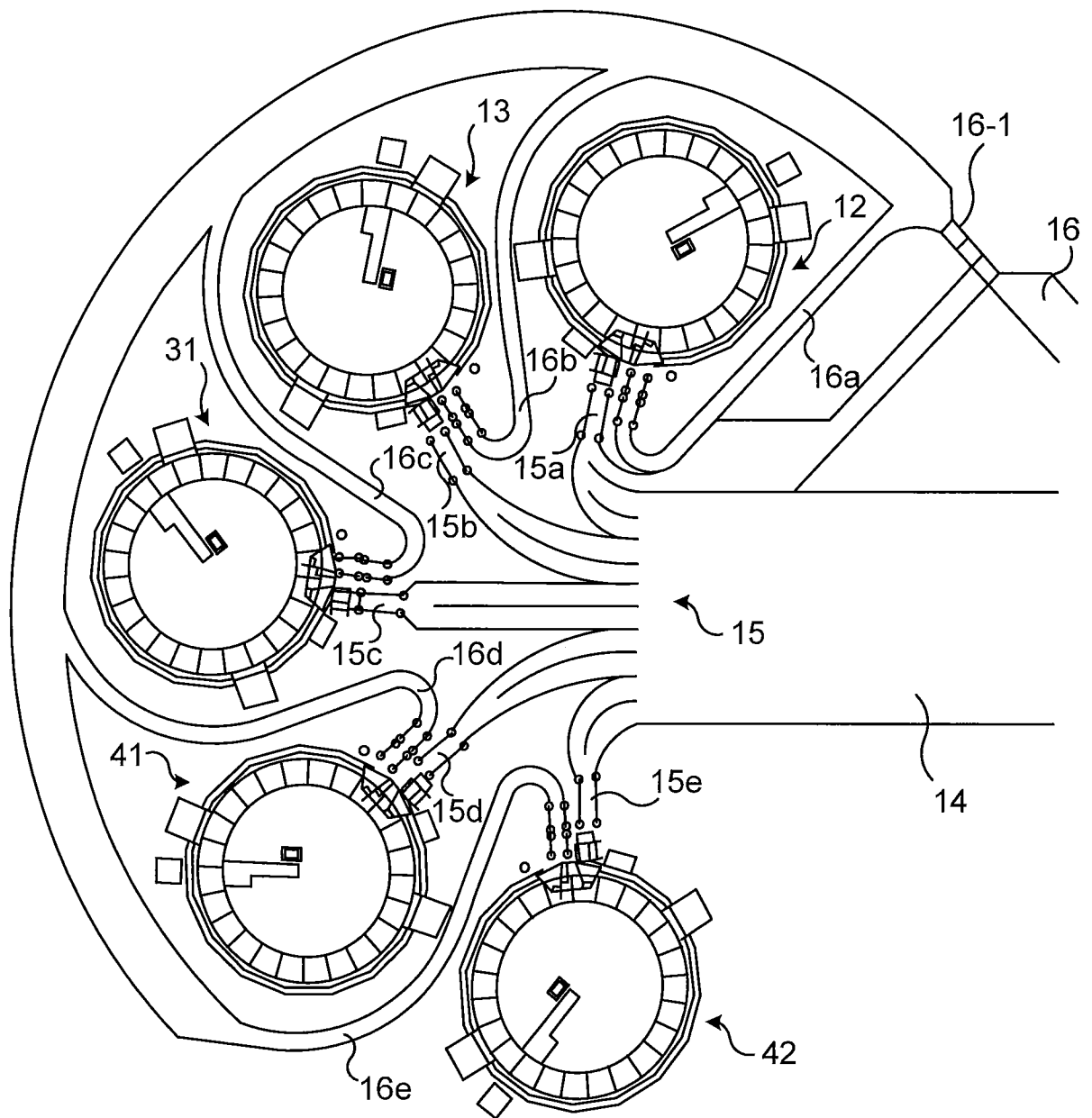


Fig. 5

