



(86) Date de dépôt PCT/PCT Filing Date: 2016/03/23
(87) Date publication PCT/PCT Publication Date: 2016/10/06
(85) Entrée phase nationale/National Entry: 2017/09/26
(86) N° demande PCT/PCT Application No.: EP 2016/056426
(87) N° publication PCT/PCT Publication No.: 2016/156159
(30) Priorité/Priority: 2015/03/27 (IT BO2015A000148)

(51) Cl.Int./Int.Cl. *B65G 47/96* (2006.01),
B07C 5/00 (2006.01), *B65G 43/00* (2006.01)
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(54) Titre : ENSEMBLE DE MANIPULATION DE PRODUITS DE TYPE FRUITS ET LEGUMES
(54) Title: ASSEMBLY FOR HANDLING FRUIT AND VEGETABLE PRODUCTS

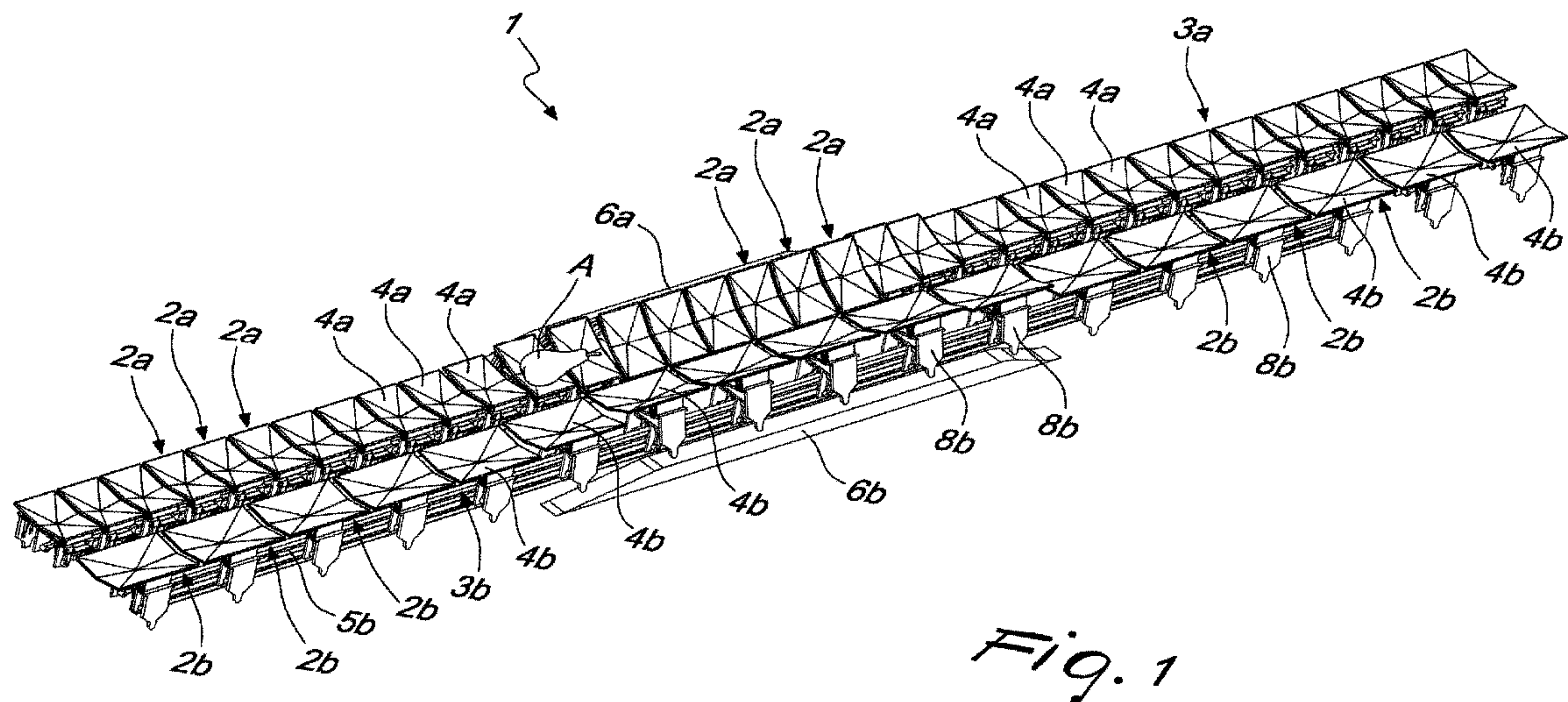


Fig. 1

(57) Abrégé/Abstract:

An assembly for handling fruit and vegetable products, which comprises first containment units (2a) for fruit and vegetable products (A) that can move along a first conveyance and/or control line (3a); the assembly (1) further comprises second containment units (2b) for horticultural products (A) that can move along a second conveyance and/or control line (3b), which is laterally adjacent and proximate to the first line (3a); the assembly comprises a plurality of means for transferring the horticultural products (A); such means are distributed at least along a part of the first line (3a) and are selectively actuatable by an electronic management and control unit, for the transfer of each product (A) from a first unit (2a) to a respective second unit (2b) in a portion chosen from a plurality of different portions of the first line (3a), upon the occurrence of a predefined condition of mutual alignment between the horticultural product (A) to be transferred, which is conveyed by the first unit (2a), and a second unit (2b).

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property

Organization

International Bureau

(43) International Publication Date

6 October 2016 (06.10.2016)



(10) International Publication Number

WO 2016/156159 A1

(51) International Patent Classification:

B65G 47/96 (2006.01) B07C 5/00 (2006.01)

(21) International Application Number:

PCT/EP2016/056426

(22) International Filing Date:

23 March 2016 (23.03.2016)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

BO2015A000148 27 March 2015 (27.03.2015) IT

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: ASSEMBLY FOR HANDLING FRUIT AND VEGETABLE PRODUCTS

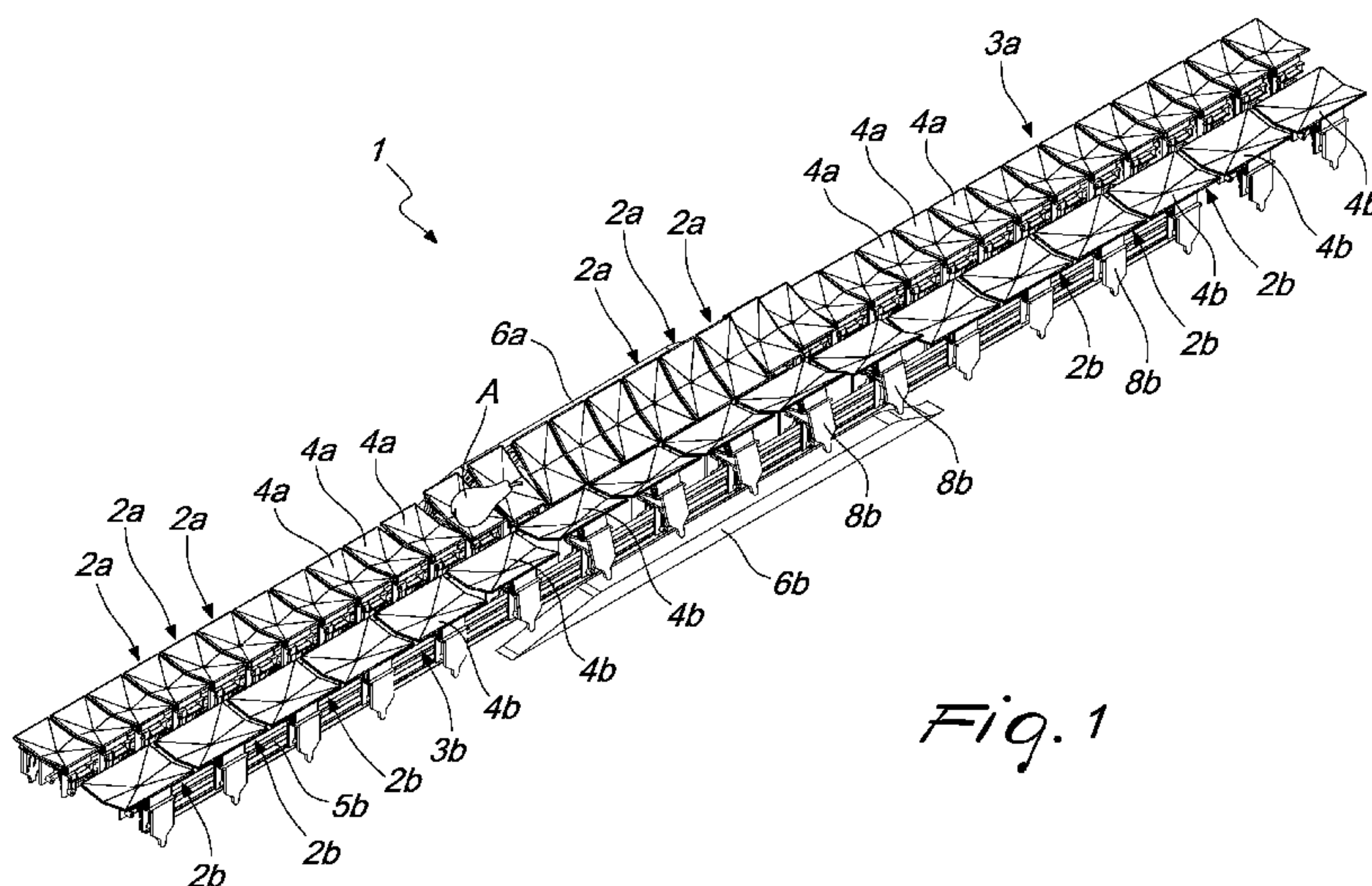


Fig. 1

(57) Abstract: An assembly for handling fruit and vegetable products, which comprises first containment units (2a) for fruit and vegetable products (A) that can move along a first conveyance and/or control line (3a); the assembly (1) further comprises second containment units (2b) for horticultural products (A) that can move along a second conveyance and/or control line (3b), which is laterally adjacent and proximate to the first line (3a); the assembly comprises a plurality of means for transferring the horticultural products (A); such means are distributed at least along a part of the first line (3a) and are selectively actuatable by an electronic management and control unit, for the transfer of each product (A) from a first unit (2a) to a respective second unit (2b) in a portion chosen from a plurality of different portions of the first line (3a), upon the occurrence of a predefined condition of mutual alignment between the horticultural product (A) to be transferred, which is conveyed by the first unit (2a), and a second unit (2b).



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ASSEMBLY FOR HANDLING FRUIT AND VEGETABLE PRODUCTS

The present invention relates to an assembly for handling fruit and vegetable products.

Companies that develop automated systems for handling and
5 checking large quantities of fruit and vegetable products often find themselves faced with problems that are not easy to resolve.

In fact, even when the system is intended for use with a single, specific type of product (a fruit for example), it is usually fed upstream with great quantities of products that arrive at the factory directly from the
10 harvest fields, and which therefore exhibit enormous variability in size and weight.

The need is therefore felt to provide automated lines that are capable of distributing products of different size categories to a plurality of receiving stations, in that often fruits (or other fruit and vegetable products)
15 of greater size (or greater weight) cannot be sent for subsequent processing, or to end consumers, together with the smaller fruits.

Moreover it seems evident that in an industrial context, and therefore in systems and lines that are at least partially automated, precisely this enormous variability requires maximum care on the part of the companies
20 that make them, in that the lines and the handling elements must be sufficiently versatile to be able to cater for the different formats with which pears, apples, strawberries, cherries etc, are presented.

To such heterogeneity we must also add the great variety of defects that fruits can exhibit, and which the system must be capable of
25 intercepting, in order to send to the downstream stations only those products that fall within the preset quality parameters (which are moreover increasingly stringent), and diverting for reprocessing, or simply discarding, those fruits that are rotten or bruised, are showing initial signs of early decay, or that exhibit other defects.

30 In such context, one of the fruits that pose the most difficulties is

certainly the pear: in order to be able to identify the defects and at the same time check its color and weight (and therefore its size category), systems are known that involve the use of video cameras for checking which are arranged along fruit handling lines and are capable of identifying the
5 defects.

Such systems usually have two handling lines, side by side, in that after a first video camera has conducted a first check on the pear being conveyed on the first line, in order to detect its shape, size, color, any surface and pulp flaws, etc., the pear is tipped over and transferred to the
10 second line, where a second video camera performs a second check on the other side of the pear, to complete the analysis.

However, the peculiar shape of the pear makes it substantially impossible to check the exact arrangement with which the pear is deposited and conveyed on the first line and, especially, at what point of the respective
15 containment unit the pear is consequently laid and conveyed along the second line.

This complicates the second check and, especially, it makes it necessary to have a third line or station for carrying out the weighing, in that for such activity it is necessary to be able to count on a certain position
20 (usually corresponding to the center of the containment unit), in order to obtain an exact measurement by the load cells and/or of the other sensors that are usually used.

The aim of the present invention is to solve the above mentioned problems, by providing a handling assembly that makes it possible to
25 transfer fruit and vegetable products between two handling lines, while at the same time being able to control their positioning, at least on the downstream line.

Within this aim, an object of the invention is to provide an assembly for handling fruit and vegetable products, which makes it possible to check
30 the color, the size category and/or the presence of flaws thereon, and at the

same time make it possible to weigh them.

Another object of the invention is to provide a handling assembly that ensures a high reliability of operation.

Another object of the invention is to provide a handling assembly that
5 can be easily implemented using elements and materials that are readily available on the market.

Another object of the invention is to provide a handling assembly that is low cost and safely applied.

This aim and these and other objects are achieved by an assembly for
10 handling fruit and vegetable products, which comprises first containment units for fruit and vegetable products that can move along a first conveyance and/or control line and second containment units for horticultural products that can move along a second conveyance and/or control line, which is laterally adjacent and proximate to said first line, characterized in that it
15 comprises a plurality of means for transferring the horticultural products, said means being distributed at least along a part of said first line and being selectively actuatable by an electronic management and control unit, for the transfer of each product from a said first unit to a respective said second unit in a portion chosen from a plurality of different portions of said first line,
20 upon the occurrence of a predefined condition of mutual alignment between the horticultural product to be transferred, which is conveyed by said first unit, and a said second unit.

Further characteristics and advantages of the invention will become better apparent from the description of a preferred, but not exclusive,
25 embodiment of the handling assembly according to the invention, which is illustrated by way of non-limiting example in the accompanying drawings wherein:

Figure 1 is a perspective view from the right-hand side of a handling assembly according to the invention;

30 Figure 2 is a perspective view from the left-hand side of the handling

assembly in Figure 1;

Figure 3 is a first detail of Figure 1;

Figure 4 is a greatly enlarged second detail of Figure 1;

Figure 5 is a greatly enlarged detail of Figure 2;

5 Figure 6 is a front elevation view of some components of the assembly in Figure 1;

Figure 7 is a perspective view from the right-hand side of further components of the assembly in Figure 1;

10 Figure 8 is a perspective view from the left-hand side of the components in Figure 6.

With reference to the figures, the reference numeral 1 generally designates an assembly for handling horticultural products such as fruit and vegetable products, which first of all comprises first containment units 2a of fruit and vegetable products A, which can move along a first conveyance
15 and/or control line 3a.

It should be noted from this point onward that in the preferred application of the invention, to which reference will often be made in the present discussion, the fruit and vegetable products A are pears, whose peculiar shape poses many problems for the companies that make
20 conventional conveyance and checking systems (problems that, as will be seen, will be solved by the assembly 1 according to the invention).

In any case it should be emphasized that the possibility is not ruled out of using the assembly 1 according to the invention for handling, conveying and/or checking other fruits or fruit and vegetable products A in
25 general, while remaining within the scope of protection claimed herein.

Furthermore, the assembly 1 comprises second containment units 2b of the fruit and vegetable products A, which can move along a second conveyance and/or control line 3b, which is conveniently arranged laterally adjacent and proximate to the first line 3a.

30 As in the accompanying figures, the lines 3a, 3b can define for the

respective unit 2a, 2b straight paths that are entirely arranged side-by-side, but assemblies 1 can also be provided in which the lines 3a, 3b, although being side-by-side and mutually proximate in at least one segment thereof, are curvilinear or mixtilinear, according to the specific logistical requirements that may for example apply inside the building for which the assembly 1 is intended.

According to the invention, the assembly 1 comprises a plurality of means for transferring the fruit and vegetable products A, which are distributed and act at least along one part of the first line 3a.

Such means can therefore be selectively actuated by an electronic management and control unit, so as to cause the transfer of each product A from a first unit 2a to a respective second unit 2b in a portion chosen from a plurality of different portions of the first line 3a. More precisely, and thanks to the presence of a plurality of means that act along the first line 3a, the transfer can be effectively commanded upon the occurrence of a predefined condition of mutual alignment between the fruit and vegetable product A to be transferred, which is conveyed up until that moment by the first unit 2a, and a second unit 2b.

It should be noted in fact that the impossibility of establishing in advance the position assumed by each pear in the respective first containment unit 2a makes it impossible to identify (at the design stage) a point of the first line 3a at which, for all pears, a predefined condition of mutual alignment occurs, and it is even less possible to ensure to this end that both the lines 3a, 3b move at the same speed.

By contrast, such condition for mutual alignment is in fact made necessary by the need to control the positioning of the fruit and vegetable products A at least in the second units 2b, in order to ensure that each pear is located at the same point of each second unit 2b.

Thanks to the means for transfer therefore, the electronic unit can choose in each instance, for each pear, the best portion of the first line 3a at

which to perform the transfer, in this way being able to control the positioning thereof along the second line 3b, and already achieving the set aim.

In fact, by conveniently choosing the condition for mutual alignment, it is for example possible to ensure that each pear is transferred to the respective second containment unit 2b at a specific point (of a specific part) of the latter, so achieving the desired control of the positioning.

It should be noted that the electronic unit can be freely chosen, while remaining within the scope of protection claimed herein: it can in fact be an electronic controller, a (micro)processor, a CPU, a PC, a computer etc.

