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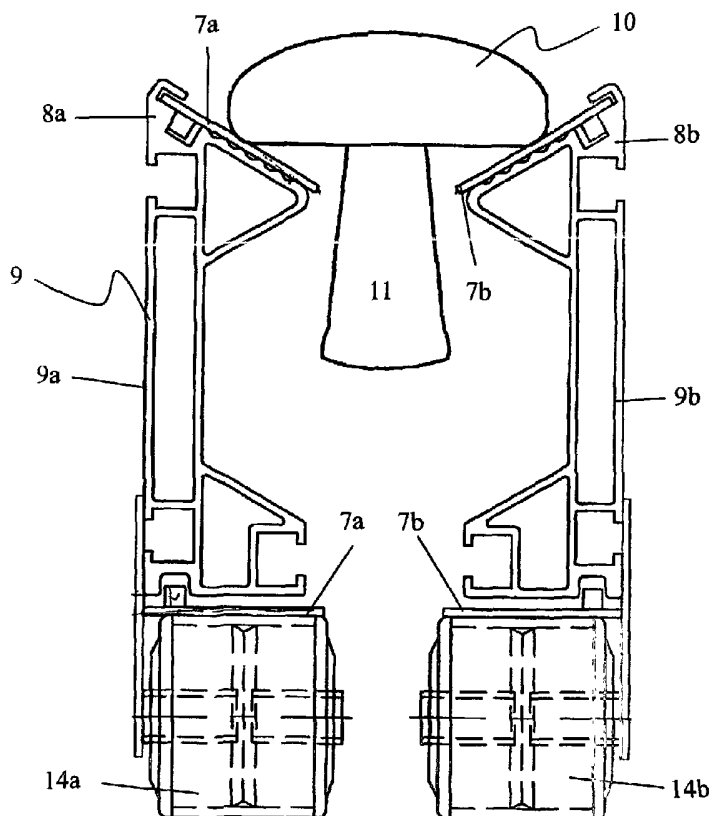
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(54) Title: DEVICE FOR CONVEYING AND CUTTING OFF PICKED MUSHROOMS



(57) Abstract: The invention relates to a device for conveying and cutting off picked mushrooms (10), comprising at least one cultivating device (2) where the mushrooms are cultivated and picked, the device (1) being provided with a cutting device (12) for cutting off the stems (11) of the picked mushrooms (10) and the device (1) being provided with a conveying system (5) for conveying the picked mushrooms (10) from the cultivating device (2) to the cutting device (12), said conveying system (5) being provided with two endless belts (7a,7b), the distance between the belts (7a,7b) being adjustable, depending on the thickness of the stem (11) of the picked mushrooms (10) which are placed between them.



WO 03/092354 A1

DEVICE FOR CONVEYING AND CUTTING OFF  
PICKED MUSHROOMS

The invention relates to a device for conveying and cutting  
5 off picked mushrooms, comprising at least one cultivating  
device where mushrooms are cultivated and picked, the device  
being provided with a cutting device for cutting off the  
stems of the picked mushrooms and the device being provided  
with a conveying system for conveying picked mushrooms from  
10 the cultivating device to the cutting device.

Since 30 or 40 years already picking mushrooms for the fresh  
food market in Europe occurs as follows: the mushrooms are  
growing on a substrate, in cultivating cells which are  
15 stacked above one another in a rack. Such racks usually  
consist of between four and seven layers above one another  
and having a length of about 50 meters.

The mushrooms are picked with one hand (usually the left  
20 hand) and the sand foot (little root) is cut off with the  
other hand by means of a small knife. Then the mushrooms are  
placed in a packing element (for instance a little box).  
When several packing elements have been filled, they are  
lowered (depending on the height) and carried out of the  
25 cultivating cell.

Today the great problem is that the price for picking is  
becoming far too high. All kinds of equipment have appeared  
on the market in order to increase the picking speed and to  
30 lower the cost price.

In US 5,081,920 a device is described for conveying freshly  
picked mushrooms from the cultivating device to the  
collecting station via an endless belt conveyor, which is

provided with receiving means for the separate mushrooms or groups of mushrooms past a cutting off device where the stems of the mushrooms are cut off while they automatically move along a knife. The receiving means of the belt conveyor are designed in such a manner that the stems of the mushrooms are brought into an upright holder, because of which the smaller mushrooms will end up deeper in these holders than the bigger mushrooms, in order to ensure that the knife will be able to cut the stem at an optimal distance. The holders are installed, freely rotatable, opposite the belt conveyor or they are mounted on the belt conveyor by a certain friction. In case the holders are not freely rotatable, the apparatus uses devices to prevent changes of the orientation of the holders, passing the mushrooms from the cultivating device to and past the cutting device.

