(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 754 661 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
21.02.2007 Bulletin 2007/08

(21) Application number: **05425599.7**

(22) Date of filing: **19.08.2005**

(51) Int Cl.:
B65B 65/00 *(2006.01)* ***B65B 35/38*** *(2006.01)*
B65G 43/08 *(2006.01)* ***B65G 47/91*** *(2006.01)*
B65G 47/68 *(2006.01)*

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(71) Applicant: **Barilla G. e R. Fratelli S.p.A.**
43100 Parma (IT)

(72) Inventors:
- **Marazzi Giorgio**
  43100 Parma (IT)
- **Canepari Luca**
  43100 Parma (IT)

(74) Representative: **Ferrari, Barbara**
Botti & Ferrari S.r.l.,
Via Locatelli, 5
20124 Milano (IT)

(54) Plant for forming and loading groups of food products on packager supply devices

(57) It is described a plant (1) for forming groups (13) of food products (5) intended for packaging comprising a first conveyor (2) fed with a plurality of food products (5) at random, a plurality of pickers (7) for picking up said food products (5) individually from said first conveyor (2) and transferring them onto at least one second conveyor (3a, 3b) so as to form groups (13) of said food products (5) on it, said at least one second conveyor (3a, 3b) being associated with a packaging machine (14) for packaging said groups (13) of food products, the plant being characterised in that it comprises at least one additional conveyor (3c) associated with a packaging machine (14) and a command and control unit (18) to control the operation of at least part of said pickers (7) so that, in the case of the packaging machine (14) associated with a second conveyor (3a or 3b) being blocked, the food products (5) intended for it are picked up from the first conveyor (2) and transferred onto said at least one additional conveyor (3c) to form groups (9) of food products (5) on it.

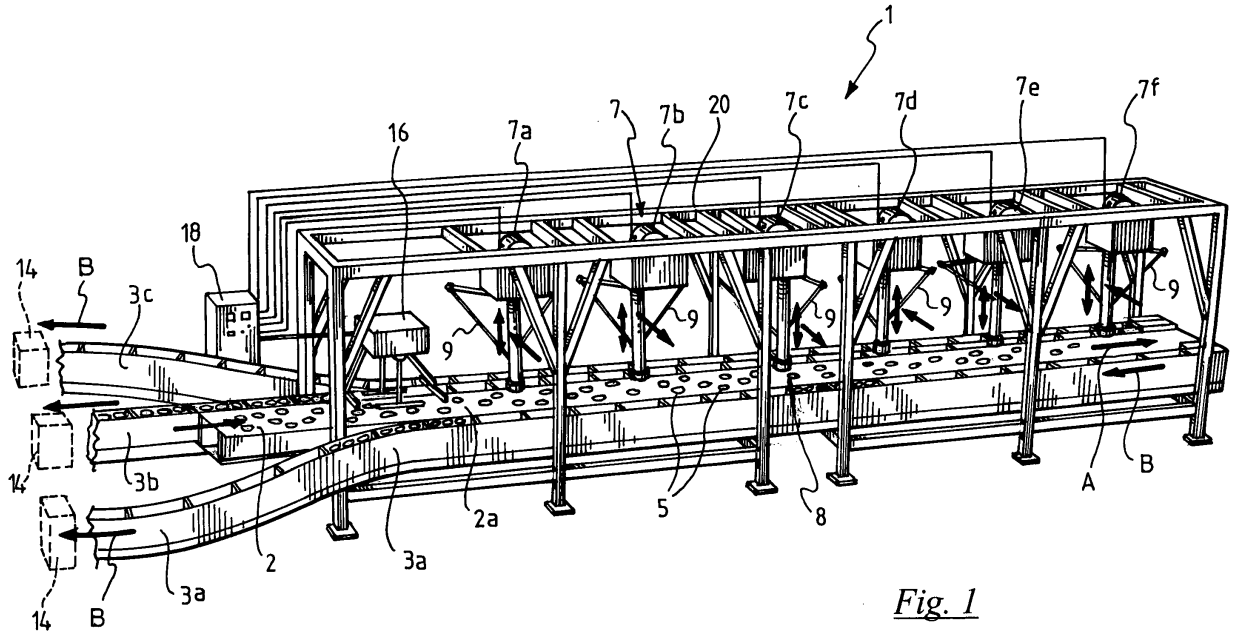

Fig. 1

EP 1 754 661 A1

Description

Field of application

[0001] In its most general aspect, the present invention refers to the field of the packaging of food products.

[0002] In particular, the present invention concerns a plant for forming and loading groups of food products on supply devices of packaging machines.

Prior art

[0003] As is well known in the food industry, food products obtained at random from production units thereof must be sorted into groups of predetermined size so that they can be packaged in suitable packaging machines, particularly of the type that use flow-pack technology.

[0004] This technology allows various products, including individual food product or food products sorted into groups, to be packaged quickly, using a sheet of plastic material, which is wound around the product or the products of a group and heat-sealed at the flaps so as to form a sort of tubular packet that encloses the product or the products of the group.

[0005] In the prior art, therefore, different plants have been made equipped with suitable systems that take care of picking up the individual food products at random and of forming groups of such products, said groups then being transported into a packaging machine for final packaging.

