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(54) Title: MILKING ARRANGEMENT AND METHOD

(57) Abstract: The disclosure concerns a milking arrangement (2) for milking a group of animals. The milking arrangement (2) comprises a milking parlour (4), an exit gate mechanism (18) configured to individually release single subgroups of animals from the milking positions (6) in the milking parlour (4), and a control arrangement (26). The control arrangement (26), in relation to a milking session of the group of animals in the milking parlour (4), is configured to: - receive one or more sorting signals related to one or more sort animals of the group of animals, and - release one or more elected subgroups of animals from the milking parlour (4), separately from the rest of the animals of the group of animals, wherein the one or more elected subgroups of animals include the one or more sort animals.

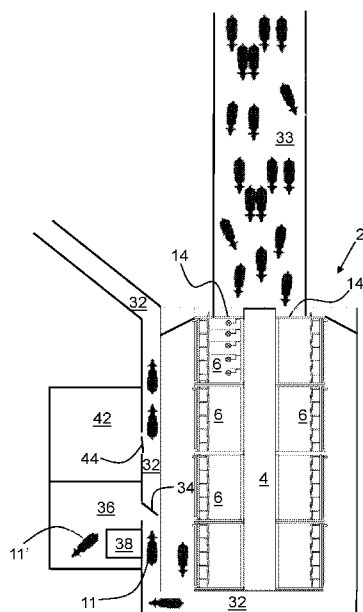


Fig. 3

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MILKING ARRANGEMENT AND METHOD

TECHNICAL FIELD

The invention relates to a milking arrangement for milking a group of animals, the milking arrangement comprising: a milking parlour, a number of milking positions arranged in the milking parlour, an entrance gate for the group of animals to enter the milking parlour and to access the milking positions, an animal identification system to identify each animal that accesses each milking position, a milking implement at each milking position, an exit gate mechanism configured to individually release single subgroups of animals from the milking positions in the milking parlour, and a control arrangement. The invention further relates to a method for facilitating a sorting of one or more sort animals from a group of animals in a milking arrangement.

BACKGROUND

In conventional milking in a stationary milking parlour, such as a parallel milking parlour or a herringbone parlour, a group comprising a certain number of animals are admitted into the milking parlour by opening an entrance gate to the milking parlour. The group of animals enter the milking parlour one after the other until all milking positions in the milking parlour are occupied by the group of animals. Thereafter, the entrance gate is closed. Milking personnel will typically prepare (pre-treat) the animals, inter alia by cleaning the teats of the animals, and thereafter attach milking implements (teat cups) to their teats for milking the animals. The teats of the milked animals are typically also post-treated by for instance applying a teat dip or teat spray on the teats.

A new group of animals cannot be admitted into the milking parlour until all animals of the group currently standing in the milking parlour have left the milking parlour. The milking parlour is configured for releasing several or the entire group of animals at once.

These steps in connection with a milking session in the milking parlour - admitting, pre-treating, milking, post-treating and releasing animals – are repeated until all relevant animals in a larger group of animals, such as all the milking animals in a herd have been milked in a milking session.

WO 2019/070185 discloses an example of a parallel milking parlour, or milking arrangement, comprising sequence gates for pushing and thereby urging animals to leave, upon their release from the milking parlour, through a front exit gate of the milking parlour. Such a release may be automatically performed after milking of the group of animals has finished.

For the purpose of sorting out particular animal individuals, a sorting gate is typically provided in an exit path/passageway from the milking parlour. The sorting gate is configured to automatically sort out specific animal individuals passing through the exit path and direct them to a separation area. The animal individuals that need to be treated or inspected for various reasons are flagged in a herd management system and with the aid of the sorting gate the flagged/specific animal individuals are identified and directed into the separation area where staff and/or veterinarian can tend to the sorted animal(s).

However, the sorting of animal individuals from the group of animals that has been milked in the milking parlour by means of the sorting gate can be complicated.

When leaving a milking parlour, the animals are often released simultaneously or essentially at the same time. Thus, in the exit path from the milking parlour, the group of animals often walk close to each other in a long line. The exit path becomes crowded and at times some animals may push or even partially mount other animals while in the exit path. This complicates the operation of a sorting gate arranged in the exit path. The sorting gate may miss a particular animal, sort out the wrong animal, or sort out more animals than only the relevant animal(s).

Moreover, a high throughput in the milking parlour and/or a larger sized milking parlour may escalate the above-mentioned problem.

SUMMARY

It is an object of the invention to provide conditions for facilitating a sorting of at least one animal from a group of animals that is being milked in a milking parlour.

According to an aspect of the invention, the object is achieved by a milking arrangement for milking a group of animals, as defined in one of the independent claims. The milking arrangement comprises: a milking parlour, a number of milking positions arranged in the milking parlour, an entrance gate for the group of animals to enter the milking parlour and to access the milking positions, an animal identification system to identify each animal that accesses each milking position, a milking implement at each milking position, an exit gate mechanism configured to individually release single subgroups of animals from the milking positions in the milking parlour, and a control arrangement. The control arrangement, in relation to a milking session of the group of animals in the milking parlour, is configured to:

- receive one or more sorting signals related to one or more sort animals of the group of animals,
- release one or more elected subgroups of animals from the milking parlour, separately from the rest of the animals of the group of animals, wherein the one or more elected subgroups of animals include the one or more sort animals.

In this way, a smaller number of animals including the sort animals is/are released from the milking parlour. Thus, conditions are provided for the one or more sort animals to walk along an exit path, which includes a sorting gate, at a larger distance from rest of the animals in the group, than if further subgroups of animals or the rest of the group of animals were released simultaneously with the one or more elected subgroups. As a result, the above-mentioned object is achieved.

According to a further aspect of the invention, the object is achieved by a method for facilitating a sorting of one or more sort animals from a group of animals in a milking arrangement, as defined in the independent method claim. The method comprises steps of:

- milking the group of animals in the milking parlour,
- receiving one or more sorting signals related to one or more sort animals of the group of animals,
- releasing one or more elected subgroups of animals from the milking parlour, separately from the rest of the animals of the group of animals, wherein the one or more elected subgroups of animals include the one or more sort animals.

As discussed above with reference to the milking arrangement, also the method provides conditions for the one or more sort animals to walk along an exit path, which includes a sorting gate, at a larger distance from the rest of the animals in the group, than if further subgroups of animals or the rest of the group of animals were released simultaneously with the one or more elected subgroups. As a result, the above-mentioned object is achieved.

Accordingly, when one or more animals are to be sorted out from the group of animals being milked in the milking parlour, a release procedure that deviates from an ordinary release procedure is applied. The separate release of the one or more elected subgroups, according to the invention, may appear to conflict with a general desire of providing a high throughput in the milking parlour. However, a more reliable sorting of animals, leads to improved animal welfare/health, less labour-intensive manual fetching of missed animals and over-all time savings since the relevant animals are more likely to be sorted out and treated/inspected in a

first attempt. Hence, they do not need to be sorted out at a later milking session or separately fetched after the milking session.

In this context a group of animals includes at most the same number of animals as the number of milking positions in the milking parlour. Typically, the group of animals may form part of a larger group of animals on a dairy farm. The larger group of animals normally includes many more animals than the milking parlour comprises milking positions. Thus, at different milking sessions, the group of animals standing in the milking parlour typically include a combination of different animal individuals from the larger group, depending on the order the animals enter the milking parlour. A farm may keep its animals in several such larger groups. Each larger group is typically kept together and handled as one entity for feeding and milking based on for instance their lactation stage or production level.

Herein, the term “group of animals” relates to the animals being milked in the milking parlour. The term “sort animal” relates to an animal that is elected or flagged for being sorted from the group of animals. The term “subgroup of animals” relates to the smallest number of animals that can be released simultaneously in the milking parlour. The term “elected subgroup” relates to a subgroup of animals that includes at least one sort animal.

The animals are milk producing animals such as cows, sheep, or goats. The milking positions are configured for milking the animal. For instance, each milking implement comprises a relevant number of teat cups for the kind of animal.

The milking arrangement may be a milking arrangement inside a farm building or underneath a protective roofing structure e.g., in connection with a pasture area. The milking arrangement is configured for milking a group of animals in the milking parlour. The milking parlour, in turn, is configured for milking one animal at each milking position utilising the respective milking implement at the relevant milking position.

The milking parlour is a parallel milking parlour or a herringbone milking parlour. Accordingly, the milking positions are arranged in a stationary parallel or herringbone configuration in the milking parlour. A common denominator for the relevant kind of stationary milking parlour is that it is configured for loading a group of animals in a batch via the entrance gate and, after milking has finished, releasing the group of animals in the milking parlour via the exit gate mechanism. Thus, if no animal of the group of animals is to be sorted out, and if so desired, the entire group may be released at once by the exit gate mechanism. A further common denominator for the relevant kind of milking parlour is that animals of a subsequent group

cannot be admitted into the milking parlour until all animals of the group currently in the milking parlour have left the milking parlour.

The entrance gate is arranged for passage of one animal at a time into an aisle of the milking parlour. Thus, the milking positions of the milking parlour are accessed and loaded one after the other as the animals enter the milking parlour through the entrance gate. All animals of a new/un-milked group of animals enter the milking parlour in this manner in one side of the milking parlour via a single entrance gate. The parallel/herringbone milking parlours are typically double-sided, wherein each side comprises its own entrance gate and exit gate mechanism. Thus, a larger group of animals are gathered in a holding area and group-wise allowed to enter the first and second sides of the double-sided milking parlour via a respective entrance gate. This is a common manner of loading animals into a double-sided milking parlour.

Due to this manner of entering and accessing the milking positions, it is possible to provide the animal identification system with an animal identification reader at the entrance gate to identify each animal that accesses each milking position. Alternatively, or additionally, the animal identification system may be provided with readers at other positions in the milking parlour or in relation to the milking parlour e.g., at each milking position or in strategic positions around the milking parlour to allow triangulation for determining animal identities at each milking position. Any suitable known animal identification system may be utilised for determining an identity of each animal at each milking position.

The exit gate mechanism is configured to individually release single subgroups of animals from the milking positions in the milking parlour. Put differently, the exit gate mechanism is subdivided into separately manoeuvrable gate sections. Each gate section is associated with one or more specific milking position(s) of the milking parlour. In the one or more specific milking position(s), a single subgroup is milked.

