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(54) **System and relative method for sorting a plurality of pillow bags containing salty products**

(57) The present invention relates to a system and a method for sorting a plurality of pillow bags (100, 101, ..., 100x) containing salty products, comprising a loading station (2) having a conveyor belt (4) extending by a predetermined length (L) along a first horizontal lying plane (X), first motor means (2A) to move said conveyor belt (4) with a first advancement speed (v1) so as to transport a row of pillow bags (100, 101, ..., 100x) from a loading position to an unloading position; an ordering station (3) having a support plane (5) extending along a second horizontal lying plane (X') and intended to receive and support a plurality of pillow bags (100, 101, ..., 100x), second motor means (3A) to move said support plane (5) with a second advancement speed (v2) from a loading position to an unloading position; a plurality of panels (6,7) active on said support plane (5) to define a plurality of containing spaces (8), each of which being intended to contain a predetermined plurality of pillow bags (100, 101, ..., 100x); gripping means (9) configured to grasp a pillow bag at a time from said row of pillow bags (100, 101, ..., 100x) present on said conveyor belt (4) and to put it into a containing space (8) defined on said support plane (5); detecting means (10) of the spatial position of each bag of said row of pillow bags (100, 101, ..., 100x), said detecting means (10) being associated to said conveyor belt (4) in the proximity of said loading position and configured to generate a passage signal (S1) upon the passage of each pillow bag (100, 101, ..., 100x) present on said conveyor belt (4), said passage signal (s1) being representative of the time instant at which said pillow bag (100, 101, ..., 100x) has passed; processing and driving means (11) in signal communication with said detecting means (10) and electrically connected with said gripping means (9) and with said second motor means (3A), said processing and driving means (11) comprising a firmware configured for:
- processing said passage signal (S1) as a function of said first advancement speed (v1) and said length (L) of said conveyor belt (4) so as to generate a position signal (S2) identifying the position taken by each of said pillow bag (100, 101, ..., 1 00x) with respect to said conveyor belt (4) and
- generating a driving signal (S3) to drive said second motor means (3A) to change said second advancement speed (v2) as a function of said position signal (S2).

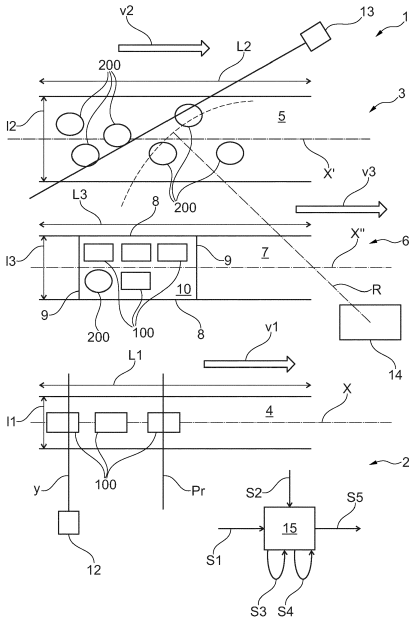

Fig. 1

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Description

Application field

[0001] The present invention relates to a system and a method for sorting a plurality of pillow bags containing salty products.

[0002] Particularly, the present invention relates to a system and a method for sorting at a case packer a plurality of pillow bags containing salty products produced by a bagging machine.

Description of the prior art

[0003] As it is known, the pillow bags are bags of the type having a symmetric upper and lower welding, and they are made by using a plastic film.

[0004] Such bags are intended to contain food products under protected conditions. The pillow bags on which the supplying device according to the present invention is intended to operate are pillow bags containing salty snacks preferably having a bulk density ranging between 0.02 and 0.15 Kg/liter.

[0005] An example of such pillow bags, which will be explicitly referred to herein below, is given by bags containing chips or the like.

[0006] By case packer is meant, in the context of the present invention, a machine that is able to form a box, usually made of cardboard, intended to contain a plurality of pillow bags.

[0007] The case packers intended to form a container, usually made of cardboard, intended to house pillow bags containing salty snacks have been long used in the salty snack production industry.

[0008] More and more often the case packers are arranged downstream of the bagging machines and connected therewith by a conveyor belt, so as to directly connect the bagging machine intended to the formation and filling of the pillow bags to the case packer intended to insert the pillow bags into the cardboard container being formed. In this manner, it is possible to avoid the use of operators who provide for manually transferring the pillow bags into the cardboard containers, with apparent advantages.

[0009] Particularly, the bagging machines are usually configured to supply the pillow bags that have been obtained and containing the salty snacks to a conveyor belt.

[0010] The pillow bags are individually supplied to the conveyor belt (one bag at a time) so as to obtain a single ordered row of bags.

[0011] Each bag is oriented parallel to the other ones, with the front portion thereof (carrying images and information regarding the bag contents) in contact with the rear portion (the portion opposite the front one) of the bag preceding it in the row.

[0012] The case packers usually provide for a forming line (or track), along which the container forming stations are arranged, which line extends along a rectilinear path. The insertion of the bags in the forming line occurs perpendicularly thereto, so that the pillow bags are inserted into the container being formed.