[0006] More specifically, such plants generally comprise a first conveyor, normally coming from the production unit, on which the food products are arranged at random, a plurality of second conveyors, generally flanked to the first conveyor, on which the food products are arranged in groups and pickers arranged along the flow direction of the first conveyor through which the random food products are picked up individually from the first conveyor and arranged to form groups on the second conveyors.

[0007] Each second conveyor of the plurality of second conveyors is associated with a packaging machine (particularly of the flow-pack type) in which the groups of food products transported by it are packaged.

[0008] The aforementioned plants also comprise a sensor upstream of the pickers along the flow direction of the first conveyor to detect the orientation and position of the individual food products on the first conveyor and a command and control unit in communication with the sensor and the pickers to control the operation of the pickers according to the data detected by the sensor.

[0009] A plant of the aforementioned type is described for example in US patent 5,186,599. This document describes a plant in which discshaped biscuits arranged at random on a first conveyor are picked up from said first conveyor through suitable pickers and arranged to form groups of piled up biscuits on second conveyors flanking the first conveyor for a portion thereof.

[0010] In particular, each group of piled up biscuits is arranged in a space defined between two consecutive thrusters emerging vertically from the plane of the second conveyors. The first conveyor and the second conveyors are made to flow in the same flow direction and, moreover, the second conveyors have a packaging machine associated with them into which the groups of biscuits are transported by the thrusters for packaging.

[0011] Although the plants described above substantially meet their purpose, they have the serious drawback that, in the case of a packaging machine becoming blocked, the production capacity is drastically reduced since the pickers can operate for the formation of the groups of food products on a lower number of conveyors, i.e. on the conveyors associated with the packaging machines that are still in operation.

[0012] The technical problem at the basis of the present invention is that of providing a plant for forming groups of food products intended for packaging that overcomes the quoted drawbacks with reference to the prior art and in particular a plant capable of constantly ensuring a suitable production capacity even in the case of faults for example with the packaging machines.

Summary of the invention

[0013] Such a technical problem is solved by a plant for the formation of groups of food products according to claim 1 and thereafter.

[0014] In particular, the aforementioned technical problem is solved by a plant for forming groups of food products intended for packaging comprising a first conveyor fed with a plurality of food products at random, a plurality of pickers for picking up said food products individually from said first conveyor and transferring them on at least one second conveyor so as to form groups of said food products on it, said at least one second conveyor being associated with a packaging machine for packaging said groups of food products, the plant being characterised in that it comprises at least one additional conveyor also associated with a packaging machine and a command and control unit to control the operation of at least part of said pickers so that, in the case of the packaging machine associated with a second conveyor being blocked, the food products intended for it are picked up from the first conveyor and transferred on said at least one additional conveyor to form groups of food products on it.

[0015] The characteristics and advantages of the present invention shall become clearer in the following description of some preferred embodiments, given for indicating and not limiting purposes with reference to the attached drawings, in which:

- figure 1 shows a perspective view of a plant for forming sorted groups of food products according to a first embodiment of the invention,

- figure 2 shows a perspective view of a detail of the plant of figure 1,

- figures 3 and 4 each show a plan view of a detail of the plant of figure 1 in a respective operative configuration,

- figure 5 shows a plan view of a detail of a plant according to a second embodiment of the invention.

[0016] With reference to figures 1-4, a plant for forming groups of food products intended to be packaged is globally indicated with 1.

[0017] The plant 1 comprises a first conveyor 2 having a portion 2a mobile along a flow direction A and two second conveyor 3a and 3b respectively arranged for an end portion thereof at opposite sides of the portion 2a of the first conveyor 2. In the example, the two second conveyors 3a and 3b are respectively arranged at the opposite flanks of the portion 2a of the first conveyor 2.

[0018] The plant 1 also comprises a plurality of pickers 7 supported on a frame 20 and arranged in series above the portion 2a of the first conveyor 2, along its flow direction A, so as to define an active area 8 for gripping food products 5 from the first conveyor 2. Such food products 5, in the example a plurality of buns, come from a unit for their production (not shown) and are fed at random on the first conveyor 2.

[0019] The pickers 7 are *per se* conventional. In particular, each picker 7 is of the type having one or more robotised arms 9 terminating at the bottom with a suction head 10 to which a vacuum is applied or the application of the vacuum is interrupted to pick up to individual food products 5 from the first conveyor 2 and to arrange the picked up food products 5 on one of the two second conveyors 3a and 3b respectively. Alternatively, the one or more robotised arms 9 can terminate with a gripper to carry out the same functions indicated above instead of with a suction head 10. Examples of pickers 7 that can be used in the present invention include, without any limitation, scara robot and delta robot.

[0020] In the present invention, each picker 7 has an action range corresponding to a predetermined portion of the active picking area 8 and is able to move along the entire direction of the width of the first conveyor 2.

[0021] The second conveyors 3a and 3b each have a plurality of thrusters 11 projecting from them at the top and arranged a predetermined distance apart. Each pair of consecutive thrusters 11 of a second conveyor 3a or 3b defines a space 12 in which the individual food products 5 picked up by the pickers 7 from the first conveyor 2 are arranged so as to form sorted groups of food products. In the present example, each sorted group 13 consists of two piled up rows of three buns each.

[0022] The second conveyors 3a and 3b are each mobile in counterflow, i.e. along a flow direction B opposite the direction A of the first conveyor 2 and are each in communication with a packaging machine 14 (shown schematically with a dotted line in figure 1) in which the groups 13 of food products 5 thrusted by the thrusters 11 are transported for packaging.

