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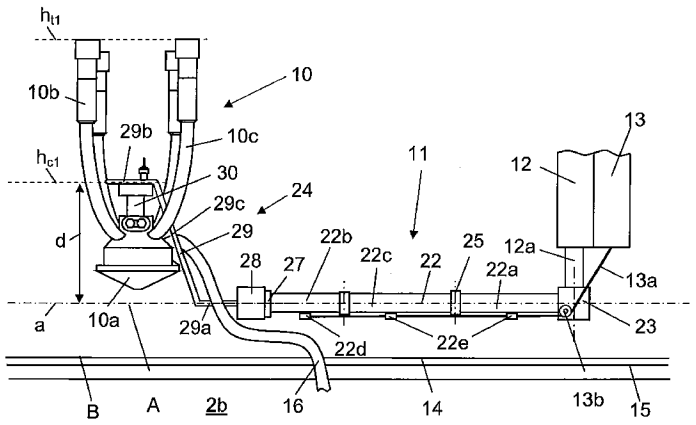

Fig 3

(57) Abstract: The invention relates to a support arm device for a milking member (10) in a milking parlour. The support arm device (11) comprises an arm mechanism (22) having an extension between a first end (22a) and a second end (22b). A first joint mechanism forms (23) a connection between the first end (22a) of the arm mechanism (22) and a support device (12a, 12), and a second joint mechanism (24) forms a connection between the second end (22b) of the arm mechanism (22) and the claw (10a). The second joint mechanism (24) has a design allowing a rotational movement of the claw (10a) in relation to a longitudinal axis (a) at the second end (22b) of the arm mechanism (22). The second joint mechanism (24) is designed to allow the claw (10a) to rotate around a longitudinal axis (a) at the second end (22b) of the arm mechanism (22) between a first rotational position and a second rotational position.

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A support arm device for a milking member and a milking parlour comprising such a support arm device

BACKGROUND OF THE INVENTION AND PRIOR ART

The present invention relates to a support arm device for a milking member, wherein the milking member comprises a claw and teat cups, wherein the support arm device comprises an arm mechanism having an extension between a first end and a second end, a first joint mechanism forming a connection between the first end of the arm mechanism and a support device, and a second joint mechanism forming a connection between the second end of the arm mechanism and the claw.

The teat cups of a milking cluster are usually attached manually to the cows by an operator. The operator may attach the teat cups from a working position in a pit arranged between two rows of milking stalls. During an attachment process of the teat cups, the operator has to support the claw at the same time as the teat cups are attached to the cows. In order to facilitate the attachment process of the teat cups, it is known to use a support arm supporting the claw during the attachment process of the teat cups. The support arm may have a design making it is possible to move the cluster in a supported state from a parking position at a side of a milking stall to a milking position below the teats of the cow.

The milk cluster must be cleaned with regular intervals. The cluster can be cleaned by means a washing device mounted on a wall surface in the pit. The washing device is mounted at a lower level than the floor surface of the milking stalls. When it is time to provide a washing process of a cluster supported by a support arm, the operator has to disconnect the cluster from the support arm and turn the claw 180° before it is possible to place the teat cups of the milking cluster on a respective rod shaped-member of the washing device.

SUMMARY OF THE INVENTION

The object of the present invention is to provide support arm device for a claw of a milking member where it is possible to place the claw in different rotational positions without disconnecting the claw from the support arm device.

This object is achieved by the initially mentioned support arm device which is characterized by the features that the second joint mechanism is designed to allow the claw to rotate around a longitudinal axis at the second end of the arm mechanism between a first rotational position and a second rotational position. When the teat cups are to be attached to a milking animal, the claw has to be supported in a rotational position which facilitates the attachment of the teat cups to the teats of a milking animal. When the milking member is to be cleaned, the claw is turned to another rotational position before the teat cups are placed on a washing device. The present support arm device is able to supports the claw of the cluster in two different rotational position. When the teat cups are to be attached to a milking animal, the support arm device supports the claw in the first rotational position. When the teat cups are to be placed on a washing device, the claw is rotated from the first rotational position to the second rotational position. This rotary movement is performed without disconnecting the cluster from the support arm device. When the washing process is finished, the claw is rotated back to the first rotational position.

According to an embodiment of the invention, the second joint mechanism has a design such that the claw is located at a distance from the longitudinal axis at the second end of the arm mechanism. It is many times necessary to design the second joint mechanism such that the claw is at one height level when the teat cups are attached to a milking animal and at another height level when the teat cups are placed on the washing

device. In case the longitudinal axis is arranged in a horizontal plane or has a horizontal component, the height level of the claw varies when it rotates around the longitudinal axis.

According to an embodiment of the invention, the claw is configured to rotate 180 degrees between the first rotational position and the second rotational position. The claw may be arranged in an upright position in a milking position and in an upside down position in a washing position.

According to an embodiment of the invention, the second joint mechanism is designed to allow only rotation of the claw within a limited angular range defined by the first rotational position and the second rotational position. In this case, it is only possible to rotate the claw from the first rotational position to the second rotational position in one rotational direction and back to the first rotational position in an opposite rotational direction. The first rotational position and the second rotational position constitute ends of the limited angular range. The risk that milk tubes and pulse tubes connected to the claw will be twisted is hereby reduced.

According to an embodiment of the invention, the second joint mechanism comprises a lock mechanism configured to releasably lock the claw in at least one of said rotational positions. In particular, only the lowest located rotational position will be stable. It is suitable to lock the claw in the first rotational position and the second rotational position if they are unstable rotational positions. The lock mechanism may comprise a spring loaded lock member or the like which automatically slides into a recess and locks the claw when it arrives to one of said rotational position. The operator may move the claw from said rotational position by means of a suitable releasing mechanism.

According to an embodiment of the invention, the second joint mechanism comprises an distance element having a first end portion connected to the second end of the arm mechanism, a second end portion connected to the claw and an intermediate portion having an extension such that the second end portion of the distance element is located at a longer radial distance from the longitudinal axis of the second end arm of the arm mechanism than the first end portion of the distance element. With information of suitable height level for the claw during a milking process and a suitable height level for the claw during a washing process, it is possible to size the distance element such that the claw obtains suitable height levels both in the first rotational position and in the second rotational position. The intermediate portion may comprise an opening for a milk tube conducting milk from the claw. In this case, the milk tube will not be twisted when the distance element rotates. The risk that the milk tube gets entangled when the distance element rotates is thus reduced.

