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(54) Carton filling machine and method

(57) The present invention relates to a method and apparatus for delivering objects such as sweets, chocolate bars, biscuits and confectionary to a carton. A conventional machine conveys objects one at a time from a first conveyor to a second conveyor and then uses a robotic arm to transfer each object from the second conveyor to a trap door. This method is slow as only one object is loaded into each pocket on the second conveyor and it is difficult to increase the speed because it is necessary for the second conveyor to be stationary when picking up objects from the first conveyor. According to the present invention an object accelerating device 25 is used to accelerate objects 200 from the first conveyor 5 on to the second conveyor 10. A plurality of objects are stacked in each pocket 20 on the second conveyor 10. In this way a large number of objects can be transferred quickly onto the trap door 50 and deposited into a carton 85. The second conveyor 10 is preferably lower than the first conveyor 5 and a gas blower may be used to accelerate objects downwardly from the first conveyor 5 on to the second conveyor 10.

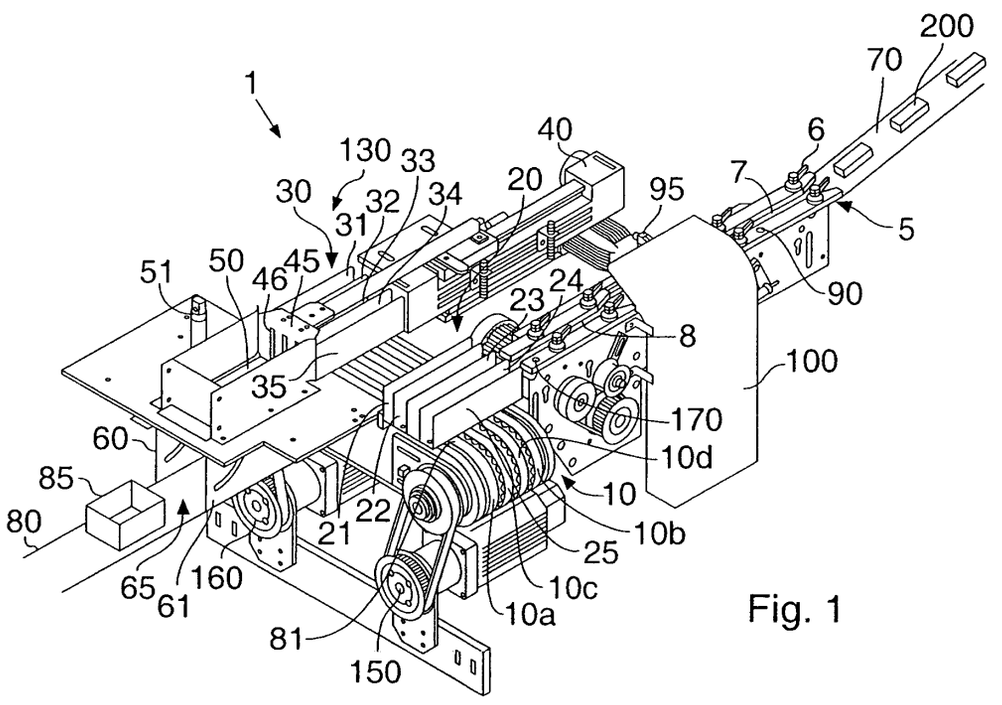

Fig. 1

EP 1 557 360 A1

Description

[0001] The present invention relates to a method and apparatus for delivering objects to a carton. For example the objects may be small items such as sweets, chocolate bars, biscuits, confectionary, toffee, nuts, medical or cosmetic items. Usually the objects will be flow wrapped, but this is not essential. The present application is not limited to the above list and other suitable objects will be apparent to a person skilled in the art.

[0002] An existing machine has a first conveyor, a second conveyor, a loading mechanism and a trapdoor. The first and second conveyors are at right angles to each other and at the same height. The second conveyor has a plurality of dividing walls extending perpendicular to its direction of motion, which walls divide the conveyor into a plurality of pockets for receiving objects from the first conveyor. The second conveyor moves in a stepped motion and picks up objects from the first conveyor during periods when it is not moving (i.e. in between the steps). Only one object is loaded into each pocket on the second conveyor

[0003] As the second conveyor moves on soon after picking up an object from the first conveyor, any momentum imparted to the object by the first conveyor is quickly 'killed' by movement of the second conveyor. The second conveyor conveys the objects received in the pockets to a trapdoor loading location where a robot arm picks up objects from the pockets and moves them onto a trapdoor. The trapdoor is then opened to drop the objects into a carton below. This type of machine, using a trapdoor, is known as a 'tumble loader'. It is particularly, but not exclusively, suitable for situations where a predetermined number of objects have to be packed into a carton, but the precise arrangement of the objects is not important as long as they fit into the carton.

