

Description

The invention relates to a method and a device for cleaning crates, such as for example crates for the temporary storage of agricultural produce.

In agriculture, use is increasingly being made of large crates for storing agricultural produce in cold stores, in order to be able to utilize a refrigeration unit more efficiently. For this purpose, crates with a volume of about 1 m³ or more are now being used. The advantage of this is that a plurality of types of produce can be stored at a short distance apart in a refrigeration unit or cold store and also that produce from a plurality of producers can be stored separately from one another in the same cold store.

After a crate has been used for a particular agricultural product, the crate has to be cleaned. Owing to the soil, remainders of produce, dirt, germs, such as for example potato rots, etc., remaining in a crate, the crates have to be thoroughly cleaned, since otherwise there is a risk of germs being transmitted to the newly stored produce, which will result in the quality of the produce deteriorating very rapidly.

However, crates with dimensions of the size of the agricultural crates in question, the length, width and height of which are usually greater than 1 metre, are not easy to handle, with the result that hitherto it has been possible to clean crates of this kind as well as possible, but never completely. Residues which are unable to pass through the gaps in the crate, above all, frequently remain behind in a crate of this kind. Moreover, cleaning an agricultural crate of this kind is a difficult and labour-intensive operation which requires considerable time for each crate.

The object of the device and the method according to the invention is for it to be possible to clean carefully a crate or container whose volume is more than 1 cubic metre with the aid of water jets, and for it to be possible to place this crate in a plurality of positions during cleaning.

This object according to the invention is achieved by means of a method according to the invention by the fact that:

- a crate is placed in a cleaning space,
- after which the crate is clamped into a clamping device;
- after which the crate and the underside of the cleaning space are moved away from one another;
- after which the crate is turned upside down about an axis of rotation, both the inwardly directed surfaces and the outwardly directed surfaces of the walls of the crate simultaneously being sprayed down with water jets.

This measure allows dirt remaining in the crates to be cleaned out efficiently and quickly. Moreover, this method is easy to automate. In order to move the crate

and the underside of the cleaning space away from one another, the crate can be lifted up or the underside of the cleaning space, which is formed for example by a feed conveyor belt, can be moved downwards. A combination of the above is also possible.

In a preferred embodiment of the method according to the invention, the side walls of a crate to be supplied are sprayed down, after which the clamping means are placed on the sides in order to tip the crate. The parts of the crate which are covered by the clamping means can also be cleaned thoroughly in this way.

Furthermore, the spraying location is preferably closed off on all sides after a crate has been moved in, so that the environment is protected from splash water.

The object of the invention is also achieved by means of a device of the type described in the preamble, the washing device comprising:

- a first frame in which a crate to be cleaned can be placed;
- which first frame is provided with clamping means which serve to be able to hold a crate in place in a clamping manner when this crate has been placed inside the first frame;
- which first frame can rotate about a horizontal rotation shaft, and it being possible to change the distance between the rotation shaft and the underside of the frame with the aid of means, for example lifting means;
- means for spraying down the walls of the crate, comprising
- a feed line for supplying cleaning agent, such as water or some other cleaning liquid, which feed line is connected to a line which is provided at the end with one or more spray openings, which line is attached to the first frame and, with the aid of displacement means, can be placed into a crate to be cleaned,
- drive means enabling the first frame to be rotated together with the clamping means about the horizontal shaft.

By tilting the case, the water with the dirt can be discharged in a suitable manner, while the water can be sprayed correctly and powerfully against the entire inner surface of the crate.

In a preferred embodiment, the device comprises a second or fixed frame, in which the first frame is placed, as well as a feed belt and a removal belt, and the means for spraying down the walls also comprise means for spraying down the outside of the crate, which means comprise a line with a plurality of spray openings which serve to make it possible to spray the outside of the crate, and which line is connected to the feed line. This allows the outer sides of the crate also to be thoroughly cleaned. Dirt which is sprayed outwards through the gaps in the planks on the inside of the crate is then flushed off the outside of the crate.

In a further preferred embodiment, the water jets placed on the outside of the crate comprise a tube with nozzles placed at regular intervals, which nozzles spray water jets onto the wall over the entire width of the crate, in which case guide means enable the water jets always to spray virtually perpendicular to the wall of the crate during the rotation of the crate. In this way, it is possible to cover the entire outer surface of the crate. The cleaning action is optimal because the water jets remain directed virtually perpendicular to the outer surface.

The guide means can be realized in a simple and expedient manner by designing the guide means, for guiding the nozzles perpendicularly onto the crate, as a control disc or guide rail with a contour which at least partially essentially follows the contour of the crate to be cleaned, which guide rail rotates in the frame at the same time as the crate, the tube with the nozzles being arranged on an arm in such a manner that it can tilt with respect to the frame, a sensor or runner moving along the periphery of the guide rail during the rotation of the crate, which runner is rigidly connected to the tube provided with nozzles.

In this case, guide means are preferably provided with means for correcting the rotational speed at which the crate is tilted, with the aid of a signal which depends on the position of the runner. As a result, it is possible to correct the speed of movement of the tube with the nozzles with respect to the outer surface of the crate to be cleaned in such a manner that this speed of movement is more or less constant.

Preferably, the first frame comprises a water-spraying head which, with the aid of displacement means, such as for example a hydraulic or pneumatic cylinder, can be placed in a crate to be cleaned. As a result, the spraying head can be placed close to the surfaces to be cleaned.

Preferably, the device comprises a bracket in which a water feed is arranged and which can be placed over the open side 4 of a crate to be cleaned, which bracket can be rotated simultaneously with the crate and at the same speed as the latter. This design can be realized in a simple and advantageous manner.

The device is preferably mobile, so that it can be deployed at a number of locations.

The invention will be explained in more detail with reference to the drawing, in which:

Figure 1 shows a longitudinal section through a device according to the invention;
 Figure 2 shows a device in accordance with Figure 1 with a clamped, tilted crate;
 Figure 3 shows part of a device according to the invention with guide means for directing the nozzle tube;
 Figure 4 shows a clamped, tilted crate in which a spray opening has been positioned;
 Figure 5 shows a detailed view of an end roller of a device according to the invention;

Figure 6 shows sprayers of a device according to the invention for cleaning the underside of a crate;

Figures 1A-D show side views of sprayers in accordance with Figure 6 in successive phases of the cleaning operation;

Figures 8A-B show frontal views of a frame with a clamping device of a device according to the invention.