According to an embodiment of the invention, the second end portion of the distance element is fixedly connected to the claw via a releasable fastening mechanism. The second end portion of the distance element and the claw rotate as a unit by means of such a fastening mechanism. It is here possible to connect and disconnect the claw from the support arm device in a simple manner. Preferably, said fastening mechanism has a design allowing a manually connection and disconnection without tools.

According to an embodiment of the invention, the first end portion of the distance element is connected to the second end of the arm mechanism via connection members allowing said rotational movement. Said connection members may be suitable components such as casings, bushings or the like which are rotatably connected to each other. The first connection member may be fixedly connected to the first part of the distance element and the second connection member may be fixedly

connected to the second end of the arm mechanism. The first connection member and the second connection member may include the above mentioned rotational limiting mechanism and the lock mechanism.

According to an embodiment of the invention, the first joint mechanism is configured to connect the first end arm to an equilibrium device configured to equilibrate the support arm device. The equilibrium device may be set in an equilibrium mode when it is time to manually move the milking member from the parking position to a milking position. The equilibrium device acts on the support arm device and the supported milking member such that they will be substantially weigh less. The use of such an equilibrium device makes it very easy for an operator to move the milking member from the parking position to the milking position. When the milk flow starts during a milking process, the equilibrium device may be set in a milking mode. The equilibrium device lowers the support arm device such the supported milking member hangs down from the udder with its own weight.

According to an embodiment of the invention, the first joint mechanism allows a rotary movement of the arm mechanism in relation to said support device. In this case, the arm mechanism may be rotated as a unit. The arm mechanism may comprise a first end arm connected to the first joint mechanism and a second end arm connected to the second joint mechanism. In this case, the arm mechanism comprises at least two arms. Preferably, the individual arms of the arm mechanism have a straight line extension. The claw is here rotatably arranged around a longitudinal axis of the second end arm. The arm mechanism may comprise several arms connected to each other by means of vertical pivot joints such that the arm mechanism allows a movement in a horizontal plane. By means of such an arm mechanism, it is possible to move the milking member to substantially arbitrary positions within a relatively large area.

The initially defined object is also achieved by a milking parlour, comprising at least one milking stall having a floor surface supporting animals during a milking process and a washing device configured to wash a milking member, wherein the milking parlour comprises a support device configured to support a support arm mechanism according to any one of the claims 1 to 13. In this case, the claw may be rotatable to a first rotational position from which the teat cups are attached to an animal in the milking stall and to a second rotational position from the teat cups are placed on the washing device.

According to an embodiment of the invention, the second joint mechanism has a design such that the claw is located at a distance from the longitudinal axis at the second end of the arm mechanism, wherein the claw is located at a lower level in relation to the height level of the floor surface in the milking stall in the second rotational position than in the first rotational position. In order to facilitate the attachment of the milking member to milking animals, the operators usually work in a low position in relation to the milking animals. It is common to arrange the washing device at a lower level than the height level of floor surface in the milking stall. The washing device may be arranged 25-30 cm below the floor surface of the milking stall. It is possible to move the milking member to a relatively low level in relation to the floor surface in the milking stall by means of the support arm mechanism and attach the milking member on the washing device.

According to an embodiment of the invention, support arm device may be connected to a removing device for the teat cups, wherein the support arm device is configured to transmit a movement from the removing device to the milking member which removes the teat cups from the animal. In this case, the removing device is connected to the arm mechanism. The removing device removes the teat cups from the animal at the same time as it moves the arm mechanism and the claw from a milking position to a parking

position. The removing device may be configured to perform a removing motion of the milking member to a parking position located substantially straight above the washing device. In such a parking position, it is only necessary to rotate the cluster from the first rotational position to the second rotational position and place the teat cups on the washing device. Consequently, it is not necessary to move the claw by the arm mechanism in a horizontal direction before the teat cups can be placed on the washing device.

The rotary parlour may comprise a pit for operators to stand in when they attach teat cups to animals in the milking stall and that the washing device is arranged on a wall surface of the pit at a distance below the floor surface of the milking stall. The pit may be arranged between two rows of milking stalls. Since the washing device is arranged on a wall surface in the pit, it is important that the support arm device is able to move the claw to a relative low washing position from which it is possible to attach the teat cups to the washing device. The support arm device may also be used in a milking parlour where the milking stalls are arranged on a rotary platform.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following, a preferred embodiment of the invention is described as an example and with references to the attached drawings, in which:

Fig 1 shows a herringbone milking parlour wherein each milking stall is provided with support arm device according to an embodiment of the invention,

Fig 2 shows a side view of one of the milking stalls in Fig. 1,

Fig 3 shows the support arm device when it supports the claw in a milking position,

Fig 4 shows the support arm device when it supports the claw in a parking position,

Fig 5 shows the support arm device when it supports the claw in a washing position and

Fig 6 shows some components of the support arm device more in detail.

BRIEF DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

Fig 1 shows a milking parlour for milking of cows 1. The milking parlour comprises a pit 2 in which at least one operator works. The pit 2 has an elongated extension. A first group of milking stalls 3 is located on a first side of the pit 2 and a second group of milking stalls 4 is located on an second side of the pit 2. In this case, each group comprises five milking stalls 3, 4. A first entrance gate 3a to the first group of milking stalls 3 is pivotally arranged between an open position and a closed position. The first entrance gate 3a defines an inclined side wall of the first group of milking stalls 3 in a closed state. A first exit gate 3b is pivotally arranged between an open position and a closed position. The first exit gate 3b defines an inclined side wall of the first group of milking stalls 3 in a closed state. In a corresponding manner, a second entrance gate 4a and a second exit gate 4b are pivotally arranged between an open position and a closed position on the opposite side of the pit 2. The cows 1 are arranged in the milking stalls 3, 4 in a herringbone pattern. When the cows are standing in the milking stalls 3, 4, a longitudinal axis 7 through the cows forms an angle to a vertical plane 6 extending in a longitudinal direction of the pit 2. In this case, the longitudinal axis 7 through the cows forms an angle of about 30° in relation to the vertical plane 6 through the pit 2. A fence arrangement 8 is arranged around the pit 2. The fence arrangement 8 prevents the cows 1 from stepping down into the pit 2.