[0004] However, the above arrangement can be slow and is not always suitable when large numbers of objects are to be packed into each carton. It can be difficult to increase the speed of the second conveyor due to the requirement that it is stationary while picking up objects from the first conveyor.

[0005] Accordingly, the present invention, at its most general, proposes a method in which a plurality of objects are stacked into each pocket on the second conveyor, and an apparatus configured to carry out this method. The objects may be stacked vertically, on top of each other, or side by side and may be stacked in a non-regular arrangment.

[0006] Thus, a first aspect of the present invention may provide a method of delivering objects to a carton comprising the following steps:

(a) using a first conveyor to convey an object onto a pocket on a second conveyor, said pocket comprising a pair of sidewalls between which objects from said first conveyor can be received

(b) repeating step (a) one or more times so that a plurality of objects are stacked in said pocket

(c) using said second conveyor to convey said stacked objects to a loading position

(d) using a loading mechanism to move said stacked objects at said loading position from said pocket onto a trapdoor; and

(e) opening said trap door so that said objects fall into a carton.

[0007] As a plurality of objects are stacked into the pocket (or each pocket where there are more than one pockets), a larger number of objects can be delivered to the carton in a shorter period of time. Usually, the objects are delivered one by one from the first conveyor onto the second conveyor and stacked in a pocket.

[0008] Preferably said second conveyor is lower than said first conveyor. This enables the objects to fall onto said first conveyor from said second conveyor (in steps (a) and (b)) and is a convenient way of ensuring that several objects can be stacked in the same pocket. Usually the first and second conveyors are approximately perpendicular to each other with the first conveyor approximately parallel to the pockets of the second conveyor, but this is not essential.

[0009] Usually the pocket sidewalls will extend perpendicular to the direction of motion of the conveyer (when the conveyor is moving), although this is not essential. Usually the machine will have a stationary pocket end wall on the side of the second conveyor opposite the first conveyor; this end wall prevents objects from flying out of the other side of the pockets. It would also be possible for the pockets to have an end wall which moves together with the conveyor (e.g. integral with the sidewalls), but this makes it more difficult to offload the objects from the pockets onto the trapdoor.

[0010] Preferably an object accelerating device is used to accelerate objects from said first conveyor onto said second conveyor. In this way it can be ensured that an object has settled into place in the pocket and does not obstruct the next object to be stacked in the pocket. For example, where the second conveyor is lower than the first, gravity is too slow to ensure this for some objects meaning that they can collide with each other unless accelerated by an accelerating device. Usually the objects will be accelerated by the device after leaving the first conveyor (and before they have reached the second conveyor). Where the second conveyor is lower that the first conveyor, the object accelerating means will usually be configured to accelerate the objects downward e.g. to accelerate their fall.

[0011] The object accelerating device may be a blower for blowing a stream of gas to accelerate objects from said first conveyor onto said second conveyor. For Example, a blower provided above said second conveyor for blowing a stream of gas downward to accelerate objects falling from said first conveyor onto said second conveyor. The blower may be a high pressure blower or a low pressure blower, it may eject air or another gas

and may be powered by a fan, or a source of compressed gas. Other types of blower may be apparent to a person skilled in the art.

[0012] Alternatively the object accelerating device may be a suction device (e.g. a vacuum device) configured to use suction to accelerate objects from the first conveyor to the second conveyor. For example the suction device may comprise a suction generator (e.g. a vacuum source) connected to one or more apertures on the second conveyor, (e.g. in each pocket or a pocket end wall) so that objects are accelerated by suction on to the second conveyor. If the apertures are positioned towards the edges of the conveyor or pocket edges then the risk of the suction being blocked by accumulation of objects on the conveyor can be minimised or avoided.

[0013] Alternatively the object accelerating device may be a mechanical mechanism e.g. a robot arm or a plunger arm.

[0014] Preferably the second conveyor has a plurality of pockets, arranged adjacent to each other to form a set of pockets, wherein after step (b) said other pockets in the set are stacked with objects according to steps (a) and (b). In this way several columns of objects can be built up for depositing into a carton.

[0015] Preferably in step (d) said loading mechanism moves said objects in all said pockets in said set onto the trap door.

[0016] Preferably the second conveyor has a first pocket or set of pockets and a second pocket or set of pockets and said first and second pocket or pocket sets are moved independently of each other. This enables a first pocket or pocket set to be moved slowly in steps while it is being stacked with objects, while a second pocket or pocket set is moved quickly and/or continuously around after unloading the objects on the trap door to come round to a position in which it is ready to receive objects from the first conveyor.

