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### Remarks:

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### (54) Loading device for supplying articles such as blanks

(57) A loading device for supplying articles such as blanks to a machine for processing those articles, the loading device comprising a loading mechanism (70), a first conveyor (32) for supplying pallets loaded with articles (8); a conveyor (36) for removal of empty pallets (4)

and a first pallet lift (38) wherein the conveyor (32) for supplying pallets loaded with articles (8) is disposed in substantially parallel alignment with the conveyor for removal of empty pallets such that full pallets are deliverable as empty pallets are removable.

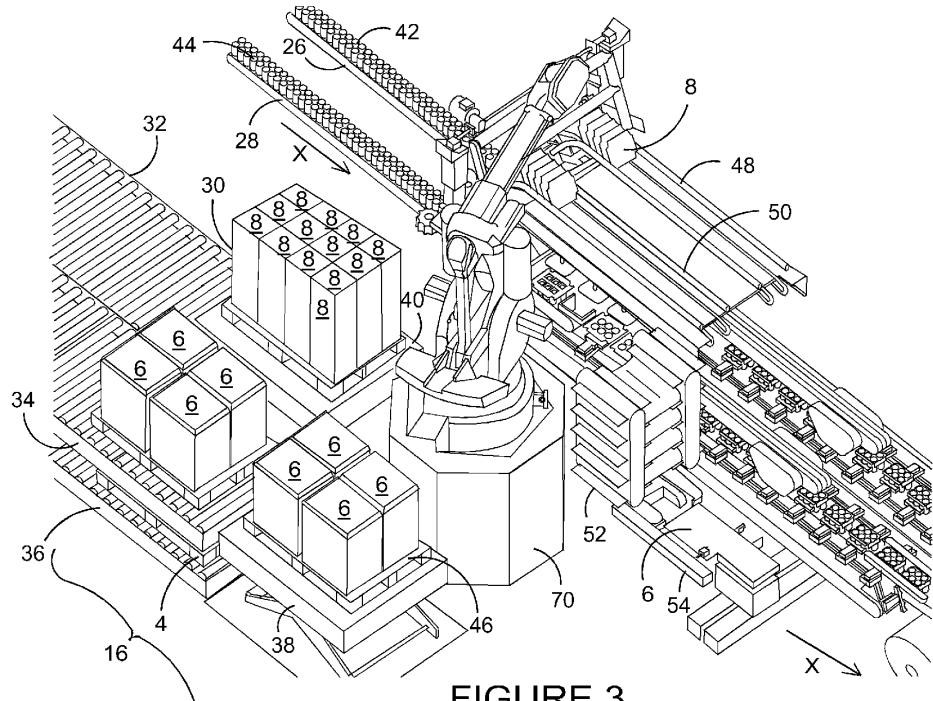


FIGURE 3

**Description****FIELD OF THE INVENTION**

5 [0001] The invention relates to packaging of primary articles, such as cans or bottles, in multiple packaged cartons. More particularly, but not exclusively, the invention relates to an apparatus and method of packaging articles conveyed in more than one adjacent streams simultaneously; an apparatus for and method of metering and grouping articles conveyed in two lines in more than one adjacent streams; a packaging line incorporating such a metering system and including an integrated tertiary packaging system and quaternary wrapping system.

**BACKGROUND OF THE INVENTION**

10 [0002] In the field of packaging it is required to provide adaptable machines that are capable of packaging a variety of types of primary article, such as cans and bottles, into secondary packages (cartons) that contain or hold together an array of articles in a multipack. It is known to provide such multipacks to subsequent sub-assemblies for collating a number of multipacks or cartons into a tertiary package. Furthermore it is known to provide groups of such tertiary packages to yet a further subsequent sub-assembly for collating a number of such tertiary packages and wrapping them into palletised load for distribution to retail outlets.

15 [0003] In the interests of economic and efficient packaging, it is required to achieve the highest throughput of cartons and wrapped tertiary packages as possible. The linear size of a packaging line; the types of article; and the type of carton that can be accommodated by a packaging line are also important considerations as well as the wear on the machine. Higher throughputs can be achieved if machine lines can be run faster; however this is not always possible when manipulation of cartons introduces complexities that limit the run-speed. Additionally, running at high-speeds can cause components of a machine to suffer wear and damage due to friction and heat. This in turn can cause down time to the packaging machine and potentially the entire bottling line as well as costly repair to the machines. It is therefore advantageous to optimise machine output in other ways than simply increasing the machine run-speed. In fact because of the wear, friction and heat damage that can be caused, it is desirable to run machines at slower speeds without compromising the throughput of packaged articles.

20 [0004] Many known machines are capable only of packaging one type of carton and bottling plants can be required to use a plurality of machines to package different carton types; each machine takes up considerable floor space and can be expensive to purchase and operate. It is therefore desirable to have packaging machines that are adaptable for accommodating a variety of articles; carton types and carton sizes. It is also desirable to minimise the linear size of packaging machines to reduce the amount of floor space occupied.

25 [0005] The present invention seeks to provide a number of advantages or improvements in the field of packaging.

**SUMMARY OF INVENTION**

30 [0006] According to a first aspect, the invention provides a packaging machine comprising at least two independent paths upon which primary articles to be contained by a secondary carton are conveyed from an infeed end of the packaging machine to an integral tertiary packaging device wherein secondary cartons directly output from said two independent paths are merged and combined with a tertiary package characterised in that tertiary packages are conveyed along a transfer means out of said tertiary packaging device travelling at a speed the same as that of each of the paths upon which incoming primary articles are disposed.

35 [0007] Preferably, the packaging machine comprises a device for grouping articles operable to interact with articles on each path simultaneously.

40 [0008] Optionally, the device for grouping articles disposed between two adjacent ones of said paths, for grouping and metering primary articles conveyed on each of the two paths simultaneously. Additionally, or alternatively, the packaging machine comprises a transfer conveyor for supplying a tertiary article to the tertiary packaging device for combination with the processed articles being merged, the transfer conveyor having an infeed end disposed above or below a horizontal plane containing said two paths and being inclined such that an output end of the transfer conveyor is disposed between and in substantially co-planar alignment with said two paths whereat the processed articles are merged and combined with the tertiary article.