Each milking stall 3, 4 comprises a rear positioning element in the form of a rump rail 9 adapted to define the position of the rear portion of the cows 1 in the milking stalls 3, 4. Each rump rail 9 has

a contact surface which is substantially perpendicular to the longitudinal axis 7 of a cow 1 standing in the milking stall 3. Each milking stall 3, 4 may comprise front positioning elements (not visible in the drawings) adapted to define the position of the front portion of the cows 1 in the milking stalls 3, 4. Such front positioning elements may be feeding troughs which moves the cows 1 to a position such that the rear portions of the cows 1 come in contact with the rump rails 9. With such a positioning of a cow 1 in a milking stall 3, 4, it is easy for an operator in the pit 2 to reach the udder of the cow 1 and attach a milking member in the form of a cluster 10 to the cow 1. The cluster 10 is supported by a support arm device 11. Each milking stall 3, 4 comprises an equilibrium device 12 connected to the support arm device 11 and a removing cylinder 13 removing the cluster 10 from a cow 1 when a milking process has been completed.

Fig. 2 shows a view of one of the milking stalls 3 located on the first side of the pit 2. The milking stall 3 comprises a floor surface 14 for the cows 1 to stand on during a milking process in the milking stall 3. The pit 2 comprises a floor surface 2a for operators to stand on during the work in the milking parlour. The floor surface 2a of the pit 2 is located at a lower level than the floor surface 14 of the milking stalls 3. The pit 2 comprises a substantially vertical wall surface 2b connecting the floor surface 2a of the pit 2 and the floor surface 14 of the milking stalls 3. An overhang 15 is arranged at an upper edge of the wall surface 2a of the pit. The overhang 15 may be a suitably shaped metal sheet protecting components mounted on the vertical wall surface 2b of the pit 2. The fence arrangement 8 comprises vertical posts 8a arranged on the floor surface 14 of the milking stalls 3 at the vicinity of the vertical wall surface 2b of the pit 2 and horizontal parts 8b. The fence arrangement 8 is provided with openings to the milking stalls 3 used by the operators when they, for example, attach a cluster 10 to a cow 1 in the milking stalls 3.

During a milking process, the milk from the cluster 10 flows to a long milk tube 16. A milk meter 17 measures the milk flow in the long milk tube 16. The milk meter 17 is mounted on the wall surface 2b of the pit 2. The milk in the long milk tube 16 flows to a common milk line 18 for the milking parlour. The milk conduit 18 has a horizontal extension along the wall surface 2b of the pit 2. A vacuum source applies a vacuum pressure to the milk conduit 18 during the milking processes in the milking stalls 3, such that milk is sucked from the clusters 10, via the long milk tubes 16, the milk meter 17 and the milk conduit 18, to a not shown milk tank. A washing device 19 is mounted on the wall surface 2b in the pit. The washing device 19 may be movably arranged between an active position and a folded away position. In this case, the washing unit 19 comprises four candle-shaped members 19a. The teat cups of the cluster 10 are to be placed on a respective candle-shaped member 19a during a washing process. The washing device 19 is connected, via a washing liquid tube 20, to a washing liquid conduit 21 having a parallel horizontal extension with the milk conduit 18 along the wall surface 2b of the pit 2.

The support arm device 11 supports the cluster 10 during a milking process in the milking stall 3. The support arm device 11 comprises an arm mechanism 22. The arm mechanism 22 is, at a first end, connected to a lower part 12a of the equilibrium device 12 via a first joint member 23. The arm mechanism 22 is, at a second end, connected to the cluster 10 via a second joint mechanism 24. A removing device in the form of a removing cylinder 13 is arranged closed to the equilibrium device 12. The removing cylinder 13 is provided with a not visible movable piston connected to the arm mechanism 22 by means of an elongated flexible element such as a cord 13a, wire, chain or the like. The equilibrium device 12 and the removing cylinder 13 may by fixedly mounted on the fence arrangement 8 by suitable fastening means.

Fig 3 shows the support arm device 11 in the milking position more in detail. The support arm device 11 supports a cluster 10 in the

form of claw 10a and four teat cups 10b connected to the claw 10a by four short flexible milk tubes 10c and four short flexible pulse tubes. The support arm device 11 comprises an arm mechanism 22 in the form of a number of arms linked together. In this case, the arm mechanism 22 comprises a first end arm 22a, a second end arm 22b and an intermediate arm 22c. The arms 22a, b, c are connected to each other by means of pivot joints 25 allowing a rotary movement of the arms 22a, b, c to around a vertical axis. An angle of about 140° is formed between adjacent arms 22a, b, c when the support arm device 11 is in the milking position.

The first end arm 22a of the arm mechanism 22 is, via the first joint mechanism 23, connected to a lower cylindrical part 12a of the equilibrium device 12. The first joint mechanism 23 may include a casing or the like allowing a rotary movement of the arm mechanism 22 around a vertical axis of the cylindrical part 12a. The second end arm 22b is provided with a fastening member 22d for attachment of an outer end of the cord 13a of the removing cylinder 13. The remaining arms 22b, c comprise guide elements 22e provided with through holes for the cord 13. A guide member 13b for the cord 13 is arranged on the outside of the joint mechanism 23. The guide member 13b may be a guide roller or the like. The guide member 13b is arranged at a distance from the vertical axis through the cylindrical part 12a. A retraction movement of the cord 13a results in a folding movement of the arms 22a, b, c and a rotary movement of the arm mechanism 22 around the cylindrical part 12a. The arm mechanism 22 is movably arranged in a horizontal plane A. The horizontal plane A of the arm mechanism 22 is located at a suitable height level above a horizontal plane B of the floor surface 14 in the milking stall 3.

The second end arm 22b of the arm mechanism 22 is connected to the claw 10a by means of the second joint mechanism 24. The second joint mechanism 24 comprises a first connection member 27 fixedly attached to the second end arm 22b. A second connection member 28 is rotatably connected to the first

connection member 27. The second connection member 28 is rotatably arranged around a longitudinal axis a of the second end arm 22b. The second joint mechanism 24 also comprises a distance element 29. The distance element 29 comprises a first end portion 29a fixedly connected to the second connection member 28. The first end portion 29a of the distance element 29 is arranged in the same plane A as the connection members 27, 28 and the linked arm mechanism 22. The distance element 29 comprises a second end portion 29b fixedly connected to an upper part of the claw 10a via a fastening mechanism 30.

