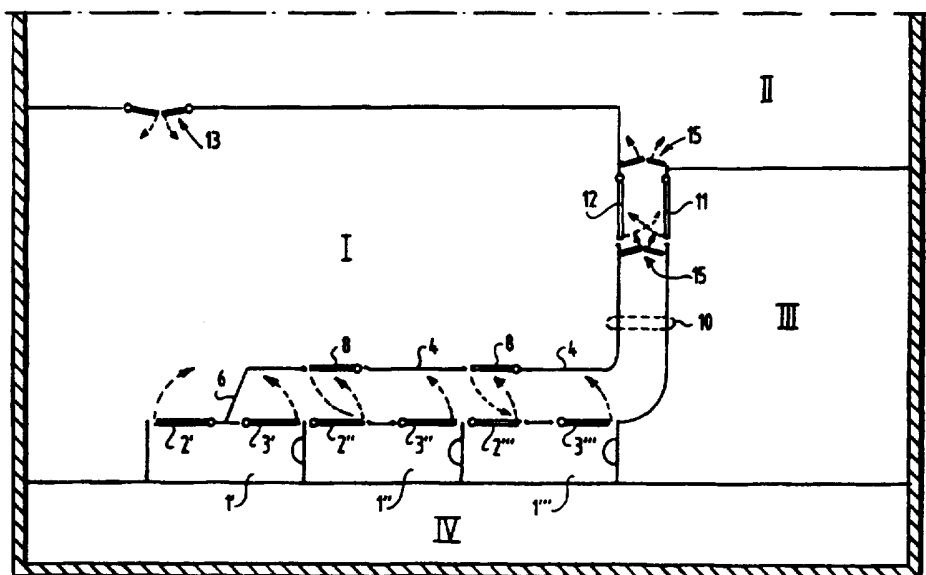




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(54) Title: A DEVICE AND METHOD FOR AUTOMATIC MILKING OF ANIMALS



(57) Abstract

The invention comprises a device for automatic milking of animals with two or more milking stalls (1, 1', 1'') which are placed one after another in lengthwise direction. These are each provided on one of the long sides with an entrance door movable with drive means and an exit door movable with drive means, wherein the cows can walk via the exit door and a passageway out of the milking stall to an accommodation area (II). The access to the second and subsequent stalls crosses this passageway and the invention relates to an access gate through which the entrance door of the milking stall is directly accessible from a waiting area (I).

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A DEVICE AND METHOD FOR AUTOMATIC MILKING OF ANIMALS

The invention relates to a device for unmanned milking of animals with an automatically operating control system, comprising two or more milking stalls which are placed one after another in lengthwise direction and
5 which are provided on a long side with an entrance door movable with drive means and an exit door movable with drive means, a waiting area for animals for milking, a passageway to an accommodation area which runs from the exit door of the first milking stall along the long side
10 of the other milking stalls along which milked animals can leave the milking device and a separating fence along the passageway on the side remote from the milking stalls.

Such milking devices are known inter alia from EP-A
15 0270165. The drawback of the known device is that the cows enter the first and subsequent milking stalls via the passageway, wherein the cows must walk one behind another in the passageway. The cows must herein always wait for each other. Long waiting times can hereby occur
20 and the milking stalls are not always utilized optimally. These waiting times occur particularly when one cow of a high rank stands still in front of or in the passageway and the other cows do not push it aside. The capacity of the installation is hereby limited. The invention has for
25 its object to increase the capacity of the known milking device by improving the access to the milking stalls.

According to the invention the separating fence is provided for this purpose close to the entrance door of the second milking stall respectively each subsequent
30 milking stall with an access gate movable with drive means which can leave clear an access path from the waiting area to the relevant milking stall.

Thus is achieved that at two or more locations there is access to the milking stalls and that one cow can no
35 longer prevent other cows from allowing themselves to be milked.

In accordance with a further improvement of the invention in the case of each access path the opened access gate or the opened entrance door can block passage to the part of the passageway directed toward the accom-
5 modation area.

Thus achieved in simple manner is that a cow cannot enter the part of the passageway in open connection with the accommodation area without having visited a milking stall.

10 According to a further improvement of the invention coupling means are present with which the drive means of the entrance doors and of the associated access gates are coupled.

