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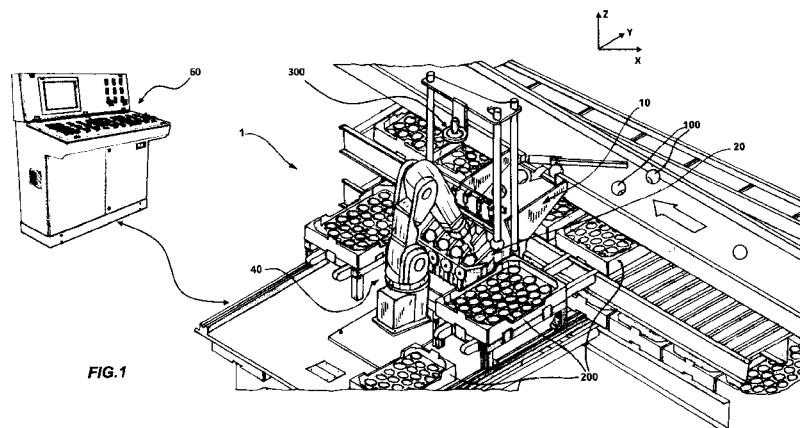
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(54) Title: MACHINE FOR THE AUTOMATIC ORIENTED POSITIONING OF FRUITS IN A PRIMARY PACKING CONTAINER



(57) Abstract: The present invention relates to an automated machine for accumulating, separating, orienting and positioning fruits in primary packing containers.

MACHINE FOR THE AUTOMATIC ORIENTED POSITIONING OF FRUITS IN A PRIMARY PACKING CONTAINER

DESCRIPTION

5 The present invention relates to an automated machine for accumulating, separating, orienting and positioning fruits in primary packing containers.

 This machine is created by the productive and economic need for automating the process for positioning fruit in a primary packing.

 Currently this activity is carried out manually as it results to be technically
10 complicated to replace the operator versatility in front of the extreme variability of the product to be packed and the stringent market requirements. The average number of the operators involved in this phase is around six/eight units per each output belt of the selection line and the purpose is to reduce or eliminate the human presence in this phase characterized by repetitiveness, heaviness and the risk of developing articular
15 pathologies.

 The possible variables are the type of fruit, the grade thereof, the (wrinkled, waxed, wet, etc.) fruit surface conditions, the degree of ripeness (sensibility to crushing), the possible presence of leaves or branches, the possible presence of second-class or waste fruit, the packing type required by the customer, the fruit orientation in the
20 packing for aesthetical purposes.

 Hereinafter in the present description a specific type of fruits will be referred to, peaches, therefor the above-mentioned problem is particularly felt.

 In particular, for reasons including both technical and commercial reasons, it is wished that peaches are positioned in the primary packing container all in the same
25 direction and precisely with the leaf stalk directed downwards towards the container and with the most red-coloured portion (therefore the one designating a higher degree of ripeness) exposed upwards.

 However, it is to be meant that the machine could be used for treating other types of fruits, therefor there is the same need for oriented positioning, and which, for shape
30 and geometry, can be treated and handled as it will be described hereinafter, even if with the required mechanical adaptations of the machine or parts thereof.

 The object of the present invention is then to overcome the above-illustrated problems and this is obtained through a machine as defined in claim 1.

Additional features of the present invention are defined in the corresponding depending claims.

The present invention, by overcoming the known art problems, involves several and evident advantages.

5 The current lines for treating, selecting and packing the fruit are characterized by handling each batch of processed fruit as a single entity during the whole input, cleaning and transportation phase. Even the grading machine, which has the purpose of selecting the single fruits according to different criteria, has a process for separating and loading fruits on small carriages favouring speed rather than precision.

10 On the contrary, upon devising this machine, one has decided to handle each treatment channel, each orienting system and each fruit in an independent way, by adopting a 'modus operandi' derived from the industrial automation field, wherein it is important that the object to be moved, in this case each single fruit, has a known position and orientation, to allow a robot to know how picking-up and positioning the
15 fruit in the packing according to the specifications required by the customer.

One passes from a casual and not precise separation leading to a probable filling-up of the container (the small carriage of the grading machine) to a systematic separation allowing to process precisely all single fruits by avoiding dead time.

20 From this handling method, oriented towards the single fruit, derives a high versatility of the system which is able to handle different types of fruit, different type of packing and different requirements for orienting the fruit in the packing, by making available and processing at software level a high number of data and information connected to the real situation connected to the loaded fruit.

25 The mix of these three variables determines the rules to be set (in particular at software level) to obtain the packaging wished for a specific product.

30 From this it follows that, to perform a "change in production", for each configuration in case it is necessary to adopt some dedicated mechanical components (for example a specific configuration of gripping member for the robot, a properly shaped orientation seat, etc.). In any case the strategy adopted in devising the machine makes that the need for such mechanical modifications is reduced to the minimum upon each production change.

The spread of this machine will involve a considerable reduction in the number of operators involved in repetitive jobs, heavy and dangerous for health.

This machine, thanks to the application and multisectorial technological combination, is able to automate a complex productive phase, ruled by several variables, therefore sensibility in handling, versatility and effectiveness, apart from what already enlisted in this description, are to be considered the main novelty aspects characterizing it.

Among the main advantages brought by this machine the ones to be highlighted are:

- the automation of the process for packaging the fruit in the primary packing, therefrom a reduction follows in terms of manpower used in the productive line and the possibility of working with continuous cycle;

- the high versatility and flexibility in handling the input variable conditions (type and features of the fruit, type of primary packing) and the requirements connected to the packed product (orientation of fruits in the primary packing);

- handling the above-mentioned versatility mainly at software level instead of at mechanical level, therefrom a timing and complexity of production change reduced to the minimum follows.

- the fact that it is a system which can be customized based upon the type of fruit to be handled;

- the modularity and repeatability of the machine to obtain high productive rates;

- the integrability of the machines in the current lines for treating the fruits on the market.

Other advantages, together with the features and the use modes of the present invention, will result evident from the following detailed description of preferred embodiments thereof, shown by way of example and not for limitative purpose.