A first disadvantage of such a system is that the belt conveyor is provided with holders to receive the mushrooms. The size of the mushrooms here being a substantial factor. For a certain holder the mushrooms may be too small or too big. When the mushrooms are too big they do not fit into the vertical opening of the holder, while, in case the mushrooms are too small, they will fall through the opening. A second disadvantage of such a system is that the pickers, after having picked the mushrooms, have to look at the holders in order to be able to place the mushrooms into the vertical opening in the right manner.

In US 5,234,375 an equipment is described for picking mushrooms, provided with a bringing in section for bringing in picked mushrooms, which extends over the mushroom cultivation-bed, a cutting off device for the stems of the mushrooms and a conveying and sorting section. The mushrooms

are cut off by means of cutting wheels and, via a wheel, are conveyed to the sorting section where the mushrooms are sorted out according to their dimensions, by means of conveying wires, the intermediate distance of which is increasing.  
5

A first disadvantage of such a system is, that the bringing in section extends only over a part of the cultivating bed, because of which the pickers have to shift this bringing in section continuously over the length of the bed, while they are picking the mushrooms.  
10

A second disadvantage of such a system is that the sorting out section is at right angles to the bringing in section, because of which the mushroom has to be turned between these two conveying elements. Consequently friction will occur at the bottom of the mushroom, which might cause the mushroom to be damaged.  
15

A third disadvantage is that the strings on which the mushrooms are moving are not equidistant from one another everywhere, because of which there is a chance the mushroom will fall between the strings.  
20

The purpose of the present invention is to provide a device for conveying and cutting off freshly picked mushrooms, which has not the aforementioned disadvantages and where first of all the picking speed is sufficiently high, secondly the quality of the mushrooms is maintained and thirdly the comfort of the pickers while they are picking is improved.  
25

The purpose of the invention is attained by providing a device for conveying and cutting off picked mushrooms, comprising at least one cultivating device, where the mushrooms are cultivated and picked, the device being  
30

provided with a cutting device for cutting off the stems of the picked mushrooms, and the device being provided with a conveying system for conveying the picked mushrooms from the cultivating device to the cutting device, and said conveying  
5 system being equipped with two endless belts, the distance between the belts being adjustable depending on the thickness of the stem of the picked mushroom being placed between them.

10 The great advantage of such a device is that the working load no longer rests on one shoulder of the person who is picking, because he will be able to use both hands for picking.

15 In a preferred embodiment of the device according to the invention the cultivating device is provided with one or more cultivating beds, and the conveying system comprises a first part, which extends over practically the entire length of the cultivating beds and a second part serving as a  
20 removing device for removing the picked mushrooms.

This has the advantage that the pickers do not have to move the device while they are picking.

25 In a preferred embodiment of a device according to the invention the conveying system is carried out in a straight line over practically the entire length in the conveying direction of the picked mushrooms.

30 This has the advantage that no major rotating movements are required for the mushrooms, which means that hardly any or no damage at all will be sustained by the mushrooms.

The mutual distance between the two endless belts will

remain practically constant over the entire length of the conveying system in the conveying direction of the picked mushrooms.

5 So consequently the mushrooms will not fall between the endless belts.

In a preferred embodiment of the device according to the invention the two endless belts are provided to be stretched  
10 over said first and second parts.

In a preferred embodiment of a device according to the invention the said cutting device is provided at the extremity of said first part of the conveying system where  
15 the picked mushrooms are removed.

This has the advantage that the mushrooms are prevented from coming engaged in a rolling movement, when they are cut by the knives, as the mushrooms will get a slight tap when they  
20 are moving between the knives.

In a preferred embodiment of a device according to the invention, the device comprises a number of cultivating beds disposed above one another in a cultivating rack, in which  
25 said second part of the conveying system is provided to be installed at an angle with respect to the said first part.

Providing an angle allows the mushrooms to be conveyed downwards or upwards.

30 Preferably, in said first part of the conveying system, the two endless belts are inclined towards one another.

This has the advantage that the mushrooms may be brought

easily and without any damage between the two endless belts. Furthermore, in this manner, the small mushrooms are situated in a lower position, and the bigger mushrooms in a higher position, because of which the stems of the mushrooms  
5 are always cut off in the right place.

In said second part of the conveying system the two endless belts are situated in a same plane with respect to one another.

10

In this manner the picked mushrooms are prevented from rolling when conveyed upwards or downwards.

In an embodiment of the invention, said conveying system may  
15 move upwards or downwards, with respect to the various cultivating beds, by means of a suspension system, the end point of the conveying system always remaining in the same place.