Control of the access gates is greatly simplified
15 hereby because they are mainly actuated by the entrance doors.

According to a further improvement of the invention the coupling means are embodied such that the entrance door opens first and then the access gate.

20 It is hereby ensured in simple manner that the passageway is free of cows since, if they are present, they will obstruct opening of the entrance door and they are stimulated by the movement of the entrance door to walk on to the exit of the passageway at the accommo-
25 tion area.

According to a further improvement of the invention the coupling means are embodied such that the access gate closes first and then the entrance door.

Thus achieved is that a cow walking behind a first
30 cow after this latter has entered a milking stall is forced back to the waiting area in simple manner.

According to a further improvement of the invention the hinges of the entrance door and the exit door of the second or subsequent milking stalls are arranged on the
35 milking stall such that both doors open on the same side remote from the first milking stall.

Hereby is achieved that a cow cannot become jammed in the passageway with its hipbone between an opening entrance door and the separating fence but that the

opening door will stimulate the cow to walk on or take a step back.

According to another feature of the invention the separating fence is provided close to the exit door of the last milking stall with a return gate movable with drive means.

In simple manner is thus achieved that the animals for whom connection of the teat cups has failed can be sent back to the waiting area by making an opening in the separating fence. Because they then do not have to walk over a long path this will cause little congestion.

According to another feature of the invention each milking stall is provided with an identification device for establishing the identity of the animal present in the milking stall and sorting means are placed in the passageway after the last milking stall with which the passageway can be connected to the waiting area, the accommodation area or a segregation area, and an identification device co-acting with the sorting means is arranged in the passageway in front of the sorting means.

Hereby achieved is that the animals with a particular problem, such as in the case that a cow must be guided to the segregation area or the waiting area, can leave the milking stall directly without having to wait until all animals are out of the passageway. The milking stalls can now operate independently of each other whereby control becomes simpler and whereby the waiting times decrease and the capacity of the device therefore becomes greater.

The invention also comprises a method for automatic milking of animals with teat cups which form part of a device according to the invention, wherein the access gates, the exit doors and the return gate are controlled such that, should the case arise, for instance after failure to place the teat cups, an exit path crossing the passageway is formed from a milking stall to the waiting area.

The cows are hereby returned to the waiting area by a short route since they are sent directly via an access gate or the return gate. The passageway is herein used

hardly at all or for a very short time, whereby the capacity of the device increases.

The invention will be elucidated hereinbelow with reference to a drawing of a number of embodiments.

5 In the drawing:

Figures 1 and 2 show a schematic top view of a first embodiment of an automatic milking device for cows with two milking stalls placed in line, with a first position of an access gate;

10 figure 3 shows a schematic top view as according to figures 1 and 2 with a second position of the access gate;

figure 4 is a schematic top view of a second embodiment of an automatic milking device for cows with two milking stalls placed in line, with a first position of an access gate;

figure 5 is a schematic top view as according to figure 4 with a second position of the access gate;

20 figure 6 is a schematic top view of a third embodiment of a milking device with three milking stalls and two access gates;

figure 7 is a schematic top view as according to figure 6, wherein the first and third milking stall are accessible;

25 figure 8 is a schematic top view as according to figure 6, wherein the first and second milking stall are accessible;

figure 9 is a schematic top view as according to figure 6, wherein three stalls are accessible;

30 figure 10 is a schematic top view of a fourth embodiment wherein a return gate is incorporated in the separating fence; and

figure 11 is a schematic top view of a fifth embodiment.

35 In the different embodiments is shown a schematic top view of an automatic milking device, wherein it is assumed that the teat cups of a milking cluster are arranged with automatically operating equipment round the teats of a cow, which can take place without human supervision.
40

This automatic placing equipment is relatively expensive and the aim is therefore to use one robot, the teat cups of which can be connected to the udder of a cow in a plurality of stalls.

5 In the shown embodiments the milking stalls are placed for this purpose in a straight line and the placing equipment can move in rectilinear manner along one of the long sides of the milking stalls. It is of course also possible for the placing equipment to follow a
10 circular path and the milking stalls to be placed one after another in a circular arc.