[0017] The term trapdoor is to be understood broadly to include any arrangement in which a supporting surface can be moved to drop objects supported on it to an area below. The trapdoor may for example comprise one or more hinged panels; alternatively it may comprise one or more retractable members.

[0018] Preferably the trap door comprises first and second hinged members which swing downwardly when the trapdoor is opened. In this way the first and second hinged members can guide the objects into a carton below, in effect forming a funnel through which the objects drop. There may be (stationary) sidewalls on either side of the area beneath the trap door, so as to form the funnel together with the hinged members.

[0019] Preferably the objects are conveyed to the first conveyor by a third conveyor that moves at a slower speed than the first conveyor. This difference in speed causes the objects on the first conveyer to be spaced out compared to objects on the third conveyor. This can be useful where the objects are produced at a rapid rate and close together by another machine, but need to be spaced apart by a larger amount in order for the second conveyor to effectively collate and/or stack the objects in the pockets.

[0020] Preferably there is a vacuum apparatus for retaining the objects on the first conveyor. This enables the first conveyor to convey the objects at speeds that would not otherwise be possible (the vacuum helps to prevent the objects from sliding backwards on the conveyor at high speeds).

[0021] Preferably the cartons are brought to a loading station beneath the trapdoor by a fourth conveyor for conveying cartons.

[0022] A second aspect of the present invention may provide a machine configured to deliver objects to a carton according to the method of the first aspect of the present invention.

[0023] The machine may comprise:

a first conveyor for conveying objects to a pocket on a second conveyor,
a second conveyor having one or more pockets comprising a pair of sidewalls between which objects from said first conveyor can be received;
a trapdoor;
a loading mechanism for transferring objects from a pocket or pockets on said second conveyor onto said trap door; and
an actuator for opening the trapdoor so that objects on the trapdoor fall to a location beneath the trapdoor; wherein
said second conveyor is lower than said first conveyor.

[0024] In this way, as the second conveyor is lower, when the machine is in use objects can fall onto the second conveyor from the first conveyor, leaving room for more objects to be stacked on top.

[0025] Instead or as well as the second conveyor being lower than the first conveyor, the machine may have an object accelerating device as described above under the first aspect of the present invention. This helps to prevent or minimise the possibility of, earlier objects obstructing later objects delivered to the same pocket on the second conveyor. The object accelerating device may be a blower for blowing a stream of gas to accelerate objects from said first conveyor onto said second conveyor. Alternatively it may be a mechanical or suction device, as described above.

[0026] Preferably the second conveyor has a plurality of pockets adjacent each other forming a set of pockets, each pocket comprising a pair of sidewalls between which objects from said first conveyor can be received.

[0027] Preferably the machine is programmed or configured to load each pocket in said set with objects from said first conveyor before conveying the pocket set to a trap door loading location, which is usually near the loading mechanism.

[0028] The loading mechanism is preferably a pusher

arm that is extendable into said pocket or pockets to push any objects in said pockets onto a trapdoor adjacent the opposite side of the pockets to the pusher arm. It may be pneumatically powered. The pusher arm may have a pusher head having slots for accommodating the pocket sidewalls when the pusher arm is extended into the pocket or pockets.

[0029] Preferably the second conveyor comprises a first belt on which are mounted a first pocket or set of pockets and a second belt on which are mounted a second pocket or set of pockets, said first and second belts being independently controllable. This enables the first and second pockets or pocket sets to be moved at different speeds or for one to be kept still while the other is moving, which has the advantages described above under the first aspect of the present invention.

[0030] The machine may comprise a third conveyor for conveying objects to said second conveyor. Preferably the third conveyor is configured to convey objects at a slower speed than the first conveyor, which has the advantages described above under the first aspect of the present invention.

[0031] Preferably the first conveyor is provided with a vacuum apparatus for retaining objects on the conveyor. This enables the first conveyor to convey the objects at speeds that would not otherwise be possible (at high speeds the objects may otherwise slide backwards on the conveyor due to inertia).

[0032] Preferably the trapdoor comprises two hinged doors, which are swingable downwards in response to the actuator. The trapdoor may be pneumatically powered.

[0033] The machine may have a fourth conveyor for conveying cartons to a carton loading station beneath the trapdoor.

[0034] The machine may have any of the features described above under the first aspect of the present invention or be configured to carry out any of the steps described under the first aspect of the present invention.