45 [0009] Optionally, a finishing device is disposed upstream of said tertiary packaging device, the finishing device being structured and arranged to receive articles directly output from the tertiary packaging device, and to convey finished packages out of said finishing device along a transfer means travelling at the same speed as each of the paths upon which incoming primary articles are disposed.

50 [0010] Optionally, the packaging machine comprises means for supply of secondary packages to each of the two paths for combination with the primary articles; a means for supply of tertiary packages for combination with the primary

articles and secondary packages, the means of supply of the tertiary package being up stream of the means for supply of the secondary article; and a single loading device operable to load, in turn, secondary packages and tertiary packages to the respective means for supplying secondary and tertiary articles.

[0011] Accordingly, a second aspect of the invention provides, a device for grouping articles to be contained by a secondary carton, the device comprising a first series of spacer elements arranged to move along a pre-determined path, each spacer element operable to engage at least one article from a first infeed stream and to convey articles through a working reach of the device, the device further comprising a second series of spacer elements arranged to move along a similar pre-determined path, each spacer element of the second series operable to engage at least one article from a second infeed stream of articles, characterised in that a spacer element of the first series of spacer elements is coupled to a spacer element of the second series of spacer elements by a drive means such that the coupled spacer elements are conveyed at the same speed.

[0012] Preferably, the spacer elements of the first and second series are disposed back-to-back and operate on separate streams of primary articles disposed on separate independent conveyors to synchronise the processing of primary articles on said separate independent conveyors such that primary articles processed by the device as they are conveyed on each of said separate independent conveyors are similarly grouped and metered and output from the output end of their respective separate independent conveyor in synchrony.

[0013] Optionally, spacer elements of the first series are coupled to spacer elements of the second series in pairs by means of a common bar and said pairs of spacer elements structured and arranged to follow a cam-path of the device to control and synchronise their journey through the working reach of the device.

[0014] According to a third aspect, the invention provides a loading device for supplying articles such as blanks to a machine for processing those articles, the loading device comprising a loading mechanism, a conveyor for supplying pallets loaded with articles; a conveyor for removal of empty pallets and a first pallet lift wherein the conveyor for supplying pallets loaded with articles is disposed in substantially parallel alignment with the conveyor for removal of empty pallets such that full pallets are deliverable as empty pallets are removable.

[0015] Optionally, the loading device further comprises a second conveyor for supplying loaded pallets and a second pallet lift, wherein the same loading mechanism is also operable to take articles from a loaded pallet on the second conveyor and supply them to another in-feed point of a packaging machine and wherein the second pallet lift is operable to move a pallet from the second conveyor for supplying pallets to the said conveyor for removal of empty pallets, which conveyor for removal of empty pallets services both the first and second conveyors for supplying loaded pallets.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Exemplary embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Figures 1A and 1B show exemplary carton packages constructed by a packaging machine according to a first embodiment of the invention;

Figure 2 shows a perspective view of an exemplary packaging line according to a first embodiment of the invention;

Figure 3 shows an enlarged view of an infeed end of the packaging line of Figure 2;

Figure 4 shows an enlarged view of a metering mechanism and carton forming section of the packaging line of Figure 2;

Figure 5 shows a zoomed in view of the carton infeed, carton forming and metering mechanism shown in Figures 2 to 4;

Figure 6 shows an enlarged view of the metering mechanism of the packaging line of Figure 1; and

Figure 7 shows an enlarged view of a tertiary packaging section of the packaging line of Figure 1.

[0017] For ease of reference to the features shown in the drawings, a list of features and their corresponding reference numeral is provided below:

Reference numeral	Feature	Reference numeral	Feature
X	Direction of travel of articles and packages on packaging line	50	Second hopper for carton blanks

(continued)

Reference numeral	Feature	Reference numeral	Feature	
5	C	Primary articles	52	Lift for case packer blanks
4	Empty pallet (used for tertiary carton blanks)	54	Hopper for tertiary blanks	
10	6	tertiary carton blanks	56	infeed end
12	8	secondary carton blanks	58	rotary vacuum mechanism
14	10	Packaging Line	60	Suction cups
15	12	tertiary carton infeed mechanism	62	Star wheel
16	14	finishing device	64	Grouping mechanism
18	16	auto-loading assembly	66	Delay mechanism
20	18	Transfer robot	68	Finishing mechanism
24	20	Robot rotator	70	Loading mechanism
26	24	secondary package to tertiary package loading section	72	Lifting arm
28	26	First conveyor	74	former
30	28	Second conveyor	76	Single lug
32	30	pallet loaded with secondary carton blanks	78	Tertiary blank conveyor
34	32	Conveyor for supplying a full pallet of secondary carton blanks	80	Completed secondary package
36	34	Conveyor for supplying full pallet of tertiary carton blanks	82	Group of two pairs of completed secondary packages
38	36	Conveyor for empty pallets	84	Outer endless drive means
40	38	First pallet lift	86	inner endless drive means
42	40	Second pallet lift	88	Spacer elements
44	42	first stream of primary articles	90	bars
46	44	Second stream of primary articles	92	Cam path
48	46	pallet loaded with tertiary carton blanks	94	Outer grouping mechanism
	48	First hopper for carton blanks	96	Inner grouping mechanism

## DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

**[0018]** A packaging line of the present invention will be described with general reference to each of the Figures 2 - 7. The present invention provides for the efficient packaging of primary articles such as cans or bottles (C) into secondary cartons, such as the exemplary top-gripping clips 8a, 8b (as shown in Figures 1A and 1B) by utilising two incoming streams of articles C. The articles C on each incoming stream are processed simultaneously thus doubling the output compared to a single article stream packaging machine running at an equivalent linear speed.