Precisely with reference to the preferred (but not exclusive) embodiment, each second containment unit 2b is associated with a respective device for weighing the fruit and vegetable product A being conveyed.

Any type of device for weighing can be used, and for example each second unit 2b can be provided with a respective load cell.

It should be noted that weighing devices of the type indicated above necessitate an exact positioning of the product A with respect to the second unit 2b that accommodates it, in order to be able to operate correctly: in such context, it is therefore evident that the assembly 1 ensures an optimal weighing, thanks to the possibility of choosing the moment in which to perform the transfer toward the second containment unit 2b.

With further reference to the preferred embodiment of the invention, the assembly 1 comprises an electronic control apparatus, which in turn is provided with a first video camera that faces the first line 3a and is capable of checking the color, the size and/or the presence of surface and pulp flaws of various types on the fruit and vegetable products A, while these are supported and conveyed by the first units 2a in a first arrangement. It should be noted that such first arrangement (in which a pear is for example shown in Figure 1) usually corresponds to the position with which each product A

has been deposited on the respective first containment unit 2a, in the initial segment of the first line 3a. In such first arrangement, each product A is therefore conveyed along the first line 3a and its surface portion directed upwardly can thus be checked by the first video camera, above the first line
5 3a.

Furthermore, the control apparatus 2b is provided with a second video camera that faces the second line 3b, so that it can also check the color, the size and/or the presence of surface and pulp flaws of various types on the fruit and vegetable products A, while they are supported and conveyed by
10 the second units 2b in a second arrangement (in which a pear is for example shown in Figure 3), obtained automatically as a consequence of the transfer of the products A from the first line 3a to the second line 3b.

More precisely, the transfer causes the partial rotation of each pear, which thus assumes a second arrangement and directs a different surface
15 portion upwardly, which can therefore in turn be checked by the second video camera (above the second line 3b), thus completing the check of the color, the size category and/or the presence of any flaws (and of the shape and size) for each fruit and vegetable product A.

It should be noted therefore that in the preferred embodiment the
20 assembly 1 is effectively capable of weighing each pear (or other fruit and vegetable product A) and/or of checking for the presence therein of surface flaws (over the entire surface) and pulp flaws and/or, more simply, of measuring its size.

It should be noted again that the possibility is still not ruled out of
25 adopting the innovative concepts illustrated herein for different handling assemblies 1, while remaining within the scope of protection claimed herein.

In the embodiment illustrated in the accompanying figures for the purposes of non-limiting example, each first unit 2a is constituted
30 substantially by a first tray 4a, which can move along a first guiding track 5a

which substantially defines the first line 3a. Furthermore, each first tray 4a is rotatable about to a first main axis, substantially parallel to the first track 5a: the previously-mentioned means therefore comprise elements for actuating the rotation of respective first trays 4a about the first main axis. As
5 can be seen for example from Figure 3, the rotation thus produces the partial tipping of the respective first tray 4a, and this causes the consequent transfer of the corresponding fruit and vegetable product A (which is in turn overturned) toward the respective second unit 2b.

It should be noted further that as a consequence of the tipping, the
10 fruit and vegetable product A automatically passes from the first arrangement to the second arrangement (in order to allow the complete checking for any flaws present, as we have already seen).

Conveniently, in order to be able to perform the transfer in the predefined condition of mutual alignment, the control apparatus comprises
15 an electronic viewer (optionally coinciding or integrated with the first video camera) associated with the electronic unit and arranged along the first line 3a. The viewer in fact is capable of acquiring, according to conventional methods, information about the position assumed by each fruit and vegetable product A in the respective first unit 2a. In turn, the electronic unit
20 will be provided with an algorithm for calculating the portion (of the point) of the first line 3a corresponding to the occurrence of the predefined condition of mutual alignment, as a function of the shape and of the speed of the first unit 2a and of the second unit 2b, and of the position detected by the viewer.

25 Therefore, whatever the position assumed by the pear in the respective first tray 4a, the electronic unit is capable of calculating and identifying the moment at which the predefined condition of mutual alignment arises, in order to command, right at that moment, the transfer of the pear to the second line 3b, thus obtaining an exact and repeatable
30 positioning on the second units 2b.

It should be noted that the electronic management and control unit can be freely programmed to choose any predefined condition of mutual alignment. In the preferred embodiment in any case, such predefined condition corresponds to the alignment of the fruit and vegetable product A to be transferred, which is conveyed by the respective first unit 2a, with the central portion of a respective second unit 2b, so that the fruit and vegetable product A is arranged exactly in such central position. As we have already seen in fact, in this manner it is possible to obtain the correct weighing of each pear, in that the device designed for this purpose operates best when the pear is exactly positioned in the center of the second unit 2b.

In the embodiment illustrated in the accompanying figures, and in a manner similar to what was observed for the first units 2a, each second containment unit 2b is constituted substantially by a second tray 4b, which can move along a second guiding track 5b which substantially defines the second line 3b and has a shape and dimensions that are optionally different from those of the first tray 4a. It should be noted in fact that in the solution shown, each second tray 4b, although being rectangular in plan like the first tray 4a, with respect to the latter is appreciably larger (and is oriented with the long sides parallel to the second track 5b). This in fact makes it possible to obtain a better positioning of the pears in the second units 2b, and therefore a more exact weighing.

Furthermore, and in further analogy with the first units 2a, each second tray 4b can also rotate, about a second main axis which is substantially parallel to the first main axis and to the second track 5b. This therefore makes it possible to obtain the partial tipping of the second trays 4b in the opposite direction to that of the partial tipping of the first trays 4a, at least during the transfer of the respective fruit and vegetable product A.

In this manner in fact, when the pear is transferred to the second unit 2b, the partial tipping thereof reduces (guards against) the danger that the transfer occurs without the necessary gentleness and/or that an excessive

thrust could make the pear fall from the second line 3b, overshooting the second tray 4b.

In particular, in order to perform the tipping of the first trays 4a (and the transfer of the pears) at a chosen portion of the first line 3a, the means
5 for transferring comprise at least one first guiding plate 6a, which faces in a parallel arrangement and is proximate to the first line 3a on the opposite side with respect to the second line 3b.

As can be seen clearly for example from Figure 7, at least along the lateral wall of the first plate 6a that directly faces the first line 3a, there is a
10 plurality of inclined lanes 7: following the actuation of the corresponding actuation element, a first shank 8a with which each first tray 4a is provided can selectively engage in each lane 7, so as to cause the rotation of the corresponding first tray 4a as a consequence of the sliding of the first shank 8a in the lane 7.

15 So, effectively, each lane 7 behaves like a cam that imposes a specific movement on the first shank 8a with which it engages, and therefore causes the rotation of the respective first tray 4a, which is integral with the first shank 8a.

More specifically, each actuation element (not shown for the sake of
20 simplicity in the accompanying figures) comprises at least one actuator (which can be conventional), which is integral with the respective first unit 2a and which usually faces the first shank 8a. Each actuator can be selectively actuated by the electronic unit (upon the occurrence of the predefined condition of mutual alignment or in the moments immediately
25 preceding it) in order to force the engagement of the first shank 8a in a corresponding lane 7, thus obtaining the desired rotation of the first tray 4a which is carrying the pear to be transferred to the second line 3b.

In the embodiment proposed for the purposes of non-limiting example in the accompanying figures, and with specific reference to Figure 7,
30 following the engagement the first shank 8a follows a first inclined corridor

7A, then proceeds along the straight back 7B of the first plate 6a, and finally descends along a ramp 7C. Such progression obviously causes a corresponding rotation of the respective first tray 4a, to which the first shank 8a is anchored.

5 Advantageously, the handling assembly 1 according to the invention comprises a second guiding plate 6b, which in turn faces in a parallel arrangement and is proximate to the second line 3b on the opposite side with respect to the first line 3a. Differently from what was seen for the first plate 6a (which can intercept the first shanks 8a only following the
10 activation of the actuation element), the second plate 6b is arranged along the path of second shanks 8b of each second tray 4b.

As can be seen from the accompanying figures, such choice causes the rotation of each second tray 4b (when they arrive at the second plate 6b) in that the respective second shank 8b is forced to slide on a contoured run
15 defined by the top of the second plate 6b.

The second plate 6b therefore also behaves like a cam, but it imposes the same travel and the same partial tipping (at the same portion of the second line 3b) on all the second trays 4b.

As can be seen from the accompanying figures, by conveniently
20 choosing the length of the track (equal to the full extension of the first plate 6a, affected by the various lanes 7), the second trays 4b are kept partially inclined for the entire segment of the second line 3b in which they can potentially receive a pear.

While not ruling out the provision of assemblies 1 in which the
25 second plate 6b has lanes 7 similar to those described for the first plate 6a, for selectively engaging with the second shanks 8b, the choice to impose the same tipping on all the second trays 4b simplifies the structure (and the cost) of the assembly 1, while still ensuring in any case the functionality described up to now.