20 This may be applied when collecting and removing the picked mushrooms is automated.

Because of this, only little space is required for the person picking the mushrooms, so that the space, in which  
25 this person is standing, can be entirely protected against falling.

Because the distance between the two endless belts is adjustable, they may receive mushroom stems of different  
30 dimensions between them.

In order to better clarify the characteristics of the present invention, and to indicate its additional advantages and particulars, a detailed description of a device for

picking and conveying mushrooms will follow hereafter. It may be obvious that nothing in the following description may be interpreted as being a restriction of the protection of this invention requested in the claims.

5

In the attached drawings:

- figure 1a is a front view of a device according to the invention provided with a cultivating device comprising several cultivating beds situated above one another and in which the cutting device is situated at the extremity of the second part of the conveying system;
- figure 1b is a front view of a device according to the invention provided with a cultivating device comprising several cultivating beds situated one above the other in a cultivating rack and in which the cutting device is situated at the extremity of the first part of the conveying system;
- figure 2a is a front view of a part of the first and the second part of the conveying system with the cutting device at the end of the second part;
- figure 2b is a front view of a part of the first and the second part of the conveying system with the cutting device at the end of the first second part;
- figure 3 is a front view of the folded up conveying system on which the cutting device is provided;
- figure 4 is a cross-section of a part of a first embodiment of the conveying system and a part of a trolley for moving back and forth the pickers;
- figure 5 is a side view of figure 4;
- figure 6 is a cross-section of a part of a second embodiment of the conveying system.

In figures 1a and 1b, a device (1) for conveying and cutting off picked mushrooms (10) according to the invention is



represented, the cultivating device (2) of which is composed of a cultivating rack (4) being placed into a cultivating cell and which is provided with several cultivating beds (3) one above the other. However, the device (1) may also consist of one single cultivating bed (3) or several  
5 cultivating beds (3) disposed next to one another.

The pickers pick the mushrooms from the cultivating beds (3). For conveying and removing the picked mushrooms (10) a conveying system (5) is provided. The conveying system (5)  
10 is provided with two endless belts (7a,7b), between which the picked mushrooms (10) are placed by the pickers, as represented in the figures 4 and 6. The two endless belts (7a,7b) support the mushrooms (10) while they are conveyed  
15 outside the cultivating device (2).

As represented in the figures 4 and 6, the distance between the two endless belts (7a,7b) is adjustable, so that they may receive mushroom stems (11) of different dimensions  
20 between them. The belts (7a,7b) are made thus that they are situated between two guidings (8a,8b), as represented in the figures 4 and 6. The belts (7a,7b) may be attached fixedly (as represented in a first embodiment in the figures 4 and 6) or in a manner (as represented in a second embodiment in  
25 figure 6) detachable from their respective guidings (8a,8b). The guidings (8a,8b) themselves are fixed to a frame (9).

In the first embodiment, as represented in the figures 4 and 5, the distance between the endless belts (7a,7b) of the conveying system (5) may be adjusted to the different sizes  
30 of mushrooms (10) (the mushrooms (10) having stems (11) of different thickness), simply by turning a screw (13) which has been provided with left handed and right handed thread. In the second embodiment, as represented in figure 6, the

frame (9) is composed of two separate sections (9a,9b) which may be moved towards one another or away from one another, for instance, by means of a screw jack (not represented in the figure). These two separate sections (9a,9b) are made,  
5 for instance, of aluminium.

In this second embodiment, the two endless belts (7a,7b) are moving over two wheels (14a,14b) supporting their respective belts (7a,7b) to avoid sagging.

10 The two endless belts (7a,7b) are driven by means of a motor (23) as represented in the figures 1a, 1b, 2a and 2b.

The conveying system (5) is composed of two parts, i.e. a first part (5a), which extends over practically the entire  
15 length of the cultivating beds (3) and a second part (5b) serving as a removing device for the picked mushrooms. The first part (5a) is installed in a horizontal position, while the second part (5b) may be inclined both upwards and downwards or may be installed in a horizontal position.

20 The two endless belts (7a,7b) may extend both over the first part (5a) and the second part (5b). The belts (7a,7b) are stretched over the first and second parts (5a,b) by means of a quick-stretching device. However, the belts (7a,7b) may be  
25 stretched separately on the first (5a) and second part (5b).

As in most cultivating spaces, and also in the embodiment of the invention as represented in the figures 1a and 1b, mushrooms (10) may be cultivated in several layers disposed  
30 above one another (racks, containers, etc...) picking should occur in places which are higher than ground level. Consequently it is necessary that the second part (5b) of the conveying system (5) may be bent or folded upwards or downwards or that there is a second conveying system (not

represented in the figure) going up or down.