[0023] The second conveyors 3a and 3b preferably move with continuous movement adjusted according to the feeding characteristics of the groups 13 of food products 5 in the packaging machines 14 associated with them and according to the speed and/or flow rate of food products 5 on the first conveyor 2.

[0024] The plant 1 also comprises at least one detection device 16 arranged on the first conveyor 2 and a command and control unit, globally indicated with 8, in two-directional communication with said at least one detection device 16 and with each picker 7, so as to receive and transmit data to and from each of them.

[0025] In particular, in the example represented by figures 1-4, the plant 1 shows a detection device 16 upstream of the pickers 7 and a command and control unit globally indicated with 18 in two-directional communication with said detection device 16 and with each picker 7. Nevertheless, it should be understood that, according to requirements, the plant 1 according to the invention can furthermore comprise one or more detection devices arranged on the first conveyor 2 at the active picking area 8 and in a predetermined distanced relationship from each other.

[0026] Each detection device 16 allows the position and orientation of the individual food products 5 on the first conveyor 2 to be detected before the entry into the active area of the pickers 7 (for the device 16 arranged upstream of the pickers 7) or in a predetermined portion of said active area 8.

[0027] The detection devices are *per se* conventional and include, without limitations, optical sensors, for example video cameras.

[0028] In the example represented in figures 1-4, the data detected by the device 16 upstream of the pickers 7 is suitably processed by the command and control unit 18 that in turn takes care of controlling the operation of the pickers 7 so that the food products 5 detected and entering into the active area 8 are picked up by the pickers 7 and arranged in the spaces 12 of a respective second conveyor 3a or 3b.

[0029] Preferably, in the plant 1 according to the invention, a part of the pickers 7 arranged along the flow direction A of the first conveyor 2 is assigned the task of picking up and arranging food products 5 in the spaces 12 of one of the two second conveyors 3a and 3b while the remaining part of the pickers 7 is assigned the task of picking up and arranging food products 5 in the spaces 12 of the other of the two second conveyors 3a and 3b.

[0030] In particular, in the present example, the plant comprises six pickers 7a to 7f half of which 7a, 7d, 7f are assigned to pick up and arrange food products 5 in the spaces 12 of the second conveyor 3b (as indicated by the arrow E in figure 3) and the other half of which 7b, 7c, 7e are assigned to pick up and arrange food products 5 in the spaces 12 of the second conveyor 3a (as indi-

cated by the arrow F).

[0031] Advantageously, the plant 1 foresees controlling the operating speed of the pickers 7 by means of the command and control unit 18 according to the speed or flow rate of food products 5 on the first conveyor 2 and/or the degree of saturation of the spaces 12 of the second conveyors 3a and 3b with the food products 5.

[0032] In a first embodiment, at a predetermined speed or flow rate of food products 5 on the first conveyor 2, the operating speed of the pickers 7 and/or the speed of the second conveyors 3a and 3b is controlled so that there are no residual food products 5 on the first conveyor 2 coming out from the portion of active area 8 of the picker 7b furthest downstream in the flow direction of the first conveyor 2 and so as to complete the filling with food products 5 of the spaces 12 between consecutive thrusters 11 that move away from the portion of the active area 8 of the picker 7a furthest upstream in the flow direction A of the first conveyor 2.

[0033] In a second embodiment, at a predetermined speed of the second conveyors 3a and 3b, the operating speed of the pickers 7 and/or the speed or flow rate of food products 5 on the first conveyor 2 is controlled so that there are no residual food products 5 on the first conveyor 2 coming out from the portion of active area 8 of the picker 7f furthest downstream in the flow direction of the first conveyor 2 and so as to complete the filling with food products 5 of the spaces 12 between consecutive thrusters 11 that move away from the portion of the active area 8 of the picker 7a furthest upstream in the flow direction A of the first conveyor 2.

[0034] Preferably, the pickers 7c to 7f of a plurality of pickers furthest downstream in the flow direction A of the first conveyor 2 are controlled by the unit 18 so that they have a greater operating speed than at least one picker 7a or 7b, preferably a plurality of pickers 7a and 7b, furthest upstream in the flow direction A of the first conveyor 2.

[0035] In such a way, the pickers 7c to 7f furthest downstream will have a greater workload and shall take care of filling most of the spaces 12 between the consecutive thrusters 11 with the food products 5 at the same time ensuring that there are no residual food products on the first conveyor 2 coming out downstream from the active picking area 8. The pickers 7a and 7b furthest upstream, on the other hand, will have a smaller workload mainly carrying out the function of completing the filling of the spaces 12 between the consecutive thrusters 11 that move away upstream of the active picking area 8.

[0036] In accordance with the present invention, the plant 1 also comprises an additional conveyor 3c arranged to the side of the first conveyor 2 on the same side as one of the second conveyors 3a and 3b. In the present example, the additional conveyor 3c is arranged flanked to the second conveyor 3b.

[0037] The additional conveyor 3c is also connected to a conventional packaging machine 14 and is structurally and functionally equivalent to the second conveyors 3a and 3b. However, unlike the second conveyors 3a and 3b that in normal operating conditions of the plant 1 are both operative (see figure 3), the additional conveyor 3c is normally not operative and intervenes, or rather is actuated in movement, whenever a packaging machine 14 associated with one of the second operative conveyors 3a or 3b becomes blocked.