For each subgroup, the exit gate mechanism has at least two states, a closed state in which the animal(s) of the subgroup is/are retained within the milking parlour and an open state in which the animal(s) of the subgroup can exit the milking parlour. Specifically, the exit gate mechanism, also permits release of several animals simultaneously, not only all animals of a single subgroup but more than one subgroup at a time. The above-mentioned WO 2019/070185 discloses an example of such an exit gate mechanism comprising a front exit gate assembly including a so-called neck rail subdivided into separately manoeuvrable front exit gate sections.

One way of utilising such an exit gate mechanism is that the control arrangement is configured to release each subgroup as soon as all animals of a subgroup have finished milking. Thus, this allows a smaller subgroup of animals to exit once milking is completed and thereby avoid congestion in the exit path/passageway from the milking parlour. Reference is sometimes made to a “gang” for each subdivision of the exit gate mechanism including the milking positions in which one single subgroup of animals stands during milking. Thus, “gang exit” refers to the release of a subgroup by opening one separately manoeuvrable exit gate section of the exit gate mechanism.

In this context it may be pointed out that the rest of the animals of the group of animals that are released separately from the one or more elected subgroups can also be released one subgroup at a time or more than one subgroup at a time. In the release of the rest of the animals, consideration may be taken to avoid congestion in an exit path from the milking parlour.

The control arrangement is configured to control the exit gate mechanism on the individual single subgroup level such that for each subgroup, the exit gate mechanism retains the animals in the milking parlour or releases the animals from the milking parlour. Also, the entrance gate may be controlled by the control arrangement to admit the group of animals to the milking parlour.

The control arrangement is configured to receive the identities of the animals in the milking parlour from the animal identification system, and to correlate each milking position with the respective animal standing therein. Moreover, the control arrangement is configured for receiving data in the form of the one or more sorting signals.

At least one or more sorting signals may be sent by a herd management system in which e.g., a farmer has flagged one or more animals for sorting. Alternatively, at least one or more sorting signals may be sent by milking personnel via an input unit, such as an input unit at a specific milking position or a handheld input unit in the form of a mobile telephone or a tablet computer. In this case, milking personnel can flag a specific animal standing in a particular milking position in the milking parlour. For instance, milking personnel, may flag an animal suspected of having an illness or being deemed in need of inspection/treatment.

Not only the farmer or milking personnel can flag animals, but also other persons associated with a farm such as hoof trimmers, veterinarians, staff responsible for artificial insemination,

etc. via any suitable input device, such as a computer or one of the above-mentioned input units in the milking parlour at the milking positions, a mobile telephone, or a tablet computer. The animals may also be monitored using an animal monitoring system comprising for instance an activity meter carried by the individual. An animal monitoring system can automatically flag an animal for sorting if it detects an animal specific condition, such as sickness, lameness or that the animal is in heat.

According to an embodiment, the control arrangement is further configured to:

- release the one or more elected subgroups of animals from the milking parlour before and/or after the release of the rest of the animals from the milking parlour.

According to a further embodiment, a pause separates the releases to enable an evacuation of the one or more elected subgroups of animals from the milking parlour, separately from the rest of the animals of the group of animals. The pause ensures that the one or more elected subgroups is released separately from the rest of the animals.

At least one elected subgroup can be released before the rest of the animals e.g., if milking of this one elected subgroup is finished before the rest of the animals are finished milking. This may be the case if milking of the animals in the at least one elected subgroup was started first in the group of animals. An alternative is to release the at least one elected subgroup after the rest of the animals have been released e.g., if milking of the at least one elected subgroup is finished after the rest of the animals are finished milking.

If there is more than one elected subgroup, there are several alternatives. Two or more elected subgroups may be released simultaneously, or the two or more elected subgroups are release consecutively with a pause between each elected subgroup and between the elected subgroups and the rest of the animals of the group of animals, or at last one elected subgroup is released before the rest of the animals of the group are released and at least one other elected subgroups is released after the rest of the animals of the group have been released.

According to embodiments, a duration of the pause is associated with expiry of a predetermined time period, or with awaiting a signal that indicates successful sorting of at least one of the one or more sort animals, or with the one or more elected subgroups of animals having passed a specific point in an exit path from the milking parlour, or with a precedingly released animal individual of the rest of the animals having passed a specific point in an exit path from the milking parlour.

The duration of the pause ensures that sort animal(s) of at least one elected subgroup of animals are physically separated from the rest of the animals and/or from at least one other elected subgroup. The physical separation is a condition that promotes reliable sorting out of the one or more sort animals.

According to embodiments, the animal identification system is RFID-based, vision-based, and/or RTLS-based. The animal identification system typically comprises at least one animal identification tag reader. The tag reader is preferably an RFID-reader arranged at the entrance gate of the milking parlour to identify the animals that enter the milking parlour one after the other. This is a conventional way of identifying animals provided with RFID-tags. The animal identification system may also or as an alternative comprise an RFID-reader arranged at each milking position in the milking parlour to identify each animal standing in a respective milking position.

The animal identification system may also comprise at least one camera arranged at the entrance gate and/or at the milking positions. Thus, the animal identification system may also be vision-based, whereby the animals may be identified without the use of animal tags and readers. The vision-based animal identification system can be used as an alternative or in a dual animal identification system to enable identification of animals without tags or animals that have lost their animal identification tags.

The animal identification system may also be based on a real-time location system (RTLS). The RTLS-based animal identification system comprises active animal identification tags carried by the animals and at least three RTLS-anchors/readers/antennas arranged in predetermined positions in the milking parlour. It determines the position of each animal in real-time by triangulation of its respective active animal identification tag. Each animal may be provided with a plurality of animal identification tags and monitored by a combination of RFID and RTLS in the milking parlour. The animal identification systems can thereby be used as alternatives or dual animal identification system to enable identification of animals without one of the tags or animals that have lost one of their animal identification tags.

According to embodiment, at least one of the sort animals is lacking an animal identification tag as indicated by the animal identification system and/or by the operator actuating the input unit. Thus, failure to detect an animal tag may be indicated by the animal identification system. This may for instance be indicated by activation of an alarm signal at the milking position of the non-identified animal or the animal may be automatically flagged for sorting by

the system. In case the alarm signal is activated, an operator (milking staff) can thereby inspect if the non-identified animal in said milking position has lost its animal tag and flag the animal for sorting by actuating the input unit. Such manual inspection may also be done without any automatic indication/alarm by the operator (milking staff), whereby the operator simply actuates the input unit to flag the animal lacking the animal identification tag. The animal is subsequently sorted and the missing animal tag can be replaced with a new one.

According to embodiments, the exit gate mechanism is configured to individually release single subgroups of animals, wherein each subgroup of animals includes 1 – 5 animal individuals. Thus, a single subgroup may be formed by a single animal, wherein the exit gate mechanism has separately manoeuvrable gate sections for each milking position. The exit gate mechanism and evacuation of the milking parlour may however become simpler and more effective when the subgroup is larger, such as separately manoeuvrable gate sections configured to release animals in subgroups of two, three, four, or five animals.

According to embodiments, the milking arrangement comprises a sorting gate arranged at an exit path from the milking parlour, wherein the sorting gate is configured to sort out the one or more sort animals. In this manner, sorting of the one or more sort animals can be performed by the sorting gate, under the control of the control arrangement of the milking arrangement.

The sorting gate may form part of a higher-level system that is not just configured for communication with the milking arrangement, but also a herd management system, in which the one or more sort animals are flagged for sorting.

The sorting gate may communicate with the control arrangement of the milking parlour. Accordingly, the one or more sorting signals related to the one or more sort animals in the milking parlour can be utilised by an animal identification system at the sorting gate for sorting out the one or more sort animals. The sorting gate may also communicate with the control arrangement and confirm that at least one of the sort animal(s) has been sorted and/or that an animal in the rest of the released animals has passed by the sorting gate. Additionally, the sorting gate is configured to receive information from the herd management system, which animals are to be sorted out. Again, an animal identification system at the sorting gate identifies the relevant animals to be sorted out.

According to embodiments, the control arrangement is further configured to:

- interrupt milking of at least one animal individual of the one or more elected subgroups of animals and/or of at least one animal individual of the rest of the animals in the group of animals. In this manner, throughput of animals in the milking arrangement can be promoted.

5 For instance, under some conditions, interrupting milking of at least one animal individual of the one or more elected subgroups of animals may provide for the one or more elected subgroups to be released prior to the rest of the animals. Milking of the animals of the rest of the animals can proceed to completion while the one or more elected subgroups leave the milking parlour, separately from the rest of the animals. Conversely, under some conditions,
10 interrupting milking of at least one animal individual of the rest of the animals in the group of animals may provide for the rest of the animals to be released prior to the one or more elected subgroups. Milking of the one or more elected subgroups can proceed to completion while the rest of the animals leave the milking parlour, separately from the one or more elected subgroups.

15 Interruption of milking of at least one of the one or more elected subgroups of animals and/or of the rest of the animals of the group of animals and other sequences of release of at least one of the one or more elected subgroups and the rest of the animals are foreseeable in these embodiments.

20 Generally, one or more rules may define when interrupting milking of an animal or several animals is/are allowed e.g., interrupting milking is allowed once at least a certain percentage of an expected yield has been milked from an animal individual, interruption of milking of the same animal individual at two consecutive milking sessions is not allowed, interruption of
25 milking of one or more animals is/are allowed if a certain percentage of the group has finished milking, etc.

According to embodiments, the control arrangement is further configured to:

- receive one or more further sorting signals related to one or more further sort animals of the
30 group of animals, wherein the one or more sort animals and the one or more further sort animals are located in milking positions related to different single elected subgroups of animals,
- release the one or more elected subgroups of animals, separately from the rest of the animals from the group of animals from the milking parlour, based on the one or more sorting
35 signals and the one or more further sorting signals. In this manner, a distinction is made between the one or more sort animals and the one or more further sort animals. This may be utilised e.g., for sorting out animals to different separation areas.

For instance, as discussed above, the one or more sort animals are sorted out to a separation area where they are examined and/or treated. The further one or more sort animals may have been flagged because their hooves are to be trimmed. Thus, these further
5 sort animals can be sorted out to a separate area related to hoof trimming.

Further features of, and advantages with, the invention will become apparent when studying the appended claims and the following detailed description.

10 BRIEF DESCRIPTION OF THE DRAWINGS

Various aspects and/or embodiments of the invention, including its particular features and advantages, will be readily understood from the example embodiments discussed in the following detailed description and the accompanying drawings, in which:

- 15 Fig. 1 schematically illustrates a top view of a milking arrangement,
Figs. 2a and 2b illustrate a gate section of an exit gate mechanism,
Fig. 3 schematically illustrates a milking arrangement according to embodiments,
Fig. 4 illustrates a control arrangement,
Fig. 5 illustrates a method for facilitating a sorting of one or more sort animals from a group
20 of animals in a milking arrangement, and
Fig. 6 illustrates embodiments of a computer-readable storage medium.