[0013] It shall be apparent that the pillow bags have to be inserted into the cardboard containers in a preordered manner, i.e., orienting each pillow bag in a predetermined manner with respect to both the container and the other bags. In particular, each type of container requires a specific ordering of the pillow bags.

[0014] In fact, it shall be noticed that, exactly due to the nature of the products to be inserted into the containers being formed, it is not possible to adopt pushing devices or flow deflectors (borrowed by the field of the casing in of solid and evenly-shaped packagings) to re-orient the pillow bags. In fact, too vigorous mechanical actions onto the pillow bags would risk to damage the same bags or to damage the salty snacks having a low bulk density contained therein. Furthermore, the bulging shape of the pillow bags makes controlling the spatial orientation thereof very difficult, which is the reason the bagging machine supplies a conveyor belt with an ordered row of pillow bags in mutual contact. Furthermore, it shall be noticed that the bagging machines have variable manufacturing rates of the pillow bags, i.e., the manufacturing thereof is not constant over time.

[0015] This may involve problems relating to the complete filling of the containers. In fact, each container is designed to contain a preset number of pillow bags, for example, six, eight, ten, etc. Since the containers move along a support plane at a predetermined speed, there is the tangible risk that some of such containers may contain a number of pillow bags less than the value that had been set when designing them.

[0016] This involves a delivery to the supply chain, whether it is a retail or a large-scale chain, of unfinished containers. In such a situation, the problem originates of the reliability in carrying out the container filling operation with the proper number of pillow bags, an economical damage to the manufacturer of salty products, to the supply chain, as well as a dissatisfaction of the clientele. Furthermore, there is also the risk that not all the produced bags are actually put into the containers. This occurs particularly when the manufacturing rate is particularly high. In this scenery there is the possibility that the operator is not able to maintain the manufacturing rate of the case packer; therefore, some bags fall out of the line.

[0017] Such problems can be further exacerbated when particular marketing campaigns are underway. In fact, and more and more frequently, selling bags of salty snacks in combination with a gadget (such as, for example, small toys, objects, picture cards, or similar products) or another type of salty snacks. In such a scenery, containers have to be produced, to be delivered to the supply chain, which take into account both the so-called base salty snack and the gadget(s) or another salty snack that has to be combined.

[0018] In order to solve such problems, it is usually

resorted to employ additional operators so as to ensure that the containers get the actual number of expected bags and gadgets and, moreover, that the bags that possibly have not been put into the containers are picked up again and inserted into a still unfinished container.

SUMMARY OF THE INVENTION

[0019] In this context, the technical task underlying the present invention is to propose a system and relative method for sorting pillow bags containing salty products at a case packer which solves the above-mentioned drawbacks of the prior art. Particularly, it is the object of the present invention to provide a system for sorting the pillow bags containing salty products at a case packer capable of ensuring the proper filling of the containers independently from the case packer manufacturing rate.

[0020] The indicated technical task and the specified objects are substantially achieved by a system and relative method for sorting pillow bags containing salty products at a case packer, comprising the technical characteristics set forth in one or more of the appended claims.

[0021] By virtue of the present invention, it is possible to implement a system capable of avoiding that a number of pillow bags less than that expected during the designing is inserted into the containers, and at the same time that no recollecting operations of pillow bags that are not immediately used to fill the containers are necessary.

BRIEF DESCRIPTION OF THE DRAWING

[0022] Further characteristics and advantages of the present invention will be more clearly apparent from the illustrative, hence non-limiting, description of a preferred, but not exclusive, embodiment of a system for sorting pillow bags containing salty products at a case packer, as illustrated in the appended drawing of Fig. 1, in which a system for sorting pillow bags containing salty products at a case packer according to the present invention is schematically shown.

DETAILED DESCRIPTION

[0023] A system for sorting pillow bags containing salty products at a case packer in accordance with the present invention has been generally indicated by the number 1 in Fig. 1.

[0024] The system 1 comprises a first loading station 2 to which a plurality of pillow bags 100, for example, bags of chips (which will be explicitly referred to herein below) is sent, a second loading station 3 to which a plurality of gadgets 200 (which will be explicitly referred to herein below) or pillow bags, for example bags of chips, is sent, and an ordering station 6 and a ordering station in which the bags 100 and the gadget 200 are ordered in a predetermined amount. The first loading station 2 is arranged at a supplying line of bags that come, for example, from a bagging machine (not shown), and it provides for a loading position at which the pillow bags are supplied, and an unloading position, opposite the loading position.