In an automatic milking device which must be able to operate without the supervision of the farmer it is important that the cows are urged or stimulated to visit
15 a milking stall and it must be ensured that all cows are milked before they can walk to the accommodation area. The problem may occur herein that cows follow each other, which is not permissible when entering the milking stalls. The gates movable with drive means must therefore
20 always be so placed that a cow following the first cow can be pushed back to the waiting area.

When the cows walk through the paths it must be prevented that the cows become jammed between the moving and stationary gates. To this end sensors can be arranged
25 in known manner on the gates with which the movement of the gates can be stopped if the gate comes up against a cow. Detectors may also be arranged in the passageways with which the position of the cows can be determined.

Present for the purpose of controlling the fences
30 and the placing device is a control system which makes use inter alia of the above mentioned sensors and detectors as well as of other known systems in such a milking device, such as for instance an identification system for the cows, milk quantity meters, feed dosages and so on.
35 These known components of the milking device are assumed known here and not further elucidated.

In the different figures corresponding components always have as far as possible the same reference, where-
40 in the same component for the first milking stall is provided with one accent, the second milking stall with

two accents and the third milking stall with three accents.

Figure 1 shows a first milking stall 1' and a second milking stall 1'', which milking stalls are placed in a straight line. Each milking stall 1 is provided with an entrance door 2 and an exit door 3 which are arranged hingedly roughly in the middle of a long side. Entrance door 2 and exit door 3 are shown as simple straight gates, but it is also possible in known manner for the gates to have a second hinge or optionally an additional pivotable part. Also shown is a separating fence 4 which forms a passageway with the long side of the milking stalls. A swivel gate 5 is placed between separating fence 4 and the first milking stall 1'.

Entrance door 2, exit door 3 and swivel gate 5 are movable by drive means under the influence of a control (not shown). Known drive means are for instance air cylinders, whereby the fences can make a steady movement.

The first milking stall 1' can be entered as according to an arrow E' by a cow present in a waiting area, the second milking stall 1'' can be exited as indicated with an arrow L'', wherein the cow can walk from milking stall 1'' to an accommodation area. The waiting area and the accommodation area can be separate spaces in a shed, but may also be segregated parts of a meadow, this as elucidated in PCT/NL95/00261 of the same applicant.

Figure 2 shows an arrangement and position of the fences comparable to figure 1 which indicates that the first stall 1' can be exited as according to an arrow L'.

In figure 3 is shown a situation wherein the second milking stall 1'' can be entered as according to arrow E''. For this purpose the entrance door 2'' is first opened, which entrance door 2'' thereby simultaneously blocks the passageway between the milking stalls and separating fence 4. Simultaneously or optionally after a short time delay the swivel gate 5 swivels to a position along separating fence 4 so that access to the second milking stall 1'' is created.

After a cow has entered the second milking stall 1'' the swivel gate 5 swivels back to the position as shown

in figures 1 and 2. A second cow which has followed the first is herein pushed back. Simultaneously or optionally after a short time delay the entrance door 2'' closes and pushes the cow into its milking position in the second milking stall 1''.

As shown in figure 3, there are two access routes E' and E'' for the cows in this arrangement, which access routes E' and E'' lie a substantial distance apart. It is hereby not possible for one cow to obstruct the access to the milking installation.

In figures 4 and 5 is shown an embodiment wherein separating fence 4 is connected to the middle of the first milking stall 1' by a fixed end fence 6 and wherein the access to the second milking stall 1'' is reached via an access gate 7 which is placed in separating fence 4 roughly opposite entrance door 2'' of the second milking stall 1''. The operation of this embodiment is comparable to that as described above, where the access routes E' and E'' have an even greater distance therebetween.

Figures 6-9 show an embodiment with three stalls. Access to the first milking stall 1' and second milking stall 1'' is comparable to that as shown in figures 1-3. Access to the third milking stall 1''' takes place via an access gate 8 in a manner comparable to that discussed in the access to the second milking stall 1'' of figures 4 and 5. In figures 6-9 the access door 2''' of the third milking stall 1''' is embodied with a hinge on the side of the first milking stall 1', wherein the hinge of access gate 8 is also placed on the other side. Placing of the hinge of access door 2''' on the side of the first milking stall 1' has the advantage that a cow cannot become jammed with its hipbone.