The distance element 29 an intermediate portion 29c connecting the first and second end portions 29a, 29b of the distance element 29. The intermediate portion 29c forms an angle in relation to the longitudinal axis a of the second end arm 22a. During rotation of the second connection member 28 in relation to the first connection member 27, the distance element 29 will rotate with the second connection member 28 as a unit around the longitudinal axis a of the second end arm 22a. The second end portion 29b of the distance element 29 will rotate at a rectilinear distance d from the longitudinal axis a of the second end arm 22a. The first end portion 29a of the distance element 29 will rotate at a negligible rectilinear distance from the longitudinal axis a.

Fig. 3 shows the distance element 29 in a first rotary position of 90° in relation to the plane A. In this position, the second end portion 29b of the distance element 29 is at a maximum height level h_{c1} and it supports the cluster 10 at a maximum height level above the height level of the floor surface 14 in the milking stall 3. The claw 10a is here at a suitable height for attachment of the teat cups 10b to the teats of a cow 1. It is here possible to attach the teat cups 10b to a cow having the teats at a height level h_{t1} or lower.

Fig. 4 shows the support arm device 11 in the parking position. The distance element 29 is in the first rotary position of 90° in

relation to the plane A. The arms 22a-c of the arm mechanism 22 is here in a folded state. Furthermore, the arm mechanism 22 has been rotated around the vertical axis of the cylindrical part 12a of the equilibrium device 12 when the claw 10a has been moved from the milking position to the parking position. In the parking position, the support arm device 11 supports the cluster in a position at the side of the floor surface 14 of the milking stall 3, 4.

Fig. 5 shows the support arm device 11 in a washing position. The distance element 29 has here been rotated to a second rotational position of -90° in relation to the plane A. In this rotary position, the second end portion 29b of the distance element 29 is at a minimum height level h_{c2} and it supports the cluster 10 at a minimum height level in relation to the horizontal plane B of the floor surface 14 in the milking stall 3. The claw 10a is here at a suitable height for attachment of the teat cups 10b to the candle-shaped members 19a of the washing device 19. It is here possible to attach the teat cups 10b to a washing device 19 located at a height level h_{t2} or higher.

Fig. 6 shows the including components of the second joint mechanism 24 more in detail. The first connection member 27 is fixedly attached to an end portion of the second end arm 22a. The first connection member 27 comprises an outer cylindrical surface. The second connection member 28 may be a casing having an inner cylindrical surface of corresponding size as the outer surface of the first connection member 27. In a connected state, the second connection member 28 is rotatably arranged on the outside of the first connection member 27. The first connection member 27 comprises an elongated depression forming a path 27a having an extension of 180° along the circumference of the first connection member 27. The second connection member 28 comprises a cam follower 28a to be in engagement with the path 27a. The path 27a and the cam follower 28a restrict the rotary movement of the second connection member 28 in relation to the first connection member

27. Due to the existence of the path 27a and the cam follower 28a, the second connection member 28 allows only a rotary movement of 180° in a reciprocation direction between the first rotational position and the second rotational position. The cam follower 28a have a schematically disclosed lock mechanism 28b which automatically locks the second connection member 28 in the first rotary position and/or in the second rotary position. A schematically disclosed releasing member 28c, which may be a button or the like, is used for releasing the lock mechanism 28b when the second connection member 28 is to be rotated from the first rotational position or the second rotational position.

The first end portion 29a of the distance element 29 comprises a connection piece $29a_1$ to be inserted in a recess in the second connection member 28. The connection piece 29a and the recess have a corresponding shape, which differs from a circular shape, such the distance element 29 and the connection member 28 will rotate as a unit. The intermediate portion 29c of the distance element 29 is provided with an opening $29c_1$. The long milk tube 16 is to be mounted such it extends through the opening $29c_1$. Thereby, the long milk tube 16 will not be entangled during the rotary motion of the distance element 29.

The second end portion 29b of the distance element 29 is connected to an upper portion of the claw 10a by means of the fastening mechanism 30. The fastening mechanism 30 comprises a first plate 30a welded to an upper part of the second end portion 29b. A fastening member 30b with an elongated notch $30b_1$ is welded to a lower part of the first plate 30a. A second plate 30c is slidably mountable in the notch $30b_1$ of the fastening member 30b. The plate 30c is locked in a predetermined position in relation to the fastening member 30b by means of a spring-loaded pin 30d. The spring-loaded pin 30d is insertable in holes disposed in the plates 30a, 30b. The second plate 30c comprises a threaded pin $30c_1$. The threaded pin $30c_1$ is arranged to be inserted in a hole in

an arc bracket 30e. The second plate 30c is connected to the arc bracket 30e by means of a nut $30c_2$ screwed on the threaded pin $30c_1$. The arc bracket 30e comprises two eyelets $30e_1$. The arc bracket 30e is fixedly attached to an upper part of the claw 10a by means of bolts arranged in said eyelets $30e_1$. The connection between the second plate 30c and the arc bracket 30e is constructed with a gap of a size such that the claw 10a is able to obtain a desired inclination of about 10° in relation to a horizontal plane. The cluster 10a is rapidly connectable and disconnectable from the support arm device 11 by means of the spring-loaded pin 30d. When the spring-loaded pin 30d has been released, the plate 30c can be displaced out of engagement with the fastening member 30b.

The support arm devices 11 supports the clusters 10 in the parking position before the milking processes start in the milking stalls 3, 4 on one side of the pit 2. In the parking position, the support arm devices 11 and the clusters 10 are not in the way of the cows when they enter the milking stalls 3, 4. When all cows 1 are in predetermined milking positions in the milking stalls 3, 4, the clusters 10 are attached to the cows 1. The attachment process of the clusters 10 in a milking stall 3, 4 comprises the step that an operator grips the claw 10a or an outer end of the support arm device 11 and moves it from the parking position to a milking position below the teats of the cow in the milking stall 3, 4. During this movement, the arms 22a-22c are turned around the pivot joints 25 such that the arm mechanism 22 will be longer. At the same time, the arm mechanism 22 provides a rotary movement around the lower cylindrical part 12a of the equilibrium device 12. The equilibrium device 12 is set in an equilibrium mode before the claw 10a is moved from the parking position. The equilibrium device 12 acts on the support arm device 11 in this mode such that the support arm device 11 and the cluster will be substantially weigh less. Furthermore, the removing cylinder 13 is in a no active state such that is does not counteract the movement of the support arm device 11 from the parking position. Thus, it is very easy for

an operator to move the cluster 10 from the parking position to the milking position by means of the support arm device 11.