The figures of the enclosed drawings will be referred to, wherein:

- figure 1 is an overall view of a machine according to the present invention;

- figure 2 is a view of a input station of the machine of figure 1;

- figure 3 is a rear view of a cadencing station of the machine of figure 1;

- figure 4 is a front view of a cadencing station of the machine of figure 1;

- figure 5 shows a support bearing seats for orienting the fruits, a portion of an orienting station of the machine of figure 1;

- figure 6 is a top view of the orientation seats of figure 5;

- figure 7 shows the rotating devices for orienting the fruits;

- figures 8 and 9 illustrate in details the modes for orienting the fruit; and
- figures 10 and 11 show two possible embodiments of a gripping hand according to the present invention.

The present invention will be described hereinafter by making reference to the
5 above-mentioned figures.

In particular, figure 1 represents an overall view of a machine 1 according to the present invention.

The machine 1 is devised to be coupled with a line for treating and selecting the fruit. More precisely, it can be placed downstream of a "grading machine" providing a
10 flow of selected fruit, according to grade and/or other criteria, input in the machine.

Alternatively, as it will be however described hereinafter, it is also possible to feed the machine with a flow of fruit not previously graded and/or selected. In this case the sensor system provided for controlling the machine, thanks to specific algorithms, can distinguish the size, the colour, the shape apart from the quality, the integrity, the
15 degree of ripeness and the sugar percentage of the fruit.

An automatic palletizer or other type of station for the secondary packing can be advantageously connected downstream of the machine.

According to the invention, a machine 1 for the automatic positioning of fruits 100 in a container 200 first of all comprises a station 10 for inputting the fruits to be positioned
20 in such container 200.

Such input station 10 comprises a region 11 for accumulating fruits, preferably shaped like a hopper with tilted plane 12 and comprising a bottom wall 13.

Advantageously, the tilting of the hopper plane can be varied, in case to adapt to the upstream line and even to adjust the speed of the incoming fruits.

25 One or more presence sensors, for example photocells placed at a predefined height level, detect the presence of fruits in the hopper itself. These sensors can be used for example to adjust the inflow of fruits, by controlling an automatic cylinder which makes a deviating bar, placed onto the fruit conveyor belt, to be opened by allowing then the filling-in of the hopper.

30 According to the present invention, the machine 1 further comprises an automated orientation station 20, for orienting a fruit according to a predefined configuration with respect to a reference system (XYZ).

Such predefined configuration, for example, can provide that the fruit (in this case a peach) has to be oriented so as to have the leaf stalk downwards (that is directed towards the inside of the primary container) and, in case, with the portion of a predefined colouring level upwards (at least as much as possible).

5 It is also evident that other configurations can be provided, with respect thereto the machine could be controlled so that the input fruits are correspondently oriented and positioned.

The machine 1, generally, comprises a plurality of sensors 50 to detect the presence of fruits in each one of the above-mentioned stations, and a unit 60
10 controlling the machine which controls the actuation thereof, even based upon data detected by the sensors 50.

The input station 10 and the automated orientation station 20 define in the machine one or more channels 5 for treating said fruits.

In the herein described example, the machine 1 comprises four treatment channels,
15 but it is evident and it will be explained in detail that as the channels are independent therebetween and coordinated by a single control unit, the machine could provide a different, greater or smaller, number thereof, without having to modify in any way the base inventive concept.

The machine 1 further comprises at least an automatic device 30 for transferring a
20 single fruit 100 from the input station 10 to the orientation station 20. Of such devices one for each one of said treatment channels is provided and they perform a function of separating input fruits.

Each one of said automatic transfer (or separation) devices 30 comprises a pusher
31 positioned at a terminal portion of the tilted plane 12 of the hopper, close to the
25 bottom wall 13.

The pusher 31, the operation thereof is controlled by the control unit 60, preferably is made of plastic material and actuated by means of a pneumatic cylinder according to a translation motion along the bottom wall 13.

The pusher 31 has a heading region 32 shaped so as to contain one single fruit. In
30 rest position the heading region 32 of the pusher can be considered a portion of the tilted plane of the accumulating hopper, whereas when the pneumatic cylinder is actuated, the pusher 31 rises along the bottom wall and brings therewith no more than one fruit.

The bottom wall 13 has an upper edge 14 faced onto the orientation station 20 and the shape of the heading region of the pusher 31 is so that, upon reaching the upper edge 14 the fruit is pushed towards the orientation station 20.

Advantageously between the input station 10 and the automated orientation station
5 20 a cadencing station 70 is provided.

The cadencing station 70 receives the fruits pushed by the pushers 31 and it adjusts the transfer thereof towards the orientation station 20, so that in the orientation station 20 there is one single fruit at a time.

Advantageously one or more sensors, for example, photocells, can be provided at
10 the cadencing station to control the actuation of the pushers 31.

Along each channel 5 of the cadencing station 70 one or more mobile barriers 33 are provided, controlled by the control unit 60 based upon data acquired by presence sensors. Such mobile barriers 33 are then actuated so that each fruit can pass along a corresponding channel and be transferred into the orientation station.

15 To this purpose, the orientation station 20, still for each treatment channel 5, comprises a respective orientation seat 21 shaped so as to receive one single fruit.

The shape and sizes of the seat 21 could be adapted to the type of fruit which the machine has to process.

In the specific example, since it is about peaches – then with substantially spherical
20 shape – the seat 21 will be substantially shaped like a hollow sphere portion. Each one of such orientation seats 21 has a pierced bottom area 22.

According to the present invention, the orientation station 20, for each channel 5, comprises a rotating device 23 assembled onto a carriage 24 moving between a rest position, wherein the rotating device 23 is outside said pierced bottom area 22, and a
25 contact position, wherein the rotating device 23 is inside said pierced bottom area 22, so as to come in contact with the surface of a fruit existing in the respective orientation seat 21 so that the rotation of the rotating device 23 puts into rotation the fruit in the orientation seat.

According to an embodiment, the fruit is placed in rotation by a contact wheel 24,
30 preferably coated with rubber. The wheel is actuated by a motor, preferably by means of a multiplier, for example a knurled metallic disc 12 actuated by an electric motor.

This mechanical group can be made to translate onto the carriage, and placed in contact with the fruit, by means of a pneumatic piston.

As illustrated more in detail in figures 8 and 9, the contact takes place by exploiting the lower opening 22 of the orientation seat 21. In particular, as shown in figure 8, the fruit 100 rotates in the cup until the leaf stalk is directed downwards. In this moment, as illustrated in the subsequent figure 9, the cavity itself of the leaf stalk determines the
5 loss of contact of the fruit 100 with the wheel 24 or at least a contact insufficient to determine the additional rotation of the fruit 100.