[0025] The second loading station 3 is arranged at a hopper (not shown) from which the gadgets are dispensed, and is provides for a loading position at which the gadgets are supplied, and an unloading position, opposite the loading position. The ordering station 6 provides for a loading position that is at both the first loading station 2 and the second loading station 3, and an unloading position, opposite the loading position, which is arranged at a case packer (not shown). Particularly, the system 1 provides for:

- the loading station 2 comprises a conveyor belt 4 extending along a first horizontal lying plane X having a predetermined linear length L1 and width 11; such loading station 2 comprises motor means configured to move the conveyor belt 4 with an advancement speed v1 so as to transport the pillow bags 100 from the loading position to the unloading position; the motor means comprise electric motors meshed with the conveyor belt 4 according to known, hence not described, techniques, in order to move the conveyor belt 4 at a speed v2 that is constant over time;

- the loading station 3 comprises a conveyor belt 5 extending along a horizontal lying plane X' having a predetermined linear length L2 and width 12; such ordering station 3 comprises motor means configured to move the 5 with an advancement speed v2 so as to transport the gadgets 200, from the loading position to the unloading position; the motor means comprise electric motors meshed with the conveyor belt 5 according to known, hence not described, techniques, in order to move the conveyor belt 5 at a speed v2 that is constant over time;
- the ordering station 6 comprises a support plane 7 extending along a horizontal lying plane X" and is intended to receive and support a plurality of pillow bags 100 and/or gadgets; such ordering station 3 comprises motor means configured to move the support plane 7 with an advancement speed v3; the motor means comprise electric motors meshed with the support plane 7 according to known, hence not described, techniques, in order to move the support plane 7 at a speed v3 that is variable over time.

[0026] According to an aspect, both the conveyor belt 4 and 5, respectively of the loading station 2 and 3, and the support plane 7 of the ordering station 6 provide at least one rotation of the conveyor belts 4, 5, or the support plane 7, about an axis perpendicular to said lying plane, by at least 90°.

[0027] It is worth noticing that the conveyor belts 4, 5 and the support plane 7 are movable lungo direzioni equiverse.

[0028] Preferably the conveyor belts 4, 5 and the sup-

port plane 7 extend along parallel directions, i.e., the lying planes X, X', and X" are mutually parallel.

[0029] It is worth noticing that the bags 100 reach the conveyor belt 4 according to an ordered row, i.e., a pillow bag after another with a spacing interval (or, similarly, a time interval) between the various pillow bags that can be constant or uneven. For example, the interval between the first bag and the second bag can be the same as or different from the interval between the second bag and the third bag, and so on.

[0030] It is worth noticing that the bags 100 reach the conveyor belt 4 according to an ordered row, i.e., a pillow bag after another with a spacing interval (or, similarly, a time interval) between the various pillow bags that can be constant or uneven. For example, the interval between the first bag and the second bag can be the same as or different from the interval between the second bag and the third bag, and so on.

[0031] It is worth noticing that the gadgets 200 reach the conveyor belt 5 in a scattered order, i.e., the gadgets are arranged unevenly.

[0032] In order to collect the gadgets 200 from the hopper, the width 12 of the conveyor belt 5 of the second loading station 3 is larger than the width 11 of the conveyor belt 4 of the first loading station 2. According to a preferred aspect, the first advancement speed v1 of the conveyor belt 4 of the first loading station 2 is equal to a speed v2 of the conveyor belt 5 of the second loading station 3.

[0033] Particularly, the support plane 7 of the ordering station 6 is divided by a plurality of panels 8, 9, which turn out to be active on such support plane 7 to define a plurality of containing spaces 10 (or containers), each of which being intended to contain, i.e., to have a useful volume, suitable for a predetermined plurality of pillow bags 100, for example of six, eight, or ten pillow bags, plus possible further gadgets 200, for example one, two, three, and so on, or equal to the number of the pillow bags 100 to be inserted.

[0034] According to an aspect, each containing space 10 is defined by at least two of the panels 8 that are stationary with respect to the support plane 7 so as to identify side containment edges for the same pillow bags. On the other hand, some of the panels 9 are movable between a containment condition, in which they engage said support plane 7 and define transversal containment edges with respect to the side containment edges 8, and a supine condition, in which they do not engage the support plane 7.

[0035] It is worth noticing that, once the containing space 10 has been completed with the expected number of pillow bags 100, suitable mechanisms (not shown) configured to obtain a packaging, for example made of cardboard, are provided for, which are capable of collecting the plurality of pillow bags that are present in the containing space 8.

[0036] The system 1 comprises robotic gripping means 14 having a predetermined gripping radius R. Particularly, the gripping radius R identifies the area inside which such robotic gripping means 14 are suitable to operate. As it shall be noticed from the appended Fig. 1, the gripping radius R is such to extend at least partially on a portion of the first conveyor belt 4 and of the second conveyor belt 5. Preferably, the gripping radius R extends in the proximity of the unloading position of the aforesaid conveyor belts 4 and 5.

[0037] With this in mind, the robotic gripping means 14 are configured to grasp:

- a pillow bag at a time from the ordered row of pillow bags 100 present on the conveyor belt 4 and to put it into a containing space 10 of the support plane 7 of the ordering unit 6;
- a gadget 200 at a time present on the conveyor belt 5 and to put it in the containing space 10 of the support plane 7 of the ordering unit 6.