Figure 1 shows a longitudinal section through a device 1 according to the invention. The device 1 comprises a storage location or loading platform 2, on which crates 3 to be cleaned, with pallet bottoms and an open side 4, are accumulated. A roller conveyor 5 which slopes downwards and has rollers 6 is then used to move a crate 3 to be cleaned, with the open side 4 directed upwards, towards a cleaning space 7. Spraying heads 8, which are connected to a feed line 9 for supplying a cleaning agent, for example water, are positioned beneath the roller conveyor 5. The spray heads 8 spray the underside of the supplied crate 3 clean. The crate 3 continues to roll until it hits a raised end roller 10. This end roller 10 can be displaced between the high position illustrated and a retracted low position, the end roller 10 being situated at or below the level of the rollers 6 of the roller conveyor 5, so that the crate 3 can then roll on into the cleaning space 7, by means of a moving belt 11. In so doing, the crate 3 passes a vertical feed tube 12 which is provided with spray openings 13 which are directed transversely to the direction of transport of the crate 3. When the crate 3 passes this feed tube, the sides of the crate are sprayed clean. The crate 3 is clamped in the cleaning space 7 with the aid of clamping means 14. These clamping means 14 comprise an arm 15, which is provided at both ends with projections 16. When the crate 3 has been placed in the cleaning space 7, the clamping means 14 on either side of the crate 3 are moved towards the crate 3 until the crate 3 has been clamped firmly. The crate 3 is then lifted, together with the clamping means 14, with the aid of lifting means 17, in this embodiment a pneumatic cylinder. The arm 15 can rotate about a rotation shaft 18. The crate 3 to be cleaned is lifted, together with the clamping means 14, with the aid of the lifting means 17 and is then tilted about the rotation shaft 18, as shown in Figure 2.

The cleaning space 7 is surrounded by a frame 19. An arm 20, which can tilt over a certain angle with respect to the frame 19, is attached to the top of the frame 19. A runner or sensor 21 is arranged at the end of this arm 20, the runner comprising an inverted T-shaped body, a small wheel 22 being arranged rotatably at both ends of the underside of the runner 21. A perspective, detailed view of the runner 21 is illustrated in Figure 3. The small wheels 22 rest on a guide rail 23. A hollow tube 24, which is provided with spray openings or nozzles 25 which are directed essentially downwards, is

attached to the upper end of the runner 21. The hollow tube 24 extends from the runner 21 as far as the opposite side of the cleaning space 7, where the hollow tube is also tiltably attached to the frame 19. The hollow tube 24 is connected to a flexible feed line or feed hose 26 for the supply of pressurized water. The guide rail 23 is bent into the form of a continuous, planar frame 27 which runs virtually parallel to the direction of transport of the crates 3 to be cleaned. The frame or sensor run 27 is in the shape of a pentagon, in which three of the five sides are essentially perpendicular to one another. The three mutually perpendicular sides 28 more or less describe the contour of the bottom and two opposite side walls of a crate to be cleaned. The other two sides 29 of the pentagon are positioned in the form of an inverted V on the three mutually perpendicular sides 28. When a crate 3 to be cleaned is clamped in with the aid of the clamping means 14, the mutually perpendicular sides 28 of the frame 27 lie directly next to the underside and the front and rear (in the direction of transport) side walls of the crate 3 to be cleaned. The inverted V-shaped sides 29 of the frame 27 project above the open side 4 of the crate 3 to be cleaned, as shown in Figure 2, where the open side 4 of the crate 3 to be cleaned is directed obliquely downwards. After clamping in a crate 3 to be cleaned, the frame 27, together with the crate 3 to be cleaned, is lifted with the aid of the lifting means 17 and is rotated. During the rotation of the frame 27, the runner 21 runs along the guide rail 23. As a result, the nozzles 25 in the hollow tube 24 are always directed more or less perpendicular to the outer walls to be cleaned of the crate 3 to be cleaned. When the open side 4 of the crate 3 has been rotated to face upwards, the runner 21 runs along the two inverted V-shaped sides 29 of the frame 27, so that the nozzles 25 are then directed obliquely towards the insides of the crate 3 to be cleaned and are able to flush the inside walls clean as well as possible.

During the spray-cleaning operation, the crate 3 and the clamping means 14 are rotated about an axis of rotation which is essentially transverse to the clamped-in side walls of the crate 3 and which runs approximately through the centre of these side walls, so that the force to be exerted in order to provide the rotation is as low as possible. During the rotation of the crate 3 and the frame 27, the distance from the runner 21 to the axis of rotation changes. As a result, the speed of movement of the runner 21 also changes with respect to the side walls of the crate 3. Since the speed of movement of the runner 21 with respect to the outside of the crate 3 changes, the rotational speed of the small wheels 22 also changes. In order to correct the speed of movement of the runner 21 and to ensure that the speed of the runner 21 remains virtually constant with respect to the side walls of the crate, the rotational speed of the small wheels 22 or the position of the arm 20 is converted into a signal, which is then used to adjust the rotational speed of the crate 3. For example, if the small

wheels 22 are rotating quickly, the rotational speed of the crate 3 is reduced, so that the speed of movement of the runner with respect to the outer sides of the crate 3 is reduced and can be kept at a more or less constant level. For example, if the small wheels 22 begin to move slowly, the rotational speed of the crate 3 is increased with the aid of the signal, so that the speed of movement of the runner 21 is also increased. In this way, the speed of movement of the runner 21 and thus of the nozzles 25 with respect to the outside of the crate can be adapted and corrected continuously.

A hollow bracket 30, with a free end 31 which is bent downwards, is attached to the clamping means 14. This bracket 30 is illustrated in detail in Figure 4. The bracket 30 is attached tiltably with respect to the clamping means 14 and can be tilted, with the aid of a pneumatic cylinder 32, between a high position, in which a crate 3 to be cleaned can be placed between the bracket 30 and the moving belt 11, and a low position. If the bracket 30 is placed in the low position when a crate 3 to be cleaned is situated on the moving belt 11, the bent end reaches deep into the crate, at a certain distance from the bottom of the crate. A rotatable spraying head 33 is arranged at the end of the bent end 31. This spraying head 33 comprises a first part 34 which is able to rotate about a first axis of rotation which is approximately in line with the end 31. A second part 35, which can rotate with respect to the first part 34 about a second axis of rotation which is more or less transverse to the first axis of rotation, is arranged on this first part 34. As a result, this second part 35 can execute rotational movements in two axes. This second part 35 is provided with a number of nozzles 36 set up on different sides. The hollow bracket 30 is connected to a feed line for supplying water.