This operation is obtained by exploiting the characteristic shape of the peach which, at the leaf stalk, has a hollow surface portion with respect to the generically spherical surface of the fruit itself.

10 A sensor in contact with the fruit can be advantageously provided to determine that the device 23 is put into rotation and it is moved from the contact position to the rest position, when said contact with the fruit is lost during the rotation.

According to the present invention, the machine 1 further comprises automated means 40 for picking up the oriented fruit from the orientation station 20 and for
15 transferring it into a primary container 200 for fruits.

According to a possible embodiment of the machine 1, the picking-up automated means 40 comprises a robotic arm 41 programmed for picking up an oriented fruit from said orientation station 20 and transferring it into the container 200.

The picking up of the fruit by the robot is made possible by a gripping member 42,
20 preferably of the pneumatic type with suction cup.

Depending upon the type of fruit to be processed, the shape thereof and/or the degree of ripeness thereof, a gripping member with single suction cup (as shown by way of example in figure 10), or with three suction cups, arranged therebetween at 120°, could be arranged for a safer and at the same time more delicate grip, as shown
25 in figure 11.

Preferably, the robotic arm 41 is of anthropomorphic type, with six axes. Such type of robot allows a greater motion flexibility and it allows to position easily each single fruit in the primary container, even in the positions inside the packing more complicated to be reached (for example two or four alveoli placed at the angles of the packings, hardly to be reached with vertical descending trajectories).
30

However it is to be meant that other robotised motion solutions can alternatively be used.

Furthermore, it is to be meant that the number of robotic arms can be greater than one, sized based upon the number of treatment channels existing in the machine and to the amounts of fruit in the time unit which one wants to treat.

By way of example, in case of presence of more than one robotic arm, the machine could comprise a group for translating the orientation station so as to position it correctly with respect to each existing robotic arm. Such translation group for example could be implemented by means of an additional robot (of Scara type or other). Furthermore, such functionality could even be exploited to treat at the same time two or more types of fruits (different therebetween by nature or grade).

The fruit-gripping analysis or study are determined by a software algorithm modulating the grip - for example in terms of void applied to the suction cups - based upon pre-established criteria connected to the type of fruit and degree of ripeness.

The suction cup system allows not to damage the fruit in case of possible collisions with the packing or with other fruits, during the positioning in the packing.

The high versatility provided by this solution allows to pick up the fruit gently and to position it properly in the container, according to the predefined spatial configuration set initially.

Advantageously, according to a possible embodiment, the machine 1 can further comprise an image acquisition system 300 apt to detect images of the fruit at least when it is in the orientation station 20.

The acquired images are transmitted to the control unit 60 which receives them and which is configured to process them and obtain data to be used to control the motion of said picking-up automated means 40, in particular of the robotic arm.

As already shown, a possible orientation criterion, which contributes to determine the wished spatial configuration, is based upon the colour of the fruit (as index of the degree of ripeness).

In this sense, the control unit 60 can include a software for recognizing the colours of the fruit in the orientation station 20 and the subsequent processing of data identifying the arrangement thereof with respect to the reference system (XYZ). These data can be used then to control the motion of the robotic arm (or other picking-up automated means).

An integral portion of the operation and the novelty of the machine is the software integrated in the same, allowing the operation thereof.

As already said, the control unit allows to handle in a simultaneous and coordinated way all apparatuses, thereamong:

- the actuation of the plungers of the separating device and of the cadencing device;
- 5 - the operation of the motor and of the plunger of the mechanical orienting device place under the fruit-holding cup;
- the handling and integration of the vision system and of the information collected thereby;
- the robot motion and the actuation of the pneumatic suction cups for gripping
10 and leaving the fruit;
- the motion coordination of the packing-holding belt with the robot leaving operations;
- the loading of the empty packings and the unloading of the filled-up ones.

The software controlling the image acquisition system is able to determine in an
15 intelligent way sizes, shape, colour, colour distribution, degree of ripeness, possible waste or second choice fruit, of each single fruit before, during and after the mechanical orientation phase in the orientation seat.

The image vision and acquisition system, for example, can be positioned to tower above the above-described orientation seats 21. In this way, by processing the images,
20 the control system could process the best trajectory to be followed by the robotic arm to position the fruit in one of the free alveoli of the primary container according to the wished configuration.

It is also to be meant that, in case of fruits with substantially not spherical shape, therefor the above-mentioned orientation method performed by rotating the fruit cannot
25 be applied or therefor it results to be difficult to be applied, the orientation could be wholly based upon the information obtained by the image acquisition system 300.

The information collected by means of the vision system are then processed and based upon the same the software orders to the robot:

- when and where the oriented fruit is to be picked up
- 30 - to discard in case the fruit;
- how much depression (pneumatic suction cups) or pressure (in case of gripping member with mechanical fingers or other) is to be exerted during the fruit gripping based upon the degree of ripeness, in order not to damage it even if with a safe grip;

- at which speed the robot has to be moved depending upon the gripping force determined previously;

- in which most suitable position or slot the fruit is to be positioned based upon the shape of the packing and of the adjacent fruits (in case of additional vision system in the area of leaving the fruits in the packing).

- which trajectory is most suitable to be adopted in order not to damage the fruit, for example horizontal trajectories or the ones processed for leaving the fruit in the angle areas of the packing and/or to approach the already positioned fruits, in packing configurations providing contact between the fruits for reasons of optimum filling up.

- to rotate properly to put back the fruit with the ripest area or the area with the strongest colour upwards (for exhibition and sale aesthetical reasons);

- etc.

It is to be meant that the machine could be equipped with several image sensors, positioned differently, to improve the knowledge of the position of fruits and thus to improve the robot motion and consequently to increase the machine effectiveness.

For example, in case the machine is not downstream of a grading machine or which however has not as input fruit already selected by grade, it is possible using the vision system for selecting the fruits based upon the sizes thereof and dividing them consequently in suitable packings.

The machine 1 can further comprise, at least according to some embodiments thereof, means for loading/unloading the primary container(s) 200. Such means, still actuated by the control unit 60, can comprise conveyor belts (with belt or chain), in case equipped with pushing inserts and positioning of the containers, which make the position univocal with respect to the reference system.

The machine is devised in modular way, therefore each single separating and orienting channel can work independently and be stopped in case of failure without stopping the working cycle of the upstream machine for this reason.