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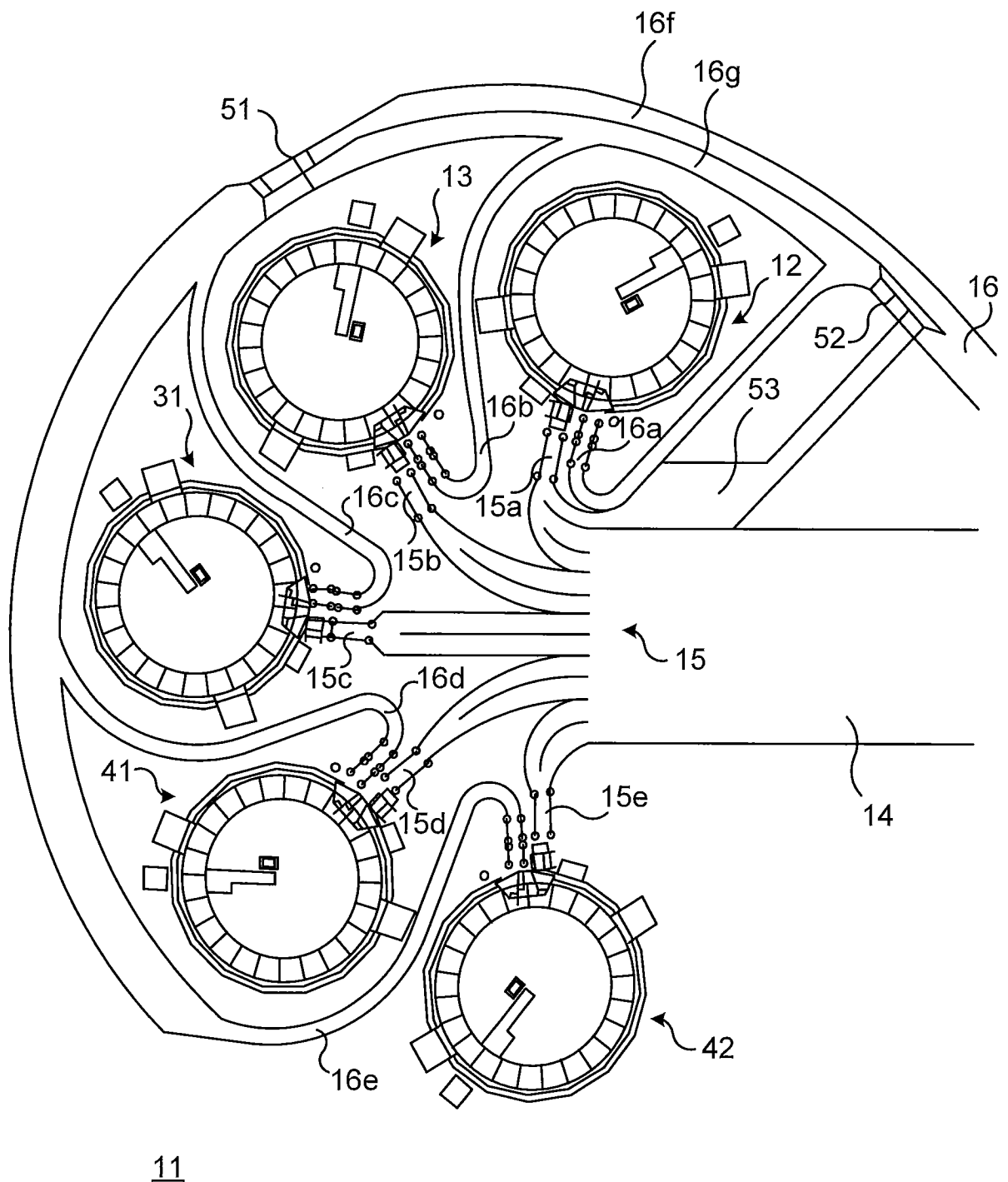