When the endless belts (7a,7b) are stretched over the first and second parts (5a,5b) as described above, it is possible  
5 to bend downwards or upwards the second part (5b) without the belts (7a,7b) coming loose from their guidings (8a,8b).

In the first part (5a) of the conveying system (5), the two  
10 endless belts (7a,7b) have been inclined towards one another, as represented in the figures 4 and 6, while in the second part (5b) of the conveying system (5), the two endless belts (7a,7b) are situated in a horizontal plane. To that effect, the guidings (8a,8b) of the endless belts (7a,7b) in the first part (5a) are also inclined and in the  
15 second part (5b) likewise provided in a same plane.

When using the device (1) the picker places himself in such a position, that the first part (5a) of the conveying system (5) will be situated between him/her and the cultivating  
20 rack (4). Picking occurs by using both hands. The mushrooms are placed, vertically from above, between the two endless belts (7a,7b). The mushroom is conducted between the two endless belts (7a,7b) to the second part (5b) of the conveying system (5). The stem of the mushroom may be cut  
25 off in different places within the conveying system (5), by means of a cutting device (12), as represented in the figures 1a, 1b, 2a and 2b. The cutting device (12) is provided with one or several knives cutting off the stem of the mushroom (10). Preferably two knives are provided,  
30 rotating with respect to one another.

The cutting device (12) may be situated on the second part (5b) of the conveying system (5) either outside the cultivating cell, as represented in the figures 1a and 2a,

or the cutting device (12) may be situated on the first part (5a) of the conveying system (5) inside the cultivating cell, as represented in the figures 1b and 2b. Finally, the mushroom (10) leaves the two endless belts (7a,7b) at the end of the second part (5b) of the conveying system (5) and ends up in a packing element outside the cultivating cell.

By making use of such a conveying system (5), supplying and removing containers, empty or filled, in the cultivating cells is no longer required. This will lower the labour costs and substantially reduce the infection pressure, as a substantial part of all the infections in mushroom producing companies is caused by bringing in all sorts of packing material.

Furthermore, as containers are no longer needed in the cultivating cell, no time is lost any more when changing level in the cultivating rack, as in the embodiments, as represented in the figures 1a and 1b, packing elements no longer have to be lifted with the rest.

When a cultivating bed (3) of the cultivating rack (4) has been picked, the conveying system (5) moves up or down. If the embodiment uses a trolley system or a hydraulic lift (15), as represented in the figures 1a and 1b, the picker is also moving up and down (or the picker is standing on a movable platform, adjustable as to height).

Additionally, it should be noted that such a conveying system (5) may be installed easily, what sometimes is desirable in cultivating cells where there are no mushrooms (10), i.e. in cultivating cells which are empty or where the mycelium is growing in in the covering layer of earth. As represented in figure 3, the conveying system (5) may be

folded up easily and moved to another cultivating cell.

A possible variant consists in providing all cultivating cells with a fixed conveying system (5).

5

By means of a suspension system, the conveying system (5) may be moved up and down. When packing the mushrooms is automated, the device (1) may be provided in such a manner, that the end point (20), i.e. the point where the mushrooms  
10 (10) are leaving the two endless belts (7a,7b) in the second part (5b) of the conveying system (as represented in the figures 1a, 1b, 2a and 2b), will always remain in the same place.

15 Moreover, the conveying system (5) rests on a rotatable element (17) (as represented in the figures 1a, 1b and 5), in such a manner that, when the conveying system (5) is moving up or down, it may move freely to the left or right in a horizontal direction, without the end point (20) being  
20 changed. As represented in the figures 1a and 1b, the rotatable elements (17) are suspended by means of suspension cables (18) moving up and down all at the same time. The rotatable elements (17) and the suspension cables (18) are moving so close to the supports (19) of the cultivating rack  
25 (4) (or container), such that they will not be in the way when picking mushrooms.

As represented in figure 4, the frame (9) may be suspended by means of a hook (21) on a cable (23).

30 Furthermore, the system (22) may be provided such, that when the conveying system (5) moves up or down, the trolley (15) will also move up or down, as represented in the figures 1a and 1b.

Therefore, the device (1) according to the invention will enable a mushroom farm to reduce the costs for labour by more than half.