[0038] According to a preferred aspect, the gripping means 14 comprise an electrically-actuated robotic arm provided with gripping members of the pneumatic type to grasp a pillow bag 100 or the gadget 200 without damaging the contents thereof and to put it into the containing space 10.

[0039] As regards the containing space 10, it shall be noticed that the containing space 10 that is first created on the support plane 7 is filled first, by the robotic gripping means 14. In other terms, the containing spaces are filled by filling the first space created by the plurality of panels 8, 9.

[0040] The system comprises means 12 for detecting the instant of passage of each bag of the row of pillow bags 100 with reference to the conveyor belt 4.

[0041] Particularly, the detecting means 12 are configured to generate a passage signal S1 relative to each pillow bag 100.

[0042] Such a passage signal S1 is representative of the time instant at which the pillow bag has passed in the reference axis Y of the detecting means 10.

[0043] It is worth noticing that the detecting means 12 are associated with the conveyor belt 4 (preferably, with the frame of the loading station 2) so as to intercept the pillow bags 100 transiting on such conveyor belt 4.

[0044] According to an aspect, the detecting means 12 comprise a photocell or a similar device for functions that are known in the operation thereof to those skilled in the art; therefore, they are not described herein.

[0045] The system 1 comprises detecting means 13 of the position of each gadget 200 with reference to the conveyor belt 5.

[0046] Particularly, the detecting means 13 are arranged in the proximity of the second loading station 3 and can be associated to the frame of the latter, or be arranged remotely.

[0047] The detecting means 13 configured for generating a position signal S2 relating to the position of each gadget bag 200 with respect to the lying axis X'.

[0048] It is worth noticing that the detecting means 13 are associated to the conveyor belt 5 so as to intercept the gadgets 200 transiting on such conveyor belt 5. According to an aspect, the detecting means 13 comprise a video camera or a similar device for functions that are known in the operation thereof to those skilled in the art; therefore, they are not described herein.

[0049] The system 1 comprises processing and control means 14 in signal communication with the detecting means 12, 13 and electrically connected with the gripping means 14.

[0050] Preferably, the processing and control means 14 are remote with respect to the loading station 2 and 3 and with respect to the ordering station 6. Particularly, the processing and control means 14 are housed, for example, in a closet or containing case.

[0051] The processing and control means 15 comprise a firmware, i.e., a program, i.e., a sequence of instructions, directly integrated in the processing and control means 15, for:

- processing the passage signal S1 as a function of the first advancement speed v1 and the length L1 of the conveyor belt 4 so as to generate a second position signal S3 which identifies the position that each pillow bag 100 takes with respect to the first lying plane X of the conveyor belt 4 as time changes,
- processing the position signal S2 as a function of the second advancement speed v2 and the width 12 so as to generate a fourth position signal S4 identifying the position taken by each gadget or pillow bag 200 with respect to the second lying plane X' of the second conveyor belt as time changes;
- combining the third and the fourth position signal S3, S4 in order to generate a driving signal S5 configured for driving the third motor means to change the third advancement speed v3.

[0052] Preferably, the advancement speed v1 and v2 of the first and the second conveyor belts 4, 5 is constant, while the advancement speed v3 is variable as a function of the position signals S3 and S4.

[0053] According to an aspect, the processing and control means 15 comprise a memory, a processing unit, and one or more data input/output boards. Particularly, For example, the value of the advancement speed v1 and v2 respectively of the first and of the second conveyor belt 4, 5 as well as the length L1, L,2 thereof width 11, 12 are stored in such memory.

[0054] Particularly, the processing and control means 15 receive the passage signal S1 which is generated by the detecting means 12, and, with such signal S1 and the value of the advancement speed v1, which is preferably constant, being known, as well as the length L1 of the conveyor belt 4, and they identify the position of each pillow bag 100 (signal S2) with respect to the length L of the same conveyor belt.

[0055] In order to determine the spatial position of each bag 100, it is provided to take, as an initial reference for the length L1, the position where the detecting means 12 are arranged.

[0056] It is worth noticing that the determination of the spatial position of each individual pillow bag is facilitated by the fact that the pillow bags are arranged in a row.

[0057] Preferably, the detecting means 12 are arranged in the loading position of the conveyor belt 4, i.e., in the portion of the conveyor belt 4 at which the pillow bags 100 are received from the bagging machine.

[0058] According to a preferred aspect, the origin point, from which the calculation of the linear length L1 of the conveyor belt 4 starts, matches with the point at which there is the association of the detecting means 12 with the same conveyor belt.

[0059] Since the width I1 is substantially equal to the width of a pillow bag 100, the signal S3 actually represents the position with respect to the lying axis X of the conveyor belt 4, which thus represents the symmetry axis of the conveyor belt 4.

[0060] Particularly, the processing and control means 15 receive the passage signal S1 which is generated by the detecting means 12, and, with such signal S1 and the value of the advancement speed v1, which is preferably constant, being known, as well as the length L1 of the conveyor belt 4, and they identify the position of each pillow bag 100 (signal S2) with respect to the length L1 of the same conveyor belt.