Although the prototype is fed by four separating channels and by four orienting devices, the modularity involves that each single separating and orienting channel could be repeated at will to make that the the robot must never be stopped waiting for a fruit ready to be positioned.

For production needs the possibility of repeating the modularity of the machine in two or more models fed by the same belt and/or by other belts and/or grading

machine(s) has been provided, by forming a packaging system in case interconnected at software level.

Consequently each single machine could be constituted by any number of separating and orienting channels and several machines of this type could work on the same conveyor belt to satisfy the customised rate requirements.

In order to increase the machine productivity it will be possible to increase at will the number of robots and/or conveyor belts of the packing, as well as any other machine component.

The system for moving the packings could be modified with other motion types, as well as the system for univocally positioning the packing on the belt.

In the same way, for simpler applications and to reduce the costs when needed, the possibility is provided of not integrating the vision system in the machine or of providing the motion of the oriented fruits inside the primary packing not by means of one or more anthropomorphic robots, on the contrary by means of scara robot, Flexpicker, Delta, cartesian axes or other, each one thereof in even number or a number greater than one according to customisation.

Based upon the type of fruit to be handled, the elements described in this text could be adapted and modified in the shape, in the used materials and in the arrangement thereof, to improve the motion of the fruits themselves.

In particular:

- the cups in the orientation area could be modified in the shape and in the material according to size and the fruit type and to be inserted in different types of modular containers for the same.

- The tools of the wrist or other operating end of the robot or cartesian axis will be implemented by means of supporting mechanical pieces with suction cups, levers, pincers, mechanical fingers, electro-adhesive strips or other devices apt to move the fruit. The devices could be in number equal or greater than one on any wrist or other operating end of the robot or cartesian axis.

- The pushers of the separating device will be made of different materials, apart from shapes, to adapt to different fruits and to different sizes.

The present invention has been sofar described with reference to preferred embodiments thereof, together with some embodiment variants. It is to be meant that each one of the variants and of the technical solutions implemented in the preferred

embodiments, herein described by way of example, could advantageously be combined differently therebetween, to create other embodiments, belonging to the same inventive core and however all within the protective scope of the herebelow reported claims.

CLAIMS

1. A machine (1) for the automatic positioning of fruits (100) in a container (200), comprising

- an input station (10) of the fruits to be positioned in said container (200); and
- 5 • an automated orientation station (20) for orienting a fruit according to a predefined configuration with respect to a reference system (XYZ);

so as to define one or more channels (5) for treating said fruits, the machine further comprising:

- 10 • at least an automatic device (30) for transferring a single fruit from said input station (10) to said orientation station (20);
- automated means (40) for picking-up said oriented fruit from the orientation station (20) and transferring it into said container (200) for fruits;
- a plurality of sensors (50) for detecting the presence of fruits in each one of said stations; and
- 15 • a control unit (60) of the machine which controls the actuation of the same based upon data detected by said sensors (50).

2. The machine (1) according to claim 1, wherein said input station (10) comprises a region (11) for accumulating fruits, preferably shaped like a hopper with tilted plane
20 (12) and comprising a bottom wall (13).

3. The machine (1) according to claim 2, wherein said at least automatic transfer device (30) comprises a pusher (31) positioned at a terminal portion of said tilted plane (12), close to said bottom wall (13), said pusher (31) being actuated in translation
25 along said bottom wall (13) by said control unit (60).

4. The machine (1) according to claim 3, wherein said bottom wall (13) has an upper edge (14) faced onto said orientation station (20) and said pusher (31) has a heading region (32) shaped so that, upon reaching said upper edge (14), a fruit
30 contained therein, is pushed towards said orientation station (20).

5. The machine (1) according to claim 3 or 4, wherein said pusher (31) has a heading region (32) shaped so as to contain one single fruit.

6. The machine (1) according to one of the previous claims, wherein between said input station (10) and said automated orientation station (20) a cadencing station (70) is provided which adjusts the transfer of each fruit from said input station (10) to said orientation station (20), so that in said orientation station (20) there is one single fruit at a time.

7. The machine (1) according to claim 6, wherein said automatic transfer device (30) comprises one or more mobile barriers (32), controlled by said control unit (60) based upon data acquired by one or more presence sensors for detecting fruits in said cadencing station (70).

8. The machine (1) according to one of the previous claims, wherein said orientation station (20) comprises an orientation seat (21) shaped so as to receive one single fruit.

9. The machine (1) according to claim 8, wherein said orientation seat (21) has a pierced bottom area (22).

10. The machine (1) according to claim 8 or 9, wherein said orientation station (20) comprises a rotating device (23) assembled on a carriage (25) mobile between a rest position wherein said rotating device (23) is outside said pierced bottom area (22) and a contact position wherein said rotating position (23) is inside said pierced bottom area (22) so as to come in contact with the surface of a fruit existing in said orientation station (21) so that the rotation of said rotating device (23) puts into rotation said fruit.

11. The machine (1) according to claim 10, wherein said rotating device (23) comprises a sensor contacting said fruit, for determining the motion of the device (23) itself from said contact position to said rest position when said contact with the fruit is lost during the rotation.

12. The machine (1) according to claim 10 or 11, wherein said rotating device (23) comprises a contact wheel (24) actuated by a motor, preferably by means of a multiplier.

13. The machine (1) according to one of the previous claims, further comprising an image acquisition system (300) apt to detect images of the fruit in said orientation station (20).

5

14. The machine (1) according to claim 13, wherein said control unit (60) is configured to receive images from the image acquisition system (300) and process them to obtain data to be used for controlling the motion of said picking-up automated means (40).

10

15. The machine (1) according to claim 14, wherein said control unit (60) comprises a software for recognizing the fruit colours in the orientation station (20) and processing data identifying the arrangement thereof with respect to said reference system (XYZ), said data being used for controlling the motion of said picking-up automated means (40).

15

16. The machine (1) according to one of the previous claims, wherein said picking-up automated means (40) comprises a robotic arm (41) programmed for picking up an oriented fruit from said orientation station (20) and transferring it into said container (200).