30 It should moreover be noted that the possibility is not ruled out of

offering assemblies 1 on the market that still remain within the scope of protection claimed herein, and wherein the second units 2b are not subjected to any rotation (and wherein, for example, the risk of falling of the pears is more simply guarded against by side walls suitably arranged along the outer
5 side of each second tray 4b).

Advantageously, as can be seen in particular from Figures 4 and 7, each tray 4a, 4b (therefore for each line 3a, 3b) is rigidly supported by a support 9a, 9b, which is pivoted, about the respective main axis, to a slider 10a, 10b which can slide along the corresponding track 5a, 5b.

10 Each shank 8a, 8b therefore extends from the corresponding support 9a, 9b, on the opposite side with respect to the corresponding tray 4a, 4b.

Therefore for the second line 3b, when the second unit 2b arrives at the second plate 6b, the respective second shank 8b rises along the top of the latter and this causes the rotation of the support 9b and of the second
15 tray 4b.

Conversely, in the first line 3a the first shank 8a (or at least one of its ends) follows one of the lanes 7 only when the actuator pushes it against that lane: by providing an appropriate number of lanes 7 it is thus possible to define a plurality of portions (points of the first line 3a) at which to make
20 the partial tipping of each first tray 4a occur.

Operation of the handling assembly according to the invention is the following.

Each pear (or other fruit and vegetable product A) is loaded onto a first unit 2a of the first line 3a in a first arrangement, which is random and
25 not predictable in advance, even in light of the irregular shape of such fruits.

The pears are thus initially conveyed along the first line 3a, where a first video camera can detect its color, shape and size and/or check for the presence of surface flaws on the exposed portion or flaws in the pulp.

Furthermore, in this step an electronic viewer associated with the
30 electronic unit acquires information about the position assumed by each

fruit and vegetable product A in the respective first unit 2a: preferably, such information relates to both the orientation with which the product A is placed on the first tray 4a (the first arrangement mentioned above), and the point of the first tray 4a at which the product A is located (with respect to fixed references, such as for example its perimeter or its center). This therefore enables the electronic unit to calculate the portion of the first line 3a where to make the transfer occur (this is chosen to correspond to the occurrence of the predefined condition of mutual alignment).

In order to carry out the transfer, the electronic unit actuates the actuator associated with the first unit 2a which is carrying the product A to be transferred; the actuator in fact pushes the first shank 8a of the corresponding first tray 4a toward the first plate 6a, engaging the first shank 8a with a chosen one of the several lanes 7. Thus, a specific travel along the lane 7 is imposed on the first shank 8a and, as a consequence, the first tray 4a rotates, tipping over partially and transferring the pear to the side, where it is received by a second containment unit 2b.

Thanks to the calculation performed by the electronic unit, it is possible to position every pear in the center of the respective second tray 4b, so as to enable an easy weighing operation.

Furthermore, with the tipping the products A change their configuration (the orientation with which they are placed on the second unit 2b), and therefore they are conveyed along the second line 3b in a second arrangement, in which they show a different surface portion (substantially opposite and complementary to the previous one) to a second video camera, thus enabling the completion of the check of flaws, color and size category.

It should be noted however that if the first video camera detects serious flaws on a pear, the electronic unit can omit to command the transfer, so allowing the fruit and vegetable product A to continue on its way until the end of the first line 3a, where it can be allowed to fall into a container of discarded material. Or, by way of using further elements of the

type of guiding plates 6a, 6b, arranged upstream and/or downstream of the lines 3a, 3b, the assembly 1 can be given the capability to unload the products A at the sides of the lines 3a, 3b, in order to discard them upon the detection of serious flaws and/or route them to conveniently provided
5 reprocessing stations.

Differently from what occurs with conventional systems, it has therefore been fully shown that the assembly 1 according to the invention makes it possible to determine with precision the point of the second containment unit 2b at which each pear is transferred, in that the electronic
10 unit is capable of choosing the exact moment at which to actuate the actuation element in order to make at least the first tray 4a tip: as has been seen, the moment chosen is conveniently the moment corresponding to the occurrence of the desired (preset) condition of mutual alignment.

Such result is therefore obtained even given the irregularities and
15 peculiarities in the shape of pears (as with any other fruit and vegetable product A), in that the electronic unit and the transfer means adopted make it possible in each instance to vary the portion at which to perform the transfer, as a function of the variable peculiarities of each product A and of its configuration.

20 During the conveying, in addition to checking for flaws and more generally checking the color and size category, the assembly 1 enables an efficacious weighing of each pear, thanks to the ability to control the positioning, at least on the second line 3b.

In practice it has been found that the handling assembly according to
25 the invention fully achieves the set aim, in that the transfer means, distributed at least along one part of the first conveyance and/or control line, are actuated by the electronic management and control unit, only upon the occurrence of a predefined condition of mutual alignment between the fruit and vegetable product to be transferred, which is conveyed by the first
30 containment unit, and a second containment unit, and this makes it possible

to transfer fruit and vegetable products between two handling lines, while at the same time being able to control their positioning, at least downstream.

The invention, thus conceived, is susceptible of numerous modifications and variations, all of which are within the scope of the
5 appended claims. Moreover, all the details may be substituted by other, technically equivalent elements.

In the embodiments illustrated, individual characteristics shown in relation to specific examples may in reality be substituted with other, different characteristics, existing in other embodiments.

10 In practice, the materials employed, as well as the dimensions, may be any according to requirements and to the state of the art.

The disclosures in Italian Patent Application No. BO2015A000148 (102015902341042) from which this application claims priority are incorporated herein by reference.

15 Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

CLAIMS

1. An assembly for handling fruit and vegetable products, which comprises first containment units (2a) for horticultural products (A) that can move along a first conveyance and/or control line (3a) and second
5 containment units (2b) for fruit and vegetable products (A) that can move along a second conveyance and/or control line (3b), which is laterally adjacent and proximate to said first line (3a), characterized in that it comprises a plurality of means for transferring the horticultural products (A), said means being distributed at least along a part of said first line (3a)
10 and being selectively actuatable by an electronic management and control unit, for the transfer of each product (A) from a said first unit (2a) to a respective said second unit (2b) in a portion chosen from a plurality of different portions of said first line (3a), upon the occurrence of a predefined condition of mutual alignment between the horticultural product (A) to be
15 transferred, which is conveyed by said first unit (2a), and a said second unit (2b).

2. The handling assembly according to claim 1, characterized in that each one of said second containment units (2b) is associated with a respective device for weighing the conveyed horticultural product (A).

20 3. The handling assembly according to claim 1 or 2, characterized in that it comprises an electronic control apparatus, provided with a first video camera that faces said first line (3a), for checking the color, size and/or the presence of surface and pulp flaws on said horticultural products (A), which are supported and conveyed by said first units (2a) in a first arrangement,
25 and a second video camera that faces said second line (3b), for checking the color, size and/or the presence of surface and pulp flaws on said horticultural products (A), which are supported and conveyed by said second units (2b) in a second arrangement that is obtained automatically as a consequence of the transfer the products (A) from said first line (3a) to
30 said second line (3b).

4. The handling assembly according to claim 3, characterized in that each one of said first units (2a) is constituted substantially by a first tray (4a), which can move along a first guiding track (5a) which substantially defines said first line (3a) and can rotate about a first main axis, which is substantially parallel to said first track (5a), said means comprising elements for actuating the rotation of respective said first trays (4a) about said first main axis, for their partial tipping and the consequent transfer of the corresponding horticultural product (A) toward a respective said second unit (2b), after such tipping the horticultural product (A) passing automatically from said first arrangement to said second arrangement.

5. The handling assembly according to one or more of the preceding claims, characterized in that said control apparatus comprises an electronic viewer associated with said electronic unit and arranged along said first line (3a), for the acquisition of the information related to the position assumed by each fruit and vegetable product (A) in the respective said first unit (2a), said electronic unit being provided with an algorithm for calculating the portion of said first line (3a) that corresponds to the occurrence of said predefined condition of mutual alignment, as a function of the shape and of the speeds of said first unit (2a) and of said second unit (2b), and as a function of said position detected by said viewer, said predefined condition corresponding preferably to the alignment of the fruit and vegetable product (A) to be transferred, which is conveyed by the respective said first unit (2a), with the central portion of a respective said second unit (2b).

6. The handling assembly according to claim 4 or 5, characterized in that each one of said second containment units (2b) is constituted substantially by a second tray (4b), which can move along a second guiding track (5b) which substantially defines said second line (3b) and has a shape and dimensions that are optionally different from those of said first tray (4a), each one of said second trays (4b) being able to rotate about a second main axis, which is substantially parallel to said first main axis and to said

second track (5b), for their partial tipping in the opposite direction with respect to the partial tipping of said first trays (4a), at least during the transfer of the respective horticultural product (A).

7. The handling assembly according to one or more of the preceding
5 claims, characterized in that said transfer means comprise at least one first guiding plate (6a), which faces in a parallel arrangement and is proximate to said first line (3a) on the opposite side with respect to said second line (3b), at least along the lateral wall of said first plate (6a) that faces said first line (3a) there being a plurality of inclined lanes (7), a first shank (8a) of each
10 one of said first trays (4a) being selectively engageable following the actuation of the corresponding said actuation element in each one of said lanes (7), for the rotation of the corresponding said first tray (4a) as a consequence of the sliding of said first shank (8a) along said lane (7).