In figure 10 is shown an embodiment wherein the second and subsequent milking stalls are accessible via an access gate 8 and wherein a return gate 9 is also placed in separating fence 4. By closing off the passageway in the direction of the accommodation area with return gate 9 it is possible to ensure that cows which have visited the milking stall but to which connection of the teat cups of the milking cluster has not been suc-

cessful are guided back to the waiting area as indicated with arrows R', R'' and R'''. The embodiment shown in figure 10 is a combination of the access to the third stall as according to figures 6-9 and the access to the second stall as according to figures 4 and 5.

Figure 11 shows a milking device with a waiting area I, an accommodation area II, a segregation area III and a operating area IV. By means of a one-way gate 13 the animals are held in the waiting area I. Animals which leave a milking stall 1 can be guided back from the passageway to waiting area I via a first separation gate 12 or to segregation area III via a second separation gate 11. Guided into segregation area III are those cows to which the farmer must pay particular attention, either because he has entered this in the control system or because the system has determined that this is necessary. In order to cause separation gates 11 and 12 to operate independently of the sequence in which the animals walk out of the milking stalls, an identification device 10 is placed in the passageway. When an animal leaves a milking stall, it is determined in the control whether it must be guided to accommodation area II, waiting area I or segregation area III. It then walks through the passageway and before arriving at the separation gates it is identified with the identification device 10 and it is determined from the control which position the separation gates 11 and 12 must take. In this manner is achieved that these control fences are as it were actuated by the animal approaching these fences and it is unnecessary for a record to be made in the control with sensors suitable for this purpose of where the animal is located in the passageway and when it will arrive at the separation gates. The distance between identification device 10 and separation gates 11 and 12 is chosen such that there is sufficient time for these fences to be able to assume the desired position. Provisions are optionally made that the cow will not begin to walk too quickly or the identification device 10 is placed in a bend.

Also shown in figure 11 are one-way gates 15 which ensure that animals cannot enter the passageway from accommodation area II or segregation area III.

As will be apparent from the description of the
5 above described embodiments, the form of the fences can be adapted to the situation of the available space, desired capacity for milking and the characteristics of the herd. It is also possible to embody the shed with two, three and four or more milking stalls.

CLAIMS

1. Device for unmanned milking of animals with an automatically operating control system, comprising two or more milking stalls (1) which are placed one after another in lengthwise direction and which are provided on a long side with an entrance door (2) movable with drive means and an exit door (3) movable with drive means, a waiting area (I) for animals for milking, a passageway to an accommodation area (II) which runs from the exit door (3') of the first milking stall (1') along the long side of the other milking stalls (1'', 1''') along which milked animals can leave the milking device and a separating fence (4, 6) along the passageway on the side remote from the milking stalls, **characterized in that** the separating fence (4) is provided close to the entrance door (2'', 2''') of the second milking stall (1'') and optionally each subsequent milking stall (1''') with an access gate (5, 7, 8) movable with drive means which can leave clear an access path from the waiting area (I) to the relevant milking stall (1'', 1''').

2. Device as claimed in claim 1, **characterized in that** in the case of each access path the opened access gate (7, 8) or the opened entrance door (2'', 2''') blocks passage to the part of the passageway directed toward the accommodation area (II).

3. Device as claimed in claim 1 or 2, **characterized in that** coupling means are present with which the drive means of the entrance doors (2) and of the associated access gates (5, 7, 8) are coupled.

4. Device as claimed in claim 3, **characterized in that** the coupling means are embodied such that the entrance door (2'', 2''') opens first and then the access gate (5, 7, 8).

5. Device as claimed in claim 3 or 4, **characterized in that** the coupling means are embodied such that the access gate (5, 7, 8) closes first and then the entrance door (2'', 2''').

6. Device as claimed in any of the foregoing claims, **characterized in that** the hinges of the entrance door (2) and the exit door (3) of the second or subsequent milking stalls are arranged on the milking stall such that both
5 doors (2, 3) open on the same side remote from the first milking stall (1').