C L A I M S

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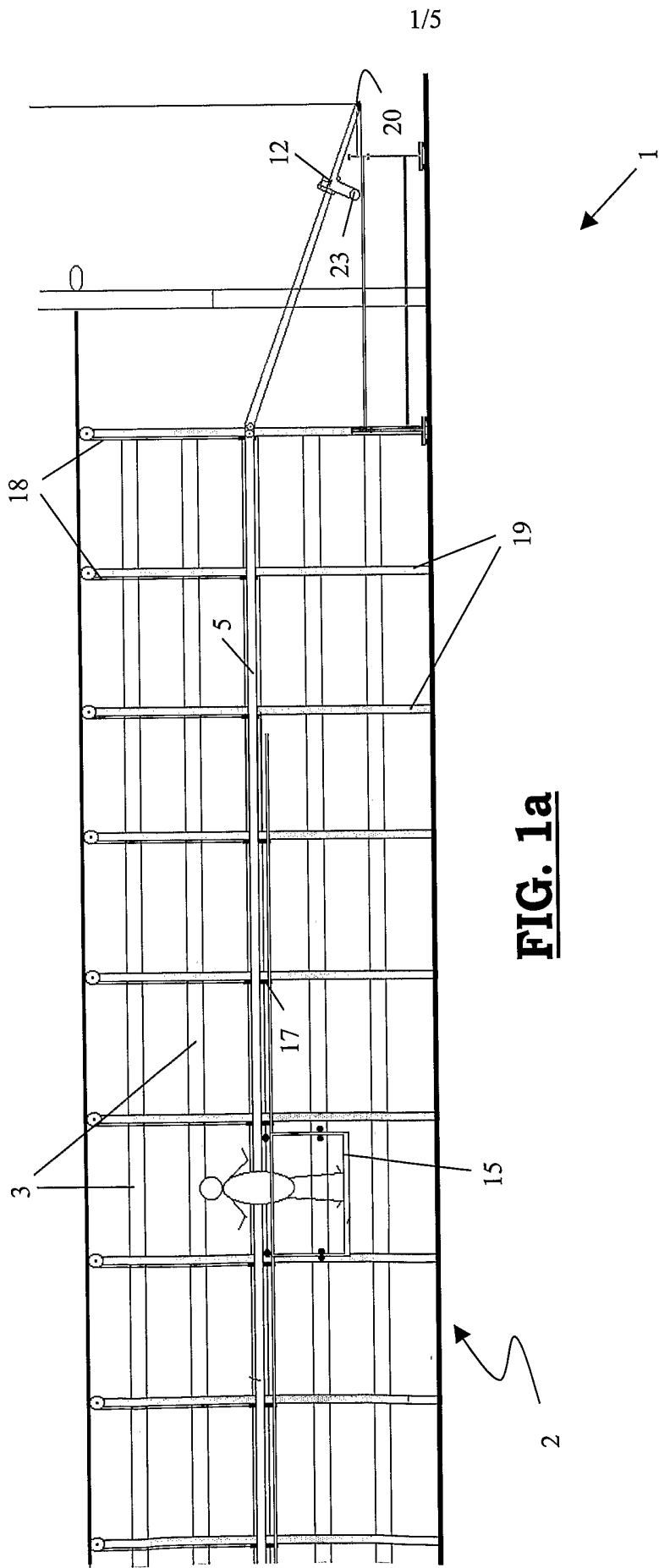
1. Device for conveying and cutting off picked mushrooms  
5 (10), comprising at least one cultivating device (2)  
where the mushrooms are cultivated and picked, the  
device being provided with a cutting device (12) for  
cutting off the stems (11) of the picked mushrooms (10)  
and the device (1) being provided with a conveying  
10 system (5) for conveying picked mushrooms (10) from the  
cultivating device (2) to the cutting device (12),  
characterized in that said conveying system (5) is  
provided with two endless belts (7a,7b), the distance  
between the belts (7a,7b) being adjustable depending on  
15 the thickness of the stem (11) of the picked mushrooms  
(10) which are placed between them.
2. Device according to claim 1, characterized in that the  
cultivating device (2) is provided with one or several  
20 cultivating beds (3), and in that the conveying system  
(5) comprises a first part (5a) which extends over  
practically the entire length of the cultivating beds  
(3) and a second part (5b) serving as a removing device  
for removing the picked mushrooms (10).
- 25 3. Device according to claim 1 or 2, characterized in that  
the conveying system (5) is carried out in a straight  
line over practically the entire length in the  
conveying direction of the picked mushrooms (10).
- 30 4. Device according to anyone of the claims 1 up to and  
including 3, characterized in that the distance between  
the two endless belts (7a,7b) is constant over  
practically the entire length of the conveying system

(5) in the conveying direction of the picked mushrooms (10).