**[0019]** The packaging line 10 of the present invention is shown in Figure 2. The packaging line comprises an infeed end generally denoted by reference 56; an auto-loading assembly generally denoted by 16 for loading secondary carton blanks 8 and tertiary carton blanks 6; a tertiary carton infeed mechanism, generally denoted by reference 12; a secondary package 8 to tertiary package 6 loading section generally denoted by reference 24 and a finishing device 14. The packaging line 10 accommodates primary articles C conveyed in two streams on a first conveyor 26 and accommodates primary articles C conveyed in two streams on a second conveyor 28. The first and second conveyors, 26, 28 receive, at one end, primary articles C from the output end of a bottling or filling line and deliver the articles C, at their other end

to the infeed end 56 of the packaging line 10. The conveyors 26, 28 may be of adjustable width to enable a variety of articles C (such as 330ml cans to 500ml bottles) to be accommodated by the packaging line. In a preferred embodiment, each of the first and second conveyors 26, 28 is sized to accommodate two primary articles C side-by-side. A first stream of primary articles C is denoted in Figure 3 by reference 42 and a second stream of primary articles C is denoted by 44.

5 Secondary cartons 8a and 8b are structured to accommodate four and six cans C arranged in 2x2 and 2x3 configurations respectively. It will be realised upon reading the following description with reference to the drawings that the secondary packaging clips 8a and 8b are illustrative examples of secondary packages or secondary carton wrappers and it is envisaged that the packaging machine of the present embodiment and other embodiments can accommodate different types of secondary packages, (more generally indicated in Figures 2 - 8 by reference numeral 8) for containing, as well 10 as cans, other primary articles C such as bottles and for example plastic dairy pots. Such primary articles C may be contained in the secondary cartons in variety of configurations. The direction of travel of the primary articles C is denoted by arrow 'X'.

[0020] To consistently provide secondary carton blanks 8 and tertiary carton blanks 6 (see Figure 3) to first and second carton hoppers 48, 50 and tertiary carton lift 52 and tertiary carton hopper 54, an auto-loading assembly 16 is provided.

15 The auto-loading assembly 16 is most clearly shown in Figure 3. The auto-loading assembly 16 comprises a loading mechanism 70, a conveyor 32 for supplying pallets loaded with secondary carton blanks 8; a conveyor 34 for supplying pallets loaded with tertiary carton blanks 6; a conveyor 36 for removal of empty pallets 4; a first pallet lift 38 and a second pallet lift 40.

[0021] The auto-loading assembly 16 is compact and therefore minimises the amount of floor space required to supply 20 pallets loaded with secondary and tertiary carton blanks 30, 38. Additionally, by automating this process, the need for an operator is alleviated. The auto-loading assembly 16 operates by the conveyors 32 and 34 supplying pallets 30 loaded with secondary carton blanks 8 and pallets 46 loaded with tertiary carton blanks 6 respectively. At the end of each conveyor 32, 34 a lift 40, 38 is provided. When a lift 40, 38 is not holding a pallet 30, 46, a loaded pallet 30, 46 is supplied by the appropriate conveyor 32, 34. The loaded pallet 30, 46 is in this embodiment moved from the end of the supply 25 conveyor 32, 34 onto the associated adjacent lift 40, 38 by the loading mechanism 70. In other embodiments a transfer means connected to the lift 40, 38 is used to transfer a pallet 30 loaded with secondary carton blanks 8 and pallets 46 loaded with tertiary carton blanks 6 to the associated lift 40, 38.

[0022] Once a pallet 30 loaded with secondary carton blanks 8 and/or a pallet 46 loaded with tertiary carton blanks 6 is disposed on a lift 40, 38, the loading mechanism 70 (fitted with an articulated lifting arm 72) picks up a stack of blanks 30 8 or 6 using an articulating lifting arm 72 and loads the blanks 8; 6 onto the appropriate hopper 48/50 or 52 respectively. Once sufficient loading repetitions have been completed and a pallet emptied of secondary or tertiary carton blanks 6, 8, the lift 40, 38 holding the empty pallet 4 is lowered substantially to the same height as the conveyor for empty pallets 36. The empty pallet is transferred, in this embodiment by the loading mechanism onto the conveyor for empty pallets 36 which is operable to remove the empty pallet(s) away from the auto-loading assembly 16. The pallet conveyors 32, 34, 36 are controlled using a programmable logic controller and therefore no human operator of the machine is required 35 in this area.

[0023] The outward conveyor 36 for removal of empty pallets 4 is disposed below the conveyor 34 for supplying pallets 40 46 loaded with tertiary carton blanks 6. This means that the supply and removal mechanism are accommodated within the same floor space and thereby minimise the amount of floor space required to supply loaded pallets and remove loaded pallets. This compact solution reduces the area required by the packaging line 10.

[0024] It is envisaged that in other embodiments, the outward conveyor 36 is disposed below the other conveyor 32 for supplying pallets 30 loaded with secondary cartons 8. In yet a further embodiment, both inward supply conveyors 34, 32 have their own outward conveyor 36. However, it is most advantageous to require only one outward conveyor 36 servicing the two inward conveyors 32, 34. A further advantage of the present invention is gained because the tertiary 45 carton lift 5 and tertiary carton hopper 54 are disposed within operable reach of the loading mechanism 70. The loading mechanism 70 can supply blanks 8 to both hoppers 48, 50 for the secondary blanks and to the tertiary carton lift 52 that in turn supplies the tertiary carton hopper 54. The compact nature of the loading mechanism 70 and its versatility enables the efficient supply of blanks 6, 8 to the packaging line. In known packaging machines a tertiary packaging assembly is provided as a separate assembly to the secondary packaging assembly or is provided so far down stream of the supply 50 for the secondary blanks that separate tertiary blank 6 supply is required. Beneficially, the packaging line of the present invention is structured and arranged such that the supply and infeed of the secondary carton blanks is situated in close proximity to the supply and infeed of tertiary carton blanks and therefore a single loading mechanism 70 can efficiently serve them both, thus increasing efficiency (by virtue of requiring less components and/or machine operators) and a more compact packaging line 10.

[0025] Meanwhile, the two incoming streams of articles 42, 44 are supplied with regular line pressure by star wheels 62. Star wheels 62 are known in the art for regulating article flow. In this embodiment four star wheels are used on for each side of each incoming stream of articles 42, 44. In other embodiments where one or each stream comprises only a single line of articles the number of star wheels may be reduced. In an alternative embodiment, where greater than 55

two incoming streams of articles are accommodated the number of star wheels 62 is greater than four. In the present embodiment, each star wheel 62 is provided with its own independent driver, preferably a servo-motor. By having independently driven star wheels 62, the packaging line remains fully adjustable in order to ensure synchronised incoming streams 42, 44.