7. Device as claimed in any of the foregoing claims, **characterized in that** the separating fence (4) is provided close to the exit door of the last milking stall
10 (1''') with a return gate (9) movable with drive means.

8. Device as claimed in any of the foregoing claims, wherein the milking stall (1) is provided with an identification device for establishing the identity of the animal present in the milking stall and wherein sorting
15 means (11, 12) are placed in the passageway after the last milking stall (1''') with which the passageway can be connected to the waiting area (I), the accommodation area (II) or a segregation area (III), **characterized in that** an identification device (10) co-acting with the
20 sorting means is arranged in the passageway in front of the sorting means.

9. Method for automatic milking of animals with teat cups which form part of a device as claimed in any of the claims 1-8, wherein the access gates (5, 7, 8), the exit
25 doors (3) and the return gate (9) are controlled such that, should the case arise, for instance after failure to place the teat cups, an exit path crossing the passageway is formed from a milking stall (1) to the waiting area (I).

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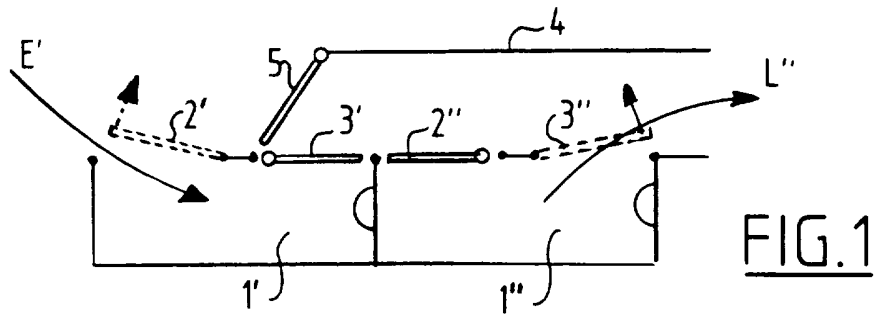