The operator attaches the teat cups 10b to the teats of the cow 1 in proper order when the claw has reached the milking position. The attachment of the teat cups 10b is easy to perform since the support arm device 11 supports the claw 10a. A control unit, which is not indicated in the drawing, receives a signal from the milk meter 17 when the teat cups have been attached and the milk flow starts. The control unit set the equilibrium device 13 in a milking mode in which a downward force acts on the teats 10b via the support arm device 11. The downward force is equal to the weight of the cluster 10 such the cluster 10 hangs in the udder of the cow 1 in a similar manner as a cluster 10 without support arm device 11.

The control unit receives substantially continuously information from the milk meter 17 about the milk flow during the milking process. When the milk flow drops below a predetermined minimum flow level during the main milking phase of a cow 1, it indicates that the cow 1 has been completely milk. The control unit resets the equilibrium device 13 in the equilibrium mode and activates the removing cylinder 12. The removing cylinder 12 provides a retraction force of the cord 13a. The retraction force is transmitted from the cord 13a, via the second end arm 22c, the second joint mechanism 24 to the claw 10a of the cluster 10. The retraction force in the cord 13a provides a movement of the arm mechanism 22 which removes the teat cups 10b from the teats of the cow 1. The force from the cord 13a provides a rotary movement of the arms 22a-22c around the pivot joint 25 such they are folded together and a rotary movement around the lower portion 12a of the equilibrium device 12 until the claw 10a reaches the parking position. The parking position of the cluster 10 is located substantially vertically above the washing device 19.

When it is time to wash the cluster 10 and associated milk lines, the operator release the lock mechanism 28b by means of the releasing member 28c such that the claw 10a is free to rotate from the first rotational position of 90°. The operator provides a movement of the claw 10a or a suitable part of the support arm device 11 such that the claw 10a is rotated to the second rotational position of -90°. The cam follower 28a follows the path 27a during this movement. The cam follower 28a reaches a stop surface of the path 27a when the support arm device 11 reaches the second rotational position. The cluster 10 is now supported in a washing position by the support arm device 11. A main part of the cluster 10 is in a lower position than the floor surface 14 of the milking stall in the washing position. The cluster 10a is in a suitable height level for placing the teat cups 10b on the candle-shaped members 19 of the washing device 19. When the washing process has been finished, the operator moves the claw 10a and the support arm device 11 back to the first rotational position. The cam follower 28a reaches a stop surface of the path 27a when the support arm device 11 reaches the first rotational position. The lock mechanism 28b locks automatically the support arm device 11 in the first rotational position. The cluster 10a is again supported in the parking position by the support arm device 11. The support arm device 11 according to the invention allows a support of the cluster 10a in a parking position, a milking position and a washing position.

The invention is not limited to the described embodiments but may be varied and modified freely within the scope of the claims. The arm mechanism 22 may, for example, include an arbitrary number of arms.

Claims

1. A support arm device for a milking member (10), wherein the milking member (10) comprises a claw (10a) and teat cups (10b), wherein the support arm device (11) comprises an arm mechanism (22) having an extension between a first end (22a) and a second end (22b), a first joint mechanism forming (23) a connection between the first end (22a) of the arm mechanism (22) and a support device (12), and a second joint mechanism (24) forming a connection between the second end (22b) of the arm mechanism (22) and the claw (10a), characterized in that the second joint mechanism (24) is designed to allow the claw (10a) to rotate around a longitudinal axis (a) at the second end (22b) of the arm mechanism (22) between a first rotational position and a second rotational position.

2. A support arm device according to claim 1, characterized in that the second joint mechanism (24) has a design such that the claw (10a) is located at a distance (d) from the longitudinal axis (a) at the second end (22b) of the arm mechanism (22).

3. A support arm device according to claim 1 or 2, characterized in that the claw (10a) is configured to rotate 180° between the first rotational position and the second rotational position.

4. A support arm device according to any one of said preceding claims, characterized in that the second joint mechanism (24) is designed to allow only rotation of the claw (10a) within a limited angular range defined by the first rotational position and the second rotational position.

5. A support arm device according to any one of said preceding claims, characterized in that the second joint mechanism (24) comprises a lock mechanism (28b) configured to releasably lock the claw (10a) in at least one of said rotational positions.

6. A support arm device according to any one of the preceding claims, characterized in that the second joint mechanism (24) comprises an distance element (29) having a first end portion (29a) connected to the second end (22b) of the arm mechanism, a second end portion (29b) connected to the claw (10a) and an intermediate distance portion (29c) having an extension between said end portions (29b, 29c) such that the second end portion (29b) of the distance element is located at a predetermined perpendicular distance (d) from the longitudinal axis (a) of the second end (22b) of the arm mechanism (22).

7. A support arm device according to claim 6, characterized in that the second end portion (29b) of the distance element (29) is fixedly connected to the claw (10a) via a releasable fastening mechanism (30).

8. A support arm device according to the claims 6 or 7, characterized in that the intermediate portion (29c) of the distance element (29) comprises an opening ($29c_1$) for a milk tube (16) leading milk away from the claw (10a).

9. A support arm device according to any one of the claims 6 to 8, characterized in that the first end portion (29b) of the distance element (29) is connected to the second end (22b) of the arm mechanism (22) via connection members (27, 28) allowing said rotational movement.

10. A support arm device according to any one of the claims, characterized in the first joint mechanism (23) is configured to connect the first end (22a) of the arm mechanism (22) to a support device in the form of a equilibrium device (12) configured to equilibrate the support arm device (11).

11. A support arm device according to any one of the claims, characterized in the first joint mechanism (23) allows a rotary

movement of the arm mechanism (22) in relation to said support device (12).

12. A support arm device according to any one of the claims, characterized in the arm mechanism (22) comprises a first end arm (22a) connected to the first joint mechanism (23) and a second end arm (22b) connected to the second joint mechanism (24).

13. A support arm device according to claim 12, characterized in the arm mechanism (22) comprises several arms (22a, b, c) connected to each other by means of vertical pivot joints (25) such that the arm mechanism (22) allows a movement in a horizontal plane (A).