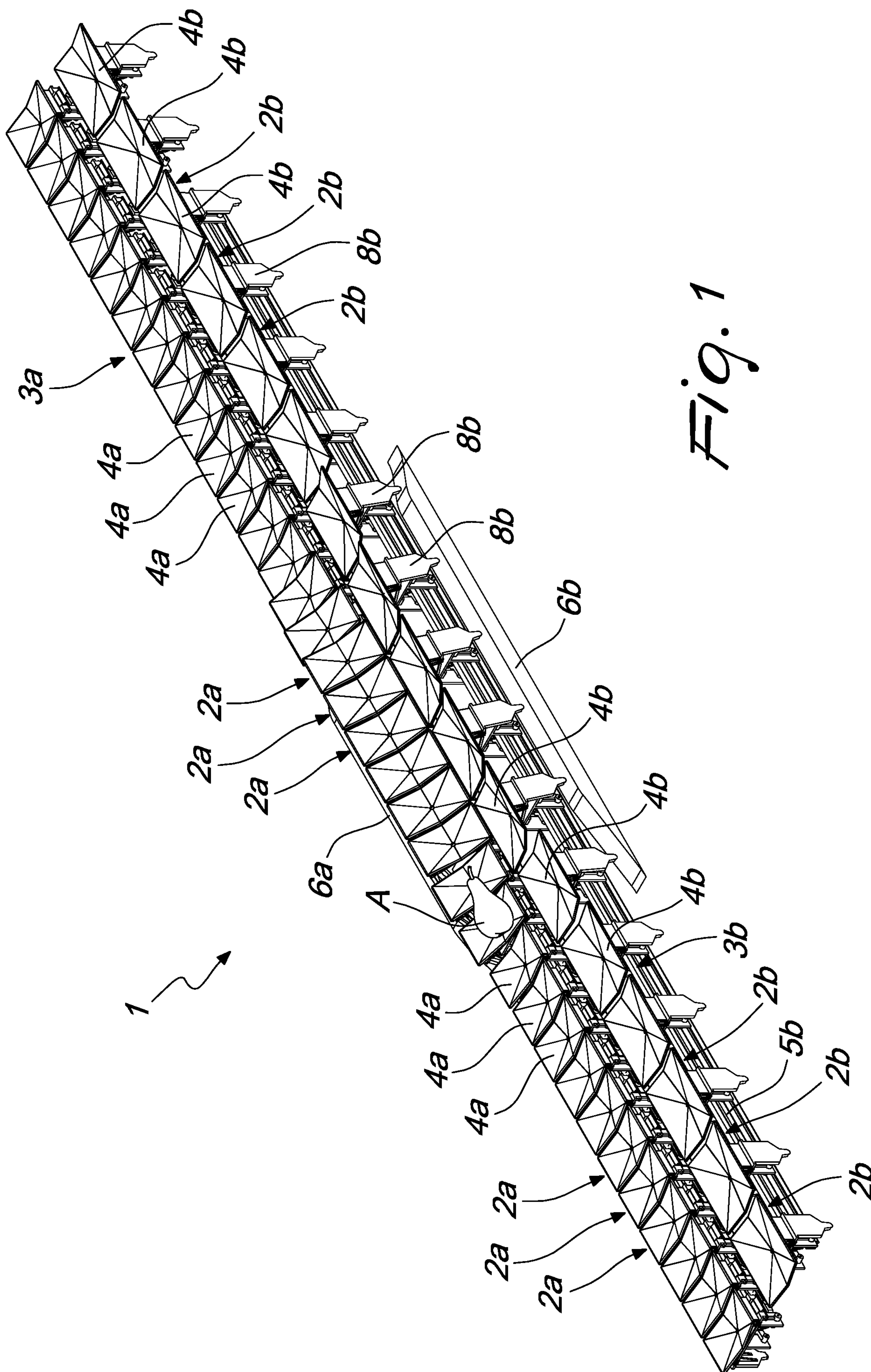
8. The handling assembly according to one or more of the preceding
15 claims, characterized in that each one of said actuation elements comprises at least one actuator, which is integral with the respective said first unit (2a) and usually faces said first shank (8a), each one of said actuators being selectively actuatable by said electronic unit in order to force the engagement of said first shank (8a) in a corresponding said lane (7).

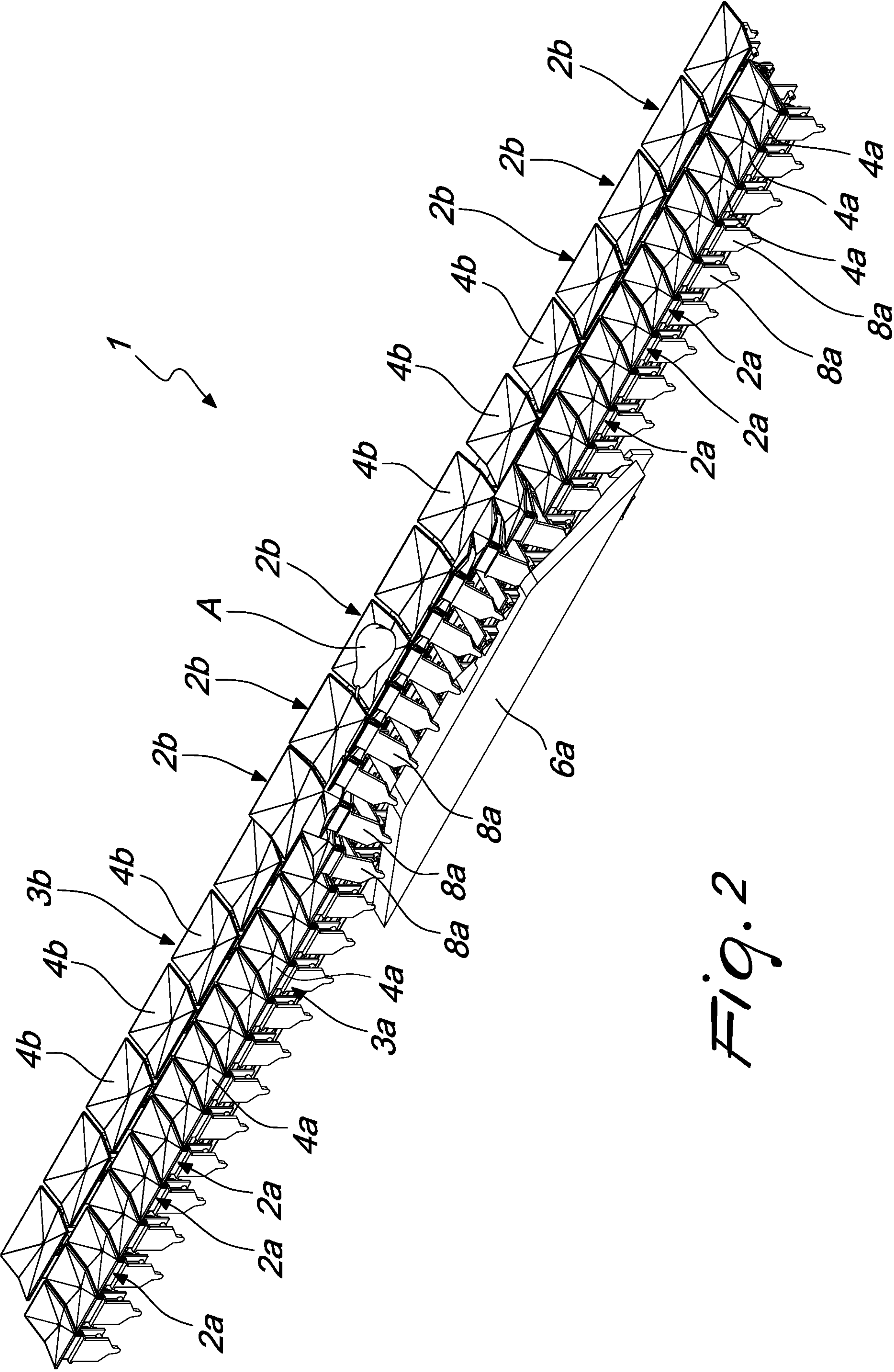
20 9. The handling assembly according to one or more of the preceding claims, characterized in that it comprises a second guiding plate (6b), which faces in a parallel arrangement and is proximate to said second line (3b) on the opposite side with respect to said first line (3a) and is arranged along the path of second shanks (8b) of each one of said second trays (4b), for their
25 rotation as a consequence of the sliding of said second shanks (8b) on a contoured run defined by the top of said second plate (6b).