5 [0026] The metering mechanism 64 (described below) groups the incoming streams of articles 42, 44 into the required configuration. In the example being described and illustrated the secondary carton blanks 8 hold 6 articles C in a 2x3 configuration (see Figure 1B). The metering mechanism 64 of the present embodiment is operable on each side of each incoming stream of articles 42, 44 and separates the articles C into groups of 2x3 articles.

10 [0027] Once the first and second hoppers 48, 50 have been supplied with secondary carton blanks 8, and in time of the assembly of a first group of articles C, each of the first and second hoppers 48, 50 simultaneously supplies an individual blank to a rotary vacuum mechanism 58 which through the use of vacuum suction cups 60 (known in the art) deposits a blank 8 simultaneously onto a group of articles C in each incoming stream 42, 44. This is illustrated in Figure 5. In this illustrated embodiment, a single rotary vacuum mechanism 58 is used to supply blanks 8 to each of the incoming streams 42, 44. This simplifies the processing and minimises the number of required motors. The need to synchronise 15 two independently driven rotary vacuum mechanisms that could be used, one to deposit blanks 8 on groups formed in one incoming stream 42 and the other to deposit blanks 8 on groups formed in the second incoming stream 44 is therefore alleviated. However, in an envisaged embodiment two independently driven rotary vacuum mechanisms are used where each incoming stream 42, 44 comprises different articles C and C' (not shown). This optional feature whilst incorporating a slight increase in complexity provides the advantage that the packaging line 10 can offer a greater degree of flexibility.

20 [0028] Subsequent groups of articles C are created as both streams of articles 42, 44 are conveyed downstream of the infeed 56. In this embodiment the secondary cartons are placed upon a group of articles C by means of a former 74. In other embodiments the 2x3 former is replaced with an appropriate former for the configuration of the cartons being packaged. In other embodiments a former is not used, as such a former is entirely optional.

25 [0029] The grouping mechanism 64 will now be described with specific reference to figure 6. The first and second infeed streams of articles 42, 44 each comprising articles C in side by side abutting relationship is introduced into each infeed end of the grouping mechanism 64. As mentioned above, the line pressure of the articles C is preferably controlled by infeed star wheels 62 as is well known. The article grouping mechanism 64 groups the correct number of articles C per carton as described below with the mechanism also controlling the flow of articles C, so that they can be coupled with the cartons at the same rate of carton flow downstream of the grouping mechanism 64.

30 [0030] The grouping mechanism 64 comprises a grouping assembly 94 positioned on each side of the article conveyor. Each grouping assembly 94 is similar in construction; first the outer grouping assembly 94 will be described and then an inner grouping assembly 96 (comprising two grouping assemblies disposed in back-to-back relationship) will be described.

35 [0031] The assembly 94 includes a plurality of spacer elements 88 mounted on an endless conveyor comprising a spaced pair of endless chains 84. In this embodiment, each spacer element 88 includes an engagement portion comprising three partly cylindrical recesses, positioned adjacent one another. If the articles C to be packaged are the same size then each recess has an identical length and is shaped substantially to conform to a peripheral wall portion of a bottle or can C (or other article) with which the recess is to engage. The spacer elements 88 can be grouped into pairs with leading or trailing spacer elements.

40 [0032] Cam followers project from the underside of body portions of the spacer elements (not shown). Each spacer element 88 is connected to the endless chains 84 by suitable attachment means. In this embodiment, the body portion of each element is slidably mounted on a pair of bars 98 extending between and secured to the endless chains 84 (only one visible). This arrangement permits transverse movement but prevents a rotational or longitudinal movement of the spacer elements 88 with respect to the endless chains 84.

45 [0033] The endless chains 84 are mounted onto guide tracks of the assembly 94. The assembly 94 further comprises a cam track 92 to receive the cam followers extending from each spacer element 88. The endless chains 84 are driven by a motor, for example a servo motor (not shown) through a drive shaft. As each spacer element 88 moves downstream along the path of the cam track 92 the recesses are maintained in a plane parallel to the direction of motion of the articles C on the article conveyor 26, 28.

50 [0034] In operation continuous downstream motion of the endless chains 84 causes the leading spacer element 88 to be deployed into engagement with the articles C before a trailing spacer element, thus causing the mechanism to form two groupings of articles C having a maximum length of three articles C and a relatively short pitch therebetween.

[0035] Optionally, in order that the grouping mechanisms 94, 96 can be used to produce two groupings of between one and three articles length in the flow direction, or alternatively one grouping comprising between four and six articles length in the article flow direction, the mechanism has a second mode of operation.

[0036] To this end, in addition to the primary cam track 92, (that brings the spacer elements 88 into contact with the articles C to achieve the desired grouping), a secondary cam track (not shown) is in another embodiment provided such that spacer elements 88 following the secondary cam track are delayed from being deployed into contact with the articles

C. An adjustment or selecting means is provided to select whether the leading spacer element 88 enters the secondary cam track according to the particular mode of operation. A blocking member is preferably provided at the exit of the secondary cam track to ensure that the trailing engagement member (not depicted) does not partially retract when passing the opening or catch in the opening.

5 [0037] The inner grouping assembly 96 has been structured and arranged to optimize the space required by this section of the packaging line 10. The spacer elements 88 on the inner grouping assembly 88 are mounted onto each end of the double ended bars 90 that extend between and are secured to the endless chains 86. In this way the inner grouping assembly 96 is formed from two of the outer grouping assemblies 94 arranged back-to-back but with the significant difference that a spacer element 88 is mounted onto each end of the bars 90 and only two endless chains 10 86 are needed to drive two opposed spacer elements 88, whereas in the outer grouping assembly 94, two endless chains 84 (or other suitable drive means) are required for only a single headed assembly. The inner assembly 96 is therefore narrower than the sum of the widths of two outer assemblies 94 such that a dual ended metering system is 15 operable between the two processing streams 26 and 28. It is envisaged that in other embodiments the spacer elements 88 on each side of the dual-ended metering system could be differently configured, arranged and/or shaped in order to 20 accommodate different styles of articles C in each of the two lanes 42, 44.