[0061] In order to determine the spatial position of each bag 100, it is provided to take, as an initial reference for the length L, the position where the detecting means 12 are arranged.

[0062] It is worth noticing that the determination of the spatial position of each individual pillow bag 100 is facilitated by the fact that the pillow bags are arranged in a row.

[0063] Preferably, the detecting means 13 are arranged so as to have in their view field the loading position of the loading station 3. Particularly, the detecting means 13 identify the coordinate in the ordinate that each gadget 200 takes with respect to the lying plane X', which thus represents the symmetry axis of the conveyor belt 5. According to a preferred aspect, the origin point, from which the calculation of the linear length L2 of the conveyor belt 5 starts, matches with the point at which same belt begins.

[0064] Therefore, the signal S2 identifies the spatial position of each gadget in the abscissas along the horizontal lying plane X' with respect to the origin point, and in the ordinates, with the suitable positive or negative sign, with respect to the above-mentioned horizontal lying plane X'.

[0065] Therefore, the spatial position of each bag 100 present on the conveyor belt 4 and the spatial position of each 25 gadget 200 on the conveyor belt 5 being known, as time changes, the processing and control means 15 process the driving signal S5 when gripping means 14 take one of the pillow bags 100 in order to put

it into the first one of the containers 100 present on the support plane 7 of the gadget 200, i.e., the spatial coordinates thereof, and in the gripping radius of said gripping means 14.

[0066] The driving signal S5 is configured to change the value of the advancement speed v3 so as to change the advancement speed of the support plane 7, hence of the containers 10.

[0067] Advantageously, it is possible to change the advancement speed of the support plane 7 as a function of the bagging machine manufacturing rate.

[0068] In fact, the driving signal S5 is generated as a function of the position where (i.e., the spatial coordinate in the abscissa along the horizontal lying plane X of the conveyor belt 4) each pillow bag 100 on the conveyor belt 4 is withdrawn by the gripping means 14.

[0069] When the spatial coordinates of a gadget 200 is within the gripping radius R of the robotic gripping means 14, then it is possible to take also that gadget 200 and to put it in the same containing space 10 where the pillow bag 100 has already been put.

[0070] In a preferred aspect of the present description, the driving signal S5 is configured to increase the second advancement speed v3 when the position signal S3 is indicative of a position (i.e., the spatial coordinate in the abscissa 1 along the horizontal lying plane X of the conveyor belt 4) downstream of a reference point Pr and the gadget 200 is in the gripping radius of said gripping means 14, while the driving signal S5 is configured to decrease the second advancement speed v3 when the position signal S3 is indicative of a position (i.e., of a withdrawing point by the gripping means 14) upstream of the reference point Pr and the gadget 200 is in the gripping radius of said robotic gripping means 14.

[0071] According to an aspect, if multiple gadgets 200 are present inside the gripping radius R of the robotic gripping means 14, the gadget will be preferred, which has spatial coordinates nearest to the unloading position of the conveyor belt 5.

[0072] It is worth noticing that the reference point Pr indicates the spatial coordinate along the horizontal lying plane X of the conveyor belt 4, i.e., the coordinate in the abscissa with respect to the origin, which is arranged at the point where the detecting means 12 are located.

[0073] For example, the reference point Pr can be located in the middle of the length L1 of the lying plane of the conveyor belt 4, i.e., Pr has as its coordinate in the abscissae a value equal to half the linear length L1 of the conveyor belt 4.

[0074] In such a scenery, if the withdrawing point of a pillow bag 100 is upstream (i.e., spatially before) of the reference point Pr, where Pr is equal to *L1*/2, then the processing and driving means generate the driving signal S5 so as to decrease the second advancement speed v3 of the support plane 5, while if the withdrawing point of a pillow bag 100 is downstream (i.e., spatially after) of the reference point Pr, then the processing and driving means generate the driving signal S5 so as to increase the second advancement speed v3 of the support plane 7.

[0075] Such increase/decrease of the advancement speed v3 ensures that all the pillow bags produced by the case packer are actually grasped and put into the container 10.

[0076] On the contrary, it is worth noticing that the gadgets 200, that are not immediately used to fill the container 10 are put back into hopper by suitable mechanical transport means (for example, a further conveyor belt) or manually.

[0077] In other terms, it is not essential that the gadgets are actually used, unlike the pillow bags 100, i.e., avoiding that the gadgets are withdrawn again from their unloading position.

[0078] Preferably, the robotic gripping means 14 deposit the pillow bag 100 in the container 10, which is free to receive it. Such a container 10 is the one that is the nearest to the unloading position located at the case packer.

[0079] In order to ensure that the containers 10 are completed with the predetermined number of expected pillow bags (for example six, eight, ten, etc.) and any gadgets 200, the processing and driving means 15 store in a memory portion thereof, beside to data relating to the advancement speed v1, the length/width L1/l1 of the conveyor belt 4, the advancement speed v2, the length/width L2/l2 of the conveyor belt 5, the firmware, as well as the position of the reference point Pr, also the number of pillow bags 100 and/or the gadgets 200 already deposited into a specific container 10.

