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(54) Title: MILKING INSTALLATION

(57) Abstract: A milking installation includes a rotary platform (9) for transporting animals to fully automated milking stalls (10), the animals being allowed to board the rotating platform at a loading zone (12) and to disembark the platform (9) at an available milking stall (10) under the control of gates (17) located around the platform.

Milking Installation

This invention is concerned with an installation for milking animals, especially but not necessarily exclusively cows.

Traditionally cows are milked in milking parlours housing several milking stalls and associated milking equipment. The cows are admitted into the parlour in batches and occupy respective stalls during milking. The stalls are usually stationary although there are also known rotary or carousel milking installations in which the stalls are located on a platform which is rotated continuously so that cows can enter respective stalls at an entrance location and be milked whilst being conveyed around on the platform to an exit location where the milked cows can leave the rotating platform.

In recent years fully automatic robotic milking systems have been developed wherein cows can, at their own volition, enter a milking stall where they can be supplied some feed stuff and can be milked without any direct human supervision of the milking process. A sensor means arranged on a robot arm is used to detect the positions of the teats of the animals and to control the robot arm to apply the teat cups to the teats. These robotic milking systems can be very efficient. However, it has been found that cow behaviour, e.g. due to the herd hierarchy and pecking order, and the time taken for cows to reach or to be brought to the vicinity of the milking stall can sometimes interfere with the efficient operation of the milking installation and reduce its capacity in terms of the number of milkings achieved per day.

Described in US 4889074 is a mobile milking unit including two milking stalls positioned in longitudinal alignment and each having entry and exit gates. A robot arm for attaching the teat cups is movable between the two stalls. Cows to be milked approach the container, in which the milking stalls are housed, along a ramp. A recognition device is provided for recognising the cows by means of

transponders worn by the cows and a turntable is provided in front of the doorway into the container. Cows are allowed onto the turntable one at a time and are allowed to cross over the turntable, in order to proceed into the container, only if it is determined that the recognised cow should be milked. Otherwise, by operation of the turntable, the recognised cow is directed away from the milking unit or possibly into a sorting enclosure if that is determined appropriate. An intermediate area or space is defined directly inside the container entrance and via this space a cow having gained admission for milking can proceed to one of the milking stalls, if or when it is vacant. In this arrangement the turntable provides a means for sorting cows in condition to be milked from other cows, but it offers nothing to alleviate the problem of improving the access and flow of cows to be milked to a milking stall as referred to above.

In accordance with the present invention there is provided an installation for milking animals comprising at least one stationary milking area for accommodating an individual animal during milking and having an entrance for admitting an animal into the area, characterised in that a conveying means is provided for transporting animals to be milked along a path to the milking area entrance.

The provision of conveying means to transport animals to a milking area ensures efficient arrival of animals at the milking area and can eliminate, or at least alleviate, problems that tend to arise when queques of animals awaiting milking can form. With the conveying means arranged to transport the animals directly to the entrance of a milking area, in particular a milking stall, any area or waiting space immediately in front of the milking area can be eliminated so that conflicts between animals waiting in such a location will be avoided.

In a preferred embodiment, to increase the milking capacity of the installation, a plurality of milking areas are provided with their entrances positioned along the conveying path. The same conveyor means can then serve to transport animals to

several milking areas allowing each animal to enter the first available milking area along the conveying path. The or each milking area preferably comprises a milking stall with entry and exit gates and an associated milking robot for automatic attachment of teat cups to the teats of an animal accommodated in the stall. Conveniently the milking stalls are organised in pairs, with the stalls of each pair positioned in parallel and alongside each other, and arranged to share a common robot arm for attaching teat cups to the teats of animals accommodated in the respective stalls.

In a preferred milking installation the or each of the milking areas is arranged for an animal to enter and leave the area in a direction transverse to, in particular substantially perpendicular to, the direction of conveying path at the entrance to the milking area.

Ideally the conveying means is capable of transporting animals around a substantially closed path. This has the advantage that the transportation need not be interrupted even if there is no milking area available for an animal to enter. Furthermore, in the case of a fully automatic voluntary milking system, an animal can be immediately transported away from the milking area if it is determined, upon identification of the animal, that it is not ready to be milked.

Conveniently the conveying path extends along an arcuate route and the or each milking area is located radially outwardly of the arcuate path. For example, the conveying means may comprise a rotary conveyor defining a substantially circular conveying path. However other conveyor configurations are also possible, such as a conveyor with one or more straight sections extending past one or more milking areas.