When a crate 3 to be cleaned has been placed in the cleaning space 7, it is then clamped by the clamping means 14 and then lifted by means of the lifting means 17, the bracket 30 being tilted and moved into the crate to be cleaned as far as to a distance away from the bottom of the crate 3. Water is then supplied and sprayed around into all corners, gaps and holes on the inside of the crate 3, by means of the rotating nozzles 36. In the meantime, the crate 3 is rotated, together with the clamping means 14 and the frame 27, and is sprayed clean on the outer sides by the nozzles 25. The dirt which is sprayed away from the inside of the crate 3 by the nozzles 36 is, on the one hand, flushed towards the outer sides via gaps and openings in the crate 3, where it is then sprayed away by the nozzles 25. On the other hand, some of the dirt from the inside is flushed out of the crate 3 together with the used water when the crate 3 is tilted in such a manner that the open top side of the crate 3 is directed downwards.

The whole of the cleaning space 7, with the frame 19 and the moving belt 11, is placed on a mobile chassis with wheels 37.

A second roller conveyor 38, which slopes down-

wards from the moving belt 11 at a slight angle, for example an angle of about 10 degrees, is arranged adjacent to the end of the moving belt 11. A stop 39 is attached to the end of this roller conveyor 38, the crate striking this stop when it rolls downwards along the roller conveyor 38.

Finally, Figure 5 shows a detailed view of an end roller 10 which is arranged at the end of the first roller conveyor 5. The end roller 10 is attached to the end of a lifting arm 40 which, with the aid of a cylinder 41, can be tilted about a pivot pin 42 between a first limit position and a second limit position. In the first limit position, the end roller 10 projects above the rollers 6 of the roller conveyor 5 and a crate 3 supplied will be halted before it can be moved into the cleaning space 7 on the moving belt 11. When the lifting arm 40 is tilted into the second limit position, with the aid of the cylinder 41, the end roller 10 moves into a position which is level with or below the rollers 6 of the roller conveyor 5, so that any crate 3 which it is holding back can roll onwards. After the end roller 10 has moved downwards in order to allow a crate 3 to pass, the end roller 10 is placed back in the first, high limit position when more than half, for example more than three quarters, of the crate has moved past, as illustrated in Figure 5. This prevents the end roller 10 from also allowing through a second crate which is immediately behind the first crate 3.

Figure 6 shows part of a device according to the invention which is intended for cleaning a crate with pallet-like underside. The underside 43 of the crate comprises a bottom 44 made of slats 45 which lie adjacently, beneath which a second layer 46 of slats is arranged, these slats being positioned at a regular distance apart. The first layer of slats 45 and the second layer of slats 46 are connected to one another by means of cross-bars 47. Figures 7A to 7D show how the underside 43 of a crate of this kind is sprayed clean. The crate to be cleaned is guided, via two conveyor belts 48 which act on both sides of the crate, in the direction of a number of tilting wheels 49 which are disposed at a distance from the conveyor belts 48. Each tilting wheel 49 can tilt about a pivot pin 50 which is approximately level with the circumference of the tilting wheel 49. An arm 51 is attached to each tilting wheel 49 in a rotationally fixed manner, a transverse arm 52, which extends in a direction perpendicular to the direction of transport, being attached to the end of this arm 51. A number of sprayers or nozzles 53 are attached to the transverse arm 52.

The crate is conveyed, by the conveyor belts 48, in the direction of the tilting wheels 49. The crate is then stopped by the tilting wheels 49, as shown in Figure 7A. The sprayers 53 are directed so that they flush clean the top side of the adjacent bottom slat 46. When the crate is conveyed further by the conveyor belts 48, the tilting wheels 49 tilt owing to the weight of the crate, so that the sprayers 53 are also tilted and consequently are directed at the underside of the upper slats 45 of the bottom of the crate (cf. Figure 7B). When the crate is

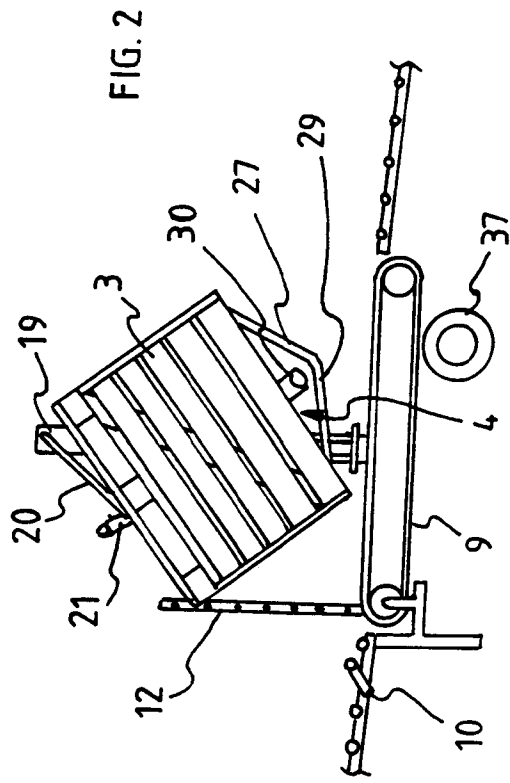
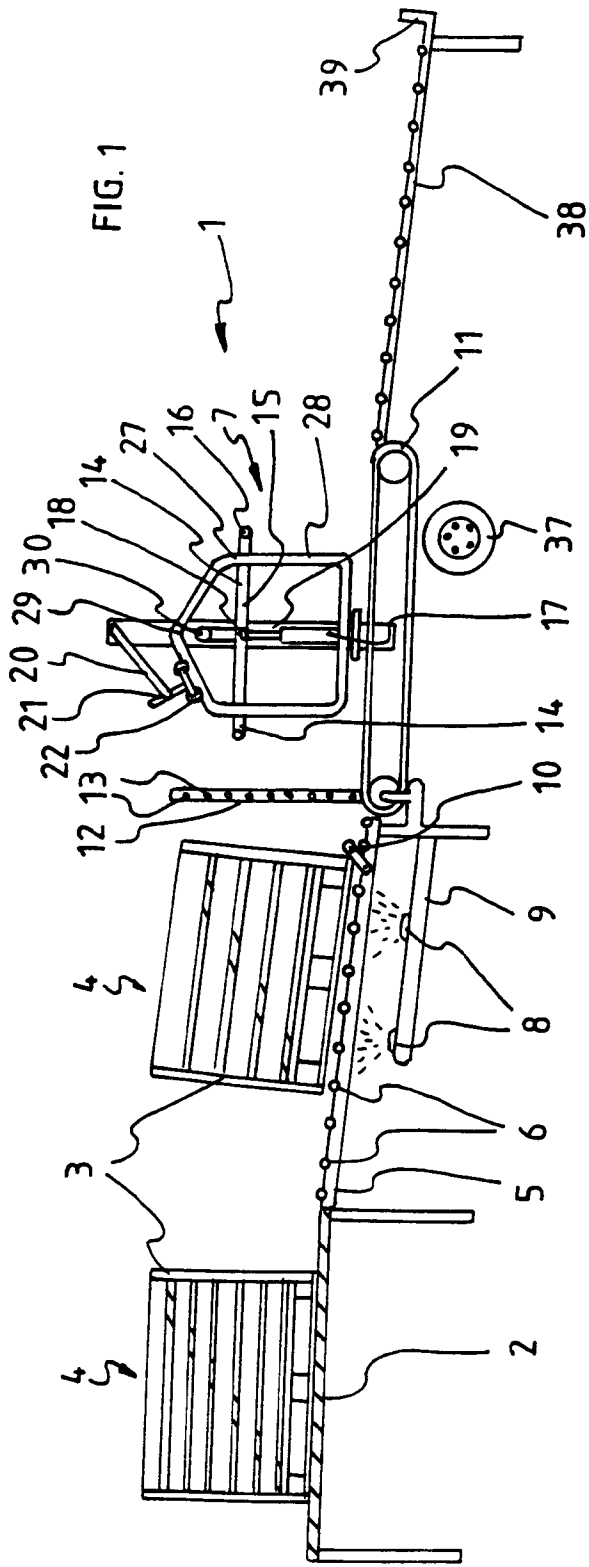
conveyed even further and the tilting wheel 49 tilts further, the sprayers 53 spray the underside of the bottom slat 46 clean (Figure 7C). When the first slat of the second layer of slats 46 has moved completely past the tilting wheel 49, the tilting wheel 49 is situated in the space between two adjacent slats 46, and the tilting wheel 49 is driven back, for example by a spring, into the starting position shown in Figure 7A, so that the following slat 46 can be sprayed clean on the top side and the cycle can repeat itself (Figure 7D).