25 [0038] The grouping of articles C is, as described above, adaptable such that groups of between 1 and 6 articles C can be created (for 4 - 6 articles C a dual cam track arrangement is needed and two adjacent spacing elements 88 operate as a pair, this is not shown). The grouping of the articles C is an optional feature of the general packaging line 10 and metering may be done in other ways, however for the dual lane packaging line described, the double sided 30 grouping mechanism 96 offers a compact solution that is adaptable to different sizes of articles C and can accommodate cartons requiring a variety of configurations. Because the grouping mechanism 96 is narrower than the sum of the widths of two outer assemblies 94, the overall width of the packaging line 10 is kept sufficiently narrow that collated carton groups 82 easily can be transferred onto a tertiary blank 6 (see description below).

35 [0039] Additionally, it is envisaged that in other embodiments, the spacing elements on one side of the grouping assembly 96 might differ in shape and/or size than those of the other side to accommodate different types of article C being provided on the first and second processing lines 26, 28. In such an embodiment the final tertiary package would 40 contain say two packs of cans and two packs of bottles.

45 [0040] The carton package is completed by passing the grouped articles C and secondary carton through finishing mechanism 68, in this case a pair of rollers 68 which apply pressure to each side of a package to ensure that the side portions of the carton have been secured in place. As discussed above, the precise nature of the carton to be packaged is optional and as such the use of pair of rollers 68 is entirely optional. The completed package 80 is then transferred to a delay mechanism comprising a single lug 76, lug chain. As completed packages 80 are transferred to the delay mechanism 66 the travel of a leading package 82 is slowed and an immediately trailing package catches up. The slowing of a package to create a group of 2 packages is achievable with a system of belts, wheels, a robot or chains with and 50 cam path such that articles are regrouped into 2x6 articles (2 packages of articles arranged in a 2x3 configuration or 3 packages arranged in a 2x2 configuration) and is not limited to the mechanism described herein.

55 [0041] At the same time as the carton packages 80 are being assembled, tertiary carton blanks 6 are transferred, along a conveyor 78 from the lift for case packer blanks 52 onto the tertiary carton hopper 54 and then conveyed underneath and between the grouping mechanisms of the first incoming stream 42 and second incoming stream 44. By using two tiers, the linear dimension of the packaging line is reduced and made more compact. The delivery of tertiary carton blanks 6 is synchronized with the assembly of the carton packages 80 such that the tertiary carton blanks arrive proximate the level of the grouped packages 82 and between the two processing streams (see Figure 8). Almost immediately the construction and grouping of a pair of packages 80 in each processing stream is completed a tertiary blank 6 is supplied to receive them. A transfer robot 18 is provided either side of processing streams 42, 44 to move the collated pair of packages 82 of each processing stream 42, 44 onto the tertiary blank 6 disposed therebetween (as shown in Figure 7). By using robots to pick and place the collated packages 82 in this way the pitch of the packaging line 10 is maintained and the tertiary packaging assembly is formed as an integral part of the packaging line 10 without the need for conveying the finished packages 82 to a separate sub-assembly for transferring the collated secondary packages to a tertiary package.

60 [0042] In an optional final step in the processing carried out by the packaging line 10 described, the tertiary packages are transferred by a rotator robot 20 and transferred to a finishing device, in this embodiment a shrink wrapping device.

65 [0043] The construction of the carton 8 as illustrated in the Figures provides an illustration of how the benefits of the present invention can be applied to a specific secondary carton formation and tertiary packaging into a crate. It is envisaged that cartons formed by a different series of sequential folding operations, preferably in a straight line machine, could be assembled by a packaging machine according to the invention without necessarily involving the grouping, forming and finishing steps described. As such the invention should not be construed as being limited in application to the specific carton or article types described or folding and construction process described and these aspects may be altered according to particular manufacturing requirements.

[0044] Upon reading the foregoing it will be understood that the present invention provides improvements in the field of packaging machinery. In a known single line packaging machine, articles are collated using a secondary clip, the grouped articles are then transferred along a conveyor to a second in-line sub-assembly, a divider, where the single line is split so that two side-by-side packages can be transferred to a third in-line sub assembly. Tertiary package blanks are supplied to the third in-line subassembly and the secondary packages are loaded into the tertiary packs which are then conveyed along to a fourth in-line subassembly where shrink wrap finishing is conducted. The average length of such a machine is 300m, whereas the aforescribed packaging line of the present invention is only 120m. The single line machine is known to run at an average linear operational speed of 760m per minute whereas the double line integrated packaging line of the present invention only needs to run at an average linear operational speed of 380m per minute to produce 300 cartons per minute (comprising 4 articles in a 2x2 configuration) and 50 tertiary packages (comprising 24 articles). In summary, the present invention provides a compact and efficient machine having a high-throughput yet being less than half the length of an equivalent known machine and able to operate at half the linear running speed of known machines without compromising the throughput. These advantages are gained by providing a dual line machine with simultaneous processing of two (or more) lanes of articles; a compact (narrow and short) metering and grouping mechanism that services both lanes of articles simultaneously; an auto-loader mechanism that services both the secondary blank hoppers and the tertiary hopper; an outward conveyor disposed in vertical alignment with the pallet delivery conveyor (to reduce the linear dimension of machine line); a tertiary carton in-feed/transfer disposed in vertical alignment with the secondary package formation (to reduce the linear dimension of machine line) and positioned such that the tertiary package blanks meet the packaged secondary articles within only a few carton pitches (preferably one) of the completion of the secondary packages; and immediate transfer of tertiary packages to finishing device.

[0045] It can be appreciated that various changes may be made within the scope of the present invention, for example in other embodiments the size and shape of the articles and cartons packaged and style of secondary and tertiary packages will differ from that illustrated herein. In other embodiments of the invention it is envisaged that the finishing device is omitted or in other embodiments where the finishing device is present, the finishing process may be other than shrink wrapping.