DETAILED DESCRIPTION

- Aspects and/or embodiments of the invention will now be described more fully. Like numbers
25 refer to like elements throughout. Well-known functions or constructions will not necessarily be described in detail for brevity and/or clarity.

Fig. 1 schematically illustrates a top view of a milking arrangement 2.

- 30 The milking arrangement 2 is configured for milking a group of animals, such as cows. The milking arrangement 2 may be wholly or partially arranged in a farm building. Alternatively, it may be wholly or partially arranged underneath a protective roofing structure e.g., in connection with a pasture area.
- 35 The milking arrangement 2 comprises a milking parlour 4. A number of milking positions 6 are arranged in the milking parlour 4.

In the illustrated embodiment, the milking parlour 4 is a parallel milking parlour i.e., a milking parlour wherein the milking positions 6 are arranged side by side such that a milking implement (milking cluster) 8 of each milking position 6 is to be attached between the rear legs of an animal standing in the relevant milking position 6.

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A parallel milking parlour is a preferred embodiment of the milking parlour 4. However, alternatively, the milking parlour 4 may be a herringbone milking parlour i.e., wherein the milking positions are arranged in a herringbone pattern and at an angle such that a milking implement 8 of each milking position 6 is to be attached between a front and a rear leg of an animal standing in the relevant milking position 6.

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In the illustrated embodiment, the milking parlour 4 is a double-sided parallel milking parlour. Accordingly, the milking positions 6 are arranged in two rows 10 on opposite sides of a milking pit 12. During milking, the animals stand in the milking positions 6 with their rear ends towards the milking pit 12 and with their heads facing away from the milking pit 12. Milking personnel stands in the milking pit 12 while handling the animals in the milking parlour 4. The illustrated milking parlour 4 is a 2x20 parallel milking parlour i.e., each row 10 of milking positions 6 has twenty milking positions 6.

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The size of the milking parlour 4 is selected for the size of the farm where it is installed and the total number of milking animals at the farm. An example of a large sized milking parlour is a 2x40 milking parlour or more, and an example of a small sized milking parlour is a 2x10 milking parlour or less. As an alternative, the milking parlour 4 may be single sided i.e., a milking parlour wherein milking positions 6 are only arranged along one row 10 at one side of the milking pit 12.

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The milking positions 6 are arranged in subgroups, as will be further discussed below, inter alia with reference to **Figs. 2a and 2b**.

The milking arrangement 2 comprises a milking implement 8 at each milking position 6. In a known manner, the milking implement 8 comprises a milking cluster with teat cups connected to milk tubes and a pulsation tubes. The milking implement 8 typically also comprises one or more sensors, such as a milk flow meter and a milk quality sensor.

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The milking arrangement 2 comprises an entrance gate 14 for the group of animals to enter the milking parlour 4 and to access the milking positions 6.

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In the illustrated embodiment, one entrance gate 14 is arranged at each row 10 of milking positions 6. A particular animal individual about to enter the milking parlour 4 may enter the milking parlour 4 through the entrance gates 14 closest to the animal individual.

- 5 Each of the entrance gates 14 is arranged for passage of one animal at a time into the row (aisle) of the milking parlour 4. Each animal having entered one of the aisles/rows 10 of milking positions 6 will walk along the relevant aisle/row 10 to occupy the first free milking position 6 farthest away from the relevant entrance gate 14. Thus, the milking positions 6 of the milking parlour 4 are loaded (accessed and occupied) one after the other as the animals enter the milking parlour 4. When all milking positions 6 in each row 10 are loaded by a group of animals, the relevant entrance gate 14 is closed.

The milking arrangement 2 further comprises an animal identification system 16 configured to identify each animal that accesses each milking position 6. In **Fig. 1**, the animal identification system 16 is generally indicated. The animal identification system 16 may be of any known kind.

The animal identification system 16 typically comprises an animal identification tag reader, wherein an animal identification tag carried by each animal, in its ear or around its neck, can be read by the tag reader of the animal identification system 16 to establish the identity of each animal in each milking position 6 in the milking parlour 4. More specifically, a conventional ID system is based on passive RFID-tags carried by animals and one or more RFID readers configured to read the passive RFID-tags. The RFID-readers are arranged at one or more suitable locations, such as at the entrance gate 14, at the milking positions 6, and/or at the sorting gate.

However, according to an embodiment, the animal identification system 16 comprises at least one RFID-reader(s) and at least one camera(s) arranged at the entrance gate 14 or at the milking positions 6. Thus, the animal identification system comprises a dual identification system, in which the animal identification system 16 can be implemented. Thus, RFID-readers form an identification tag reader and as such, can read the above-mentioned RFID-tags carried by the animals. The at least one camera can also form part of a vision-based system configured to identify animal individuals based on visual characteristics of each animal individual.

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When the at least one RFID-reader and/or the at least one camera is arranged at the entrance gate 14, and since the animals enter the milking parlour 4 consecutively occupying

one milking position 6 at the time in the same order as they pass the entrance gate 14, it is possible with the at least one RFID-reader and/or the at least one camera to identify each animal that occupies each milking position 6.

- 5 Alternatively, or in addition, each milking position 6 can be provided with an RFID-reader, and/or at least one camera to identify each animal that has accessed each milking position 6. A vision-based ID-system comprises one or more cameras arranged at one or more similar locations for visual identification of the animals. Such identification of animals need not be tag-based. Instead, camera images of the animals can be compared with reference images
10 provided in a database to identify the animal individuals.

A further ID-system is based on real-time location and is referred to as a Real-Time Location System, RTLS. The RTLS is based on active tags carried by the animals and at least three anchors/readers/antennas mounted in specific positions e.g., in or at the milking parlour 4.

- 15 The RTLS determines the positions of animals in real-time e.g., by triangulation of their respective tags. The animals at a farm may also be provided with dual or integrated tags and monitored by a combination of RFID and RTLS.

- The milking arrangement 2 further comprises an exit gate mechanism 18 configured to
20 individually release single subgroups of animals from the milking positions 6 in the milking parlour 4. The exit gate mechanism 18 extends along a front end of the milking positions 6. Thus, in the illustrated embodiment, the exit gate mechanism 18 extends along the front end of each row 10 of milking positions 6.

- 25 The exit gate mechanism 18 is divided into a number of gate sections 18' which can be opened separately. Thus, when opened each gate section 18' of the exit gate mechanism 18' releases one single subgroup of animals from the milking positions 6 in the milking parlour 4. Accordingly, the milking positions 6 may be seen to be subdivided corresponding to the gate sections 18' of the exit gate mechanism 18. A so-called "gang exit or release" refers to a
30 release of a subgroup of animals from the milking parlour 4, which release is enabled by opening of one gate section 18'.

- In **Fig. 1**, the general direction of the group of animals passing through the milking parlour 4 in connection with a milking session is indicated with broad arrows at the entrance gates 14,
35 after the exit gate mechanism 18, and along an exit path 32 from the milking parlour 4.

Figs. 2a and 2b illustrate a gate section 18' of an exit gate mechanism. In **Fig. 2a**, the gate section 18' is shown in a closed state and in **Fig. 2b**, the gate section 18' is shown in an open state. The exit gate mechanism may be an exit gate mechanism 18 as discussed above with reference to **Fig. 1**.

5

With reference to **Figs. 1 – 2b**, each gate section 18' is provided at a front end of the relevant milking positions 6 and extends along part of a row 10 of milking positions 6. The gate section 18' is movable between a lower position, see **Fig. 2b** and an upper position, see **Fig. 2b**. In the lower position, the gate section 18' closes the front side of the milking positions 6 to prevent the animals from leaving the milking positions 6. In the upper position, the gate section 18' permits the animals to leave the respective milking positions 6.

10

Sequence gates 20 are arranged between the individual milking positions 6. A function of the sequence gates 20 is to guide the animals into each milking position 6. This is done to load the milking parlour 4 in an orderly fashion from milking position located farthest away from the entrance gate 14 and sequentially one milking position 6 at a time towards the entrance gate 14 until the milking parlour 4 has been loaded with the group of animals to be milked in a milking session.

15

Optionally, the sequence gates 20 may be arranged in an assembly that permits pivoting of the sequence gates 20 upwardly and downwardly, which can be utilised for urging animals out of the milking parlour 4.

20

The gate section 18' is supported by a stationary support structure 22. The gate section 18' is movable between its lower position and its upper position by a drive device 24 arranged between the support structure 22 and the gate section 18'.

25

While the group of animals enter the milking positions 6 at the gate section 18', the gate section 18' is in its lower position, see **Fig. 2a**. After the group of animals have entered, the teats of the animals are cleaned, milk quality is checked e.g. visually by milking personnel, teat cups of the milking implements 8 are attached to the teats of the animals, whereafter the milking is started.

30

When the milking has finished, the teat cups are removed from the teats of the animals, the teats of the animals are post-treated with disinfectant, and thereafter the animals are released by raising the gate section 18' to its upper position, see **Fig. 2b**.

35

Each subgroup may be formed by a single animal, but more typically each subgroup is formed by groups of two, three, four, or five animals. Accordingly, each gate section 18' is configured for closing and opening the front end of the same number of milking positions 6. In the illustrated embodiment, the gate section 18' is configured for retaining and releasing
5 five animals from five milking positions 6.

However, according to alternative embodiments, the gate section 18' is configured for retaining and releasing 4, 3, 2 animals, or only 1 animal from the milking positions 6.

- 10 The size of the subgroups may for instance be determined by the size of the milking parlour 4. In a milking parlour of the smaller size, each subgroup may preferably be smaller, such as from one to three animals and in a milking parlour of the larger size each subgroup may be larger, such as from three to five animals.
- 15 Generally, the number of animals in one subgroup is much smaller than the rest of the group of animals. Thus, a separate release of one elected subgroup facilitates the sorting out of the at least one sort animal.

- The milking arrangement 2 further comprises a control arrangement 26. The control
20 arrangement 26 is also discussed below with reference to **Fig. 4**.

- The control arrangement 26 is configured to control various aspects of the milking arrangement 2. Furthermore, the control arrangement 26 is configured for communicating with the animal identification system 16, a herd management system 28, and one or more
25 input units 30.