[0080] Particularly, the amount of pillow bags that each containing space 8 may house being known, as well as the number of the gadgets 200 to be inserted, it is being provided that the robotic gripping means 14 continue to withdraw and deposit the pillow bags in the same containing space 10 until reaching the maximum capacity value of the containing space 10.

[0081] To this aim, a memory register is provided, into which it is tracked, by an incremental counter, of how many pillow bags 100, and/or how many gadgets 200 have been already deposited into a specific containing space 10.

[0082] In other terms, the value representative of the maximum amount of pillow bags 100 and/or gadgets 200 housable in the containing space 10 being known, it is provided for to track, for example by the updatable counter, the number of pillow bags 100 and/or gadgets 200 put into an individual containing space 10. The robotic gripping means 14 will continue to deposit the pillow bags 100 and the gadgets 200 in such individual containing space 10 until when the number of pillow bags and/or of gadgets transported in an individual containing space 10 is less than or equal to the value representative of the maximum amount of pillow bags housable in the containing space 10.

[0083] It shall be apparent that those skilled in the art, in order to meet contingent, specific needs, will be able

to make a number of modifications and variations to the system and method for sorting a plurality of pillow bags 100, 101, ..., 100x containing salty products described above, all of which anyhow fall within the protection scope as defined by the following claims.

Claims

1. A system (1) for sorting a plurality of pillow bags (100, 200) containing salty products, comprising:

   - a first loading station (2) comprising a conveyor belt (4) extending by a predetermined length (L1) and width (11) along a first horizontal lying plane (X), first motor means to move said conveyor belt (4) with a first advancement speed (vl) so as to transport a row of pillow bags (100) from a loading position to an unloading position;
   - a second loading station (3) comprising a conveyor belt (5) extending by a predetermined length (L2) and width (12) along a second horizontal lying plane (X'), second motor means to move said conveyor belt (5) with a second advancement speed (v2) so as to transport gadgets or pillow bags (200) arranged in a scattered order from a loading position to an unloading position;
   - an ordering station (6) comprising a support plane (7) extending along a third horizontal lying plane (X") and intended to receive and support a plurality of said pillow bags or gadgets (100, 200), third motor means to move said support plane (7) with a third advancement speed (v3) from a loading position to an unloading position;
   - a plurality of panels (8,9) active on said support plane (7) to define a plurality of containing spaces (10) each of which being intended to contain a predetermined plurality of pillow bags or gadgets (100, 200);
   - first detecting means (12) arranged in the proximity of said first conveyor belt(4) and configured for generating a passage signal (S1) of each pillow bag (100) that is representative of the time instant at which said pillow bag (100) has passed with respect to said first detecting means (12);
   - second detecting means (13) arranged in the proximity of said second conveyor belt (5) and configured for generating a position signal (S2) representative of the spatial coordinates of said pillow bag gadget (200) lying on said second conveyor belt (5) and of the instant at which said pillow bag gadget (200) is deposited on said second conveyor belt (5);
   - robotic gripping means (14) having a predetermined gripping radius (R) and being configured for taking inside said gripping radius the first pillow bag of said row of pillow bags (100) present on said conveyor belt (4) and to put it in a containing space (10) and/or a gadget (200) on said second conveyor belt (5) and to put it in said containing space (10);
   - processing and control means (15) in signal communication with said first and second detecting means (12, 13) and electrically connected with said gripping means (14) and with said third motor means, said processing and control means (15) comprising a firmware configured for:
   - processing said first passage signal (S 1) as a function of said first advancement speed (vl) and said length (L1) of said first conveyor belt (4) so as to generate a second position signal (S3) identifying the position taken by each of said pillow bag (100) with respect to said first lying plane (X) of the conveyor belt (4) as time changes,
   - processing said position signal (S2) as a function of said second advancement speed (v2) and said second width (12) so as to generate a fourth position signal (S4) identifying the position taken by each gadget or pillow bag (200) with respect to said second lying plane (X') of the second conveyor belt (5) as time changes;
   - combining said third and fourth position signal (S3, S4) in order to generate a driving signal (S5) configured for driving said third motor means to change said third advancement speed (v3).

2. The system according to claim 1, wherein said driving signal (S5) is configured to increase said third advancement speed (v3) when said position signal (S3) is indicative of a position downstream of a reference axis (Pr) and said gadget (200) is in the gripping radius of said gripping means (14).

3. The system according to claim 1, wherein said driving signal (S5) is configured to decrease said third advancement speed (v3) when said position signal (S3) is indicative of a position upstream of a reference axis (Pr) and said gadget (200) is in the gripping radius of said gripping means (14).

4. The system according to any of the preceding claims, wherein said processing and control means (15) comprise an updatable counter as a function of the number of pillow bags or gadgets (100,200) that have to be withdrawn and put into a containing space (10).