[0035] An embodiment of the present invention will now be described in detail, by way of example only, with reference to the accompanying drawings, in which:-

Fig. 1 is a perspective view of a machine according to the present invention;

Fig. 2 is a schematic side view of the machine of Fig 1 and shows in addition a blower for accelerating objects onto a second conveyor;

Fig. 3 is a side view of a set of pockets containing stacked objects, and

Fig. 4 is a side view of a closed trapdoor bearing some objects;

Fig. 5 is a side view of an open trapdoor which has deposited some objects into a carton;

Fig. 6 is a side view of a set of pockets containing objects stacked in a non-regular configuration;

Fig. 7 is a side view of a set of pockets containing short objects stacked vertically, and

Fig. 8 is a cross-section of Fig. 8 along the line A-A showing that the objects are also stacked side by side.

[0036] Fig. 1 is a perspective view of a machine for delivering objects to a carton. The machine 1 has a first conveyor 5 for conveying objects to a set of pockets on a second conveyor 10. The second conveyor 10 has a first set of pockets 20 and a second set of pockets 30 which are independently controllable. Both the first and second conveyors are endless conveyors. The first set of pockets 20 is shown in a pocket loading position in Fig. 1, ready to receive objects from the first conveyor 5. The second set of pockets 30 is shown in a trapdoor loading (or pocket unloading) position in Fig. 1, in which position objects can be offloaded from the pockets on to a trap door 50. A pusher arm 40 forms a loading mechanism for loading objects in the trapdoor loading position onto the trapdoor 50. Carton loading station 65 is positioned below the trapdoor 50 and a fourth conveyor 80 is provided for supplying erected cartons 85 to the carton loading station 65. A third conveyor 70 is positioned in line with the first conveyor 5 and delivers objects 200 to the first conveyor 5.

[0037] The first and second conveyors, the loading mechanism and the trap door will now be described in more detail.

[0038] The first conveyor 5 is provided with vacuum apparatus 6 which causes suction at aperture 7 in the surface of the conveyor. In this way objects can be retained on the conveyor and retained from slipping even when the first conveyor 5 conveys the objects at high speed (e.g. 700 objects per minute). The first conveyor 5 conveys the objects at a faster speed than the third conveyor 70 and this has the effect that the objects are more widely spaced on the first conveyor. This makes delivery of objects from the first conveyor 5 to the second conveyor 10 easier. First and second optical detection devices 90 are provided on the first conveyor 5 for detecting products which are too high or to close to each other. Downstream of the first and second optical detectors 90 there is a air blaster or other gas blower, 95 which is configured to eject from the first conveyor 5 into a product eject chute 100 any objects which are detected to be too high or to close to each other by the detectors 90. The ejection is effected by a blast of air or gas.

[0039] The first conveyor 5 is substantially perpendicular to the second conveyor 10. This facilitates delivery of objects from the first conveyor 5 to the second conveyor 10. The object bearing surface 8 of the first conveyor 5 is higher than the object bearing surface 81 of the second conveyor 10; this facilitates delivery of multiple products to a single pocket 24 on the second conveyor 10, as will be discussed below in more detail.

[0040] As the first conveyor feeds objects to the second conveyor and has a vacuum apparatus, it may be called an infeed vacuum conveyor.

[0041] The second conveyor 10 is an endless convey-

or and has two sets of pockets 20 and 30 mounted on it. The first set of pockets 20 comprises four pockets 21, 22, 23 and 24. Each pocket is defined by a pair of side walls 25 between which objects from the first conveyor 5 can be received. The second set of pockets 30 also comprises four pockets 31, 32, 33 and 34, each pocket being bounded by pairs of sidewalls 35. In alternative configurations there could be more or less pockets in each set, the number will be chosen according to the packing requirements of the carton.

[0042] In Fig. 1 the first set of pockets 20 are shown in a pocket loading position adjacent an end of the first conveyors. The second conveyor 10 is capable of moving the first set of pockets 20 in small steps past the pocket loading position, so that each of the pockets in turn 21, 22, 23 and 24 can be loaded with objects from the first conveyor 5. In Fig. 1 the fourth pocket 24 is in a loading position in line with the first conveyor 5 and ready to receive objects into that pocket 24.

[0043] The object bearing surface 8 of the first conveyor 5 is higher that the object bearing surface 81 of the second conveyor 10. Therefore when objects are passed from the first conveyor 5 (which in use conveys objects towards the second conveyor 10) the objects drops down onto the object receiving surface of the pocket which is in line with the first conveyor 5 (pocket 24 in Fig. 1). As the object has dropped down, there is room above for further objects to be stacked on top of it. Thus, a plurality of objects can be stacked in each of the pockets 21, 22, 23 and 24. The exact number of objects which can be stacked, depends on the size of the objects, the depth of the pocket and relative height of the first and second conveyors 5, 10 which are determined according to the loading requirements of the carton to which the objects are to be delivered.