[0038] In this case, the second conveyor 3a or 3b associated with the blocked packaging machine 14 is stopped and the additional conveyor 3c replaces it entirely in its functions and the packaging machine 14 associated with the additional conveyor 3c also replaces the blocked packaging machine 14.

[0039] More specifically, the starting of the additional conveyor 3c is automatically transmitted to the command and control unit 18, which in turn takes care of controlling the operation of the pickers 7 so that the pickers till then assigned to transfer the food products 5 picked up from the first conveyor 2 into the spaces 12 of the interrupted second conveyor 3a or 3b pass instead to transfer such food products 5 into the spaces 12 of the additional conveyor 3c.

[0040] In the operative configuration of the plant 1 shown in figure 4, in the case of interruption of the packaging machine 14 associated with the second conveyor 3b, the pickers 7a, 7d and 7f through the unit 18 shall be controlled so as to transfer the food products 5 picked up from the first conveyor 5 onto the additional conveyor 3c instead of onto the second conveyor 3b. Of course, it should be understood that in the case of interruption of the packaging machine 14 associated with the second conveyor 3a, the pickers 7b, 7c and 7f shall be controlled by the unit 18 so as to transfer the food products 5 picked up from the first conveyor 5 onto the additional conveyor 3c instead of onto the second conveyor 3a.

[0041] In such a way, it is possible to advantageously ensure a substantially constant production capacity in the production of groups 13 of food products 5 by the plant 1 and in the packaging of such groups 13 by the packaging machines 14.

[0042] Although the additional conveyor 3c can be arranged in any way with respect to the second conveyors 3a and 3b and/or to the first conveyor 1, in the present invention it is preferable that the additional conveyor 3c be arranged to the side of the first conveyor 2 on the same side at which at least one of the second conveyors 3a and 3b is arranged.

[0043] In the example shown in figures 1-4, the additional conveyor 3c is arranged at one flank of the second conveyor 3b.

[0044] In such a way, advantageously, the control of the pickers 7 by the unit 18 is easier during the transient passages of the formation of groups 13 of food products 5 from a second conveyor 3a or 3b to an additional conveyor 3c since when said second conveyor 3a or 3b and said additional conveyor are on the same side it is not necessary to reverse the direction of movement of the food products picked up by the pickers.

[0045] Now with reference to figure 5, a plant 40 for the formation of groups of food products intended to be packaged is described according to another embodiment of the invention.

[0046] In the plant 40, elements that are structurally or functionally identical or equivalent to corresponding elements of the plant 1 described above shall be attributed the same reference numerals and shall not be described in any greater detail.

[0047] The plant 40 differs from the plant 1 described above substantially for a different arrangement of the second conveyors 3a and 3b and of the additional conveyor 3c with respect to the first conveyor 2.

[0048] Indeed, in the plant 40, the second conveyors 3a and 3b and the additional conveyor 3c are arranged in series to the side of the first conveyor 2 on the same side.

[0049] With this arrangement, the control of the pickers 7 by the unit 18 during the transient passages of the formation of the groups 13 of food products 5 from a second conveyor 3a or 3b to an additional conveyor 3c is even easier since in no case is it necessary to reverse the direction of transportation of the food products picked up by the pickers 7.

[0050] The main advantage of the plant according to the invention lies in the fact that with it allows to achieve a substantially constant production capacity in formation of groups of food products and in packaging of such groups of products even in the case of faults, such as one or more packaging machine associated with it becoming blocked. Regarding this, it should be noted that the plant according to the invention can foresee many additional conveyors with relative associated packaging machines instead of just one as described above.

[0051] A further advantage of the plant according to the invention lies in the fact that the plant of the invention requires a not excessive number of additional elements with respect to the corresponding known plants, such as one or more additional conveyors with relative packaging machines and a suitable control unit capable of managing also the transitional passages for loading the food products from an operative conveyor to an additional conveyor. Such additional elements do not considerably affect the costs for making the plant according to the invention which are overall lower than those that would be necessary to have constant production with known plants (indeed, for such a purpose a plurality of such plants would be necessary). It should also be noted that the plant according to the invention does not foresee the use of expensive additional elements such as pickers, for example additional delta robots and the like.

[0052] Another advantage lies in the fact that the present invention can also be implemented on corresponding known plants which can be easily modified or modernised so as to be in accordance with the present invention.

[0053] Of course, a man skilled in the art can make numerous modifications and variations to the plant described above in order to satisfy contingent and specific requirements, all of which are covered by the scope of protection of the claims attached hereto. For example, the plant 1 could be made so as to foresee the movement of the second conveyors 3a and 3b and of the additional conveyor 3c in the same flow direction A as the conveyor 2 and a control of the operation of the pickers 7 adapted to this type of flow without affecting the need for saturation of the spaces 12 of the second conveyors 3a and 3b and possibly of the spaces 12 of the additional conveyor 3c replacing one of the second conveyors 3a and 3b.