A rotary platform can be used as a rotary conveyor and provides an economic conveyor construction. So as to ensure an orderly conveyance of animals to the milking area or areas, the conveyor means is preferably arranged to carry the

animals in a single file, i.e. with the animals lined up one behind the other, along the conveying path. For this purpose fences or guide rails can be disposed around the rotary platform to constrain the animals during their conveyance around the conveying path. Thus, a stationary guide rail can extend adjacent the periphery of the rotary platform. The stationary guide rail can include gates positioned opposite the entrances of the milking areas, and a gate control means can be provided for automatic control of the gates, particularly for opening a gate when the corresponding milking area is vacant and closing the gate when the milking area is occupied or otherwise not available to receive an animal for milking, e.g. because the milking equipment at the milking area is undergoing a routine cleaning programme or maintenance. The stationary guide rail can be interrupted around a minor part of the rotary platform periphery in order to provide a loading zone for animals to board the rotary platform. A substantially continuous inner guide rail can be mounted on the rotary platform and be positioned spaced at a distance inwardly from the periphery of the rotary platform. A continuous peripheral area extends around the rotary platform to receive animals thereon although in an alternative construction compartments can be formed around the platform to receive respective animals.

The conveying means is preferably arranged to be driven continuously by a conveyor drive means, although an intermittent or indexing drive is also a possibility.

In accordance with another aspect the invention provides a method of controlling movement of animals awaiting milking in a stationary milking stall, characterised in that the animals are conveyed to the milking stall entrance on a conveyor.

A better understanding of the invention and its preferred features will be gained from the following detailed description wherein reference is made to the accompanying drawing in which the single figure shows a plan view of a milking installation constructed in accordance with the invention.

The exemplary embodiment of the invention illustrated in the drawing comprises a building structure 1 partitioned internally to form an office accommodation 2 housing, for example, a computer for control of the milking equipment and other herd management functions, a milk room 3 accommodating ancillary equipment such as the milk tank 4 and cleaning apparatus for the milking system, and a machine room 5, e.g. for an air compressor, vacuum pump and other related machinery. Within the building structure 1 there is also a milking space 6 in which there are installed a rotary platform 9 mounted to be driven continuously, in the clockwise direction in the arrangement as shown, and a series of automatic robotic milking stalls 10, each constituting a respective milking area, disposed around one side of the rotary platform 10. In the specifically illustrated embodiment there are eight milking stalls arranged in four pairs, the milking stalls of each pair being positioned substantially parallel to each other and laterally adjacent to permit a single robot arm to be operable for attaching teat cups to the teats of animals accommodated in the respective stalls. The eight milking stalls 10 are located around approximately one half of the peripheral extent of the rotary platform 9, and at the other side of the rotary platform 9 there is a holding compound or area 11 for cows. Partitions 13, 14 extend from the opposite sides of the holding area and converge to the periphery of the rotary platform to define a loading zone 12 at which cows are free to board the rotary platform 9 which provides a conveying means for transporting the cows along a conveying path to the milking stalls. An inner fence or guide rail 15 is mounted on the platform 9 and is spaced at a fixed distance from the periphery of the rotary platform to leave a space at the edge of the platform where the cows can stand.

A stationary fence or guide rail 16 extends around the periphery of the rotary platform between the particulars 13, 14. It will be appreciated that the inner and outer guide rail 15, 16 confine between them a lane or passage in which cows can be conveyed along a circular conveyor path in single file.

The milking stalls 10 are positioned to extend substantially radially to the rotary platform 9, and hence substantially perpendicular to the direction of the conveyor path adjacent the entrance of the respective milking stall. The stationary guide rail 16 includes gates 17 positioned opposite the respective milking stall entrances, which gates are remotely controlled to be opened when the corresponding milking stall is vacant and available for milking an animal, and to be closed when the milking stall is occupied by another animal or otherwise unavailable for milking an animal. The milking stalls have individual entry and exit gates 18, 19 to control admission and departure of animals to and from the stalls. In the situation depicted in the drawing, milking stalls 10a, 10b, 10e and 10g are occupied by cows undergoing a milking procedure and the entry and exit gates 18, 19 of each of these stalls are closed. The milking stalls 10b, 10f and 10h are shown unoccupied with their exit gates 19 closed and their entry gates 18 open ready to admit a respective cow having been transported to the entrance to the milking stall on the rotary platform 9 and having been allowed to disembark from the rotating platform at the milking stall entrance by the gate 17 in the stationary guide rail having been opened. As soon as a cow passes through the gates 17 and 18 they will be closed behind her. Milking stall 10d is shown with its exit gate 19 open to allow a cow whose milking has been completed to depart, but the entry gate 18 remains closed until the cow has departed and the exit gate has been closed again.