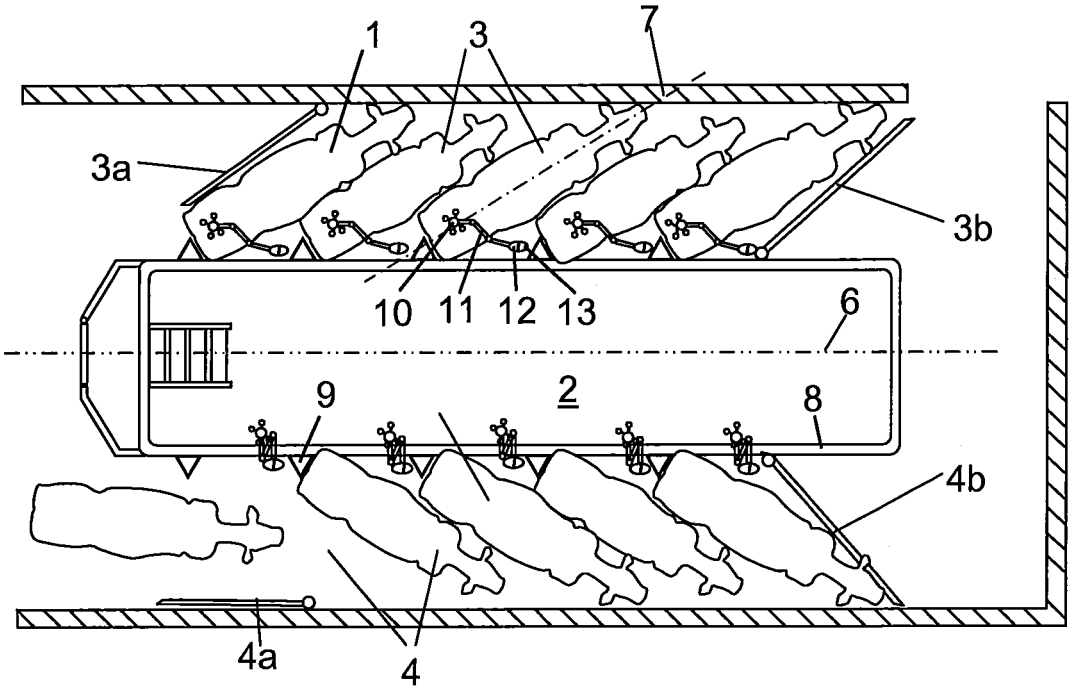
14. A milking parlour, comprising at least one milking stall (3, 4) having a floor surface (14) supporting animals during a milking process and a washing device (19) configured to wash a milking member, characterized in that it comprises a support device (12) configured to support a support arm mechanism according to any one of the claims 1 to 13.

15. A milking parlour according to claim 14, characterized in that the claw (10a) is rotatable to a first rotational position from which the teat cups (10b) are attached to an animal (1) in the milking stall (3) and to a second rotational position from the teat cups (10b) are placed on the washing device (19).

16. A milking parlour according to claim 14 or 15, characterized in that the second joint mechanism (24) has a design such that the claw (10a) is located at a distance (d) from the longitudinal axis (a) at the second end (22b) of the arm mechanism (22), wherein the claw (10a) is located at a lower level in relation to the height level (B) of the floor surface (14) in the milking stall (3) in the second rotational position than in the first rotational position.

17. A milking parlour according to any one of the claims, characterized in the support arm device (11) is connected to a removing device (13) for the teat cups (10b) in the milking parlour, wherein the support arm device (11) is configured to transmit a movement from the removing device (13) to the milking member (10) which removes the teat cups (10b) from the animal (1).

18. A milking parlour according to any one of the claim 17, characterized in that the removing device (13) is configured to perform a removing motion of the milking member from a milking position to a parking position located substantially straight above the washing device (19).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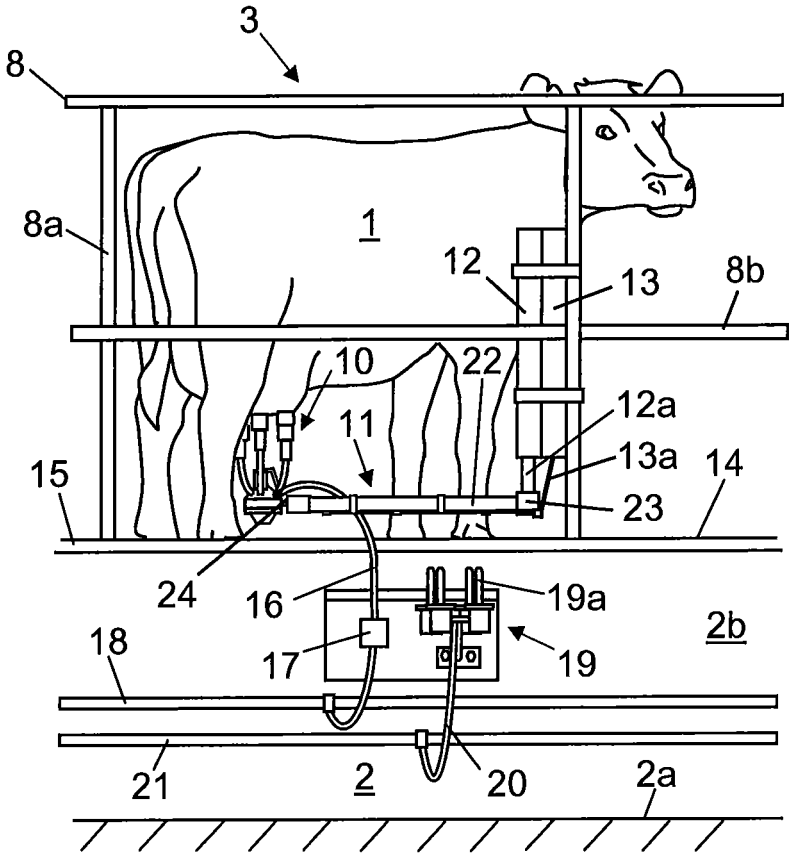
4a
4