5. The system according to any of the preceding claims, wherein each containing space (10) is defined by at least two of said panels (8,9) that are stationary with respect to said support plane (7) so as to identify side containment edges for said pillow bags or gadget (100, 200) and some of said panels (8,9) being

movable between a containment condition, in which they engage said support plane and define transversal containment edges with respect to said side containment edges, and a supine condition, in which they do not engage said support plane (7).

6. The system according to claim 1, wherein said first, second conveyor belts (4, 5) and/or said support plane (7) provide for the passage between the loading position and the unloading position, and vice versa, by a rotation of said first, second conveyor belt (4) and/or said support plane (5), about an axis perpendicular to said lying plane (X, X, X"), by at least 90°.

7. The system according to claim 1, wherein said robotic gripping means (14) comprise an electrically-actuated robotic arm having pneumatic gripping means.

8. The system according to claim 1, wherein said first detecting means (12) comprise a comprise a photocell arranged at said loading position of said conveyor belt (4).

9. The system according to claim 1, wherein said processing and control means (15) comprise a memory, a microprocessor, and one or more data input/output boards configured to interface with said first, second, and/or third motor means, said gripping means (14) and said first and second detecting means (12, 13), said memory being in signal communication with said microprocessor, said memory having a memory portion intended to permanently store at least said firmware, said value of said first speed (v1) and said second speed (v2), said first and second lengths (L1, L2), and the value contained in said updatable counter.

10. The system according to claim 1, wherein said first and second conveyor belt (4, 5) and said support plane (7) are movable along the same directions.

11. The system according to claim 1, wherein said secondi detecting means (13) are a video camera.

12. A method for sorting a plurality of pillow bags (100, 200) containing salty products, comprising the steps of:

- detecting a passage instant (S 1) of each pillow bag of a row of pillow bags (100) supported by a first conveyor belt (4) extending by a predetermined first length (L 1) along a first horizontal lying plane (X), said first conveyor belt (4) being mobile at a first constant advancement speed (v1);
- detecting a spatial position (S2) of each gadget or pillow bag (200) arranged in a scattered order and supported by a second conveyor belt (5) that extends by a predetermined second length (L2) along a second horizontal lying plane (X'), said second conveyor belt (5) being mobile at a second constant advancement speed (v2);
- providing the number of pillow bags or gadgets that have to be put into a containing space (10) defined on a support plane (7) that is movable at a third advancement speed (v3);
- withdrawing, by robotic gripping means (14), a pillow bag at a time from said first conveyor belt (4) determining the position (S3) thereof along said first horizontal lying axis (X) as a function of the passage instant (S1), of said first constant advancement speed (v1) and said first length (L1);
- withdrawing, by robotic gripping means (14), a gadget or a pillow bag at a time determining the spatial position (S4) thereof with respect to said second horizontal lying axis (X") as a function of said second constant advancement speed (v2) and said second length (L2);
- depositing, by robotic gripping means (14), said pillow bag (100) and/or said gadget (200) withdrawn in said containing space (10) defined on said support plane (7);
- changing said third advancement speed (v3) as a function of said withdrawal spatial position of said pillow bag and/or said gadget (200).

13. The method according to claim 12, wherein said step of changing said third advancement speed (v3) provides for increasing said third advancement speed (v3) when said withdrawal spatial position of said pillow bag (100) is downstream of said reference axis (Pr) and said gadget (200) is in the gripping radius of said gripping means (14).

14. The method according to claim 12, wherein said step of changing said third advancement speed (v3) provides for increasing said third advancement speed (v3) when said withdrawal spatial position of said pillow bag (100) is downstream of said reference axis (Pr) and said gadget (200) is in the gripping radius of said gripping means (14).

15. The method according to claim 12, comprising the steps of:

- tracking the number of pillow bags (100) withdrawn from said first conveyor belt (4) and put in an individual containing space (10);
- tracking the number of gadgets (200) withdrawn from said second conveyor belt (5) and put in an individual containing space (10);
- repeating the steps of withdrawing said pillow bag (100) and/or said gadget (200) until when

said number of pillow bags (100) and/or said gadgets (200) transported in said individual containing space (10) is less than or equal to said value representative of the maximum amount of pillow bags (100) or gadgets (200) housable in said containing space (10).