[0044] Fig. 2 is a side view of the apparatus of Fig. 1. It shows objects 200 being conveyed on the first conveyor 5 passed the product eject chute 100 and on to a pocket 24 on the second conveyor 10. Two parts of the apparatus, which are not shown in Fig.1, are shown in Fig. 2. Firstly there is an end wall 110 positioned on the side of the second conveyor 10 opposite the offloading point from the first conveyor 5. This end wall 110 is stationary and does not move along with the second conveyor 10. It prevents objects delivered from the first conveyor 5 from flying out through the end of the pockets 21, 22, 23 and 24 because of momentum from the first conveyor 5. Secondly, there is an air blower 120 positioned above the second conveyor 10 and in line with the first conveyor 5. This air blower 120 thus sits above the delivery point of objects from the first conveyor 5 to the second conveyor 10. It may be powered by a fan or a source of compressed gas and is configured to deliver a stream a air downwards to accelerate objects delivered from the first conveyor 5 onto the surface of the second conveyor 10. Accelerating the objects in this way helps to prevent objects from colliding with each other when they are stacked in the same pocket, which may sometimes happen when they are left to drop by gravity alone. Alternatively, instead of a blower a suction device or a mechanical mechanism may be used to accelerate the objects.

[0045] As mentioned above, the machine is configured to stack a plurality of objects in each pocket. Fig. 3 shows the first set of pockets 20, with pockets 21, 22 and 23 fully stacked with three objects 200 each and the fourth pocket 24 partially stacked with two objects. The objects are stacked vertically i.e. one on top of the other. The machine is configured so that in operation it will fill the fourth pocket 24 as well, with a further object, so that there are three objects stacked one on top of each other in each pocket, before conveying the set of pockets 20 to the trap door loading position 130 occupied by pocket set 30 in Fig. 1. Also shown in Fig. 3 is the blower 120 which is in line with the first conveyor 5.

[0046] The machine is configured to fill each of the pockets in the pocket set 20 with objects 200 from the first conveyor 5. Each pocket is filled in turn by stacking a predetermined number of objects, vertically one on top of each other, in to that pocket. For example, first objects are delivered, one at a time, from the first conveyor 5 to the first pocket 21. The objects drop down from the first conveyor 5 into the pocket 21 on the second conveyor 10 and are accelerated in this direction by blower 120. After the predetermined number of objects (three in this embodiment, but the number may be varied according to the requirements of the carton), a detector 170 indicates to a controller that predetermined number of objects have been stacked in that pocket and the controller controls the second conveyor 10 to move onwards so that the second pocket 22 is in line with the first conveyor 5. The second pocket 22 is then loaded in the same manner, followed by the pockets 23 and 24. When all of the pockets in the pocket set have been loaded with the predetermined number of objects, the pocket set is fully stacked.

[0047] Fig. 3 shows the objects stacked vertically in a regular configuration. However, it would also be possible to stack the objects side by side and/or in a non-regular configuration. Fig. 6 is a side view showing a set of pockets in which one pocket is stacked vertically with objects in a non-regular configuration (in Fig. 6 the objects are non-rectangular and relatively narrow compared to the width W of the pockets). Fig. 7 and 8 show a set of pockets, with one pocket stacked with objects in a non-regular configuration. Fig. 8 is a cross-section along the line A-A of Fig. 7. The objects are stacked vertically, and also side-by-side as they are relatively short and thus more than one object can be fitted into the depth D of the pocket (extending from one side of the conveyor to the other).

[0048] The machine is configured to convey a pocket set that has been fully stacked with objects to the trap-door loading position 130 (occupied by pocket set 30 in Fig. 1). The first pocket set 20 is mounted on belts 10a and 10b of the second conveyor 10, while the second

set of pockets 30 is mounted on belts 10c and 10d of the second conveyor 10. In other embodiments each pocket set could be mounted on only one, or alternatively more than two belts. Mounting of the pocket sets on different belts enables them to be controlled independently of each other. Thus, the first pocket set 20 can be stepped slowly passed the first conveyor belt 5, while the second pocket set 30 is moved rapidly to the trapdoor loading position 130 and then back to a position just behind the first pocket set 20, so that it can be filled up with objects from the first conveyor belt 5 once the first pocket set 20 has moved out of the way. In other words the provision of independently controllable pockets or pocket sets enables delivery of the objects to be carried out efficiently and quickly with a minimum number of pockets or pocket sets.