Claims

1. Plant (1) for forming groups (13) of food products (5) intended for packaging comprising a first conveyor (2) fed with a plurality of food products (5) at random, a plurality of pickers (7) for picking up said food products (5) individually from said first conveyor (2) and transferring them onto at least one second conveyor (3a, 3b) so as to form groups (13) of said food products (5) on it, said at least one second conveyor (3a, 3b) being associated with a packaging machine (14) for packaging said groups (13) of food products, the plant being **characterised in that** it comprises at least one additional conveyor (3c) associated with a packaging machine (14) and a command and control unit (18) to control the operation of at least part of said pickers (7) so that, in the case of the packaging machine (14) associated with a second conveyor (3a or 3b) being blocked, the food products (5) intended for it are picked up from the first conveyor (2) and transferred onto said at least one additional conveyor (3c) to form groups (9) of food products (5) on it.

2. Plant according to claim 1, **characterised in that** it comprises two second conveyors (3a, 3b) respectively arranged on opposite sides of said first conveyor (2) and an additional conveyor (3c).

3. Plant according to claim 2, **characterised in that** said additional conveyor (3c) is arranged to the side of the first conveyor (2) on the side of one of said second conveyors (3a or 3b).

4. Plant according to claim 1, **characterised in that** it comprises two second conveyors (3a, 3b) and an additional conveyor (3c) arranged in series to the side of the first conveyor (2) on the same side.

5. Plant according to any one of claims 2 to 4, **characterised in that** said first conveyor (2) is mobile along a flow direction (A) and said two second conveyors (3a, 3b) and said additional conveyor (3c) are mobile in counterflow with respect to the first conveyor (2).

6. Plant according to any one of claims 2 to 4, **charac-**

terised in that said two second conveyors (3a, 3b) and said additional conveyor (3c) each have a plurality of thrusters (11) projecting above them, and arranged a predetermined distance apart, each pair of consecutive thrusters (11) defining a space (12) in which the individual food products (5) picked up by the pickers (7) from the first conveyor (2) are arranged so as to form said groups (13) of food products (5).

7. Plant according to any one of the previous claims, **characterised in that** said pickers (7) are arranged in series above the first conveyor (2) along its flow direction (A) so as to define an active area (8) for picking up said food products (5).

8. Plant according to claim 7, **characterised in that** it also comprises at least one detection device (16) arranged along the flow direction (A) of the first conveyor (2) to detect the position and orientation of the individual food products (5) on the first conveyor (2), said command and control unit (18) being in communication with said at least one detection device (16) to further control the operation of the pickers (7) according to the data detected by said at least one detection device (16).

9. Plant according to claim 8, **characterised in that** it comprises a detection device (16) upstream of the pickers (7) to detect the position and orientation of the individual food products (5) before the entry into the active picking area (8) so that the food products (5) transported by the first conveyor (5) and entering into the active area (8) are picked up by said pickers (7) and arranged in the spaces (12) of a second conveyor (3a, 3b) or of an additional conveyor (3c).

10. Plant according to claim 9, **characterised in that** the operating speed of the pickers (7) is further controlled by the command and control unit (18) according to the speed or flow rate of food products (5) on the first conveyor (2) and/or the degree of saturation of the spaces (12) of the second conveyors (3a, 3b) or of a second conveyor (3a or 3b) and of an additional conveyor (3c) with the food products (5).

11. Plant according to claim 10, **characterised in that** at a predetermined speed or flow rate of food products (5) on the first conveyor (2), the operating speed of the pickers (7) and/or the speed of the second conveyors (3a, 3b) or the speed of a second conveyor (3a or 3b) and of the additional conveyor (3c) is controlled so that there are no residual food products (5) on the first conveyor (2) coming out from the portion of active area (8) of the picker (7f) furthest downstream in the flow direction of the first conveyor (2) and so as to complete the filling with the food products (5) of the spaces (12) between consecutive thrusters (11) that move away from the portion of the active area (8) of the picker (7a) furthest upstream in the flow direction (A) of the first conveyor (2).

12. Plant according to claim 10, **characterised in that** at a predetermined speed of the second conveyors (3a, 3b) and of the additional conveyor (3c), the operating speed of the pickers (7) and the speed or flow rate of food products (5) on the first conveyor (2) is controlled so that there are no residual food products (5) on the first conveyor (2) coming out from the portion of active area (8) of the picker (7f) furthest downstream in the flow direction of the first conveyor (2) and so as to complete the filling with the food products (5) of the spaces (12) between consecutive thrusters (11) that move away from the portion of the active area (8) of the picker (7a) furthest upstream in the flow direction (A) of the first conveyor (2).

13. Plant according to claim 11 or 12, **characterised in that** the operating speed of the pickers (7) is controlled so that the pickers (7c, 7d, 7e, 7f) of a plurality of pickers furthest downstream in the flow direction (A) of the first conveyor (2) have a greater speed than the speed of at least one picker (7a or 7b), preferably a plurality of pickers (7a, 7b) furthest upstream in the flow direction (A) of the first conveyor (2).