In operation of the milking installation the rotary platform 9 is continuously rotated by an appropriate drive mechanism. The cows are free to board the rotating platform 9 at the loading zone 12 by walking onto the platform and taking up a position in single line file with other cows on the platform. The platform 9 transports the cows around the conveyer path and a cow can disembark at the first open gate 17 to enter the milking stall 10 associated with that gate. It will be understood that the rotating platform 9 ensures orderly arrival of animals to be milked at the milking stalls and there is no build up of static queques of animals at the milking stall entrances. Even if all the stalls are occupied and unavailable since the platform continues to transport the cows around the closed conveyor

path. Furthermore, efficient transportation of cows to available milking stalls is ensured. The cows enter and leave the respective stalls 10 in a direction away from the conveyor path. Milked cows can walk around the array of milking stalls 10 to the leave the milking space 6 within the building structure 1 through one or more sorting gates 20 operable to separate cows according to particular requirements, such as into sort areas 22, 23 where drinking and feeding troughs can be located. An alleyway 24 leads the cows back to the holding area 11. The milking of the animals may be entirely on a voluntary basis, it being left to the cows to decide when to board the rotary platform conveyor 9 for transportation to an available milking stall 10. If batchwise milking is preferred a movable barrier 25 may extend across the holding area 11 and be advanced slowly towards the boarding zone 12 to ensure all cows in the group of cows are milked before any repeat milkings can take place. The barrier 25 separates recently milked cows from cows due to be milked.

In the embodiment as specifically described above the rotary platform 9 serves only the function of transporting animals to the milking stalls as a result of which a simple and economic platform structure can be used. However, if desired, washing devices for washing the teats of the cows may be provided either on or adjacent to the platform 9 so that the washing of the teats within the milking stalls is obviated and the efficiency of use of the milking stalls 10 can be further enhanced. Other modifications to the described embodiments are also possible without deporting from the scope of the invention and will occur to skilled readers.

Claims:

1. An installation for milking animals comprising at least one stationary milking area (10) for accommodating an individual animal during milking and having an entrance for admitting an animal into the area, characterised in that a conveying means (9) is provided for transporting animals to be milked along a path to the milking area entrance.

2. An installation according to claim 1 wherein a plurality of milking areas (10) are provided with the entrances thereto positioned along the conveying path.

3. An installation according to claim 1 or 2, wherein the or each milking area comprises a milking stall (10) with entry and exit gates (18, 19) and an associated milking robot for automatic attachment of teat cups to the teats of an animal accommodated in the stall.

4. An installation according to claim 3, wherein at least one pair of milking stalls (10) is located along the conveying path, and the two stalls in each pair of stalls share a common robot arm for attaching teat cups to the teats of animals accommodated in the respective stalls.

5. An installation according to any one of claims 1 to 4, wherein the or each milking area is arranged for an animal to enter and leave the area in a direction transverse to the conveying path at the entrance to the milking area.

6. An installation according to claim 5, wherein the or each milking area is arranged for an animal to enter and leave the area in a direction substantially perpendicular to the conveying path at the entrance to the milking area.

7. An installation according to any one of claims 1 to 6, wherein the conveying path extends along an arc and the or each milking area (10) is positioned radially outwardly of the arc.

8. An installation according to any one of the preceding claims wherein the conveying means comprises a rotary conveyor (9) defining a substantially circular conveying path.

9. An installation according to claim 8, wherein the rotary conveyor comprises a rotary platform (9).

10. An installation according to any one of claims 1 to 9, wherein the conveyor means is arranged to carry the animals in single file along the conveying path.

11. An installation according to claim 9, wherein guide rails (15, 16) are disposed to constrain animals to stand in single file around the rotary platform (9) during conveyance around the conveying path.

12. An installation according to claim 11, wherein a stationary guide rail (16) extends adjacent the periphery of the rotary platform (9).

13. An installation according to claim 12, wherein the stationary guide rail (16) includes at least one gate (17) positioned opposite the entrance to the or each milking area.

14. An installation according to claim 13, wherein a gate control means is provided for opening the gate (17) when the milking area (10) is vacant and closing the gate (17) when the milking area is occupied or otherwise not available to receive an animal for milking.

15. An installation according to claim 12, 13 or 14, wherein the stationary guide rail (16) is interrupted around a minor part of the periphery of the rotary platform (9) to define a loading area (12) for animals to board the rotary platform.

16. An installation according to any one of claims 11 to 15, wherein a substantially continuous inner guide rail (15) extends around the rotary platform (9) at a position spaced inwardly from the periphery of the rotary platform.