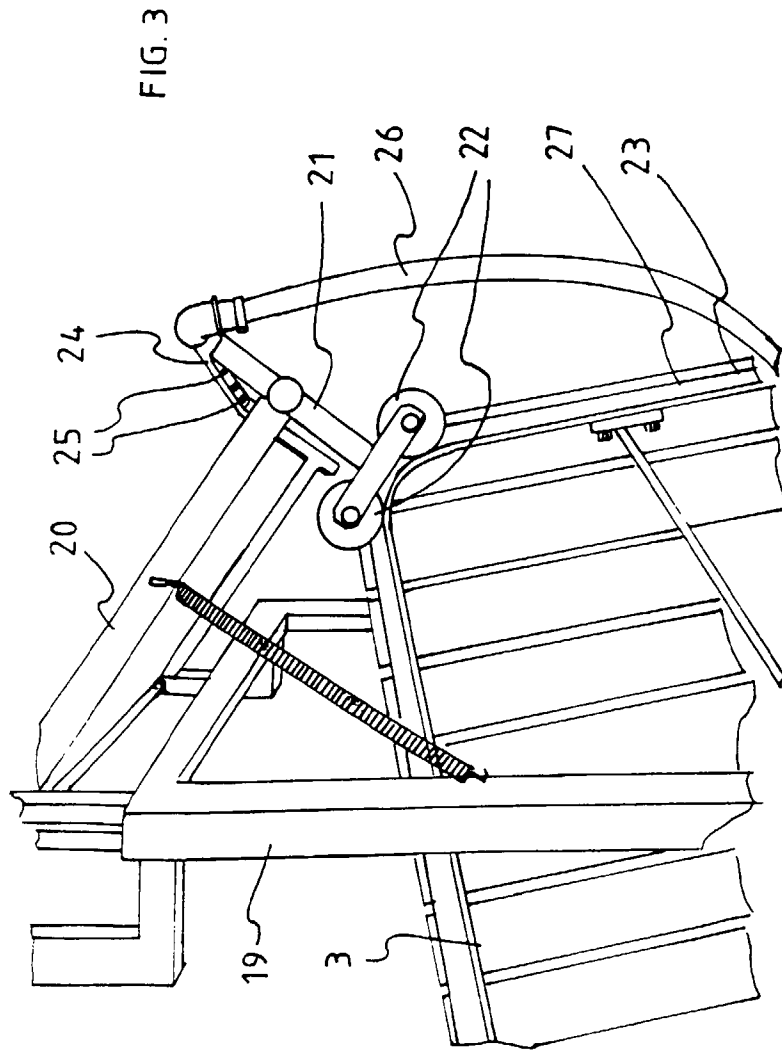
Figures 8A and 8B show a device according to the invention in which the clamping means 14 comprise two arms 54 which are provided at their bottom ends with clamping plates 55, which can be clamped onto a crate to be cleaned. The two arms 54 can be moved towards and away from one another in such a way that crates of different dimensions can be clamped in. A conveyor belt 56 is situated beneath each of the two clamping arms 54. The conveyor belts 56 act on the sides of the crate to be cleaned, so that the bottom remains virtually uncovered, with the result that the water and any cleaning medium can easily flow away together with the dirt. In order to be able to clean crates of different widths, the conveyor belts 56 may be moved towards or away from one another. As a result, the device can be adjusted optimally for different dimensions of the crates to be cleaned.

Claims

1. Method for cleaning containers, and more particularly agricultural crates, characterized in that
 - a crate is placed in a cleaning space,
 - after which the crate is clamped into a clamping device;
 - after which the crate and the underside of the cleaning space are moved away from one another;
 - after which the crate is turned upside down about an axis of rotation, both the inwardly directed surfaces and the outwardly directed surfaces of the walls of the crate simultaneously being sprayed down with water jets.
2. Method according to Claim 1, characterized in that the side walls of a crate to be supplied are sprayed down, after which the clamps are placed on the sides in order to tilt the crate.
3. Method according to Claim 1 or 2, characterized in that the crate is then removed from the cleaning space and in that a following crate is placed in the cleaning space.
4. Method according to one of the preceding claims, characterized in that the spraying location is closed off on all sides after a crate has been moved in.