Fig 1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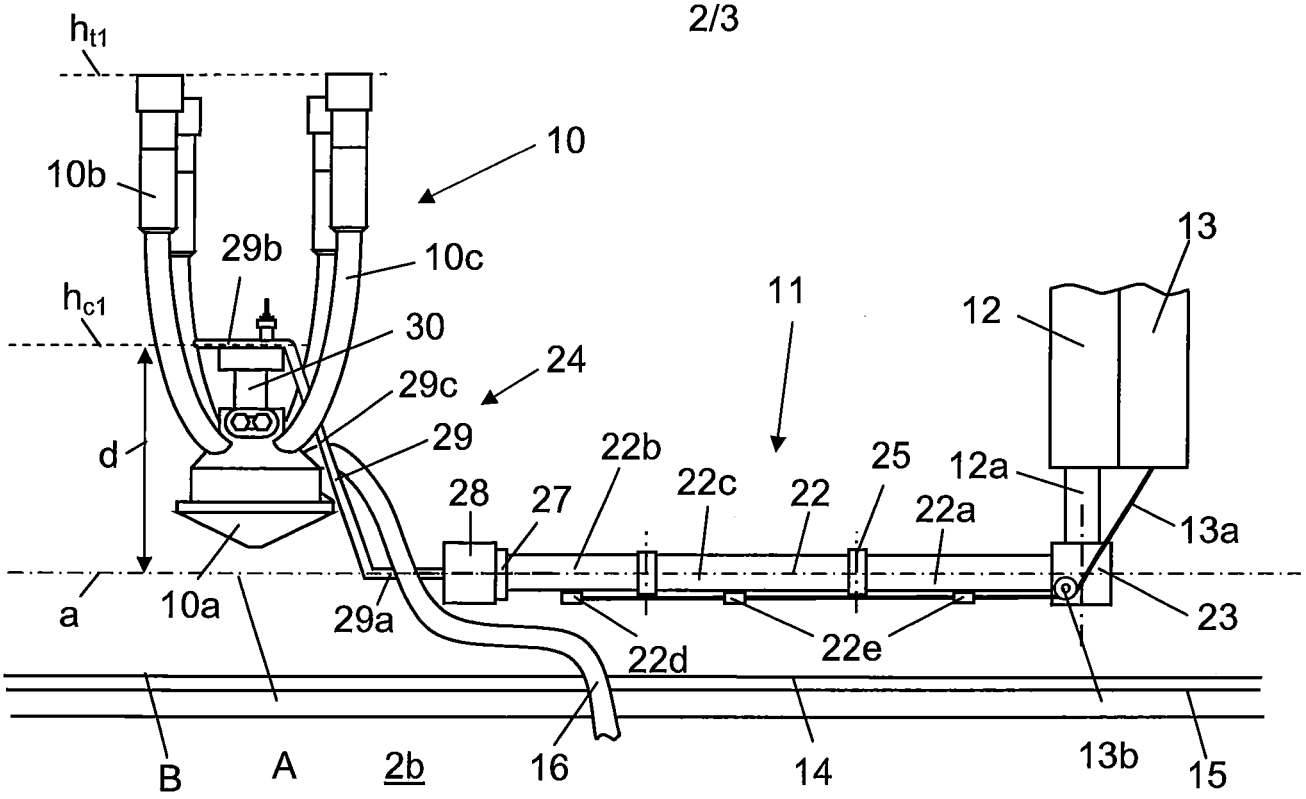
17
19
21
2
20
2a

Fig 2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28
27
22c
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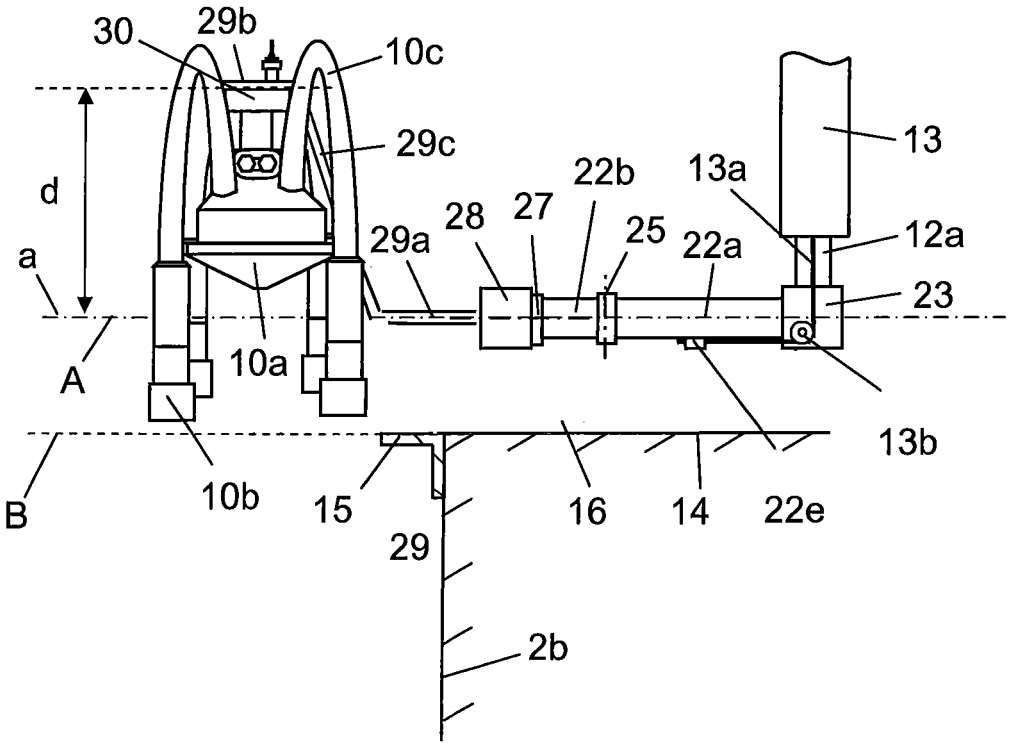
16
14
13b
15