10. The handling assembly according to one or more of the preceding claims, characterized in that each one of said trays (4a, 4b) is rigidly supported by a support (9a, 9b) which is pivoted, about the respective said
30 main axis, to a slider (10a, 10b) which can slide along the corresponding

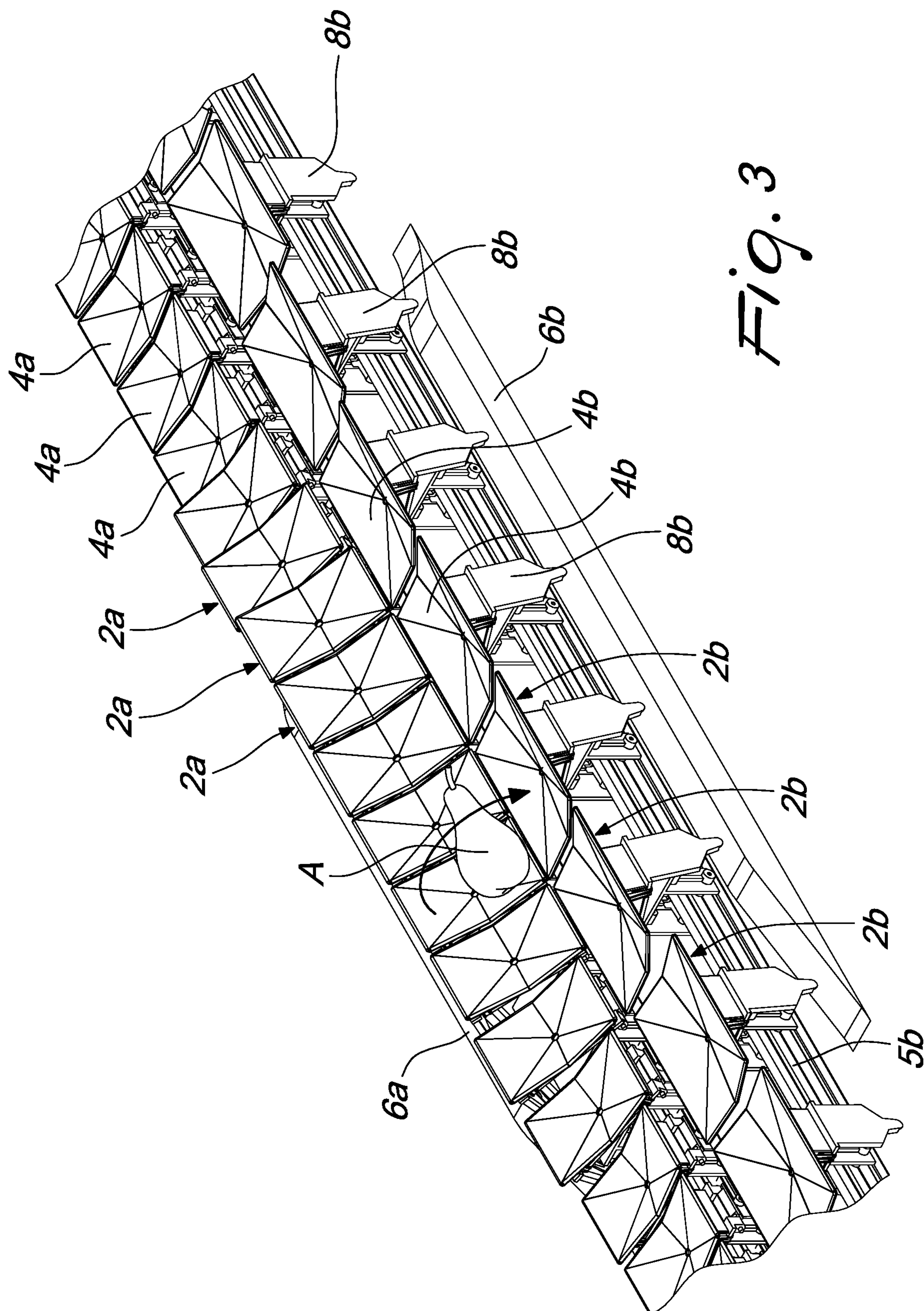
said track (5a, 5b), each one of said shanks (8a, 8b) extending from the corresponding said support (9a, 9b) on the opposite side with respect to the corresponding said tray (4a, 4b).

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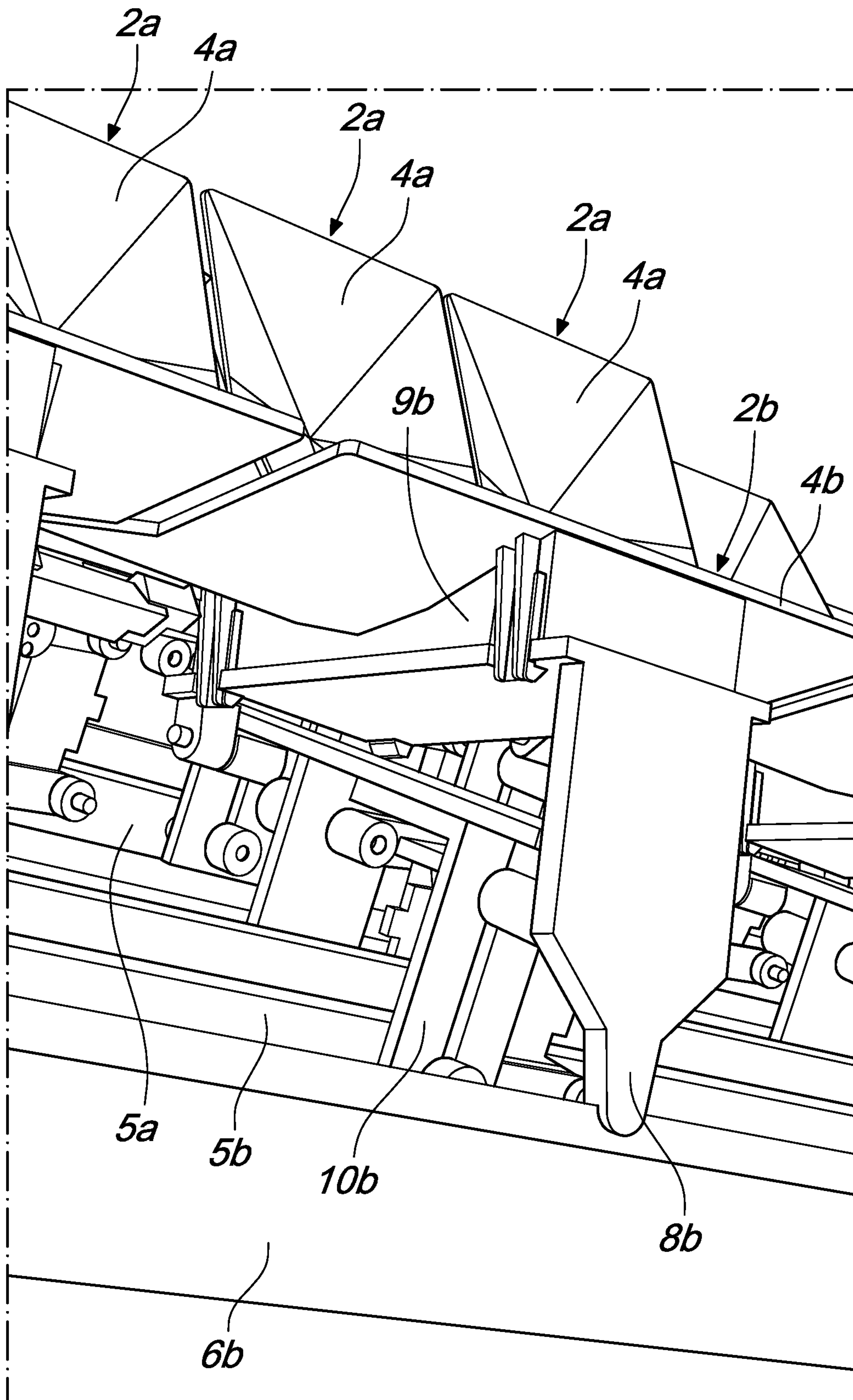