5. Device for cleaning containers, such as for example crates for the temporary storage of agricultural produce, characterized in that the device comprises:
- a first frame in which a crate to be cleaned can be placed;
 - which first frame is provided with clamping means which serve to be able to hold a crate in place in a clamping manner when this crate has been placed inside the first frame;
 - which first frame (clamping means) can rotate, with the aid of rotation means, about a horizontal rotation shaft, and it being possible to change the distance between the rotation shaft and the underside of the frame with the aid of means, for example lifting means;
 - means for spraying down the walls of the crate, comprising
 - a feed line for supplying cleaning agent, such as water or some other cleaning liquid, which feed line is connected to a line which is provided at the end with one or more spray openings, is attached to the first frame and, with the aid of displacement means, can be placed and/or moved into a crate to be cleaned,
 - drive means enabling the first frame to be rotated together with the clamping means about the horizontal rotation shaft.
6. Device according to Claim 5, characterized in that the device comprises a second or fixed frame, in which the first frame is placed, as well as a feed belt and a removal belt, and in that the means for spraying down the walls also comprise means for spraying down the outside of the crate, which means comprise a line which is provided with a plurality of spray openings which serve to make it possible to spray the outside of the crate, and which line is connected to the feed line.
7. Device according to Claim 5 or 6, characterized in that the water jets placed on the outside of the crate comprise a tube with nozzles for water placed at regular intervals, which nozzles spray water jets onto the wall over the entire width of the crate, in which case means enable the water jets always to spray virtually perpendicular to the wall of the crate during the rotation of the crate.
8. Device according to Claim 6, characterized in that the guide means for guiding the nozzles perpendicularly onto the crate comprise a control disc or guide rail with a contour which at least partially essentially follows the contour of the crate to be cleaned, which guide rail rotates in the frame at the same time as the crate, the tube with the nozzles being arranged on an arm in such a manner that it can tilt with respect to the frame, a sensor or runner moving along the periphery of the guide rail during the rotation of the crate, which runner is rigidly connected to the tube provided with nozzles.
9. Device according to Claim 8, characterized in that the guide means are provided with means for correcting the rotational speed at which the crate is tilted, with the aid of a signal which depends on the position of the runner.
10. Device according to one of Claims 5 to 9, characterized in that the first frame comprises a water-spraying head which, with the aid of displacement means, such as for example a pneumatic cylinder, can be placed in a crate to be cleaned.
11. Device according to one of Claims 5 to 10, characterized in that a bracket, in which a water feed is arranged, is placed over the open side of the crate and can be rotated simultaneously with the crate.
12. Device according to one of Claims 5 to 11, characterized in that the device is mobile.
13. Device according to one of Claims 6 to 12, characterized in that an automatic stacking device is positioned in front of the removal belt.
14. Device according to one of Claims 6 to 13, characterized in that an automatic unstacking device is placed in front of the feed belt.
15. Device according to one of the preceding claims, characterized in that one or more tilting wheels are incorporated in the feed belt or removal belt, which wheels project above the feed or removal belt by a distance which is less than the distance between the bottom slats and the top slats of a pallet-like crate bottom, and to which tilting wheels a side arm is connected, to which a number of sprayers are attached, the tilting wheel and the sprayers being positioned in such a manner that the crate, on moving past the tilting wheel, tilts the tilting wheel with the sprayers so that the sprayers are able to spray clean the whole of the space between the bottom slats and the top slats of the base and the underside of the bottom slats.





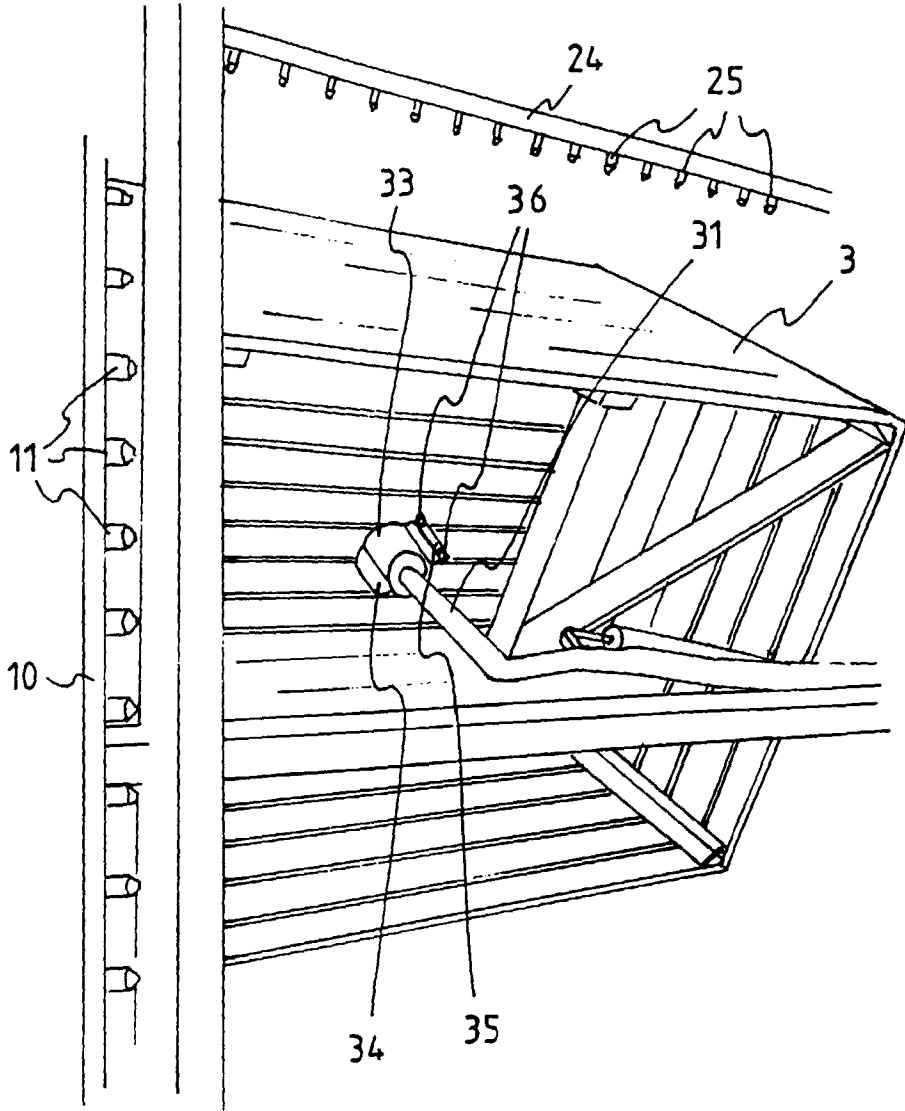
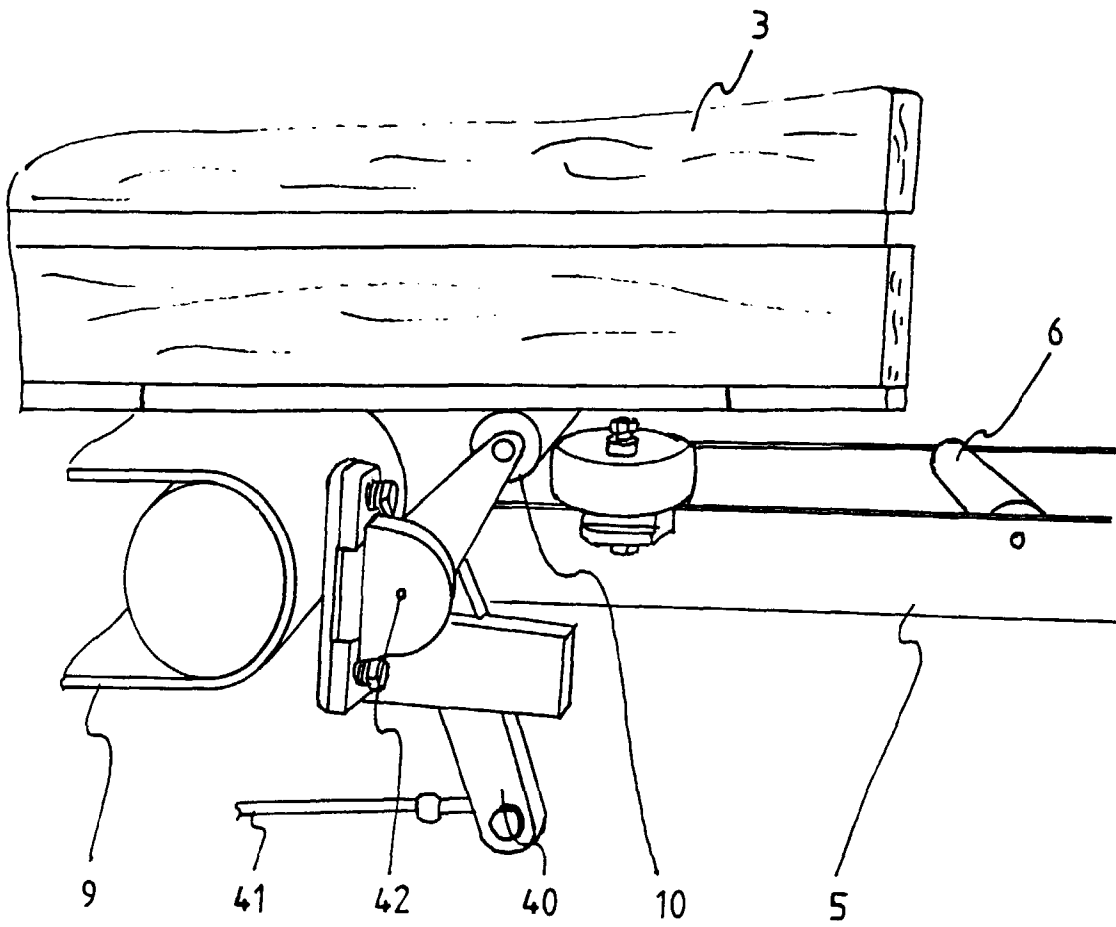