- For instance, the control arrangement 26 is configured to control the exit gate mechanism 18. Specifically, the control arrangement 26 directly or indirectly controls the drive device 24 of the gate sections 18' and accordingly, the position of each of the gate sections 18'. The
30 control arrangement 26 is configured to control the entrance gate 14 between an open position in which the group of animals is admitted into the milking parlour 4 and a closed position when all animals of the group have been admitted into the milking parlour 4. The control arrangement 26 is configured to correlate each milking position 6 with an identity of the respective animal standing therein. The animal identification system 16 may form part of
35 the control arrangement 26. Alternatively, the control arrangement 26 is configured to communicate with the animal identification system 16 and to receive the identities of the animals in the milking parlour 4 from the animal identification system 16. The control

arrangement 26 is configured for receiving data, such as animal related data. Such animal related data may relate to animal identities of animal individuals, to conditions linked to particular animal individuals, and/or to actions related to particular animal individuals. The animal related data may be received in the form of signals, such as the below discussed one or more sorting signals and one or more further sorting signals.

The control arrangement 26, in relation to a milking session of the group of animals in the milking parlour 4, is configured to:

- Receive one or more sorting signals related to one or more sort animals of the group of animals. Such one or more sorting signals may be sent to the control arrangement 26 by the herd management system 28 and/or by the one or more input units 30. The one or more sorting signals may have been sent to the control arrangement 26 prior to the commencing of the milking session and/or during the milking session.
- Release one or more elected subgroups of animals from the milking parlour 4, separately from the rest of the animals of the group of animals, wherein the one or more elected subgroups of animals include the one or more sort animals. Thus, after milking the animals of an elected subgroup has finished, each sort animal together with the animals of its subgroup i.e., the elected subgroup to which the relevant sort animal belongs, is released. Since the release is separate from the rest of the animals of the group of animals, the sort animal is easily sorted out from the thus, isolated elected subgroup or elected subgroups by a sorting gate arranged in the exit path 32 from the milking parlour 4.

In the herd management system 28, specific animal individuals are flagged if they are to be sorted out. Such flagging of an animal individual makes it a "sort animal" in the terminology used herein. Similarly, via the one or more input units 30 specific animal individuals can be flagged to become sort animals. The flagging of an animal may be done for various reasons, such as for examination of the animal, for veterinarian treatment of the animal, when care is to be given to the animal, etc.

While the herd management system 28 commonly is associated with a computer used in an office at a relevant farm, the one or more input units 30 are arranged in the milking pit 12 and/or are portable to be carried when personnel handle the animals at the farm. The herd management system 28 as well as the one or more input units 30 are associated with an animal data base related to the animals at the farm. In the animal data base, animal data are stored and updated on an animal individual level.

According to embodiments, the control arrangement 26 is further configured to:

- Release the at least one of the one or more elected subgroups of animals before and/or after the release of the rest of the animals from the milking parlour 4 from the milking parlour 4.

5 A pause may hereby separate the releases in order to enable an evacuation of the one or more elected subgroups of animals from the milking parlour 4, separately from the rest of the animals of the group of animals. The pause ensures that the at least one of the one or more elected subgroups is released separately from the rest of the animals. Thus, conditions for a reliable sorting out of the one or more sort animals are achieved.

10

As discussed above, at least one elected subgroup is either released before the rest of the animals or after the rest of the animals have been released. If there is more than one elected subgroup, two or more elected subgroups may be released simultaneously, or the two or more elected subgroups may be released consecutively with a pause between each elected subgroup and between the elected subgroups and the rest of the animals of the group of animals, or at last one elected subgroup may be released before the rest of the animals of the group are released and at least another elected subgroups is released after the rest of the animals of the group have been released.

15

20 According to embodiments, a duration of the pause is associated with one of:

- Expiry of a predetermined time period. A timer of the control arrangement 26 can be set to the predetermined time period. After its expiry the rest of the animals or at least one of the elected subgroups is released.

25 - Awaiting a signal that indicates successful sorting of at least one of the one or more sort animals. The signal that indicates the successful sorting of at least one of the one or more sort animals can be provided by the sorting gate to the control arrangement 26.

- One or more elected subgroups of animals having passed a specific point in the exit path 32 from the milking parlour 4. An animal identification reader or other suitable animal identification and/or animal counting arrangement arranged at the specific point in the exit path 32 can signal to the control arrangement 26 that the one or more elected subgroups of animals have passed the specific point. The specific point can be at the sorting gate.

30

- A precedingly released animal individual of the rest of the animals having passed a specific point in the exit path 32 from the milking parlour 4. An animal identification reader or other suitable animal identification and/or animal counting arrangement arranged at the specific point in the exit path 32 can signal to the control arrangement 26 that the preceding released animal individual of the rest of the animals has passed the specific point.

35

The duration of the pause can also be adapted/changed to ensure that the at least one or more elected subgroups is released separately from at least one other elected subgroup and/or from the rest of the animals.

- 5 According to embodiments, the control arrangement 26 is further configured to:
- receive the one or more sorting signals related to the one or more sort animals from one or more of: the herd management system 28, an operator actuating an input unit 28, a milk sensor of the milking implement 8 at each milking position 6, and/or an animal monitoring system.

10

In this manner, the one or more sorting signals can be provided to the control arrangement 26. As discussed above, in the herd management system 28, animals to be sorted out can be flagged and the input device 28 can be utilised for flagging an animal. Signals related to such flagged animals are received as the one or more sorting signals by the control

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arrangement 26.

A milk sensor of each milking implement 8 can sense abnormal milk and accordingly, flag the relevant animal individual e.g., in the herd management system 28 or provide a sorting signal directly to the control arrangement 26. Thus, once sorted out into a separation area, the

20 flagged animal can be examined and/or treated. Mentioned as examples, the milk sensor can be a conductivity sensor, optical sensor (blood sensor), a milk flow meter etc. The animal can hereby be flagged for sorting on the basis of abnormal milk quality and/or flow.

25

An animal monitoring system is configured to detect animal specific conditions, such as

25 animals in heat and/or animals having health problems e.g., lameness. A vision system may for instance be arranged in an area where the animals are held to detect an animal with an abnormal condition, such as lameness. Other known animal monitoring systems typically include sensors carried by the animals. For instance, an animal tag or necklace provided with an activity meter is configured to detect animal specific conditions including deviating

30 movement patterns caused by sickness, lameness, and/or the relevant animal being in heat. The animal monitoring system with activity meters may be integrated in RFID- or RTLS-tag.

35

According to embodiments, at least one of the one or more sort animals lacks an animal identification tag as indicated by the animal identification system 16 and/or by an operator. In

35 this manner, the at least one animal can be sorted out in order to replace the lacking animal identification tag.

The animals can for instance lose one of their animal identification tags, such as RFID-tags or RTLS-tags. Without their animal identification tags, functions within the farm that require an animal identification tag to be implemented are accordingly not available to animals that have lost their animal identification tags.

The presence at or within the milking parlour 4 of an animal that has lost its animal identification tag can be established by an operator/milking staff inspecting the animals in the milking parlour and/or with a vision-based animal identification system 16 and/or with an animal identification tag reader combined with an animal counter at the entrance gate 14 and/or using a dual animal identification system comprising two independent ID systems.

The animal identification system 16 or the operator, such the milking personnel, can flag the animal by indicating the milking position 6 in which the animal that has lost its animal identification tag is standing.

If the animal has lost its RTLS-tag, the sorting gate may nevertheless sort the animal in a conventional manner by reading its RFID-tag. Alternatively, an RTLS-based or vision-based system can for instance be arranged at the sorting gate for identifying the animal that has lost its RFID-tag for sorting to the separation area.

Fig. 3 schematically illustrates a milking arrangement 2 according to embodiments. The milking arrangement 2 is a milking arrangement 2 as discussed above with reference to **Figs. 1 – 2b**. Accordingly, in the following reference is also made to the discussion of **Figs. 1 – 2b**.

Specifically, in **Fig. 3**, the milking arrangement 2 and the milking parlour 4 are shown in a larger context than in **Fig. 1**. A holding area 33 for animals to be milked is arranged in front of the entrance gate 14, or as in the illustrated embodiments, in front of the two entrance gates 14 such that when the entrance gates 14 are open, the animals can enter the milking parlour 4 from the holding area 33 and occupied the milking positions 6.

According to embodiments, the milking arrangement 2 comprises a sorting gate 34 arranged at an exit path 32 from the milking parlour 4, wherein the sorting gate 34 is configured to sort out at least one or more sort animals. In this manner, sorting out of the one or more sort animals can be performed by the milking arrangement 2, such as under the control of the control arrangement 26 of the milking arrangement 2.

The sorting gate 34 may form part of a higher-level system that is configured for communication with the control arrangement 26 and the herd management system 28, in which the one or more sort animals are flagged.

- 5 When open, the sorting gate 34 leads from the exit path 32 to a separation area 36. When the sorting gate 34 is closed, animals can walk along the exit path 32 past the separation area 36 e.g., to a dedicated animal housing area (not shown) for feeding and resting when not being milked.
- 10 The sorting gate 34 comprises a further animal identification system 38. Thus, the one or more sort animals 11 can be identified by the sorting gate 34 for sorting the one or more sort animals 11 into the separation area 36.

Fig.3 shows a situation wherein the animals of an elected subgroup are the last animals of a group of animals, that has been milked in a milking session in the milking parlour 4, to leave the milking parlour 4 via the exit path 32 at the milking parlour 4. The sorting gate 34 has been opened in front of a sort animal 11 belonging to the elected subgroup such that the sort animal 11 will be directed into the separation area 36. A previously sorted animal 11' is already standing in the separation area 36 while waiting for being tended to. Once the animals of the elected subgroup have left one side of the milking parlour 4, the entrance gate 14 of that side is opened and a new group of animals to milked in the milking session are admitted into that side of the milking parlour 4 and its milking positions 6. Sort animals of the new group of animals will form part of at least one elected subgroup, which again is released separately from the rest of the animals of the new group of animals. Consequently, sorting of the sort animals from the new group is facilitate in the same manner as the sorting of the two sort animals 11, 11' of the previously milked group of animals.

In the following reference is made to **Figs. 1 – 3**.

- 30 The sorting gate 34 is configured for communicating with the control arrangement 26. In this manner, the sorting gate 34 can communicate to the control arrangement 26 that a particular sort animal 11, 11' has been sorted out. Accordingly, the control arrangement 26 can take action in relation to this information, such as release the rest of the group of animals or a second elected subgroup of animals from the milking parlour 4. Additionally, the sorting gate 34 can send a confirmation signal that one or more particular animal individuals of the rest of the animals of the group of animals have reached the sorting gate 34. The control

arrangement 26 can take action in relation to this information, such as release an elected subgroup of animals from the milking parlour 4.