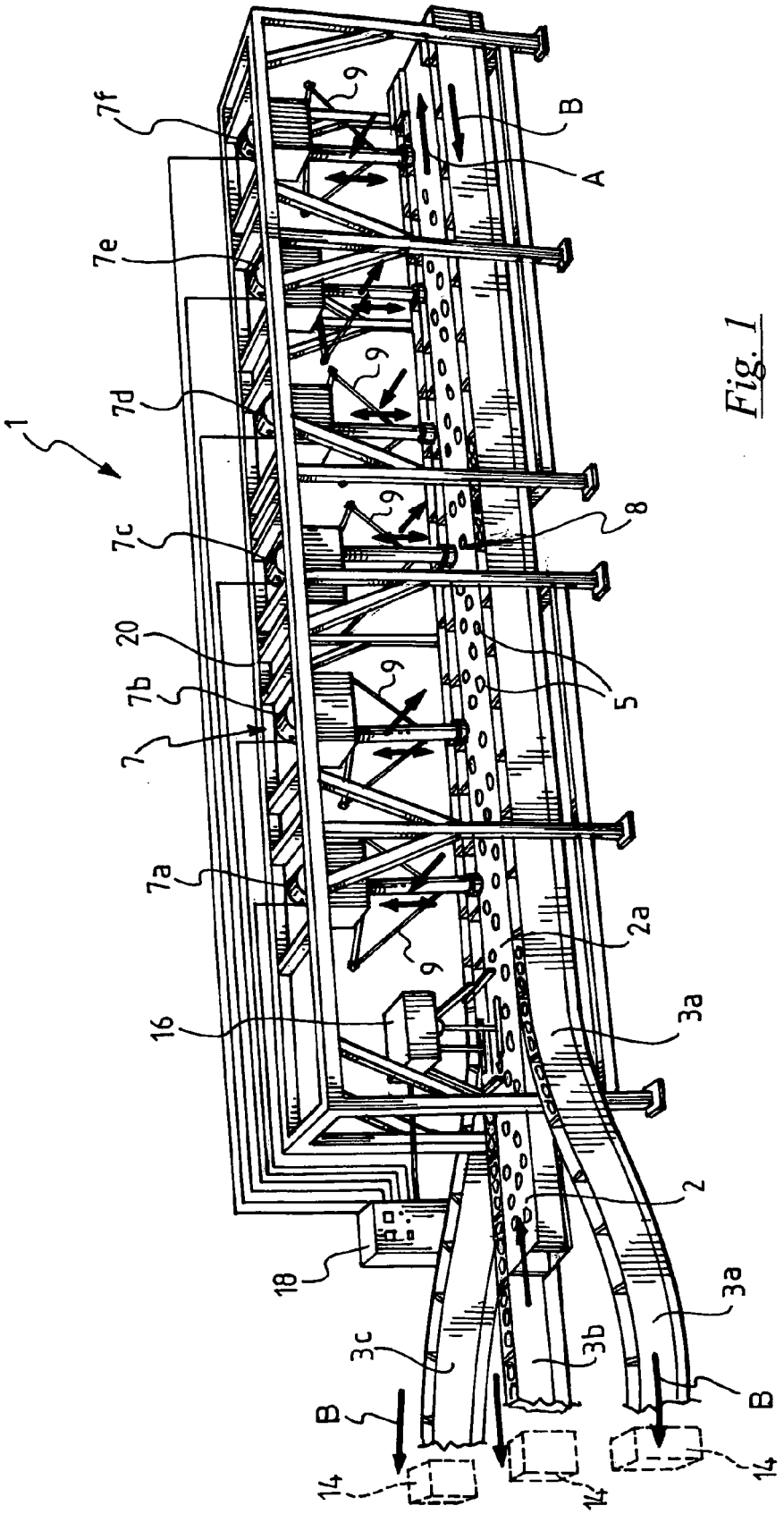

Fig. 1

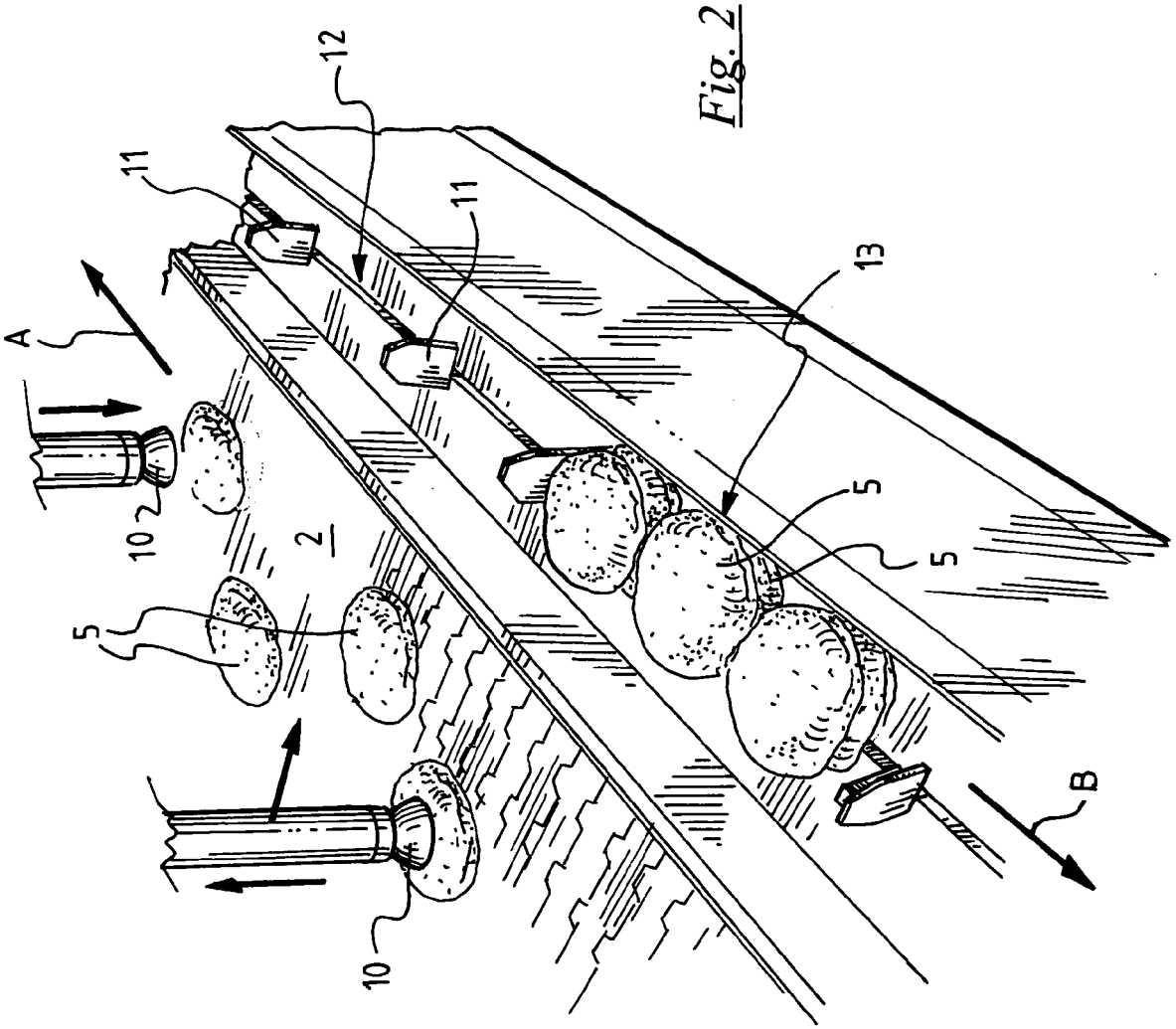

Fig. 2

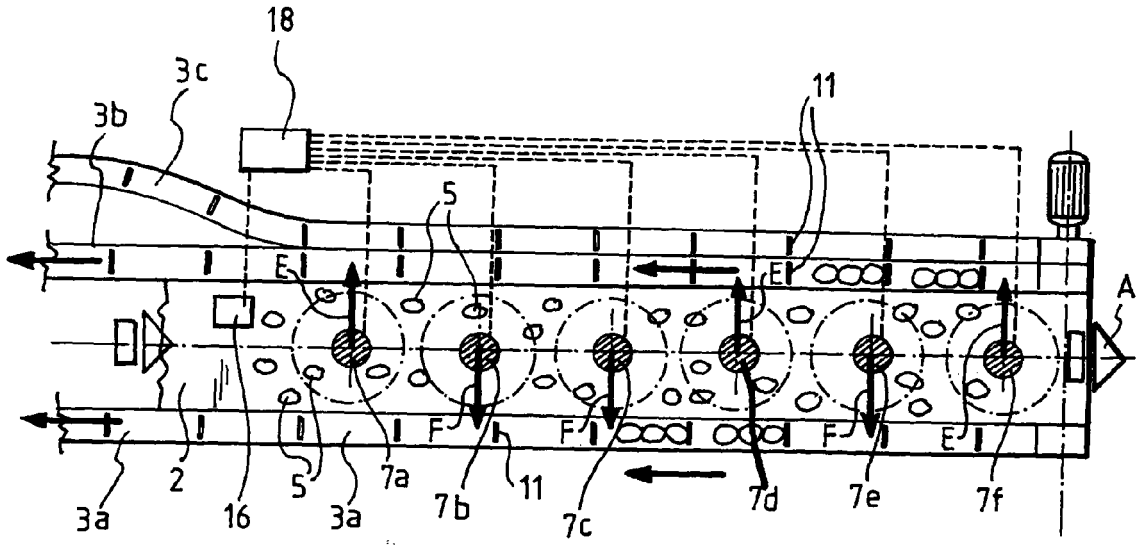
18
3c