- 5 5. Device according to anyone of the claims 1 up to and including 4, characterized in that the two endless belts (7a,7b) are provided to be stretched over the first and second parts (5a,5b).
- 10 6. Device according to anyone of the claims 2 up to and including 7, characterized in that the said cutting device (12) is provided at the extremity of said first part (5a) of the conveying system (5) where the picked mushrooms (10) are removed.
- 15 7. Device according to anyone of the preceding claims, characterized in that the device (1) comprises a number of cultivating beds (3) installed above one another in a cultivating rack (4), said second part (5b) of the conveying system (5) being provided to be installed at  
20 an angle with respect to said first part (5a).
- 25 8. Device according to claim 9, characterized in that the two endless belts (7a,7b) are inclined towards one another in said first part (5a) of the conveying system (5).
- 30 9. Device according to claim 9 or 10, characterized in that the two endless belts (7a,7b) are situated in a same plane with respect to one another in said second part (5b) of the conveying system (5).
10. Device according to anyone of the claims 9 up to and including 11, characterized in that said conveying system (5) might move up and down with respect to the

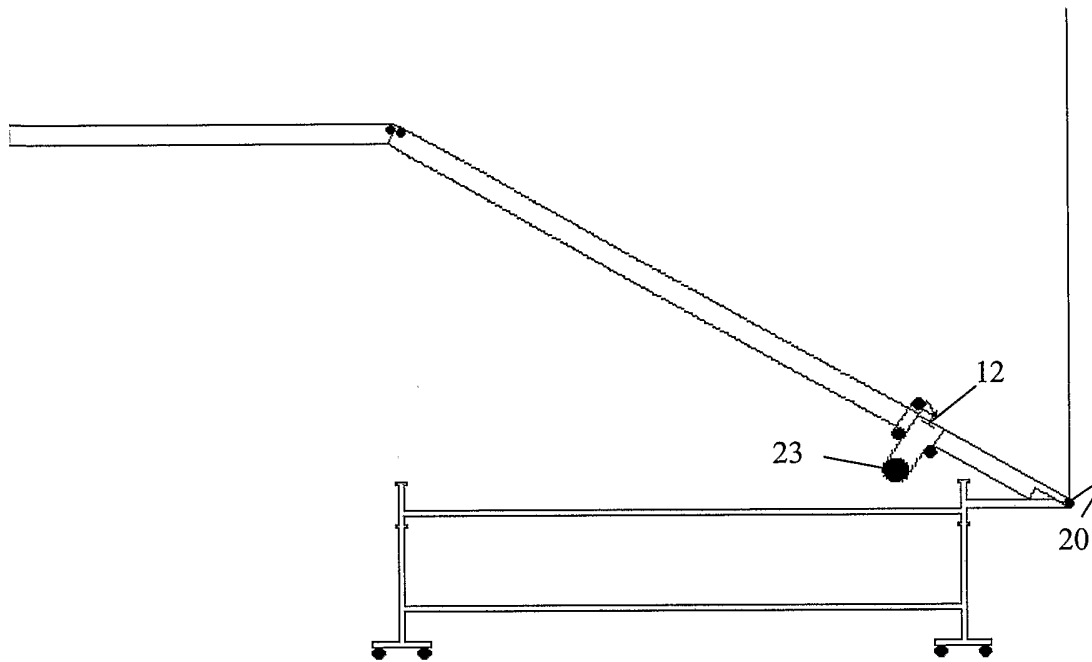


various cultivating beds, by means of a suspension system, the end point of the conveying system always remaining in the same place.