20

17. The machine (1) according to claim 16, wherein said robotic arm (41) comprises a gripping member (42, 43).

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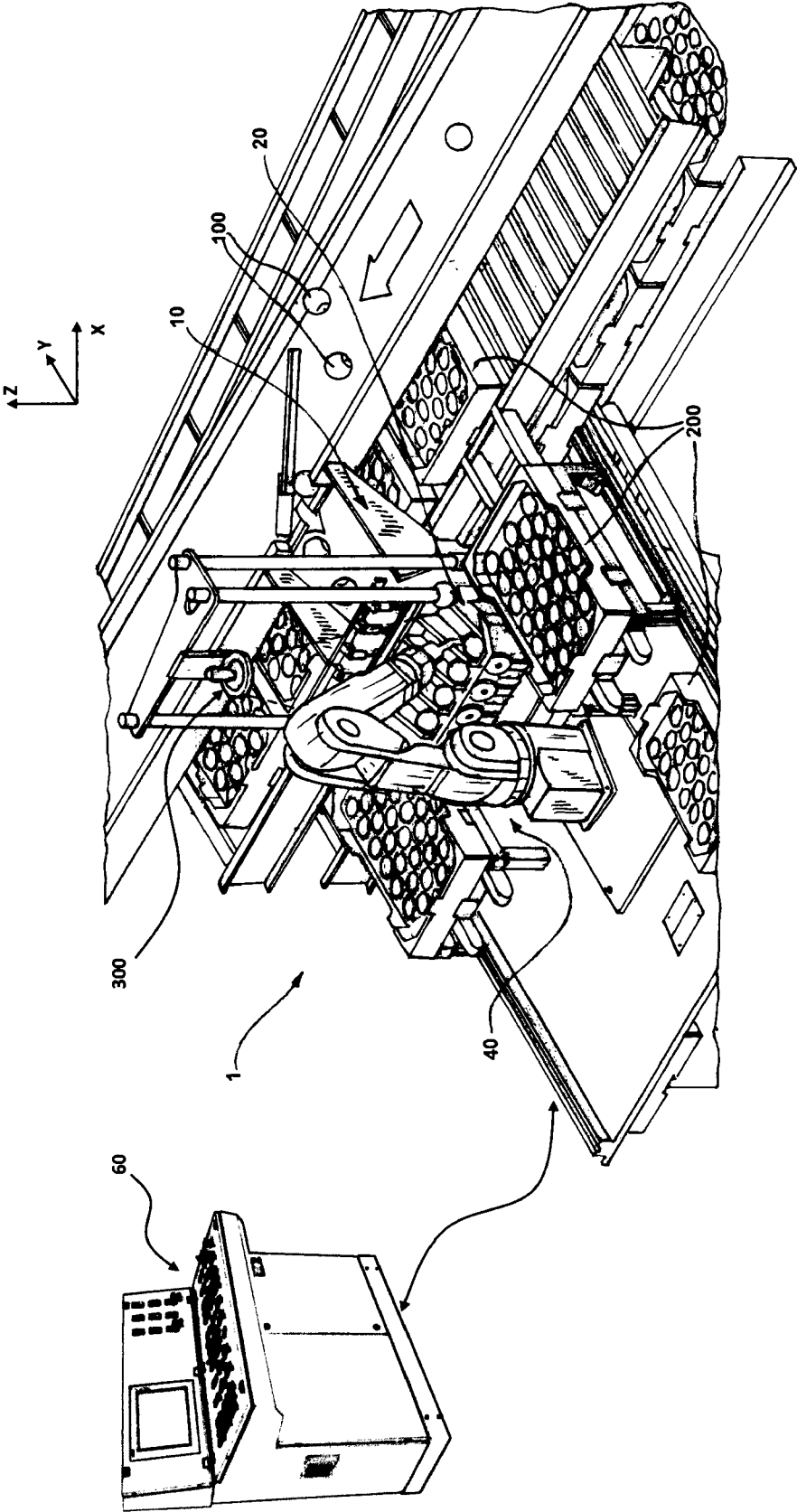
18. The machine (1) according to claim 17, wherein said gripping hand (42, 43) is of the type with pneumatic suction cup, with one (42) or three suction cups (43).

19. The machine (1) according to claim 16, wherein said robotic arm (41) is of anthropomorphic type.

30

20. The machine (1) according to one of the previous claims, further comprising means for loading/unloading said container (200), actuated by said control unit (60).

21. The machine (1) according to one of the previous claims, comprising a plurality of treatment channels (5) functionally independent therebetween and operating parallelly.