Fig 3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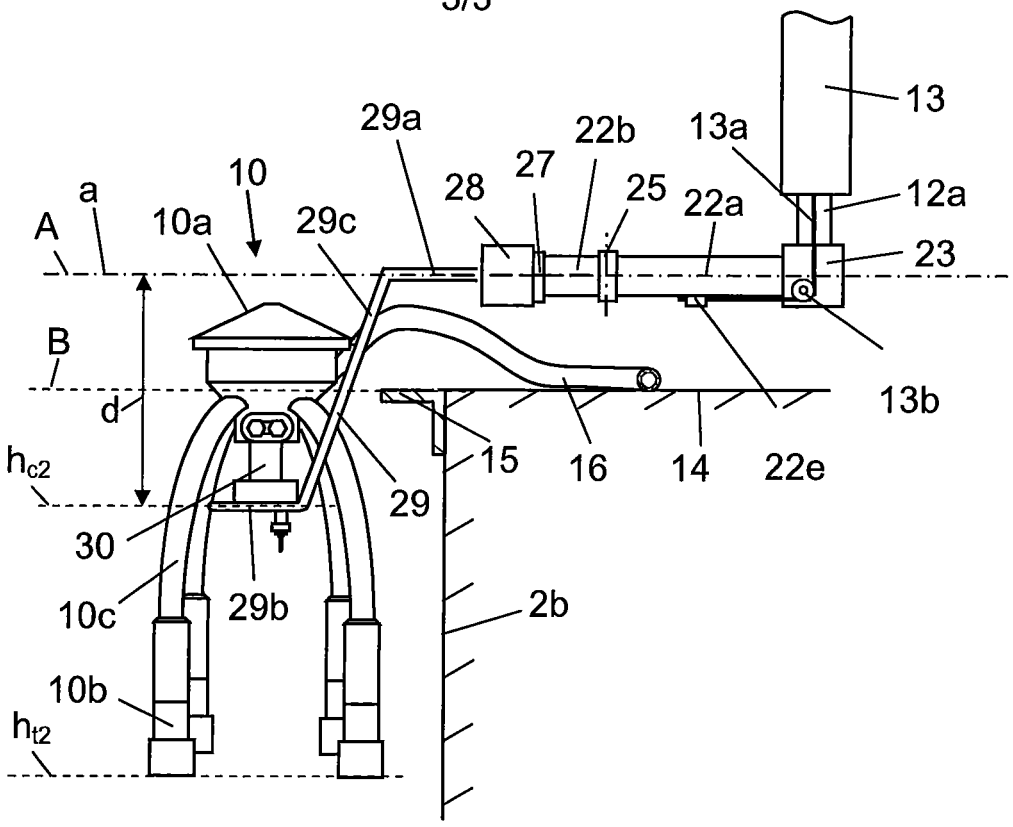
2b

Fig 4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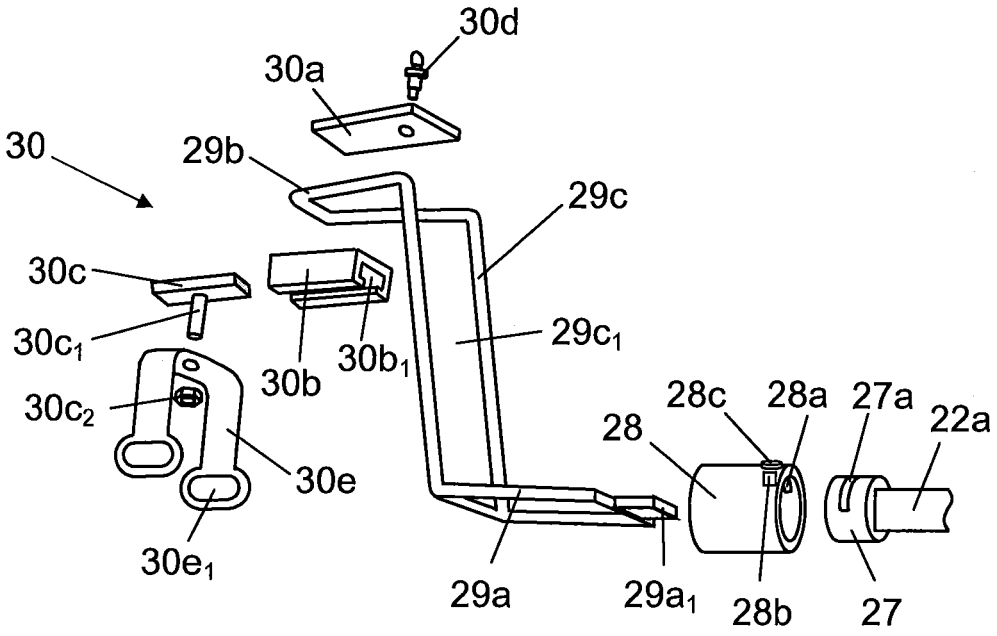
h_{t2}

Fig 5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22a
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28b
27

Fig 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2013/051024

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

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)

IPC: A01J

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

SE, DK, FI, NO classes as above

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

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 02089563 A2 (DELAVAL HOLDING AB ET AL), 14 November 2002 (2002-11-14); abstract; page 6, line 30 - page 7, line 23; figure 3 --	1-18
Y	EP 1943897 A2 (MAASLAND NV), 16 July 2008 (2008-07-16); abstract; paragraphs [0008], [0043], [0059]-[0063]; figure 4 --	1-18
A	WO 9851144 A1 (ALFA LAVAL AGRI AB ET AL), 19 November 1998 (1998-11-19); abstract; figure 5 --	1-18
A	US 3012566 A1 (BAKER ARCHIE B), 12 December 1961 (1961-12-12); abstract; column 3, line 28 - line 39; figure 2 --	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	Date of mailing of the international search report
19-12-2013	20-12-2013
Name and mailing address of the ISA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86	Authorized officer Kristina Berggren Telephone No. + 46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2013/051024

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	WO 9613150 A1 (WESTFALIA SEPARATOR AG ET AL), 9 May 1996 (1996-05-09); page 7, line 27 - page 8, line 8; figure 2 --	1-18
A	US 20120200674 A1 (HOFMAN HENK ET AL), 9 August 2012 (2012-08-09); paragraph [0030] --	1-18
A	WO 2012057677 A1 (DELAVAL HOLDING AB ET AL), 3 May 2012 (2012-05-03); abstract --	1-18
A	US 3726253 A1 (DUNCAN L), 10 April 1973 (1973-04-10); column 2, line 28 - line 31; column 3, line 21 - line 24; figures 1,2 -- --------	1-18

International application No.
PCT/SE2013/051024

Continuation of: second sheet

International Patent Classification (IPC)

A01J 5/017 (2006.01)
A01J 5/04 (2006.01)
A01J 7/02 (2006.01)

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