[0049] At the trapdoor loading position 130 the second pocket set 30 is adjacent a loading mechanism 40, in the form of a pusher arm, for moving objects from the pockets 31, 32, 33 and 34 onto the trap door 50. The pusher arm 40 is an elongate member having a pusher head 45 which is extendable into the pockets. The pusher head 45 has a plurality of slots 46 through which the side walls 35 of the pockets slot when the pusher head 45 is extended into the pockets. The pusher arm 40 and pusher head 45 are operable to push objects in the pockets 31 to 34 onto the trap door 50.

[0050] An actuator 51 is provided for opening the trap door 50 when objects have been pushed onto it. Fig. 4 shows the trap door 50 in a closed position. Objects 200 are supported by the hinged plated 52 and 53 which form the doors of the trap door. A carton 85 is positioned at the loading station 65 beneath the trap door 50. The machine has a fourth conveyor 80 for conveying cartons 85 to the loading station 65.

[0051] Fig. 5 shows the situation when the trapdoor is opened. The hinged plates 52 and 53 swing downwardly and the objects 200 are deposited into the carton 85 below at carton loading station 65. As can be seen in Fig. 5 the opened plates 52 and 53 extend substantially perpendicularly downwards at approximately 90° to their closed position and form a funnel for directing the objects 200 into the carton 85. The sides of the funnel are completed by side wall 60 and 61 which are stationary parts of the machine.

[0052] The conveyors are preferably controlled by servo motors. The first servo motor 150 for driving the first set of pockets 20 and second servo motor 160 for driving the second set of pockets 30 via the belts 10a to 10d as discussed above, are shown in Fig. 1.

[0053] The machine has a controller for controlling the second conveyor belt 10 to stack the objects in the desired fashion. In this embodiment the controller controls the first and second servo motors 150 and 160 to move or step the first and second pocket sets 20, 30 in the appropriate fashion. The controller also controls the loading mechanism 40 and trapdoor 50, both of which may be controlled by a pneumatic means. The controller is assisted by input from a third optical detector 170 positioned near the end of the first conveyor 5, and near to the second conveyor 10, which optical detector 170 counts the objects as they are sent to the second conveyor 10. This information is sent to the controller which controls the second conveyor accordingly. The controller may also control the first and second optical detectors 90 and the air blaster 95 as well as the blower 120.

Claims

1. A machine for delivering objects to a carton comprising:

a first conveyor for conveying objects to a pocket on a second conveyor,
a second conveyor having one or more pockets comprising a pair of sidewalls between which objects from said first conveyor can be received;
a trapdoor;
a loading mechanism for transferring objects from a pocket or pockets on said second conveyor onto said trap door, and
an actuator for opening the trapdoor so that objects on the trapdoor fall to a location beneath the trapdoor;

wherein the machine further comprises an object accelerating device for accelerating objects from said first conveyor onto said second conveyor.

2. A machine according to claim 1 wherein the object accelerating device is a blower for blowing a stream of gas for accelerating objects from said first conveyor onto said second conveyor.

3. A machine according to claim 1 or 2 wherein said second conveyor is lower than said first conveyor.

4. The machine of any of any one of claims 1 to 3 wherein the second conveyor has a plurality of pockets adjacent each other forming a set of pockets, each pocket comprising a pair of sidewalls between which objects from said first conveyor can be received.

5. The machine of claim 4 wherein the machine is programmed or configured to load each pocket in said set with objects from said first conveyor before conveying the pocket set to a location near the loading mechanism.

6. The machine of any one of claims 1 to 5 wherein the second conveyor comprises a first belt on which are mounted a first pocket or set of pockets and a second belt on which are mounted a second pocket

or set of pockets, said first and second belts being independently controllable.

7. The machine of any one of claims 1 to 6 wherein there is a third conveyor for conveying objects to said first conveyor.

8. The machine of claim 7 wherein said third conveyor is configured to convey objects at a slower speed than said first conveyor.

9. The machine of any one of claims 1 to 8 wherein the first conveyor is provided with a vacuum apparatus for retaining objects on the first conveyor.

10. The machine of any one of claims 1 to 9 wherein the trapdoor comprises two hinged doors, which are swingable downwards in response to the actuator.

11. The machine of any one of claims 1 to 10 wherein there is a fourth conveyor for conveying cartons to a loading station beneath the trapdoor.

12. A method of delivering objects to a carton comprising the following steps:

(a) using a first conveyor to convey an object to a pocket on a second conveyor, said pocket comprising a pair of sidewalls between which objects from said first conveyor can be received
(b) repeating step (a) one or more times so that a plurality of objects are stacked in said pocket
(c) using said second conveyor to convey said stacked objects to a loading position
(d) using a loading mechanism to move said stacked objects at said loading position from said pocket onto a trapdoor; and
(e) opening said trap door so that said objects fall into a carton.