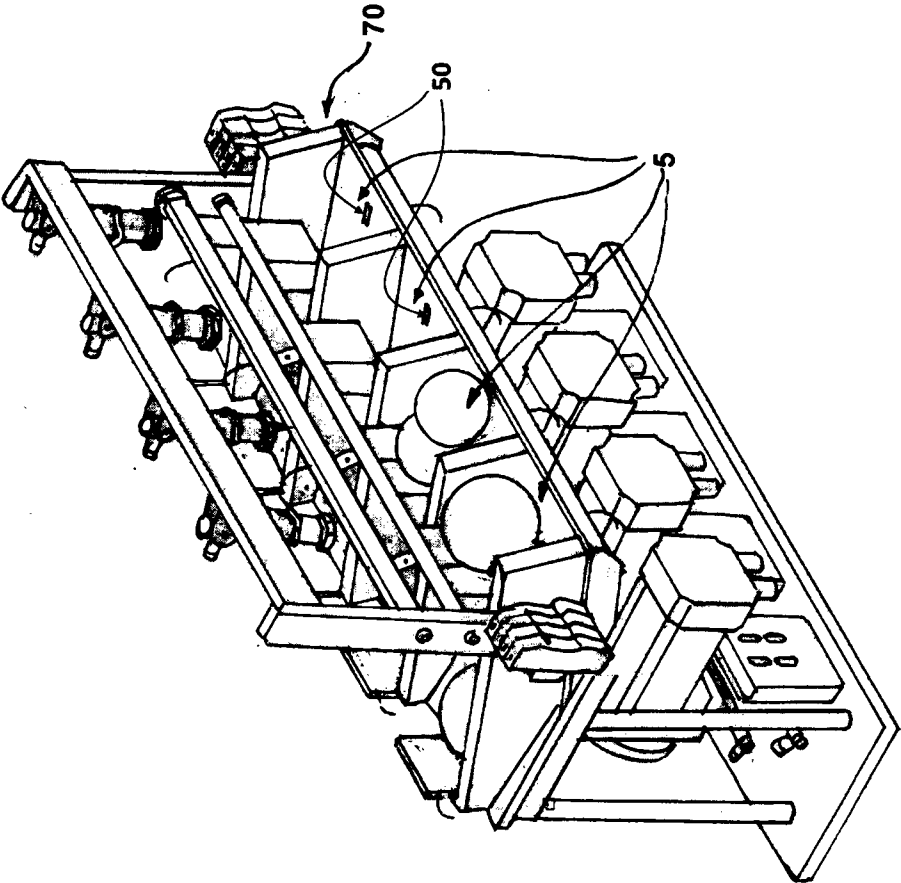


FIG.3

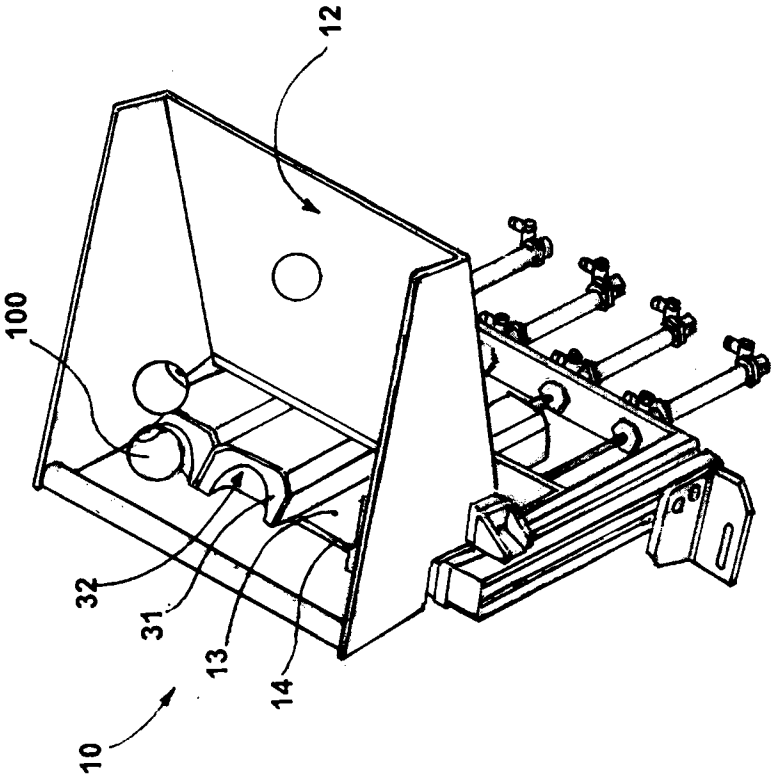


FIG.2

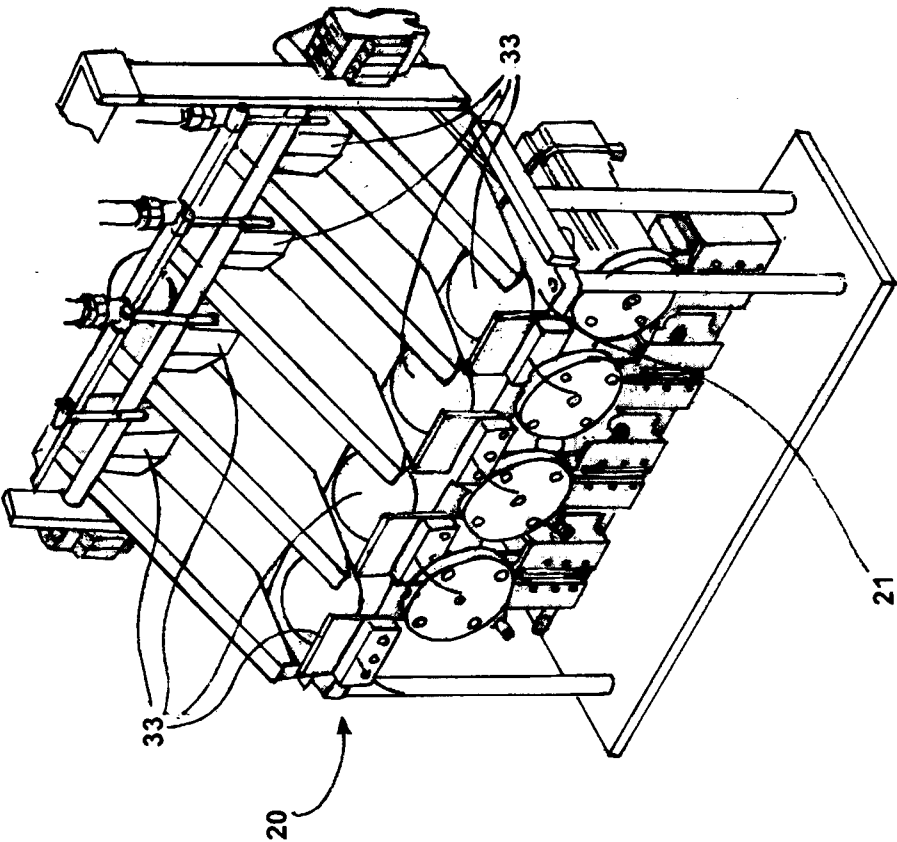


FIG. 4

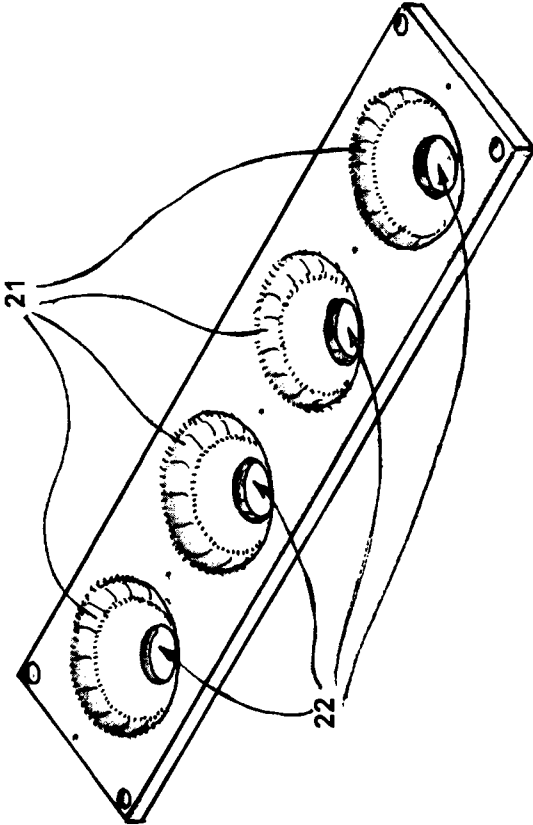


FIG. 5

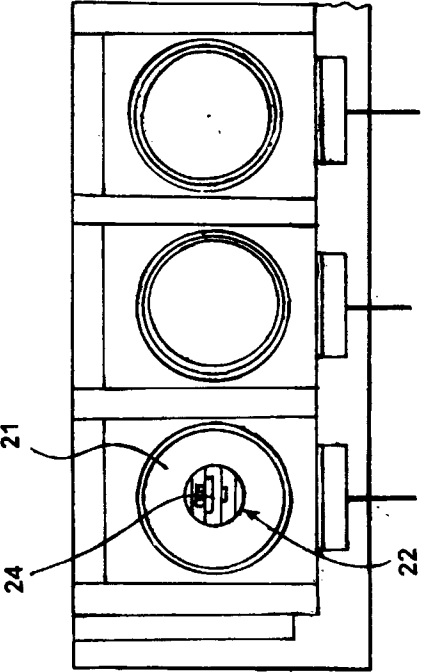


FIG. 6

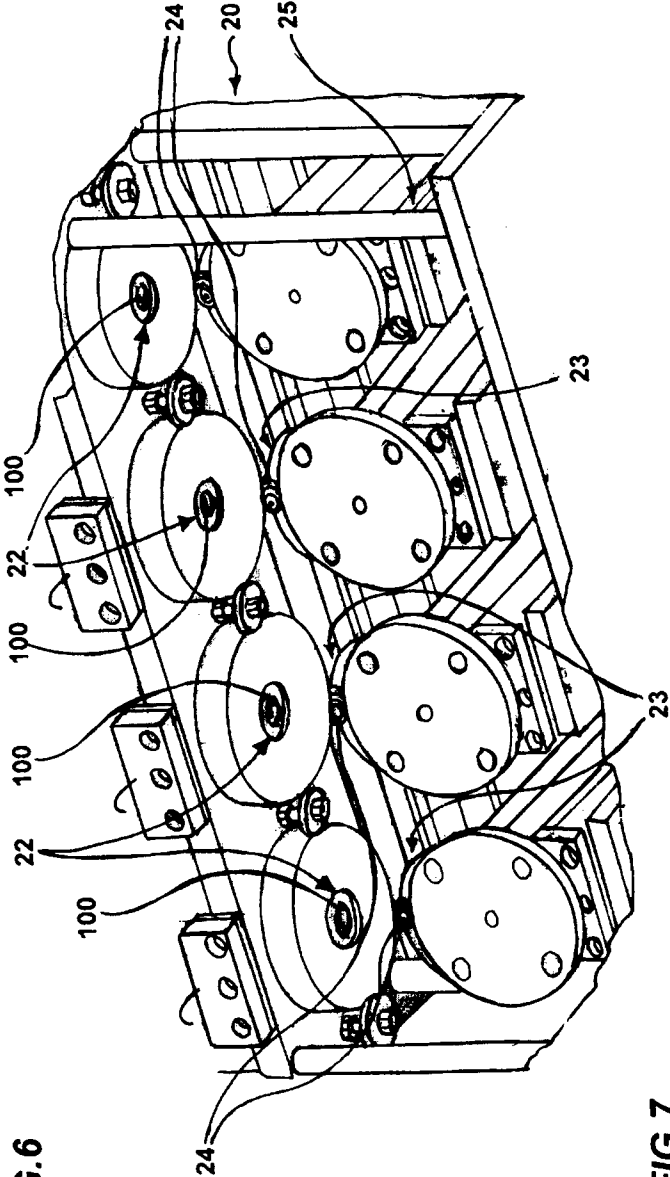


FIG. 7

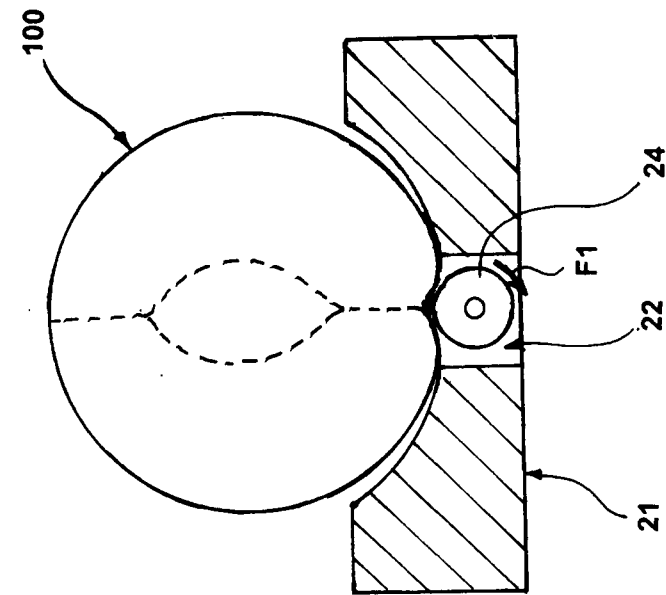


FIG.9

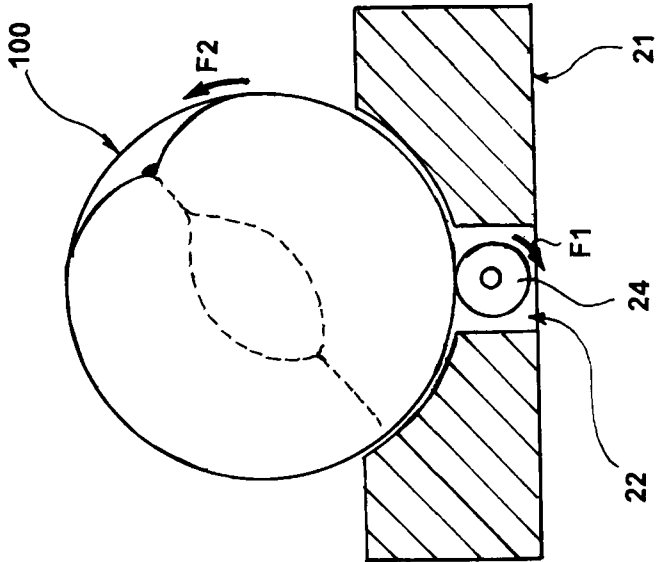


FIG.8

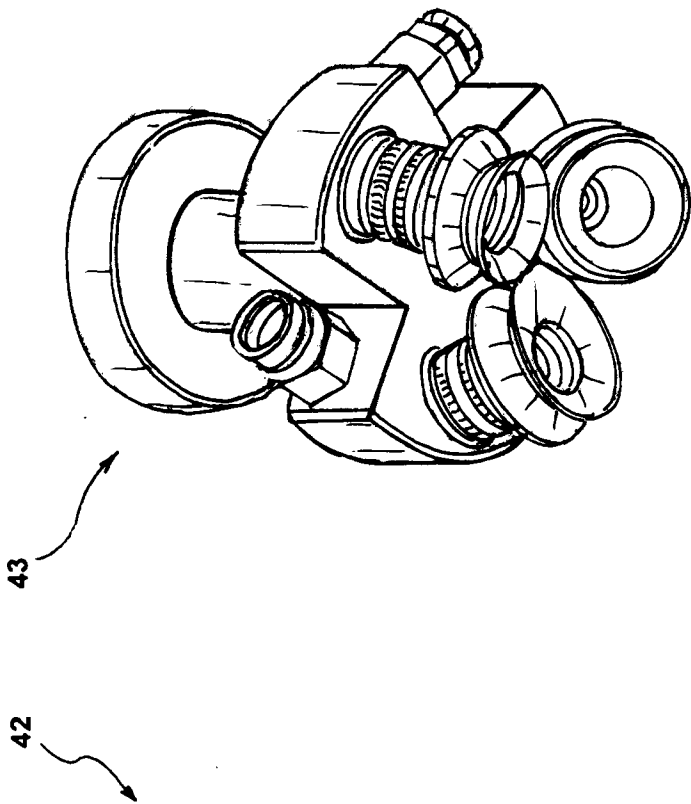


FIG.11

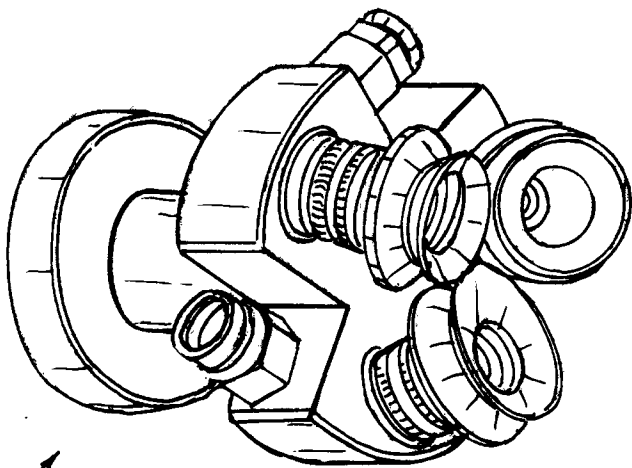
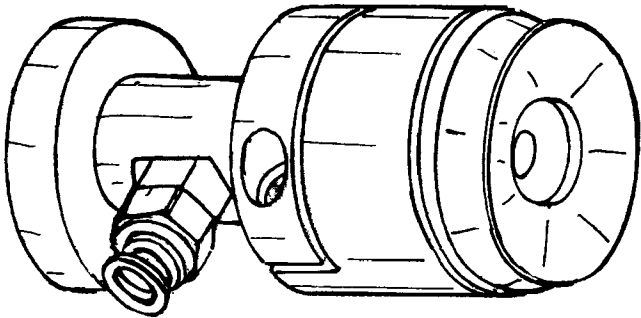


FIG.10



INTERNATIONAL SEARCH REPORT

International application No
PCT/IT2016/000054

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65B25/04 B65B5/10 B65B35/18 B65B35/56 B65B57/14
ADD.

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)
B65B

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 practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 436 168 A1 (DAUMAR TALLERES [ES]) 10 July 1991 (1991-07-10)	1,2,6,7, 21
Y	figures 1-15 column 5, line 9 - column 5, line 20 column 6, line 17 - column 6, line 35 column 6, line 42 - column 6, line 52 column 11, line 42 - column 11, line 52 -----	3-5