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*Fig. 4*

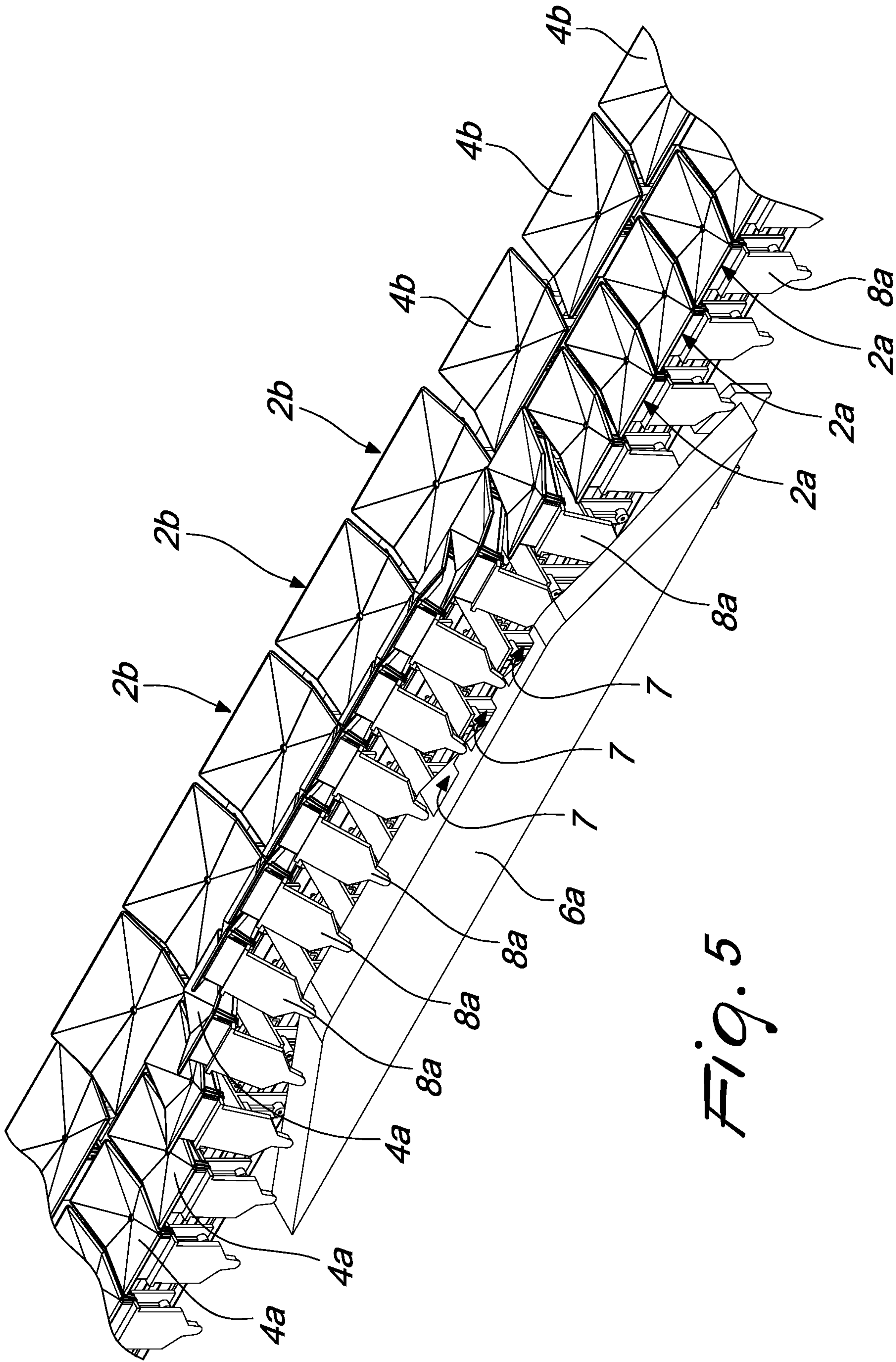


Fig. 5

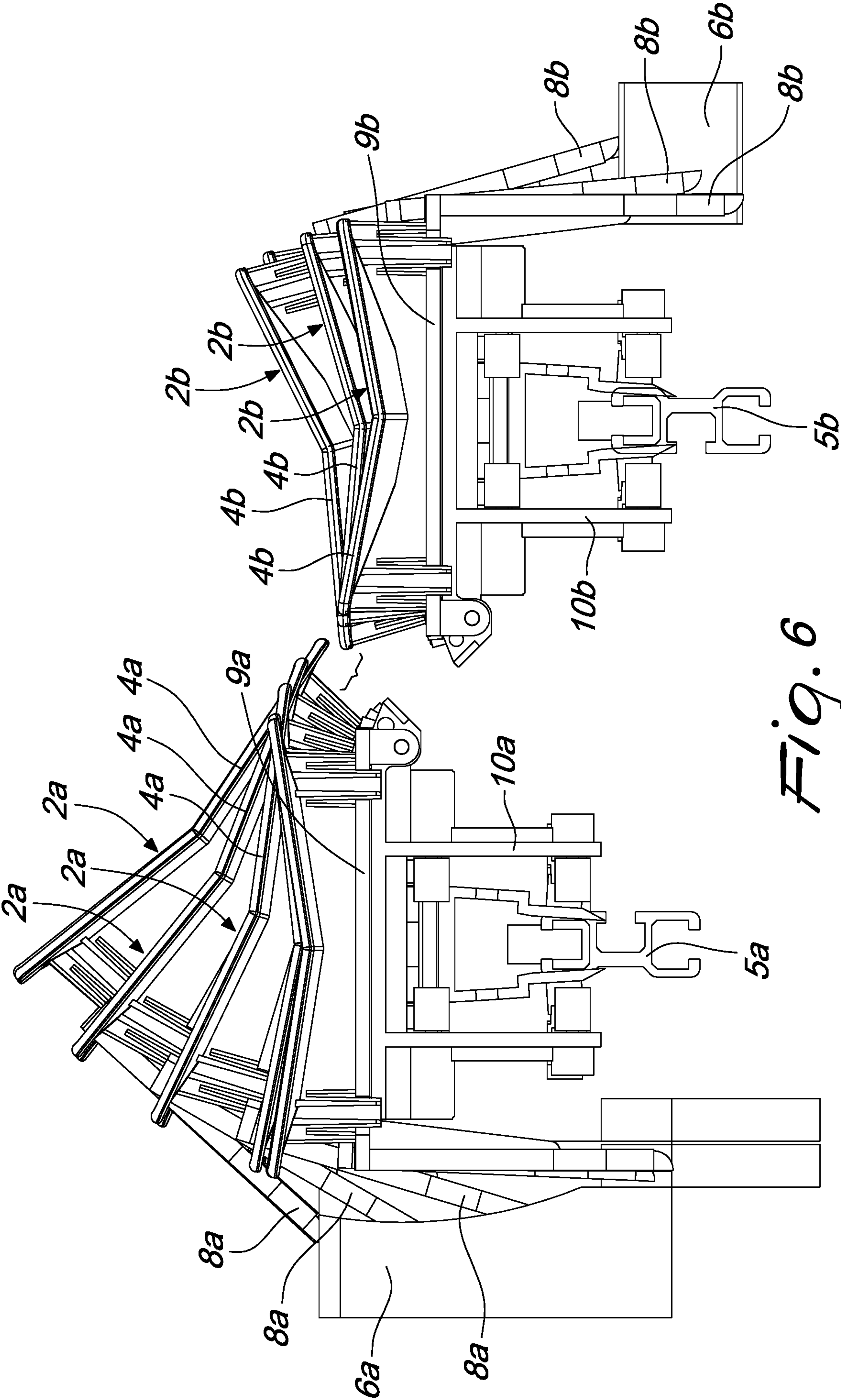
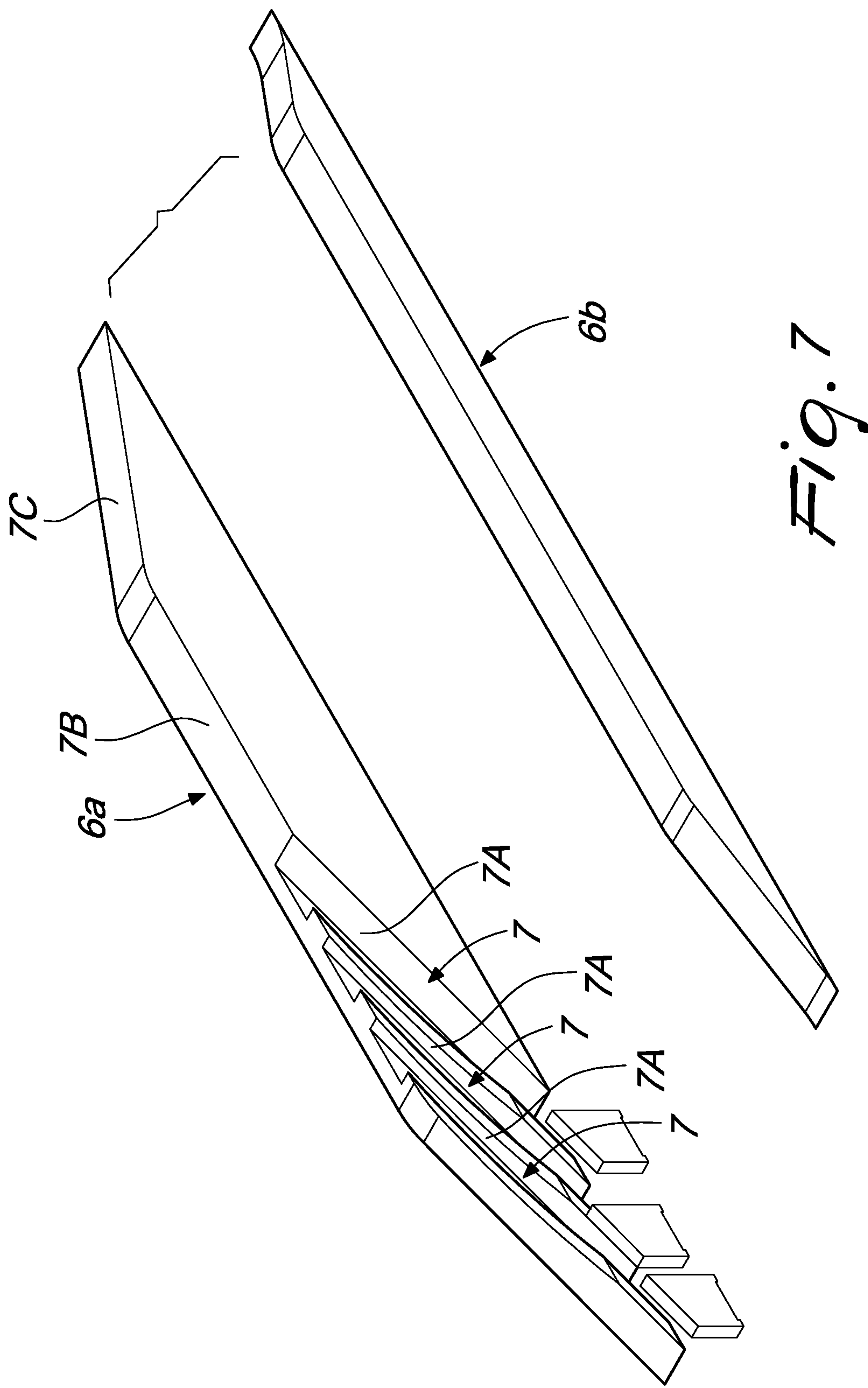