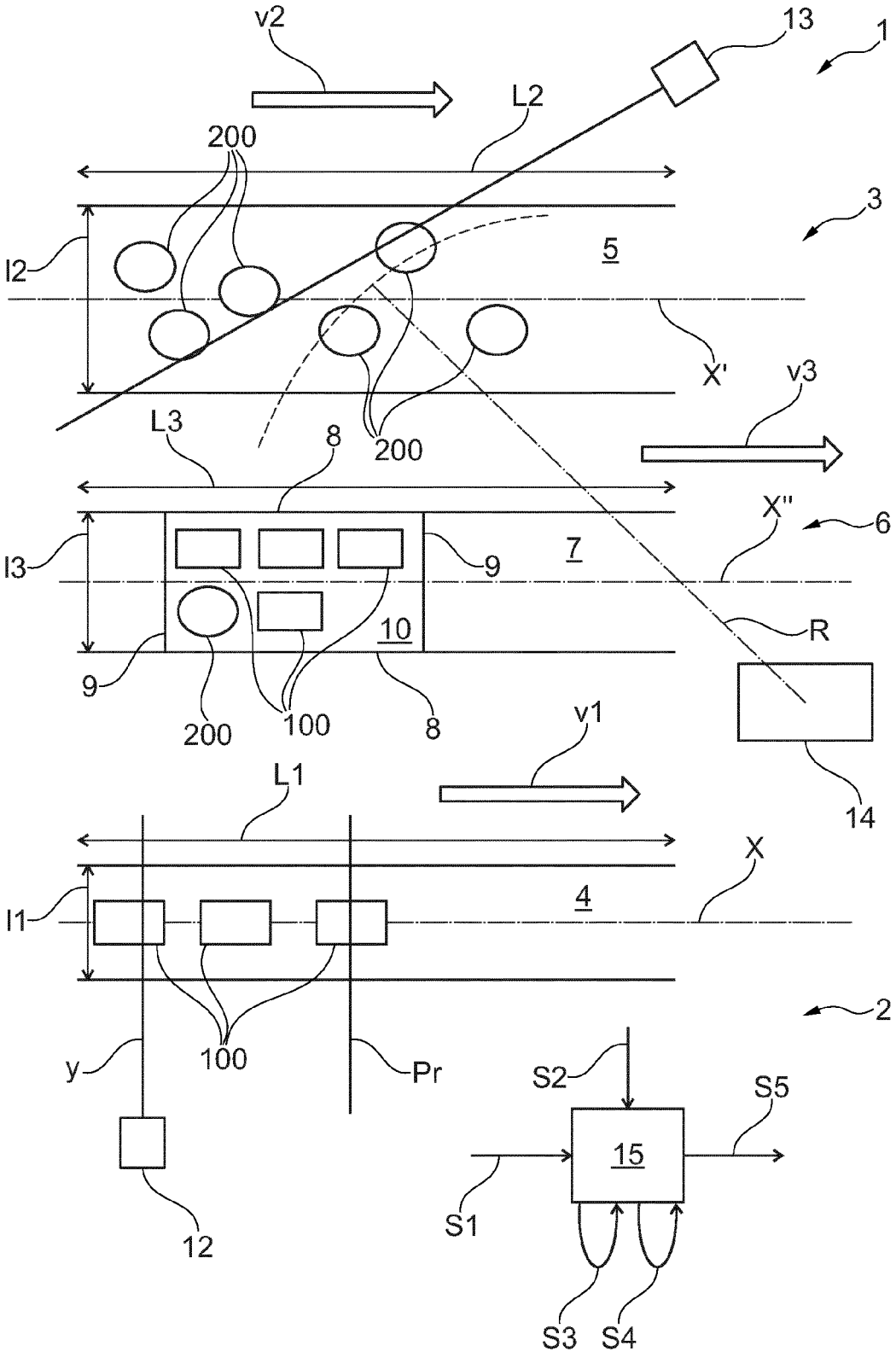
v2
13
1
L2
200
3
5
l2
X'
v3
L3
8
200
X''
6
l3
9
7
R
10
9
200
100
8
v1
14
L1
X
4
l1
2
y
100
Pr
S2
S5
15
S1
12
S3
S4

Fig. 1

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EUROPEAN SEARCH REPORT

Application Number
EP 14 42 5081

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 2 631 185 A1 (BLUEPRINT HOLDING BV [NL]) 28 August 2013 (2013-08-28) * paragraphs [0022] - [0035]; figures *	1-15	INV. B65B61/20 B65G47/52 B65B5/06 B65B5/10
A	US 2003/005665 A1 (WIPF ALFRED [DE] ET AL) 9 January 2003 (2003-01-09) * paragraphs [0017] - [0024]; figures 1,4 *	1-15	
A	US 2013/110280 A1 (FOLK MICHAEL [DE]) 2 May 2013 (2013-05-02) * paragraphs [0049] - [0054]; figures *	1-15	
A	US 2002/157919 A1 (SHERWIN JOHN P [US]) 31 October 2002 (2002-10-31) * paragraphs [0011] - [0019]; figures *	1-15	

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
Munich	16 October 2014	Lawder, M

CATEGORY OF CITED DOCUMENTS

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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
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16-10-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2631185 A1	28-08-2013	NONE	
US 2003005665 A1	09-01-2003	AT 310671 T	15-12-2005
		DE 50204996 D1	29-12-2005
		EP 1260436 A1	27-11-2002
		ES 2252418 T3	16-05-2006
		JP 4153240 B2	24-09-2008
		JP 2003020011 A	21-01-2003
		US 2003005665 A1	09-01-2003
US 2013110280 A1	02-05-2013	CA 2790521 A1	01-09-2011
		DE 102010002317 A1	25-08-2011
		EP 2477914 A1	25-07-2012
		US 2013110280 A1	02-05-2013
		WO 2011103872 A1	01-09-2011
US 2002157919 A1	31-10-2002	NONE	

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