According to embodiments, the control arrangement 26 is configured to:

- 5 - interrupt milking of at least one animal individual of the one or more elected subgroups of animals and/or of at least one animal individual of the rest of the animals in the group of animals. In this manner, throughput of animals in the milking arrangement can be promoted.

Under some conditions, interrupting milking of at least one animal individual of the one or
10 more elected subgroups of animals may provide for the one or more elected subgroups to be released prior to the rest of the animals of the group of animals without delaying the release of the rest of the animals of the group of animals, despite the rest of the animals of the group of animals being released separately from the one or more elected subgroups. Milking of the
15 animals of the rest of the animals can proceed to completion while the one or more elected subgroups exit the milking parlour, separately from the rest of the animals. Conversely, under some conditions, interrupting milking of at least one animal individual of the rest of the animals in the group of animals may provide for the rest of the animals to be released prior to the one or more elected subgroups. Milking of the one or more elected subgroups can
20 proceed to completion while the rest of the animals of the group of animals leave the milking parlour, separately from the one or more elected subgroups.

The control arrangement 26 is further configured to:

- automatically release the one or more elected subgroups of animals and the rest of the animals in the group of animals separately from the milking parlour 4 based on a ready
25 signal, the ready signal being triggered by an automatic post-treatment device 40, indicated in **Fig. 1**, more precisely an automatic teat spray unit for post-treatment of the teats. In this manner, finished milking of the animals is indicated by the ready signal.

Thus, an automatic post-treatment of the animals is provided when the group of animals
30 have finished milking, whereby the ready signal automatically releases them from the milking parlour 4. Put differently, only when the ready signal related to the one or more elected subgroups and/or to the rest of the animals of the group of animals has been received by the control arrangement 26, are they released separately from each other as discussed herein.

35 Alternatively, for instance, milking personnel can acknowledge for each subgroup of animals that they have been post-treated. Such an acknowledgement is signalled to the control

arrangement 26 as a ready signal for the relevant subgroup, which accordingly can be released separately or as part of the rest of the animals of the group of animals.

According to the shown embodiment, the control arrangement 26 is further configured to:

- 5 - open the entrance gate 14 when the group of animals has been released from the milking parlour 4. In this manner, the entrance gate is automatically opened, and a new group of animals can enter the milking parlour 4 for milking therein.

Thus, milking personnel, is not required to manually push buttons to operate the milking
10 parlour. An automatic operation and efficient throughput of cows is provided, which also improves the working conditions for the operator/milking personnel.

The control arrangement 26 is further configured to:

- 15 - receive one or more further sorting signals related to one or more further sort animals of the group of animals, wherein the one or more sort animals and the one or more further sort animals are located in milking positions related to different single elected subgroups of animals,
- release the one or more elected subgroups of animals, separately from the rest of the animals of the group of animals from the milking parlour, based on the one or more sorting
20 signals and the one or more further sorting signals. In this manner, a distinction is made between the one or more sort animals and the one or more further sort animals. This may be utilised e.g., for sorting out animals to different separation areas 36, 42.

For instance, as discussed above, the one or more sort animals are sorted to a separation
25 area 36 where they are to be examined and/or treated. The further one or more sort animals may have been flagged for a particular treatment, such as hoof trimming. Thus, these further sort animals can be sorted out to a further separation area 42, in which the hooves of the animals are trimmed.

30 A further sorting gate 44 is arranged at the exit path 32 and is configured to lead to the further separation area 42. Also, the further sorting gate 44 may comprise an animal identification system (not shown) such that the one or more further sort animals can be identified and directed into the further separation area 42.

35 According to embodiments, the one or more elected subgroups of animals include a first subgroup and a second subgroup, and wherein the control arrangement 26 is configured either to:

- release the first subgroup from the milking parlour 4, separately from the second subgroup, or to:

- release the first and second subgroups substantially simultaneously from the milking parlour 4. In this manner, different ways of releasing two elected subgroups from the milking parlour 4 are provided.

In a substantially simultaneous release the control arrangement 26 does not actively separate the releases of the first and second groups as it does in separated releases.

Fig. 4 illustrates a control arrangement 26 to be utilised in connection with the different aspects and/or embodiments of the invention. In particular, the control arrangement 26 is configured for the control of the milking arrangement 2 discussed in connection with **Figs. 1 - 3**, to which also references are made in the following. The control arrangement 26 is also indicated in **Fig. 1**.

The control arrangement 26 comprises at least one calculation unit 46, which may take the form of substantially any suitable type of processor circuit or microcomputer, e.g. a circuit for digital signal processing (digital signal processor, DSP), a Central Processing Unit (CPU), a processing unit, a processing circuit, a processor, an Application Specific Integrated Circuit (ASIC), a microprocessor, or other processing logic that may interpret and execute instructions. The herein utilised expression "calculation unit" may represent a processing circuitry comprising a plurality of processing circuits, such as, e.g., any, some or all of the ones mentioned above.

The control arrangement 26 comprises a memory unit 48. The calculation unit 46 is connected to the memory unit 48, which provides the calculation unit 46 with, e.g. stored programme code, data tables, and/or other stored data which the calculation unit 46 needs to enable it to do calculations and to control the ICE. The calculation unit 46 is also adapted to store partial or final results of calculations in the memory unit 48. The memory unit 48 may comprise a physical device utilised to store data or programs, i.e. sequences of instructions on a temporary or permanent basis. According to some embodiments, the memory unit 48 may comprise integrated circuits comprising silicon-based transistors. The memory unit 48 may comprise e.g. a memory card, a flash memory, a USB memory, a hard disc, or another similar volatile or non-volatile storage unit for storing data such as e.g. ROM (Read-Only Memory), PROM (Programmable Read-Only Memory), EPROM (Erasable PROM), EEPROM (Electrically Erasable PROM), etc. in different embodiments.

The control arrangement 26 is further provided with respective devices 50, 52, 54, 56, 58, 60, 62 for receiving and/or sending input and output signals. These input and output signals may comprise waveforms, pulses or other attributes, which can be detected as information by signal receiving devices, and which can be converted to signals processable by the calculation unit 46. Input signals are supplied to the calculation unit 46 from the input receiving devices 50, 52, 54, 56, 62. Output signal sending devices 54, 58, 60, 62 are arranged to convert calculation results from the calculation unit 46 to output signals for conveying to signal receiving devices of other parts of the control arrangement 26 or the milking arrangement 2. Each of the connections to the respective devices for receiving and sending input and output signals may take the form of one or more from among a cable, a data bus, e.g. a CAN (controller area network) bus, a MOST (media orientated systems transport) bus or some other bus configuration, or a wireless connection. In the embodiment depicted, only one calculation unit 46 and memory 48 are shown, but the control arrangement 26 may alternatively comprise more than one calculation unit and/or memory.

Mentioned as examples, the output signal sending devices 58, 60, 62 may send signals to the entrance gate(s) 14, the exit gate mechanism 18, the milking implements 8, the automatic post-treatment devices 40, and the sorting gate 34. The input signal receiving devices 50, 52, 54, 56, 62 may receive signals from the animal identification system 16, the herd management system 28, the one or more input units 30, the sorting gate 34, and the automatic post-treatment device 40.

The control arrangement 26 is connected to various actuators for performing various aspects discussed herein. Such actuators may be an actuator of the entrance gate 14 and the drive device 24 of each gate section 18' of the exit gate mechanism 18.

The control arrangement 26 is configured to perform a method 100 according to any one of aspects and/or embodiments discussed herein, see below with reference to **Fig. 5**.

Fig. 5 illustrates a method 100 for facilitating a sorting of one or more sort animals from a group of animals in a milking arrangement. The milking arrangement is a milking arrangement 2 comprising a control arrangement 26 as discussed above in connection with **Figs. 1 – 4**. Accordingly, in the following reference is also made to **Figs. 1 – 4** and the discussion related thereto. Specifically, at least some of the different above-discussed embodiments and configurations of the control arrangement 26 are reflected in the different steps of the method 100.

Accordingly, the milking arrangement 2 comprises a milking parlour 4, a number of milking positions 6 arranged in the milking parlour 4, an entrance gate 14 for the group of animals to enter the milking parlour 4 and to access the milking positions 6, an animal identification system 16, a milking implement 8 at each milking position 6, an exit gate mechanism 18
5 configured to individually release single subgroups of the group of animals from the milking parlour 4.

The method 100 comprises steps of:

- milking 102 the group of animals in the milking parlour 4,
- 10 - receiving 104 one or more sorting signals related to one or more sort animals of the group of animals,
- releasing 106 one or more elected subgroups of animals from the milking parlour 4, separately from the rest of the animals of the group of animals, wherein the one or more elected subgroups of animals include the one or more sort animals.

15

The step of receiving 104 one or more sorting signals can be performed before and/or during the step of milking 102 the group of animals.

According to an embodiment, the method 100 comprises a step of:

- 20 - releasing 106 the one or more elected subgroups of animals from the milking parlour 4 before and/or after the step of releasing 108 the rest of the animals from the milking parlour 4.

According to a further embodiment, a pause separates the step of releasing 106 the one or
25 more elected subgroups of animals from the milking parlour and the step of releasing 108 the rest of the animals from the milking parlour 4.

According to embodiments, a duration of the pause is associated with expiry of a predetermined time period, or with awaiting a signal that indicates successful sorting of at
30 least one of the one or more sort animals, or with the one or more elected subgroups of animals having passed a specific point in an exit path 32 from the milking parlour 4, or with a precedingly released animal individual of the rest of the animals having passed a specific point in an exit path 32 from the milking parlour 4.

35 According to embodiments, the step of receiving 104 the one or more sorting signals related to one or more sort animals of the group of animals comprises a step of:

- receiving 110 the one or more sorting signals from one or more of: a herd management system 28, an operator actuating in an input unit 30, a milk sensor of the milking implement 8 at each milking position 6, and/or an animal monitoring system.

- 5 According to embodiments, each subgroup of animals includes 1 – 5 animal individuals.

According to embodiments, wherein the milking arrangement 2 comprises a sorting gate 34 configured to sort out one or more sort animals in an exit path 32 from the milking parlour 4, the method 100 comprises at least one of the steps:

- 10 - sending 112 a confirmation signal related to a sorting of the one or more sort animals, and/or
- sending 114 a passage signal related to all animal individuals of one subgroup of animals having passed the sorting gate. In this manner, the sorting gate 34 can notify the control arrangement 26 of when the one or more sort animals or all animal individuals of one
- 15 subgroup have been, or are, handled at the sorting gate 26. Thus, one of the steps of releasing 108 the rest of the animals from the milking parlour 4 and releasing 106 one or more elected subgroups of animals from the milking parlour 4, can be performed.