FIG. 4

FIG. 5



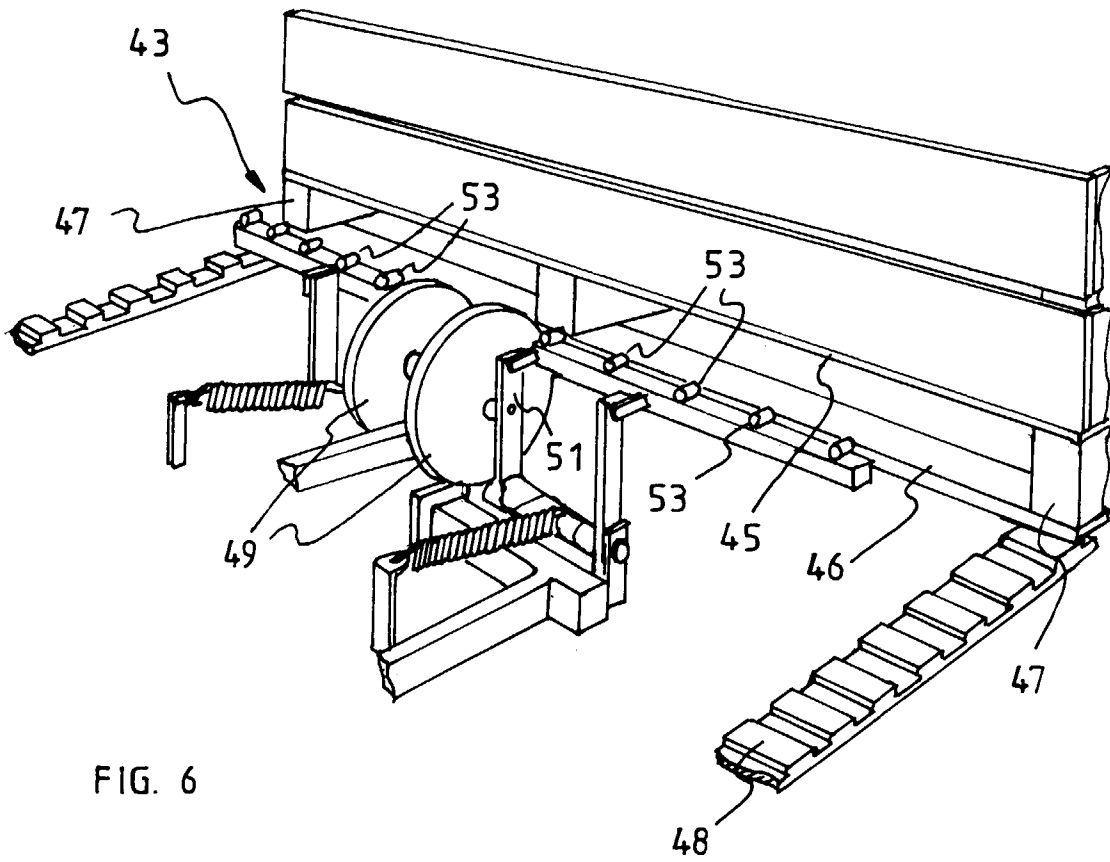


FIG. 6

FIG. 7A

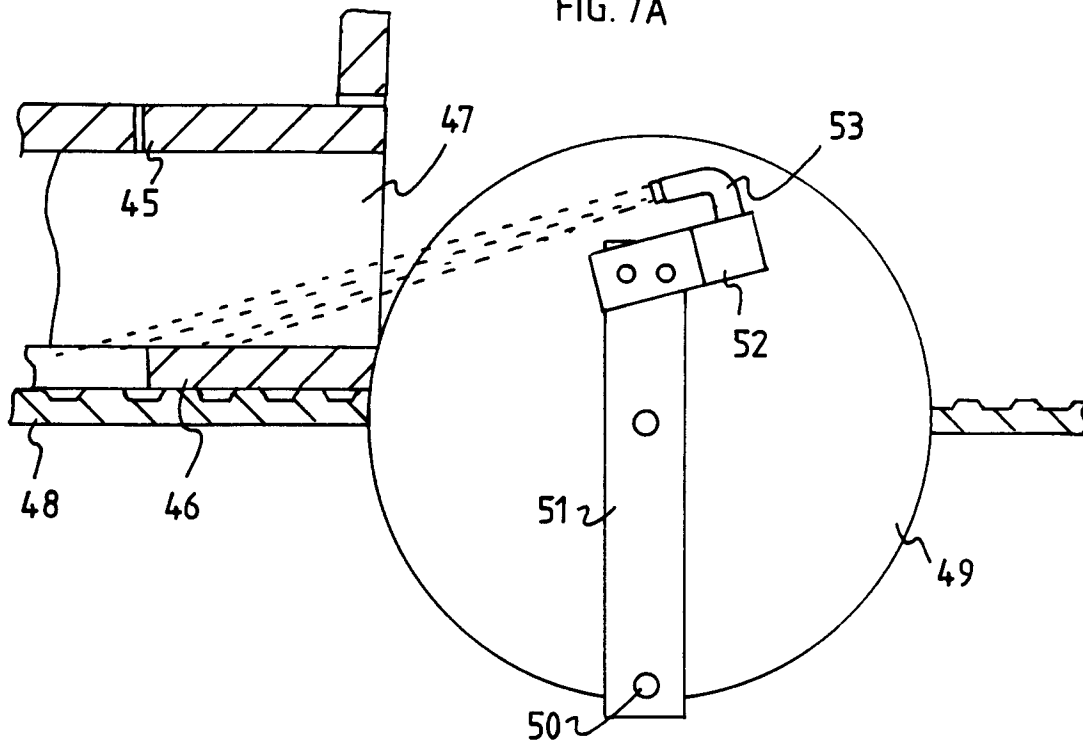


FIG. 7B

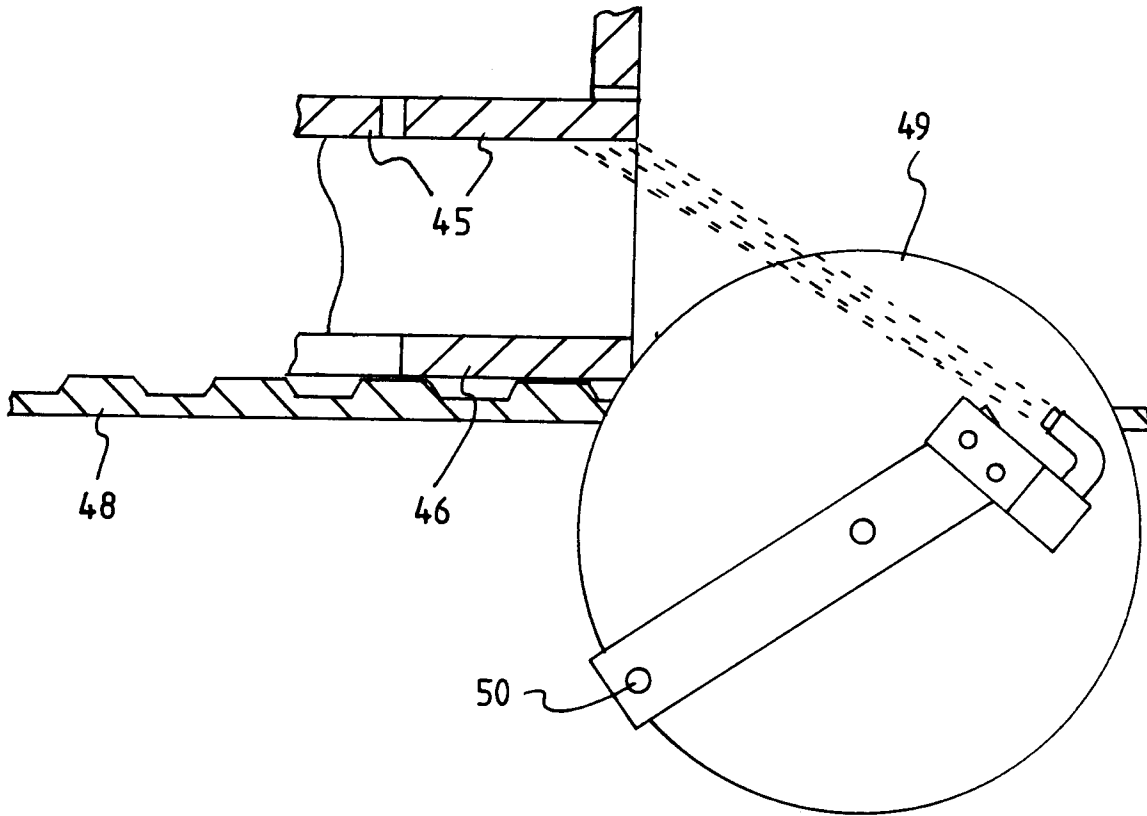


FIG. 7C

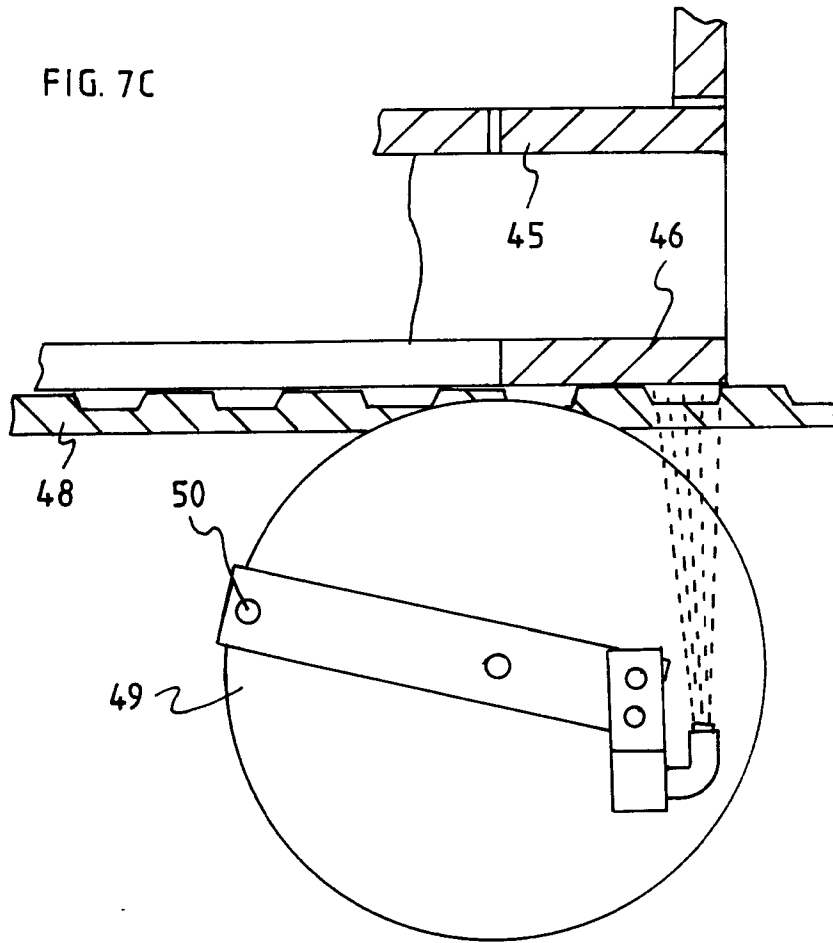
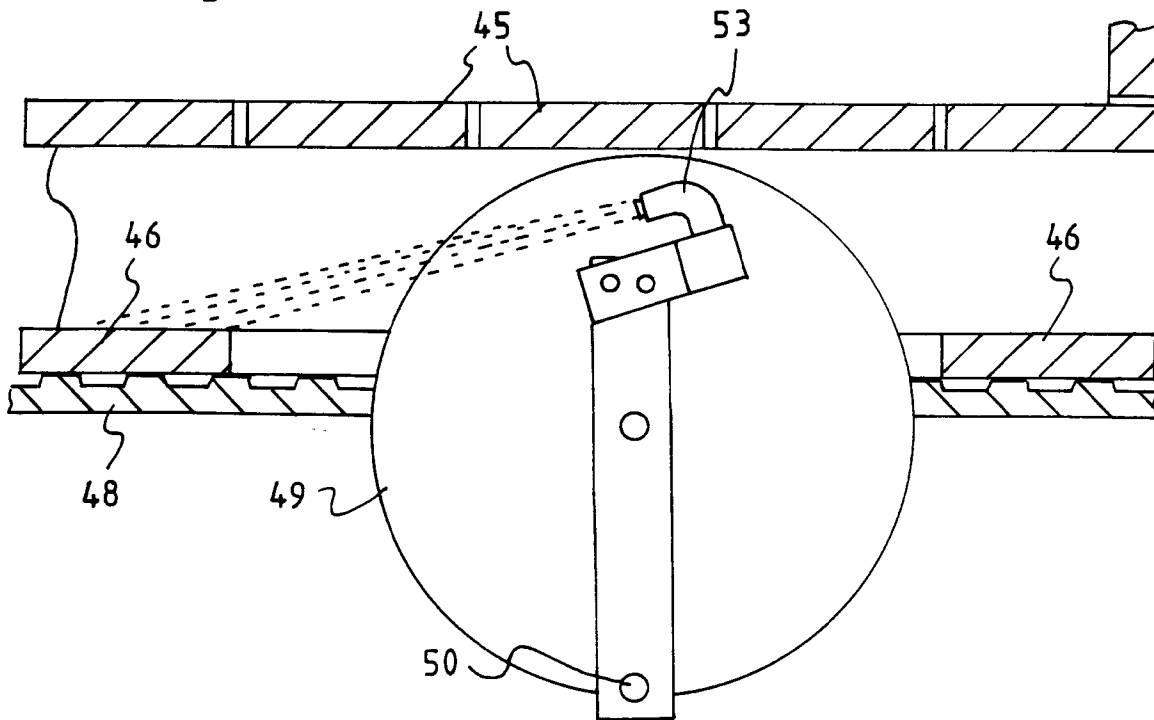


FIG. 7D



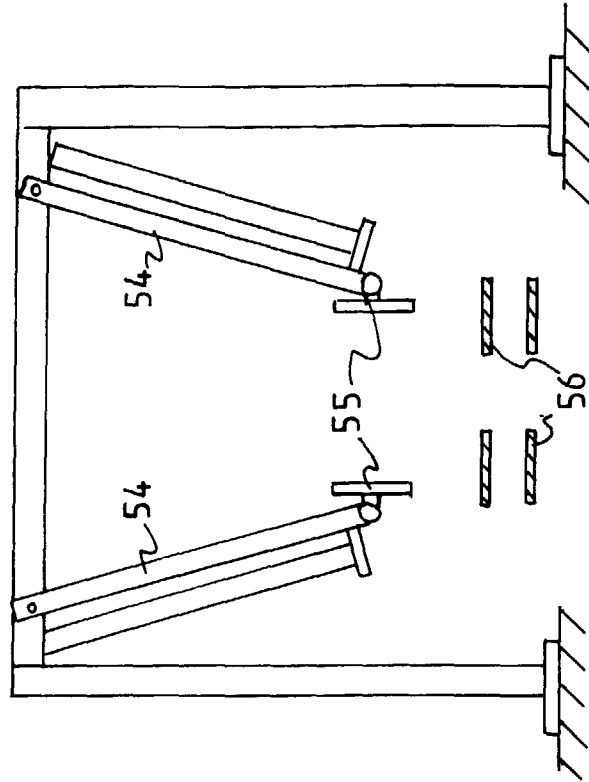


FIG. 8B