Fig. 6

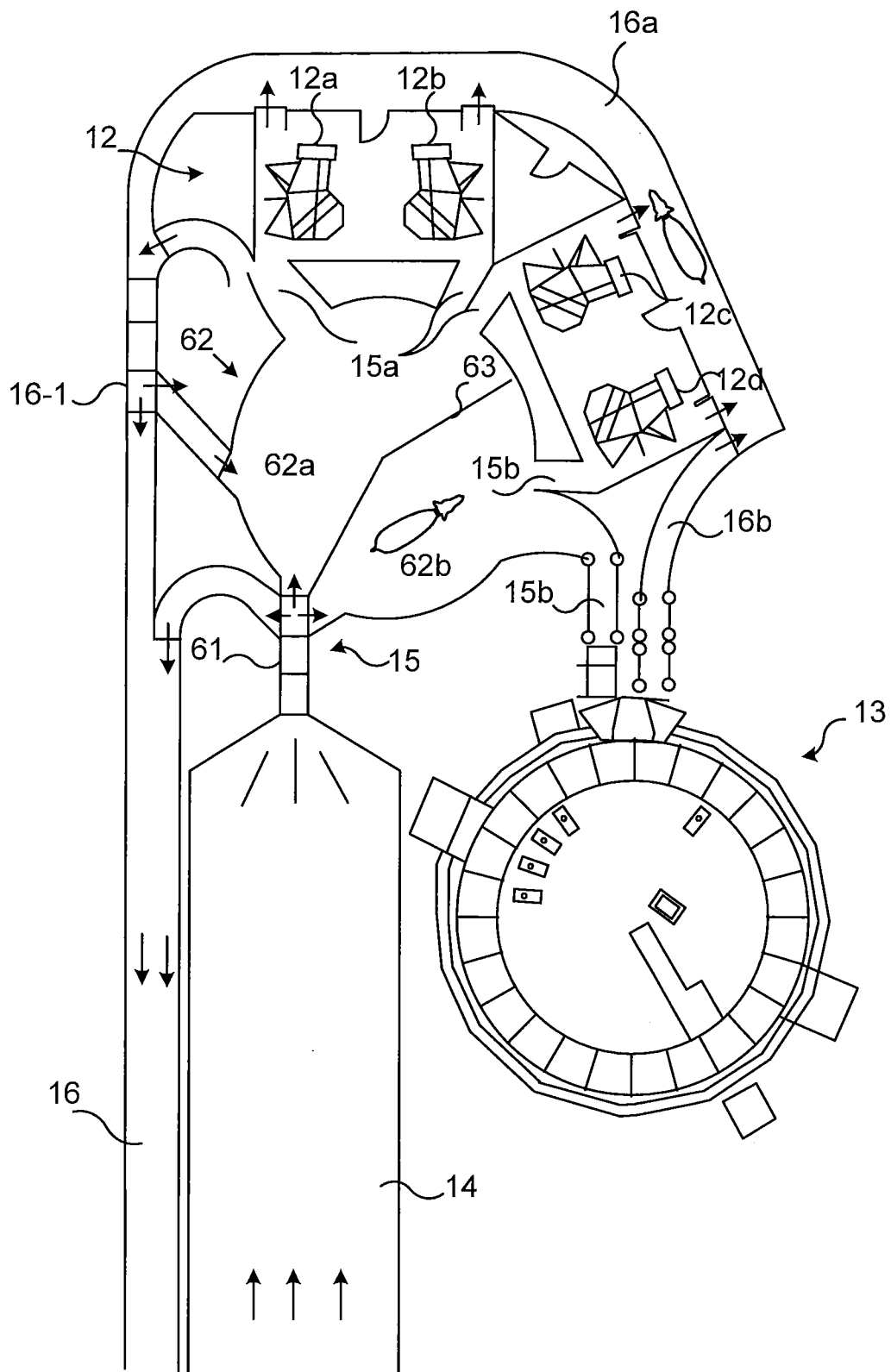


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No

PCT/SE2016/050499

A. CLASSIFICATION OF SUBJECT MATTER

INV. A01K1/00 A01K1/12
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A01K A01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2006/098678 A1 (DELAVAL HOLDING AB [SE]; SCHULTE KLAUS [SE]) 21 September 2006 (2006-09-21)	1-6, 8-16, 18-20
Y	figure 1 page 7, lines 19-20 page 12, lines 1-8 page 13, lines 8-20	7,17
Y	----- WO 2011/084048 A1 (LELY PATENT NV [NL]; VAN DE WALLE JACOBUS IZZAK DE DAAL [NL]) 14 July 2011 (2011-07-14) figure 1	7,17
A	----- US 2011/155064 A1 (DE VILLIERS PIERRE [NZ]) 30 June 2011 (2011-06-30) the whole document -----	1,11



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

11 August 2016

Date of mailing of the international search report

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Authorized officer

Nédélec, Morgan

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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