- For instance, the step of sending 114 the passage signal related to all animal individuals of
- 20 one subgroup of animals having passed the sorting gate 34, is performed when none, one, or more animal individuals have been sorted out by the sorting gate 34 and any remaining animal individuals of the relevant subgroup have continued along the exit path 32 past the sorting gate 34.

- 25 According to embodiments, the method 100 comprises a step of:
- interrupting 116 milking of at least one animal individual of the one or more elected subgroups of animals and/or of at least one animal individual of the rest of the animals in the group of animals.

- 30 According to embodiments, the method 100 comprises a step of:
- automatically releasing 118 the one or more elected subgroups of animals and the rest of the animals in the group of animals separately from the milking parlour 4 based on a ready signal, wherein
- the ready signal is triggered by an automatic post-treatment device 40, such as an automatic
- 35 teat spray unit, configured for use on animal individuals.

According to embodiments, the method 100 comprises a step of:

- opening 120 the entrance gate 14 when the entire group of animals has been released from the milking parlour 4.

According to embodiments, the method 100 comprises steps of:

- 5 - receiving 122 one or more further sorting signals related to one or more further sort animals of the group of animals, wherein the one or more sort animals and the one or more further sort animals are located in milking positions 6 related to different single elected subgroups of animals,
- 10 - releasing 124 the one or more elected subgroups of animals, separately from the rest of the animals from the group of animals from the milking parlour 4, based on the one or more sorting signals and the one or more further sorting signals.

According to embodiments, wherein the one or more elected subgroups of animals include a first subgroup and a second subgroup, and wherein the step of releasing 106 the one or

15 more elected subgroups of animals from the milking parlour comprises either a step of:

- 15 - releasing 126 the first subgroup from the milking parlour 4, separately from the second subgroup,
- or a step of:
- 20 - releasing 128 the first and second subgroups substantially simultaneously from the milking parlour 4.

According to a further aspect of the invention, there is provided a computer program comprising instructions which, when the program is executed by a computer, causes the computer to carry out a method 100 according to any one of aspects and/or embodiments

25 discussed herein.

The computer could be comprised in the above discussed control arrangement 26.

One skilled in the art will appreciate that the method 100 for facilitating a sorting of one or

30 more sort animals from a group of animals in a milking arrangement can be implemented by programmed instructions. These programmed instructions are typically constituted by a computer program, which, when it is executed in a computer or control arrangement 26, ensures that the computer or control arrangement 26 carries out the desired control, such as the method steps 102 – 128 according to the invention. The computer program is usually part

35 of a computer-readable storage medium which comprises a suitable digital storage medium on which the computer program is stored.

Fig. 6 illustrates embodiments of a computer-readable storage medium 99 comprising instructions which, when executed by a computer or control arrangement 26, cause the computer or control arrangement 26 to carry out the steps of the method 100 according to any one of aspects and/or embodiments discussed herein.

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The computer-readable storage medium 99 may be provided for instance in the form of a data carrier carrying computer program code for performing at least some of the steps 102 – 128 according to some embodiments when being loaded into the one or more calculation units 46. The data carrier may be, e.g. a ROM (read-only memory), a PROM (programmable read-only memory), an EPROM (erasable PROM), a flash memory, an EEPROM (electrically
10 read-only memory), a hard disc, a CD ROM disc, a memory stick, an optical storage device, a magnetic storage device or any other appropriate medium such as a disk or tape that may hold machine readable data in a non-transitory manner. The computer-readable storage medium may furthermore be provided as computer program code on a server and may be
15 downloaded to the calculation unit 46 remotely, e.g., over an Internet or an intranet connection, or via other wired or wireless communication systems.

The computer-readable storage medium 99 shown in **Fig. 6** is a nonlimiting example in the form of a USB memory stick.

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CLAIMS

1. A milking arrangement (2) for milking a group of animals, the milking arrangement (2) comprising:

- a milking parlour (4),
- a number of milking positions (6) arranged in the milking parlour (4),
- an entrance gate (14) for the group of animals to enter the milking parlour (4) and to access the milking positions (6),
- an animal identification system (16) to identify each animal that accesses each milking position (6),
- a milking implement (8) at each milking position (6),
- an exit gate mechanism (18) configured to individually release single subgroups of animals from the milking positions (6) in the milking parlour (4), and
- a control arrangement (26), **characterised in that**
the control arrangement (26), in relation to a milking session of the group of animals in the milking parlour (4), is configured to:
 - receive one or more sorting signals related to one or more sort animals of the group of animals,
 - release one or more elected subgroups of animals from the milking parlour (4), separately from the rest of the animals of the group of animals, wherein the one or more elected subgroups of animals include the one or more sort animals.

2. The milking arrangement (2) according to claim 1, wherein the control arrangement (26) is further configured to:

- release the one or more elected subgroups of animals from the milking parlour (4) before and/or after the release the rest of the animals from the milking parlour (4).

3. The milking arrangement (2) according to claim 1 or 2, wherein a pause separates the releases in order to enable an evacuation of the one or more elected subgroups of animals from the milking parlour (4), separately from the rest of the animals of the group of animals.

4. The milking arrangement (2) according to claim 3, wherein a duration of the pause is associated with expiry of a predetermined time period, or with awaiting a signal that indicates successful sorting of at least one of the one or more sort animals, or with the one or more elected subgroups of animals having passed a specific point in an exit path (32) from the milking parlour (4), or with a precedingly released animal individual of the rest of the animals having passed a specific point in an exit path (32) from the milking parlour (4).

5. The milking arrangement (2) according to any one of the preceding claims, wherein the control arrangement (26) is further configured to:

- receive the one or more sorting signals related to the one or more sort animals from one or more of: a herd management system (28), an operator actuating in an input unit (30), a milk sensor of the milking implement (8) at each milking position (6), an animal monitoring system and/or an animal identification system.

6. The milking arrangement (2) according to any one of the preceding claims, wherein the animal identification system (16) is RFID-based, vision-based, and/or RTLS-based.

7. The milking arrangement (2) according to any one of the preceding claims, wherein the animal identification system (16) comprises at least one RFID-reader and/or at least one camera arranged at the entrance gate (14) and/or at the milking positions (6).

8. The milking arrangement (2) according to any one of the preceding claims, wherein at least one of the one or more sort animals lacks an animal identification tag as indicated by the animal identification system (16) and/or by an operator.

9. The milking arrangement (2) according to any one of the preceding claims, wherein each subgroup of animals includes 1 – 5 animal individuals.

10. The milking arrangement (2) according to any one of the preceding claims, comprising a sorting gate (34) arranged at an exit path (32) from the milking parlour (4), wherein the sorting gate (34) is configured to sort out the one or more sort animals.

11. The milking arrangement (2) according to claim 10, wherein the sorting gate (34) is configured for communicating with the control arrangement (26).

12. The milking arrangement (2) according to any one of the preceding claims, wherein the control arrangement (26) is further configured to:

- interrupt milking of at least one animal individual of the one or more elected subgroups of animals and/or of at least one animal individual of the rest of the animals in the group of animals.

13. The milking arrangement (2) according to any one of the preceding claims, wherein the control arrangement (26) is further configured to:

- automatically release the one or more elected subgroups of animals and the rest of the animals in the group of animals separately from the milking parlour (4) based on a ready signal, the ready signal being triggered by an automatic post-treatment device (40), such as an automatic teat spray unit, configured for use on the animal individuals.

14. The milking arrangement (2) according to any one of the preceding claims, wherein the control arrangement (26) is further configured to:

- open the entrance gate (14) when the entire group of animals has been released from the milking parlour (4).

15. The milking arrangement (2) according to any one of the preceding claims, wherein the control arrangement (26) is further configured to:

- receive one or more further sorting signals related to one or more further sort animals of the group of animals, wherein the one or more sort animals and the one or more further sort animals are located in milking positions (6) related to different single elected subgroups of animals,

- release the one or more elected subgroups of animals, separately from the rest of the animals from the group of animals from the milking parlour (4), based on the one or more sorting signals and the one or more further sorting signals.

16. The milking arrangement (2) according to any one of the preceding claims, wherein the one or more elected subgroups of animals include a first subgroup and a second subgroup, and wherein the control arrangement (26) is configured either to:

- release the first subgroup from the milking parlour (4), separately from the second subgroup,

or to:

- release the first and second subgroups substantially simultaneously from the milking parlour (4).

17. A method for facilitating a sorting of one or more sort animals from a group of animals in a milking arrangement (2), the milking arrangement (2) comprising

a milking parlour (4),

a number of milking positions (6) arranged in the milking parlour (4),

an entrance gate (14) for the group of animals to enter the milking parlour (4)

and to access the milking positions (6),

an animal identification system (16),

a milking implement (8) at each milking position (6),

an exit gate mechanism (18 configured to individually release single subgroups of the group of animals from the milking parlour (4), wherein

the method (100) comprises steps of:

- milking (102) the group of animals in the milking parlour (4),
- receiving (104) one or more sorting signals related to one or more sort

animals of the group of animals,

- releasing (106) one or more elected subgroups of animals from the milking parlour (4), separately from the rest of the animals of the group of animals, wherein the one or more elected subgroups of animals include the one or more sort animals.

18. The method (100) according to claim 17, comprising a step of:

- releasing (108) the one or more elected subgroups of animals from the milking parlour (4) before and/or after the step of releasing (106) the rest of the animals from the milking parlour (4).