13. The method of claim 12 wherein said second conveyor is lower than said first conveyor so that said objects fall onto said first conveyor from said second conveyor in steps (a) and (b)

14. The method of claim 12 or 13 wherein an object accelerating device is used to accelerate objects from said first conveyor onto said second conveyor.

15. The method of claim 14 wherein the object accelerating device is a blower for blowing a stream of gas to accelerate objects from said first conveyor onto said second conveyor.

16. The method of any one of claims 15 wherein the second conveyor has a plurality of pockets, arranged adjacent to each other to form a set of pockets, wherein after step (b) said other pockets in the set are stacked with objects according to steps (a) and (b).

17. The method of claim 15 wherein in step (d) said loading mechanism moves said objects in all said pockets in said set onto the trap door.

18. The method of any one of claims 12 to 17 wherein the second conveyor has a first pocket or set of pockets and a second pocket or set of pockets and said first and second pocket or pocket sets are moved independently of each other.

19. The method of any one of claims 12 to 18 wherein the trap door comprises first and second hinged members which swing downwardly when the trapdoor is opened.

20. The method of any one of claims 12 to 19 wherein the objects are conveyed to the first conveyor by a third conveyor that moves at a slower speed than the first conveyor.

21. The method of any one of claims 12 to 20 wherein the cartons are brought to a loading station beneath the trapdoor by a fourth conveyor for conveying cartons.