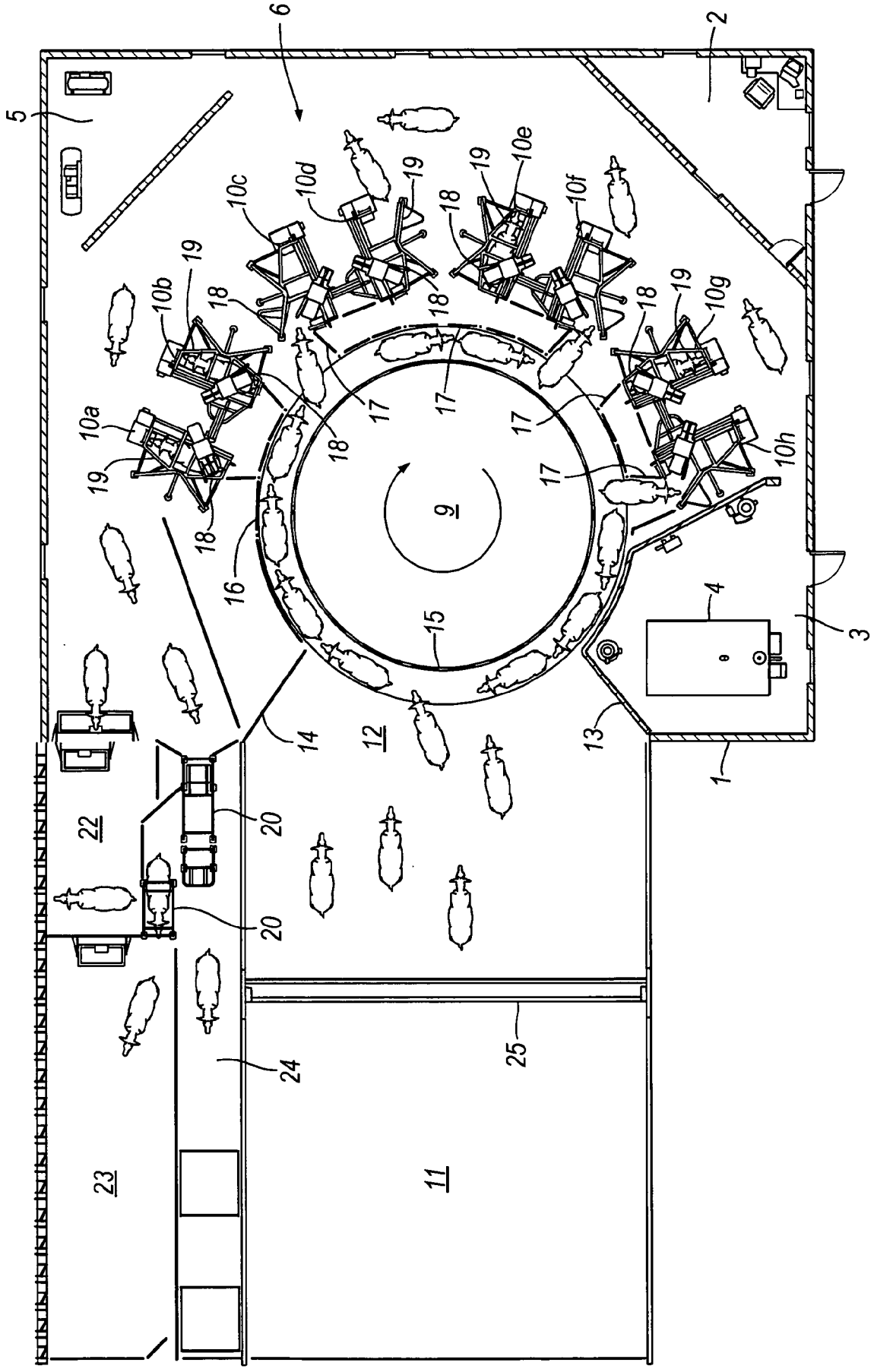
17. An installation according to any one of the preceding claims including a conveyor drive means for driving the conveyor means continuously.

18. An installation according to any one of claims 1 to 8, wherein the conveying means is capable of conveying animals around a closed path.

19. An installation according to any one of claims 1 to 18, wherein a teat washing device is provided for washing the teats of an animal as it is conveyed by the conveyor means (9).

20. A method of controlling movement of animals awaiting milking in a stationary milking stall, characterised in that the animals are conveyed to the milking stall entrance on a conveyor.

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2006/006617

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01K1/12

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 practical, 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.
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A	US 5 483 921 A (WAYBRIGHT BERT J [US]) 16 January 1996 (1996-01-16) column 5, line 9 - column 7, line 23; figure 1	1-20

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 323 033 A (VOSYKA JOSEF ET AL) 6 April 1982 (1982-04-06) column 6, line 7 - column 8, line 18; figures 1-12	1-20
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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