Y	DE 40 31 599 A1 (SCHROEDER PETER DIPL ING [DE]) 26 September 1991 (1991-09-26)	3-5
A	column 1, line 60 - column 1, line 67; figures 1,2 -----	1,2,21
A	WO 2010/053369 A2 (CREMER SPECIAALMACHINES B V [NL]; CREMER FREDIUS JOHAN [NL]) 14 May 2010 (2010-05-14) the whole document ----- -/-	1-5,21



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

23 November 2016

Date of mailing of the international search report

01/02/2017

Name and mailing address of the ISA/

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Authorized officer

Weyand, Tim

INTERNATIONAL SEARCH REPORT

International application No
PCT/IT2016/000054

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 007 227 A (MCCLUSKY STANLEY [US] ET AL) 16 April 1991 (1991-04-16) the whole document -----	1-5,21
A	US 4 329 831 A (WARKENTIN AARON J ET AL) 18 May 1982 (1982-05-18) the whole document -----	1-5,21

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IT2016/000054

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

2-7, 21(completely); 1(partially)

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 2-7, 21(completely); 1(partially)

Machine with input station for multiple fruits and transfer device for separation of single fruits

2. claims: 8-12(completely); 1(partially)

Machine and orienting station

3. claims: 13-15(completely); 1(partially)

Machine and data processing

4. claims: 16-19(completely); 1(partially)

Machine and picking up means

5. claims: 20(completely); 1(partially)

Machine and container loading

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IT2016/000054

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0436168	A1	10-07-1991	CA 2032450 A1 28-06-1991
			DE 69001751 D1 01-07-1993
			DE 69001751 T2 23-09-1993
			EP 0436168 A1 10-07-1991
			ES 2021928 A6 16-11-1991
			ES 2041109 T3 01-11-1993
			IL 96741 A 14-01-1993
			JP H0418210 A 22-01-1992
			MA 22028 A1 01-07-1991
			US 5095680 A 17-03-1992
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WO 2010053369	A2	14-05-2010	NONE
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US 4329831	A	18-05-1982	ES 8300611 A1 01-02-1983
			IL 62724 A 30-12-1983
			IT 1170949 B 03-06-1987
			US 4329831 A 18-05-1982