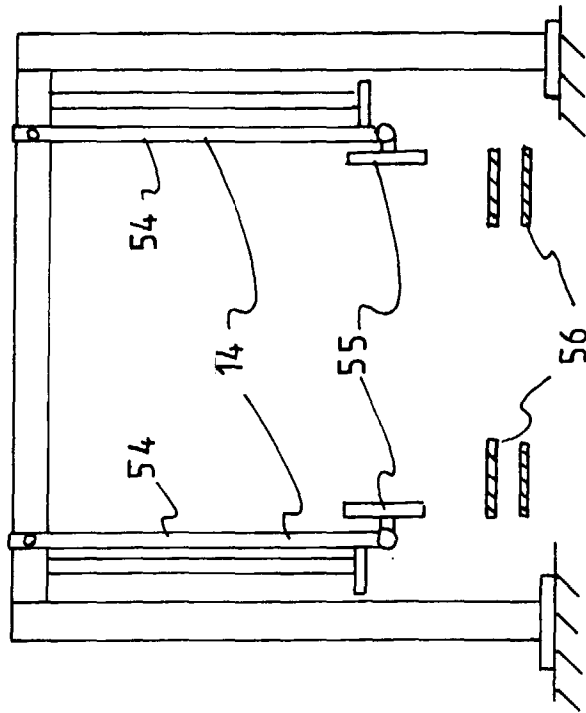


FIG. 8A



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 20 3932

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	DE 34 36 865 A (KLOTZKI) 12 June 1986 * the whole document *	1-4	B08B9/32
A	---	5-7,11	
A	US 4 039 350 A (BUCY ET AL) 2 August 1977 * the whole document *	1,3-7	
A	FR 2 645 775 A (SA COMPAGNIE PLASTIC OMNIUM) 19 October 1990 * the whole document * -----	1,3-6, 10,12	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B08B
Place of search		Date of completion of the search	Examiner
THE HAGUE		13 March 1998	Van der Zee, W
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