3b
11
5
E
A
F
2
16
5
3a
7a
7b
11
7c
7d
7e
7f
3a

Fig. 3

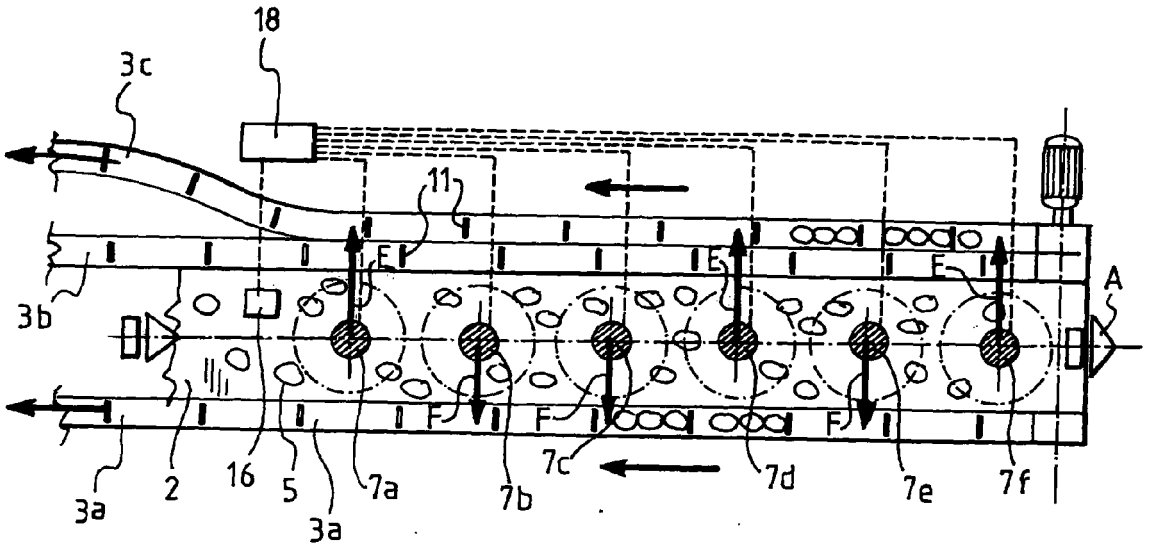
18
3c
11
E
A
3b
F
2
16
5
3a
7a
7b
7c
7d
7e
7f
3a