Fig. 6



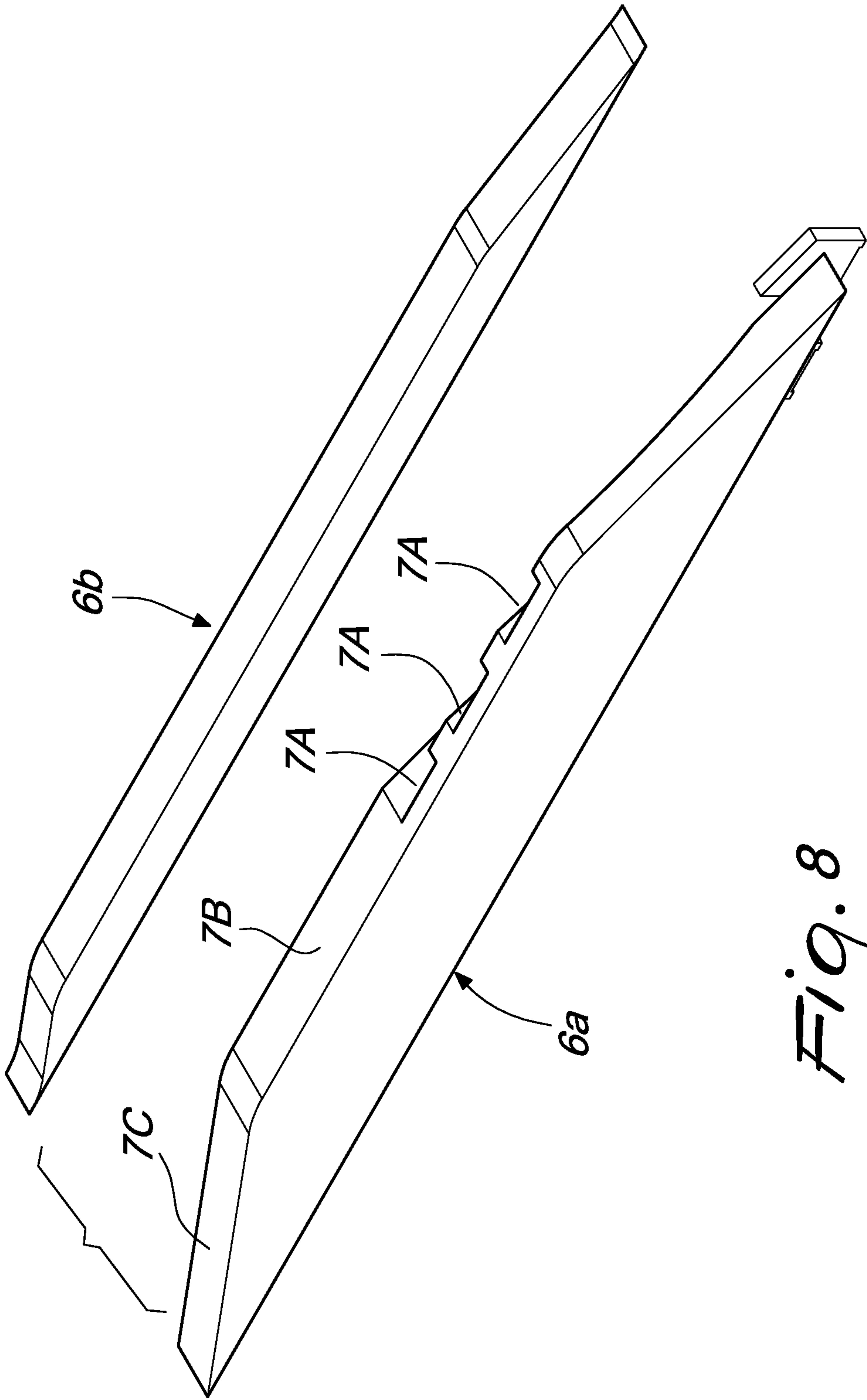


Fig. 8

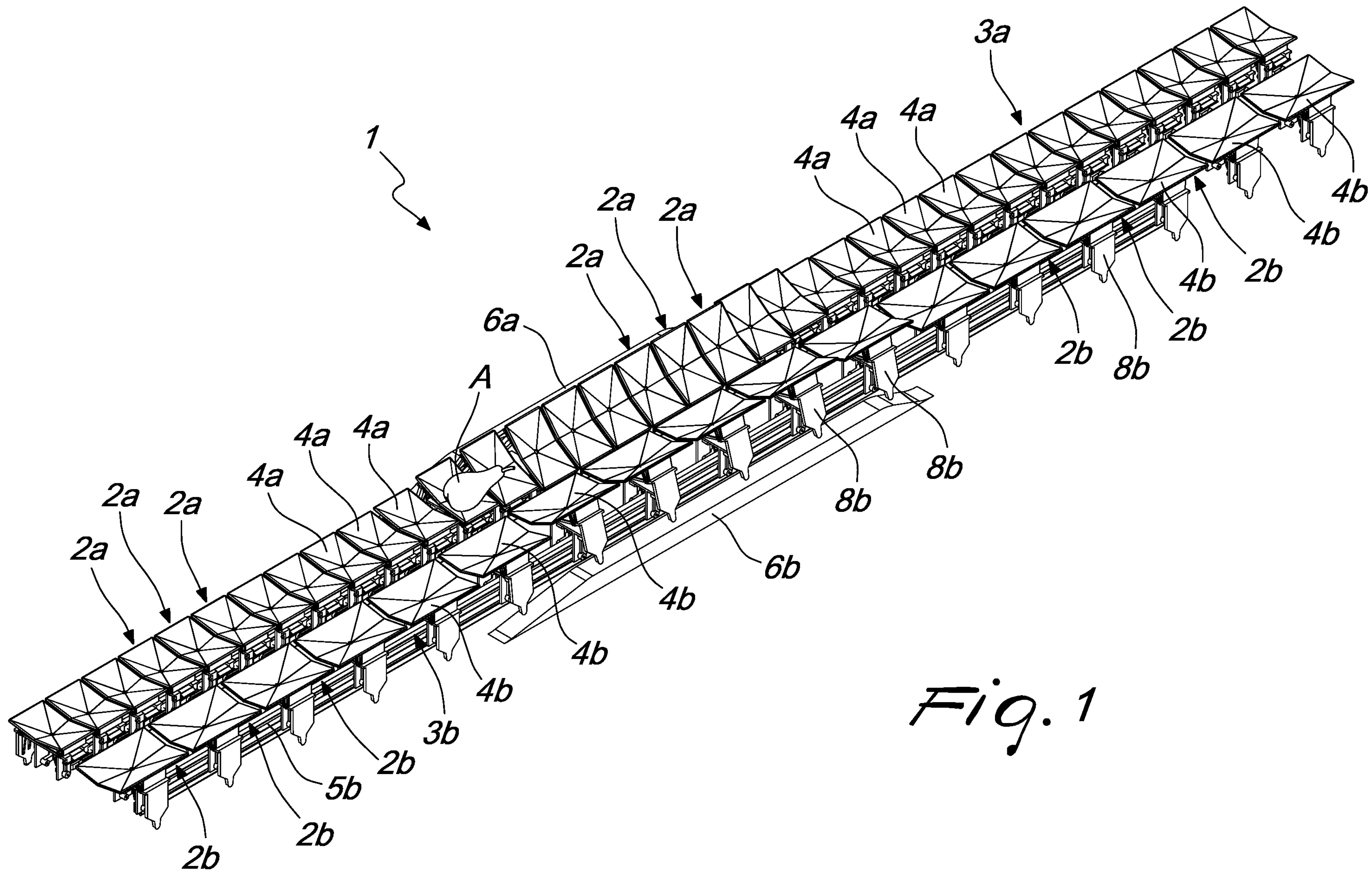


Fig. 1