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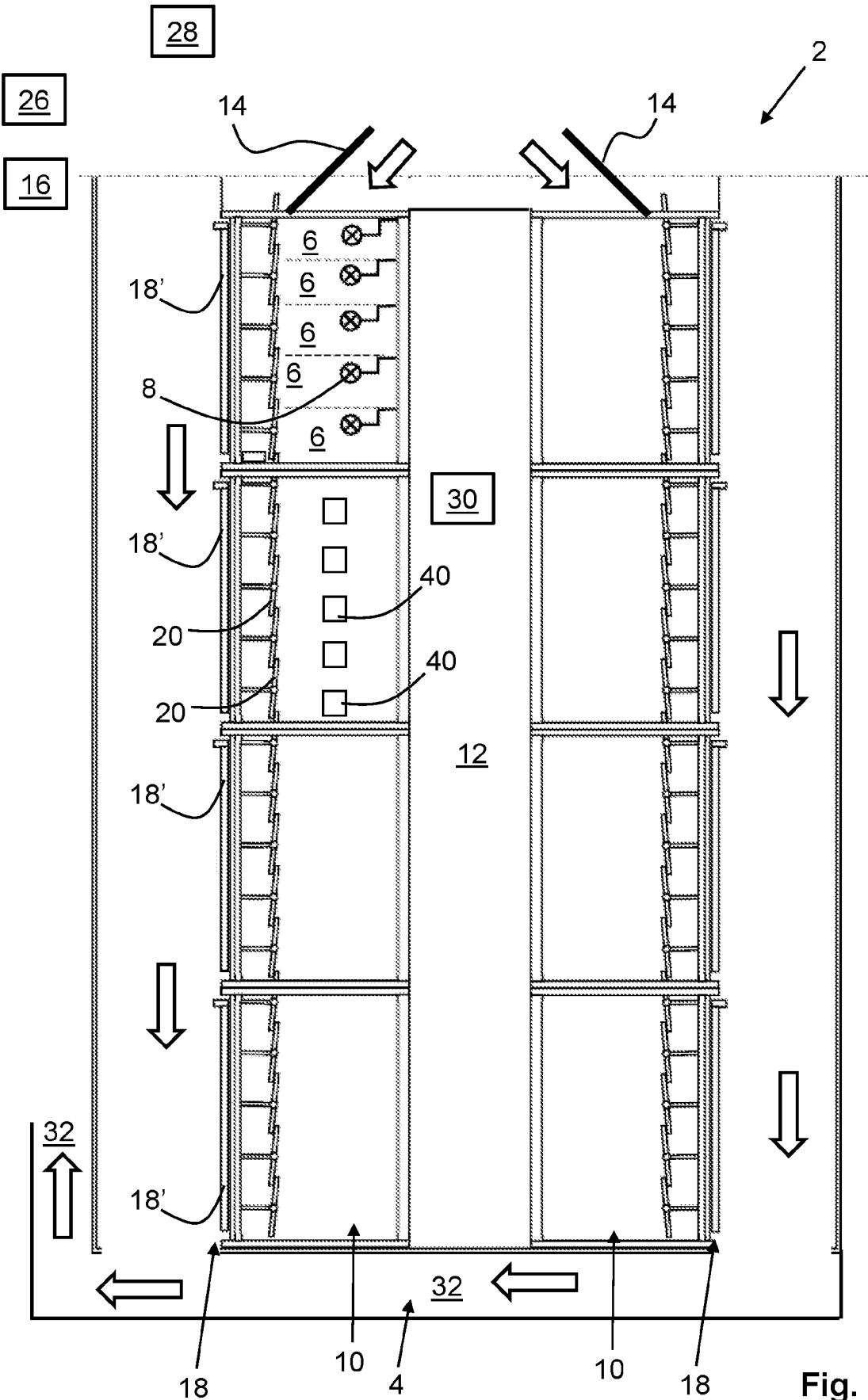
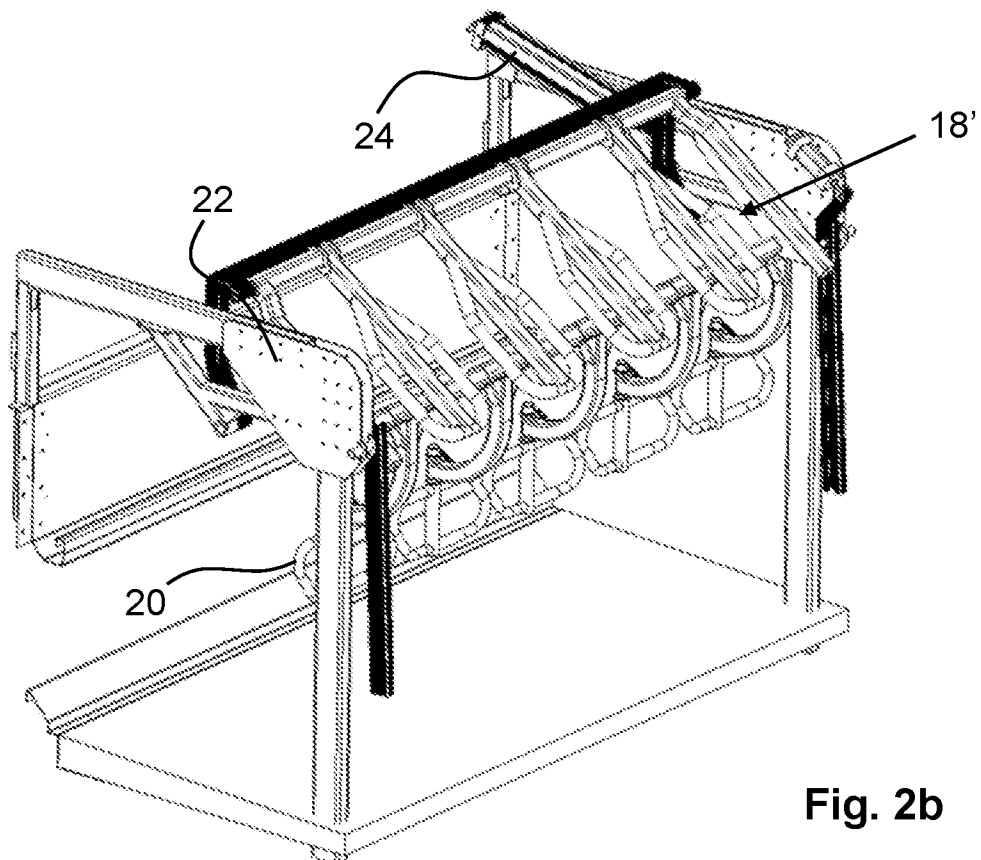
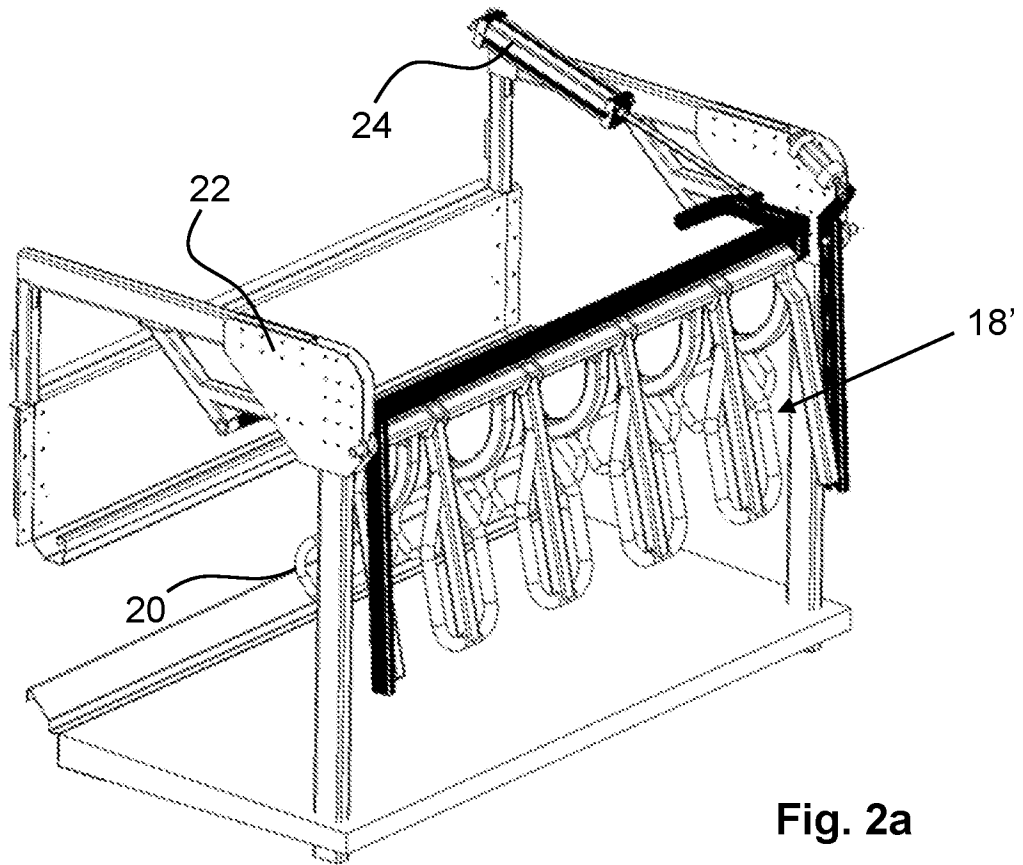


Fig. 1

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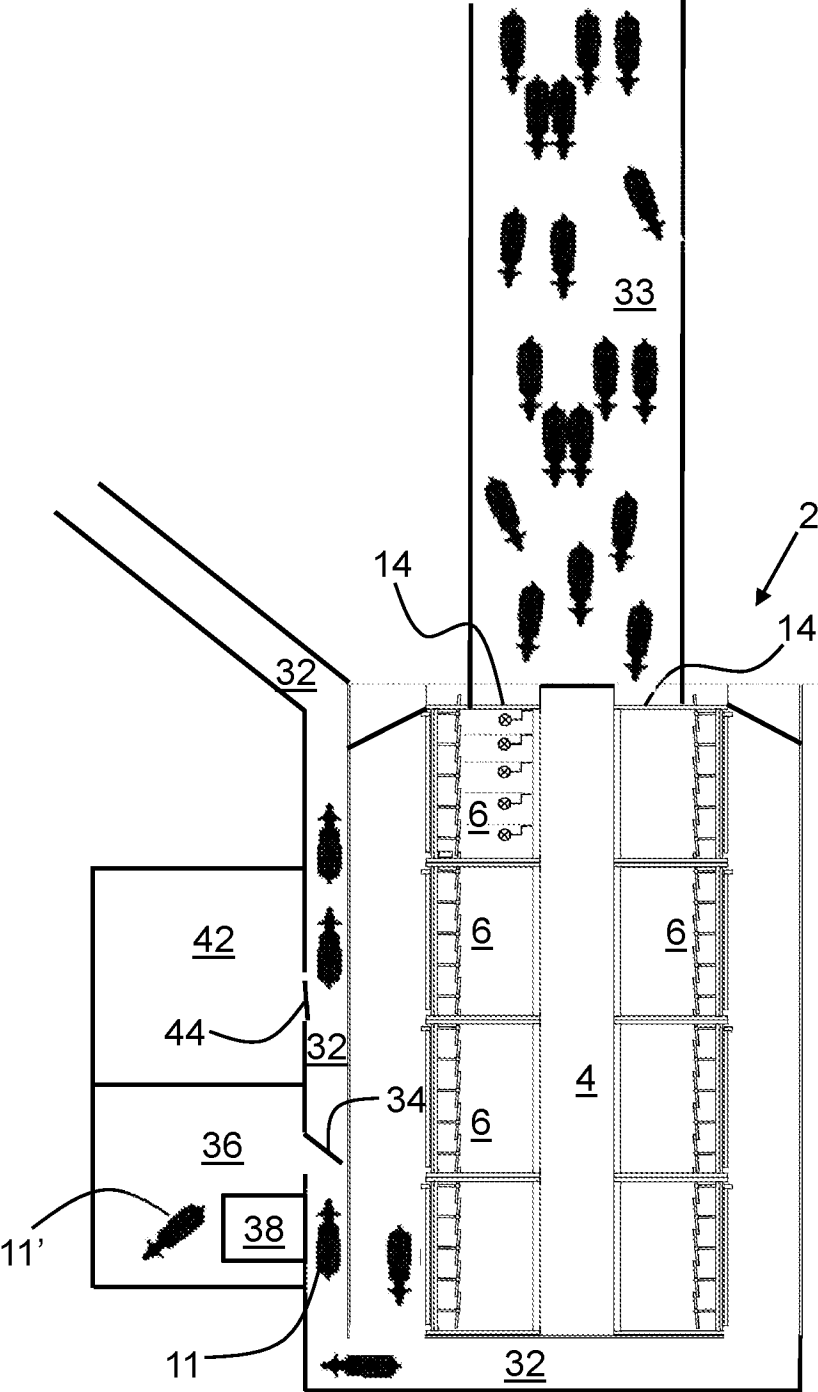