FIG. 1

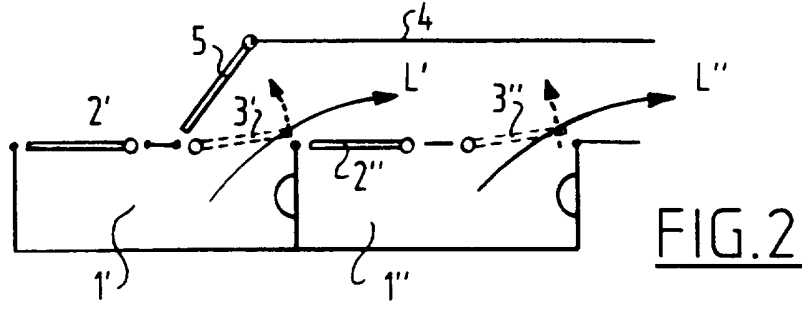


FIG. 2

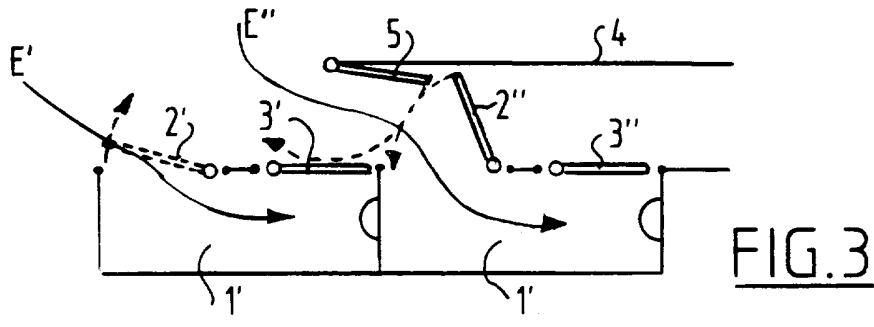


FIG. 3

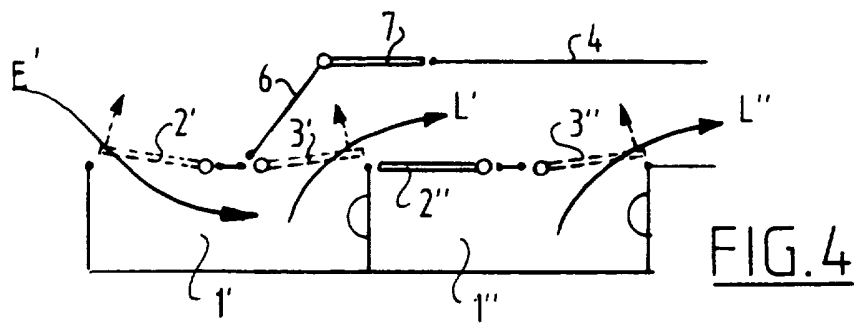


FIG. 4

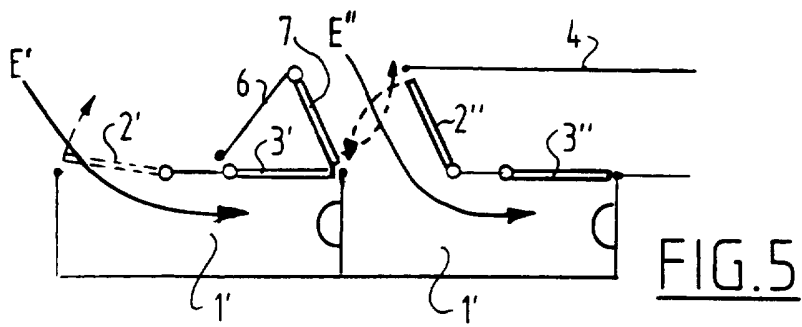


FIG. 5

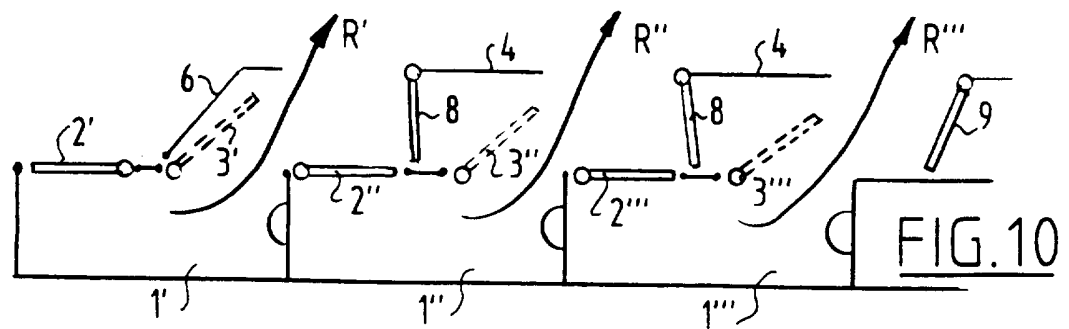
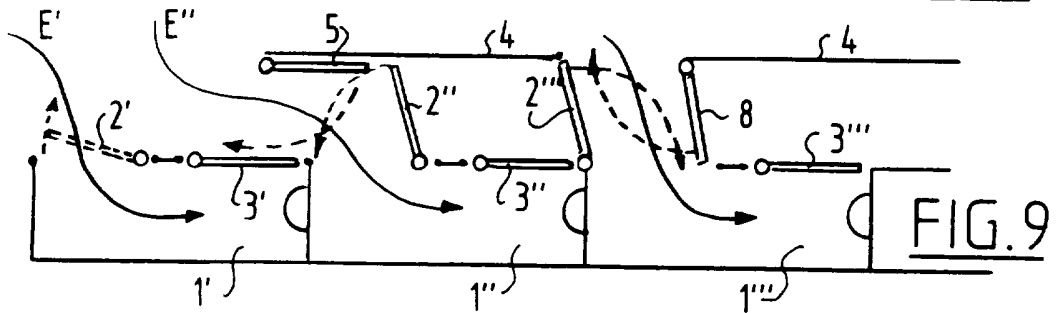
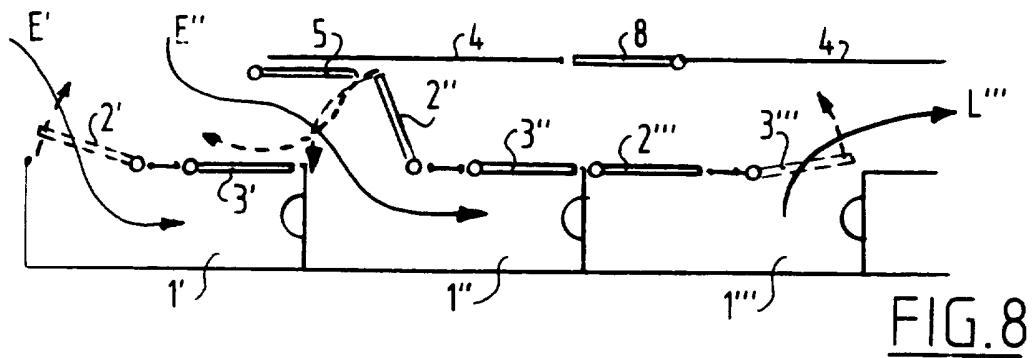
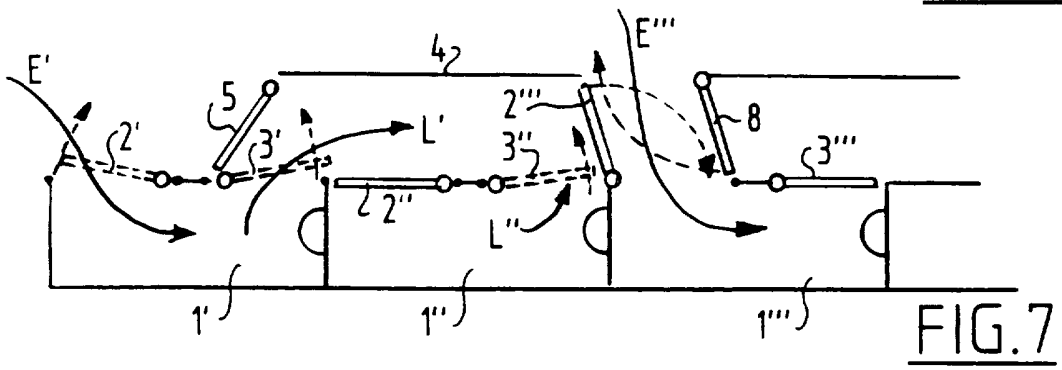
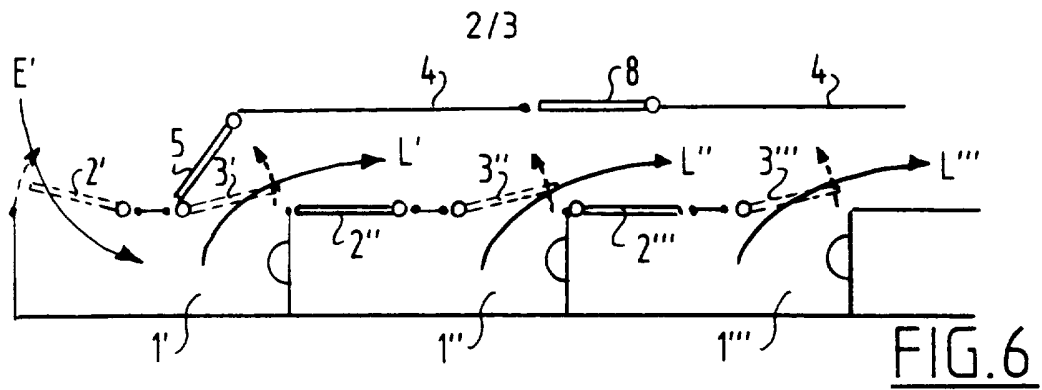
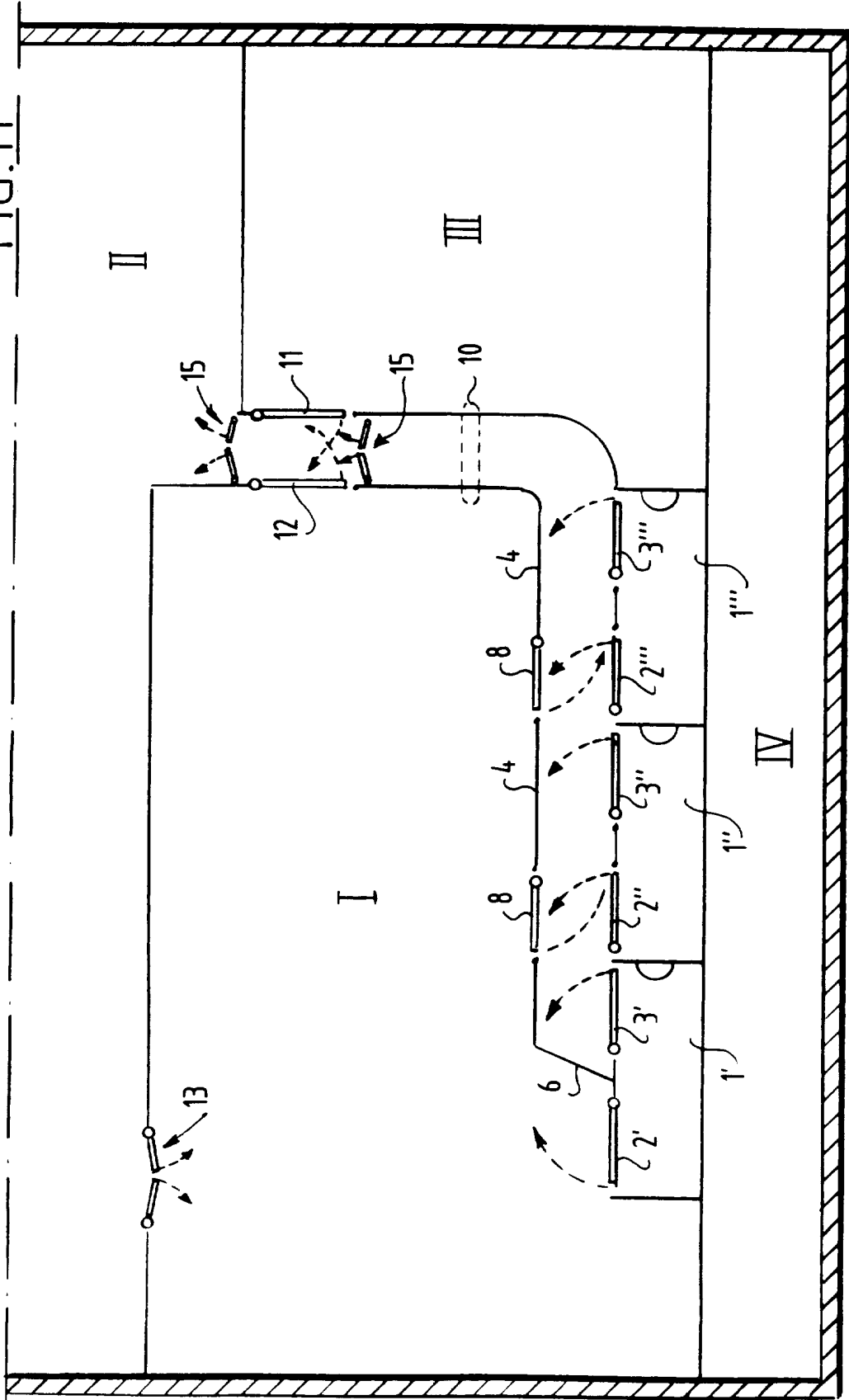


FIG.11



INTERNATIONAL SEARCH REPORT

International Application No
PC 1/NL 97/00180

A. CLASSIFICATION OF SUBJECT MATTER IPC 6 A01J5/017 A01K1/12		
According to International Patent Classification (IPC) or to both national classification and IPC		
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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)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 96 03031 A (PROLION BV ;OOSTERLING PIETER ADRIAAN (NL)) 8 February 1996 see claims; figures ---	1,8
A	DE 37 02 465 A (DUEVELSDORF & SOHN GMBH & CO K) 11 August 1988 see column 3, line 13 - column 5, line 8 see claims; figures ---	1,8
A	EP 0 639 327 A (MAASLAND NV) 22 February 1995 see claims; figures ---	1,8
A	EP 0 270 165 A (MULTINORM BV) 8 June 1988 cited in the application see claims; figures -----	1
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Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016	Authorized officer <p style="text-align: center;">Piriou, J-C</p>	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/NL 97/00180

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