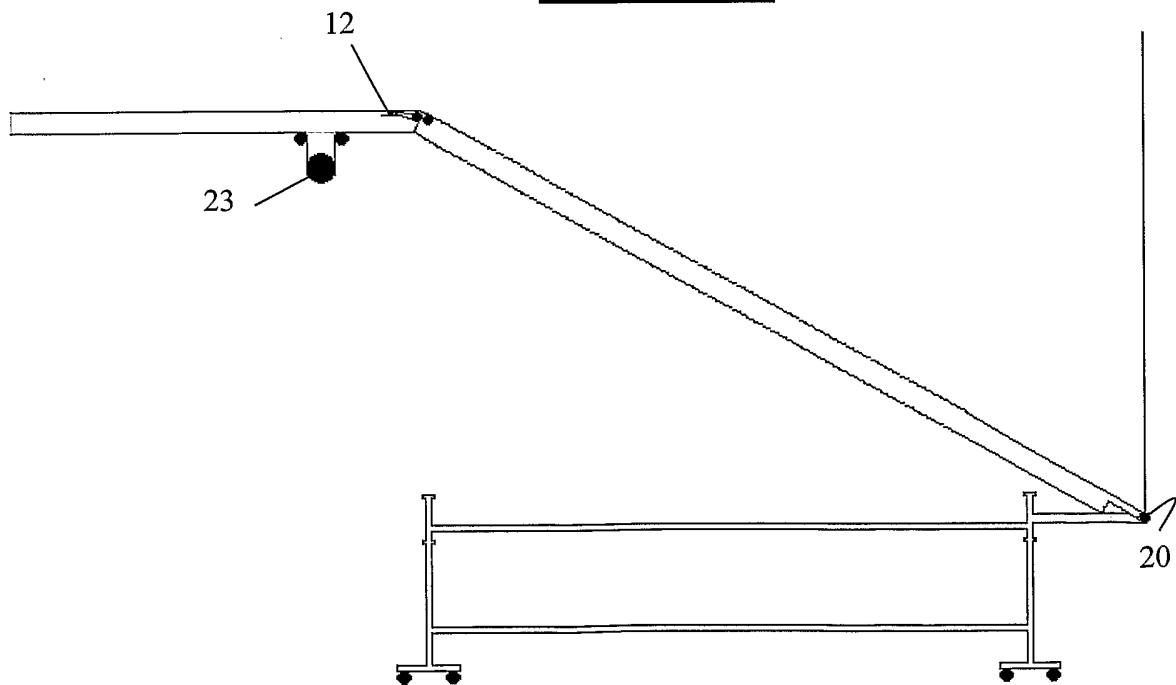


**FIG. 1a**

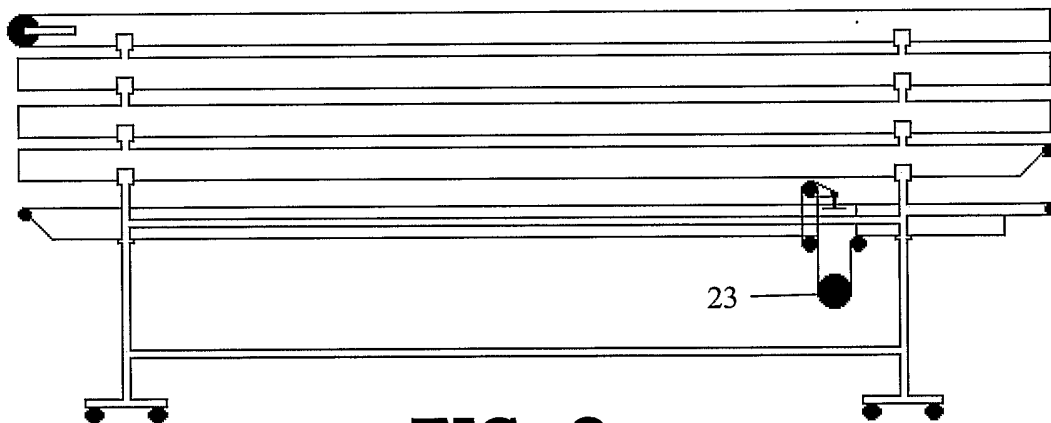




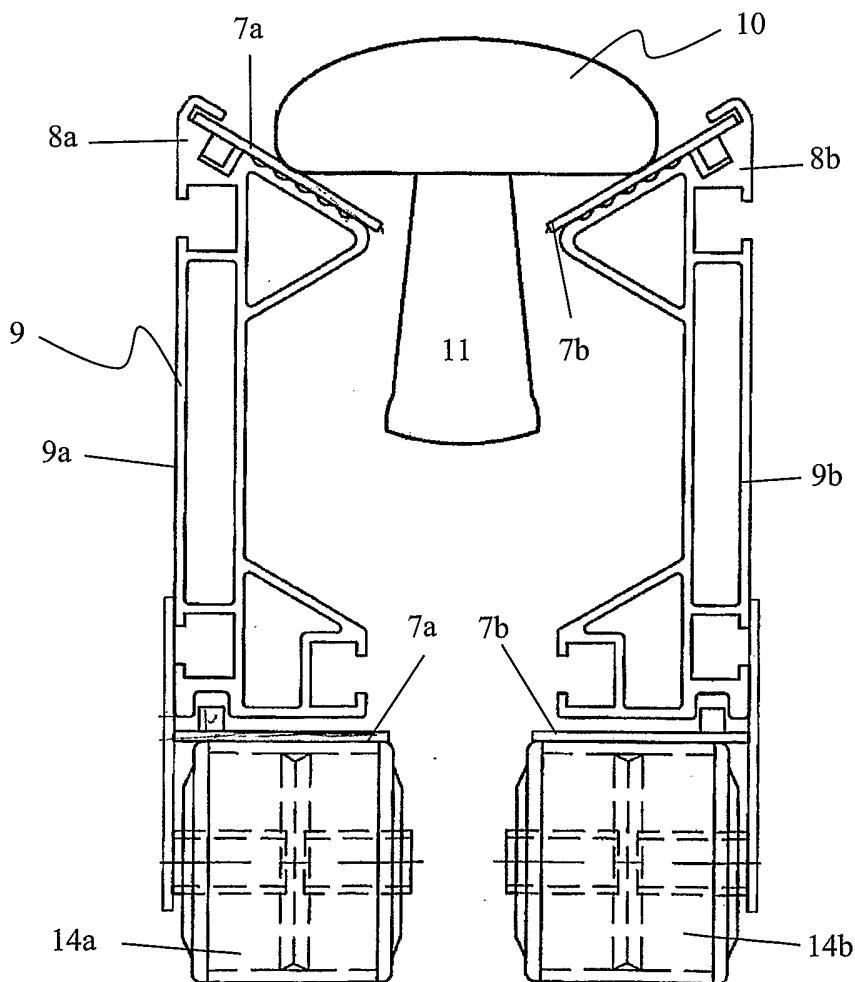
**FIG. 2a**



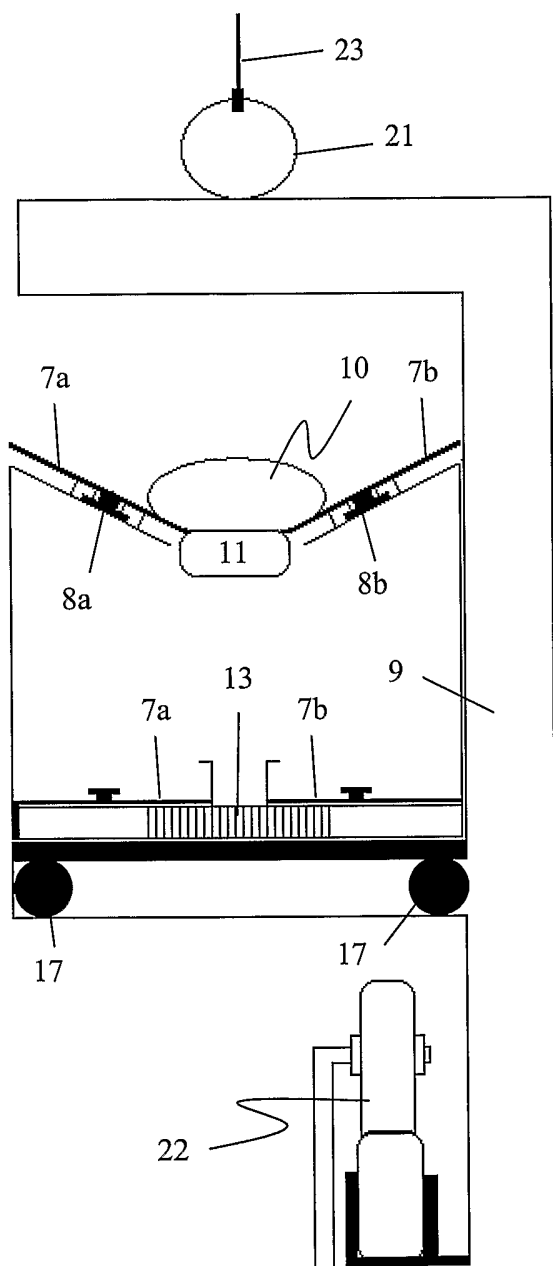
**FIG. 2b**



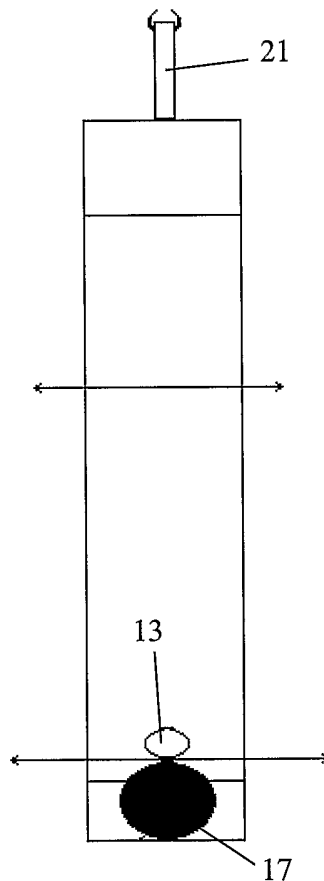
**FIG. 3**



**FIG. 6**



**FIG. 4**



**FIG. 5**

## INTERNATIONAL SEARCH REPORT

Internatic application No

PCT/IB 03/01750

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A01D45/00 A23N15/04 A01G1/04

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 7 A01D A23N A01G

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

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

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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Date of the actual completion of the international search

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