[0046] It is also envisaged that whereas processing on two lines simultaneously has been described, in other embodiments, three incoming lanes or processing lanes are provided and each are acted upon simultaneously. In such an embodiment the metering device may comprise two dual sections and two single sections. Additionally, the in feed of the tertiary package in such an embodiment may be disposed between the first and second and/or second and third lanes or alternatively, may be aligned with the end of the second lane such that cartons from the second lane are immediately fed onto the tertiary carton blank and the secondary cartons from the first and third processing lanes are transferred by the transfer robot onto the tertiary package. However, optimum benefit in reduced complexity is gained by using two processing lines and although it is envisaged that more than two processing lines can be used, it will be understood that the advantage of reducing the linear dimension will be offset by the necessary increased width of such a packaging machine.

[0047] It will be recognised that as used herein, directional references such as "in", "end", "up", "down", "side" do not limit the described feature to such orientation, but merely serve to distinguish relative orientations one another.

## 40 Claims

1. A loading device for supplying articles such as blanks to a machine for processing those articles, the loading device comprising a loading mechanism (70), a first conveyor (32) for supplying pallets loaded with articles (8); a conveyor (36) for removal of empty pallets (4) and a first pallet lift (38) wherein the conveyor (32) for supplying pallets loaded with articles (8) is disposed in substantially parallel alignment with the conveyor for removal of empty pallets such that full pallets are deliverable as empty pallets are removable.
2. A loading device according to claim 1 wherein the loading mechanism is operable to take articles from the loaded pallet and supply them to one or more in-feed points of a packaging machine and wherein the first pallet lift is operable to move a pallet from the first conveyor for supplying pallets loaded with articles to the conveyor for removal of empty pallets once the loading mechanism has taken articles from the loaded pallet.
3. A loading device according to claim 2 further comprising a second conveyor for supplying loaded pallets and a second pallet lift, wherein the same loading mechanism is also operable to take articles from a loaded pallet on the second conveyor and supply them to another in-feed point of a packaging machine and wherein the second pallet lift is operable to move a pallet from the second conveyor for supplying pallets to the said conveyor for removal of empty pallets, which conveyor for removal of empty pallets services both the first and second conveyors for supplying loaded pallets.