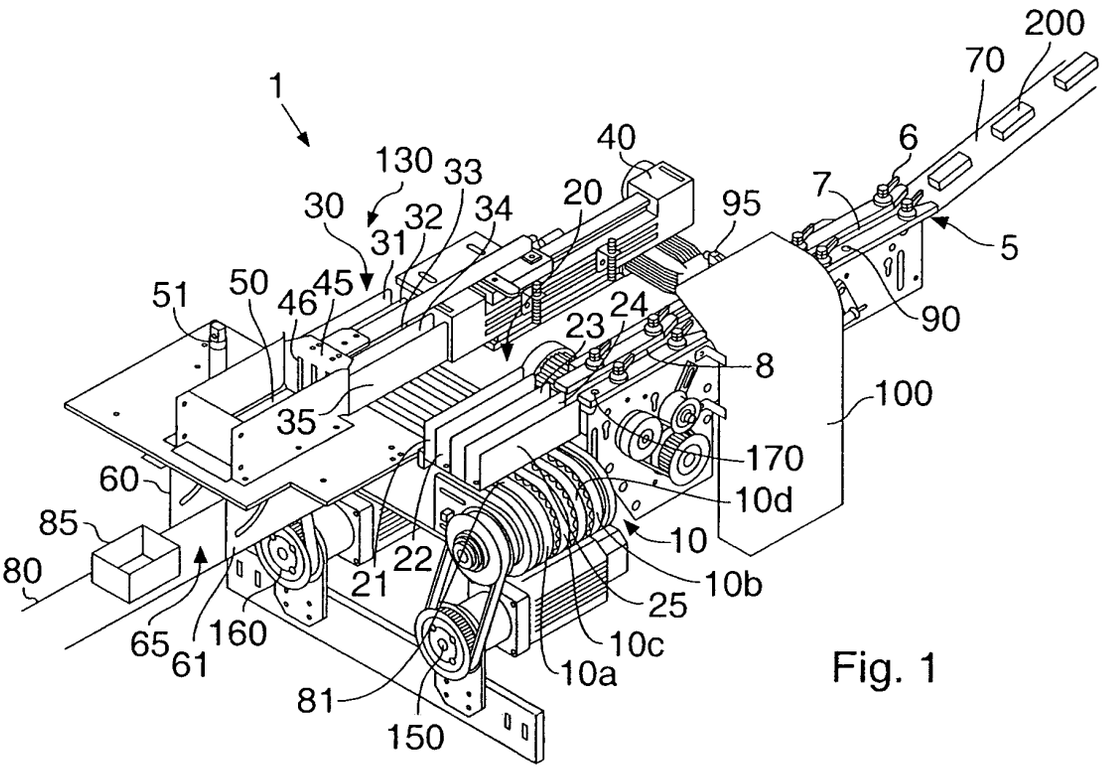

Fig. 1

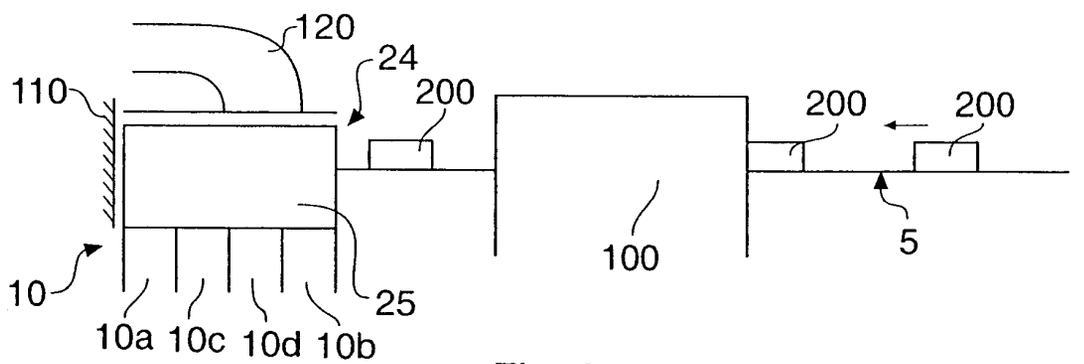

Fig. 2

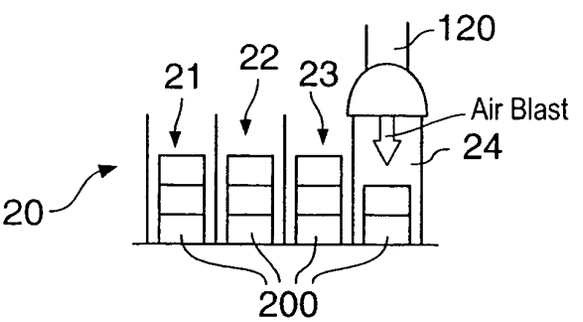

Fig. 3

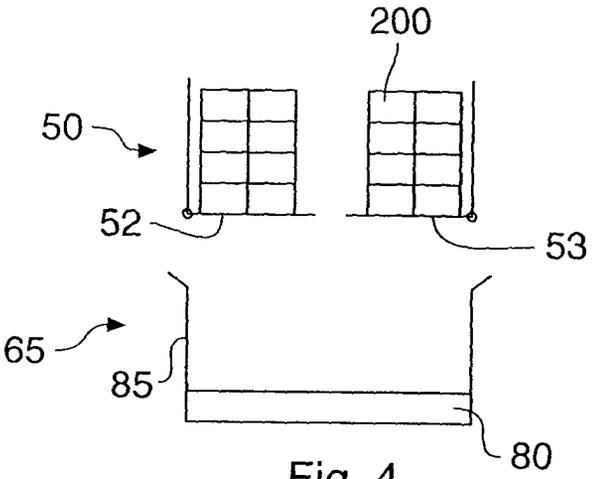

Fig. 4

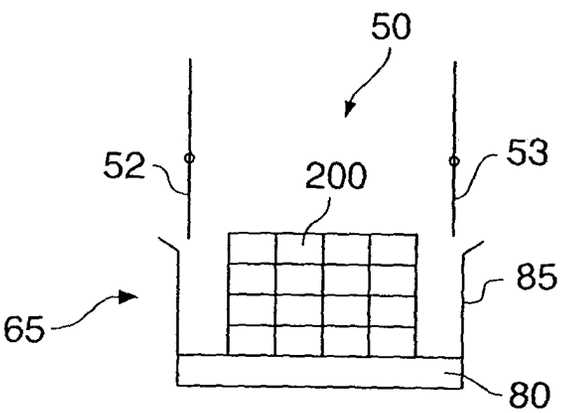

Fig. 5

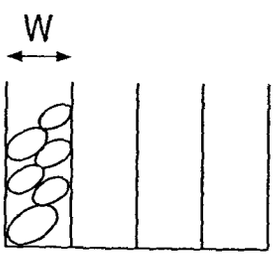

Fig. 6

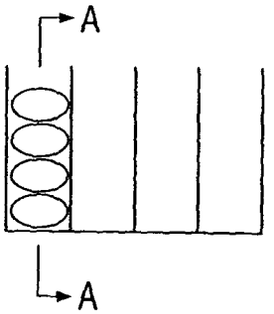

Fig. 7

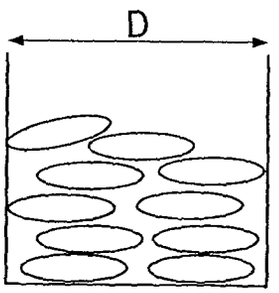

Fig. 8

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Place of search	Date of completion of the search	Examiner
The Hague	12 April 2005	Grentzius, W

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