Fig. 3

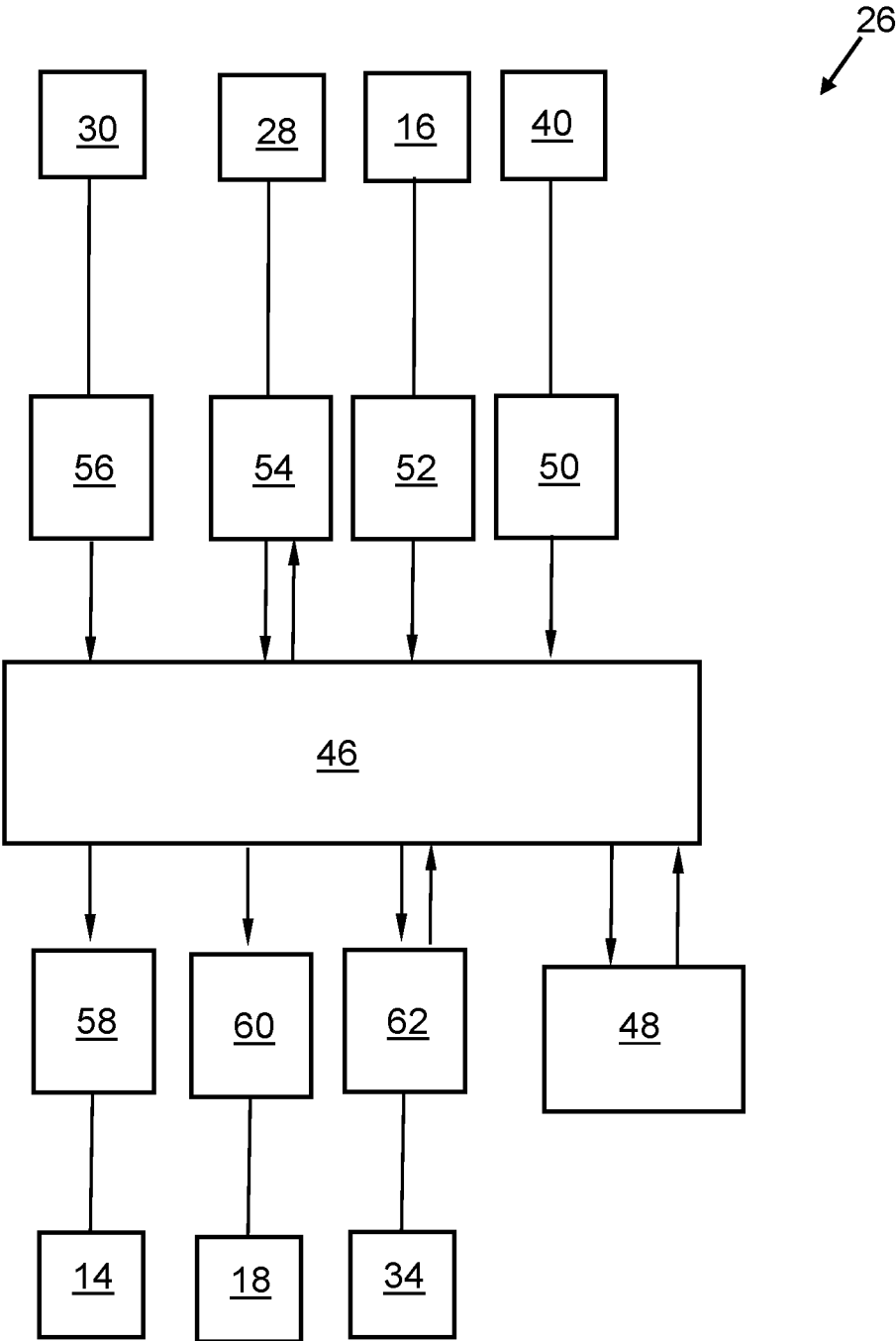


Fig. 4

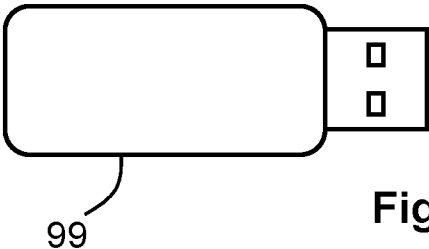


Fig. 6

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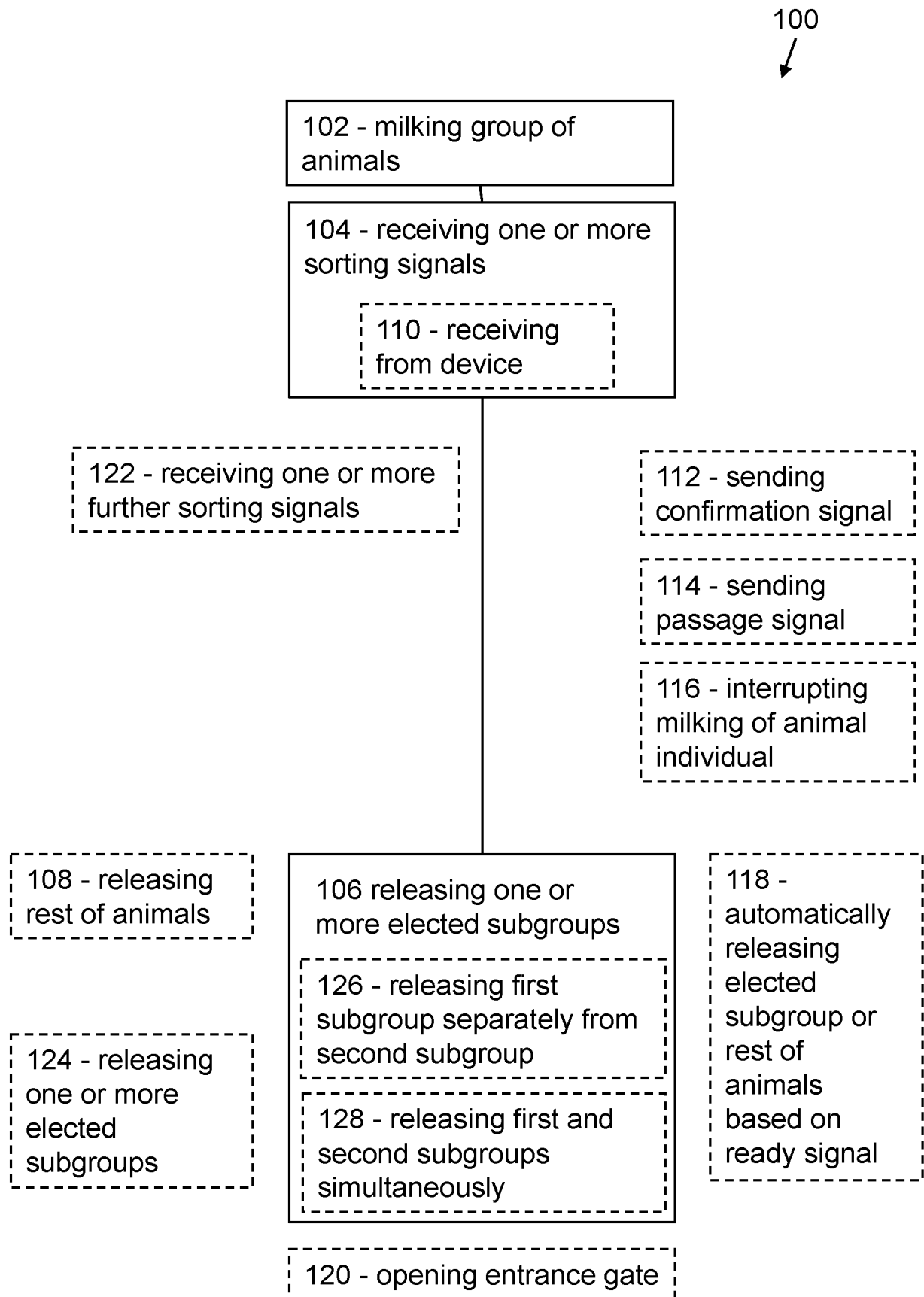


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/SE2024/051038

A. CLASSIFICATION OF SUBJECT MATTER INV. A01K1/12 A01K1/00 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		
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		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2023/113687 A1 (DELAVAL HOLDING AB [SE]) 22 June 2023 (2023-06-22)	1-7,9-18
Y	page 10 - page 22; figures 1-5 -----	8
Y	US 2012/006269 A1 (MCCAIN JAMES F [US] ET AL) 12 January 2012 (2012-01-12)	8
A	paragraph [0035] - paragraph [0041] -----	1-7,9-18
A	WO 2008/003341 A1 (DELAVAL HOLDING AB [SE]; BIRK UZI [SE]; DANNEKER GERT [SE]) 10 January 2008 (2008-01-10) page 5 - page 7; figure 1 -----	1-18
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 12 February 2025		Date of mailing of the international search report 20/02/2025
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Moeremans, Benoit

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/SE2024/051038

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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WO 2008003341 A1	10-01-2008	NONE	