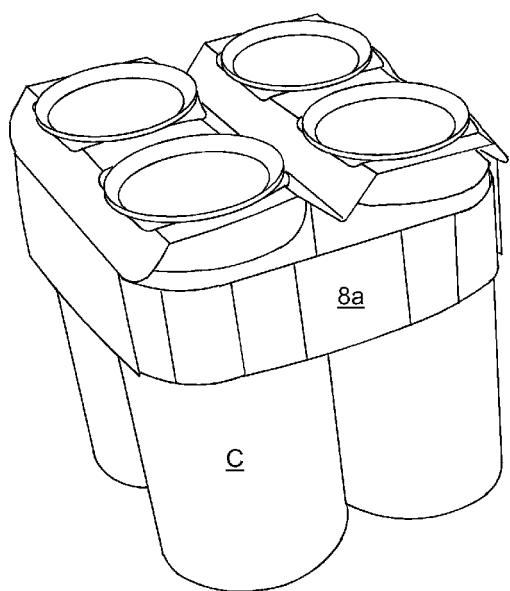


FIGURE 1A

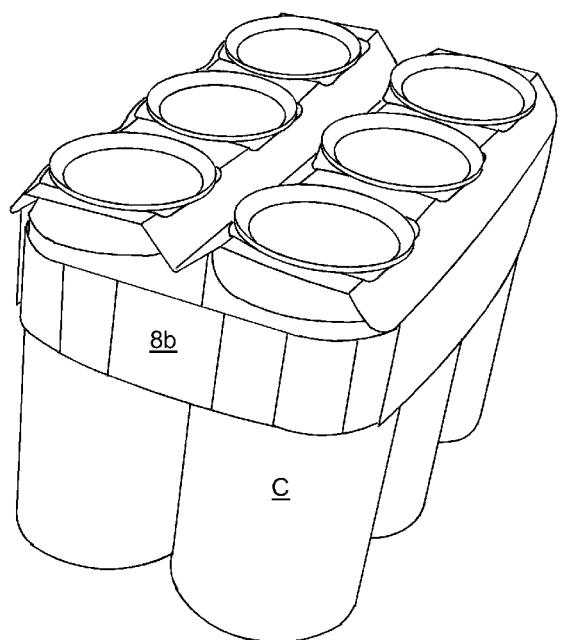


FIGURE 1B

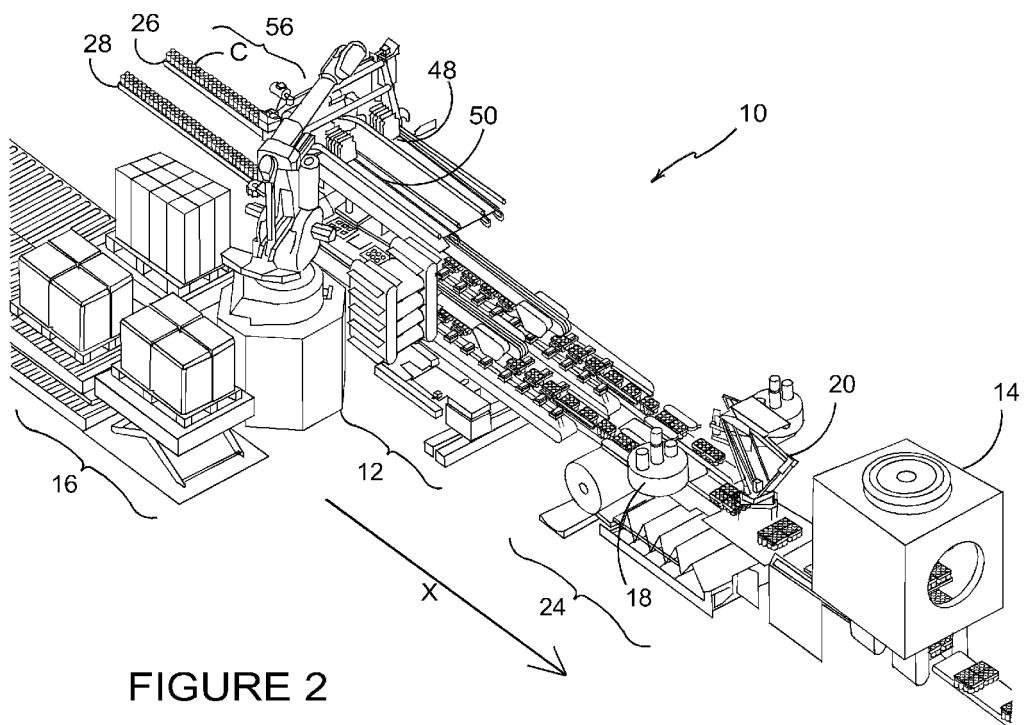
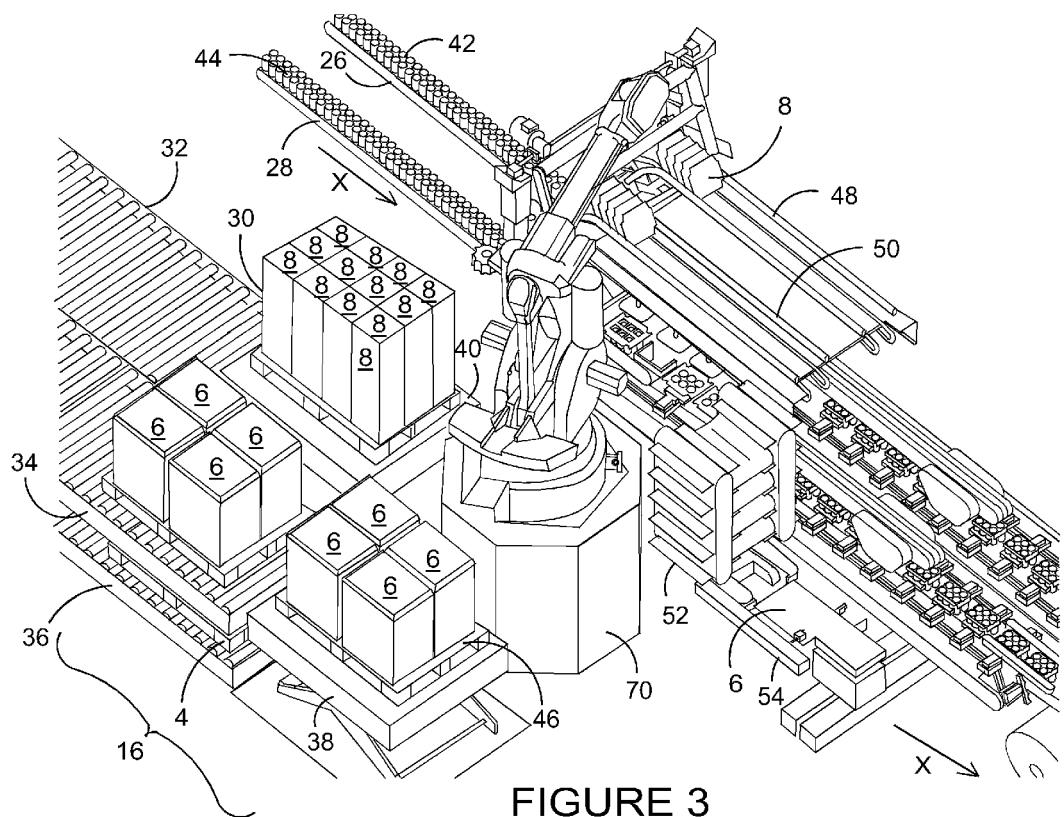