Fig. 4

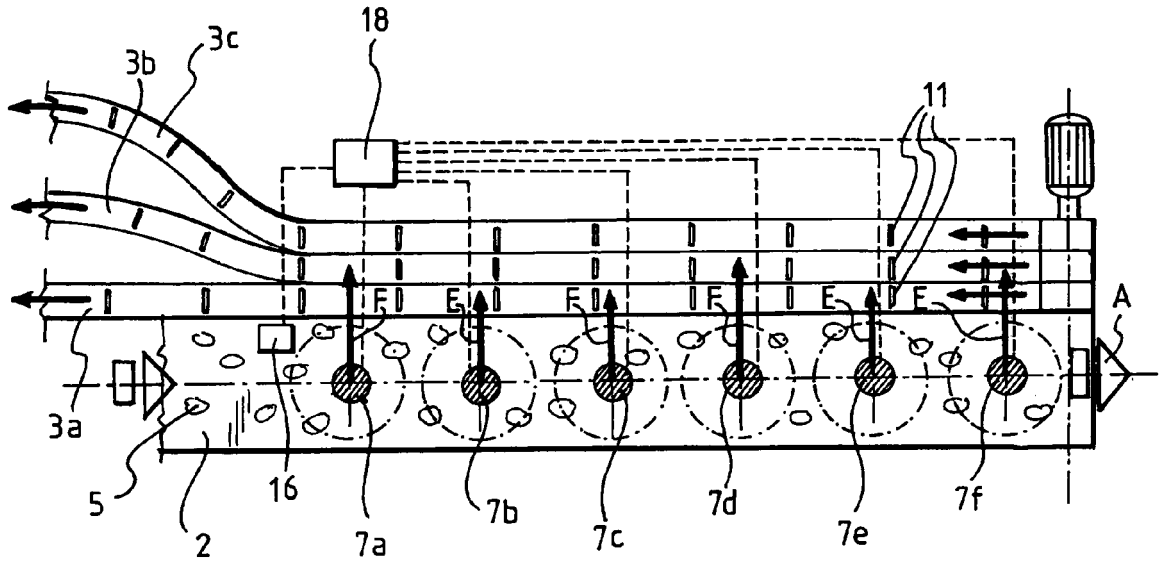

Fig. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 42 5599

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
D,Y	US 5 186 599 A (FLUCK ET AL) 16 February 1993 (1993-02-16) * the whole document * -----	1-13	B65B65/00 B65B35/38 B65G43/08 B65G47/91
Y	US 4 222 478 A (GASSER ET AL) 16 September 1980 (1980-09-16) * the whole document * -----	1-13	B65G47/68
A	EP 0 989 080 A (SOREMARTEC S.A; FERRERO S.P.A; FERRERO OFFENE HANDELSGESELLSCHAFT M.B.) 29 March 2000 (2000-03-29) * the whole document * -----	1-13	
A	US 6 061 996 A (VISSERS ET AL) 16 May 2000 (2000-05-16) * the whole document * -----	1	
A	WO 03/064298 A (KPL PACKAGING S.P.A; CASSOLI, STEFANO; GIULIANI, NICOLA; SERRA, GIULIO) 7 August 2003 (2003-08-07) * the whole document * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

B65B
B65G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	20 January 2006	Vigilante, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

3

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 05 42 5599

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-01-2006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5186599 A	16-02-1993	DE 59100645 D1	13-01-1994
		EP 0453407 A1	23-10-1991
		ES 2047392 T3	16-02-1994
		JP 4223931 A	13-08-1992
US 4222478 A	16-09-1980	CH 625474 A5	30-09-1981
		DE 2854533 A1	16-08-1979
		GB 2015458 A	12-09-1979
		NL 7812191 A	16-08-1979
EP 0989080 A	29-03-2000	AT 245116 T	15-08-2003
		DE 69816449 D1	21-08-2003
		DE 69816449 T2	08-04-2004
		ES 2201429 T3	16-03-2004
US 6061996 A	16-05-2000	AU 707699 B2	15-07-1999
		AU 2503597 A	01-10-1997
		WO 9733795 A1	18-09-1997
		EP 0886602 A1	30-12-1998
		ES 2141608 T3	16-03-2000
		JP 2000506102 T	23-05-2000
WO 03064298 A	07-08-2003	EP 1470066 A1	27-10-2004
		IT BO020020050 A1	31-07-2003

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 5186599 A **[0009]**