FIGURE 2



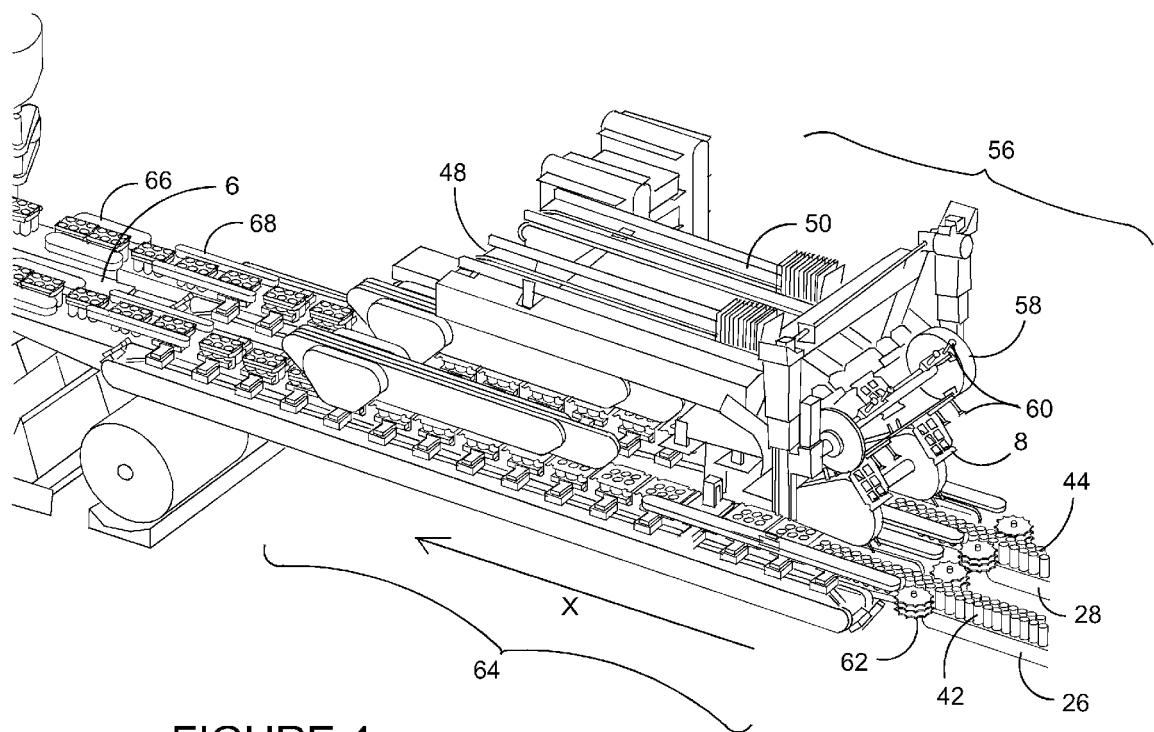
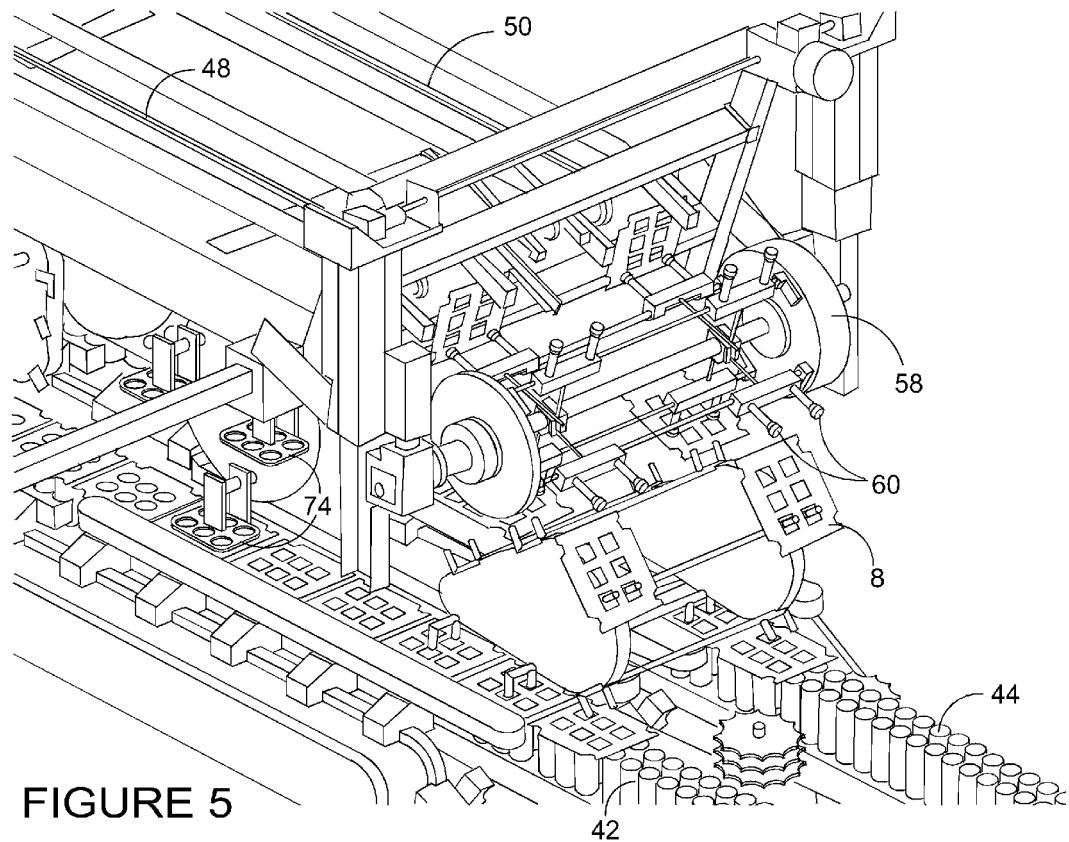


FIGURE 4



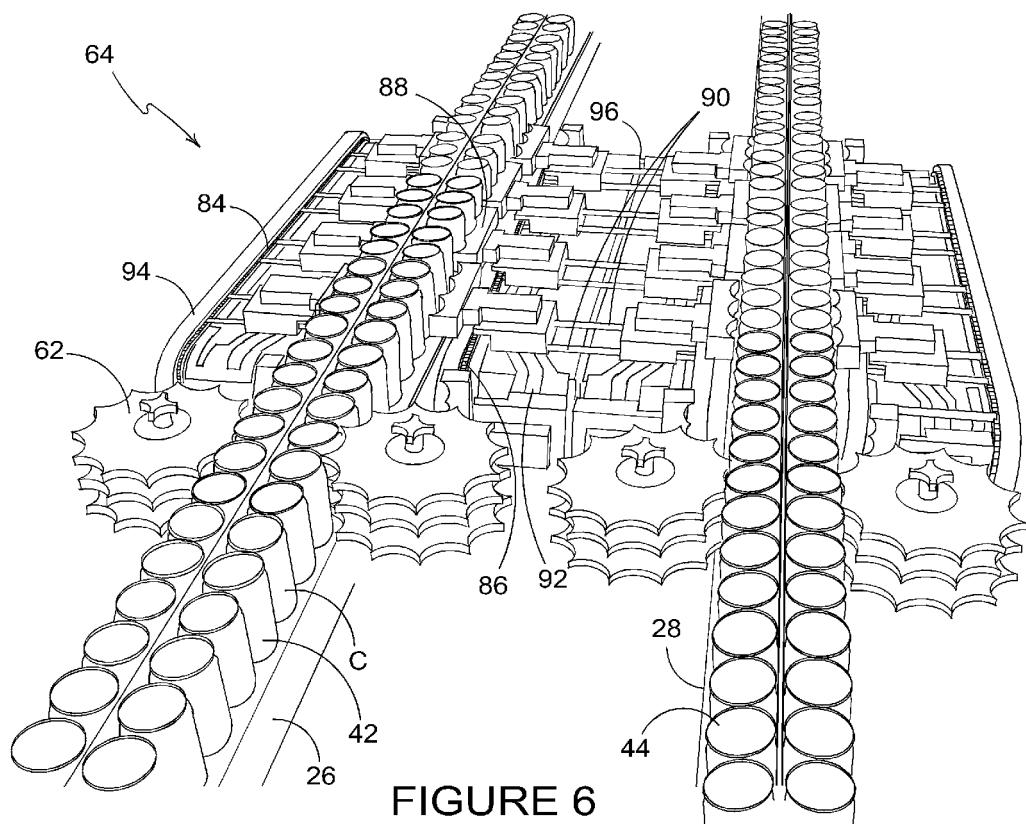


FIGURE 6

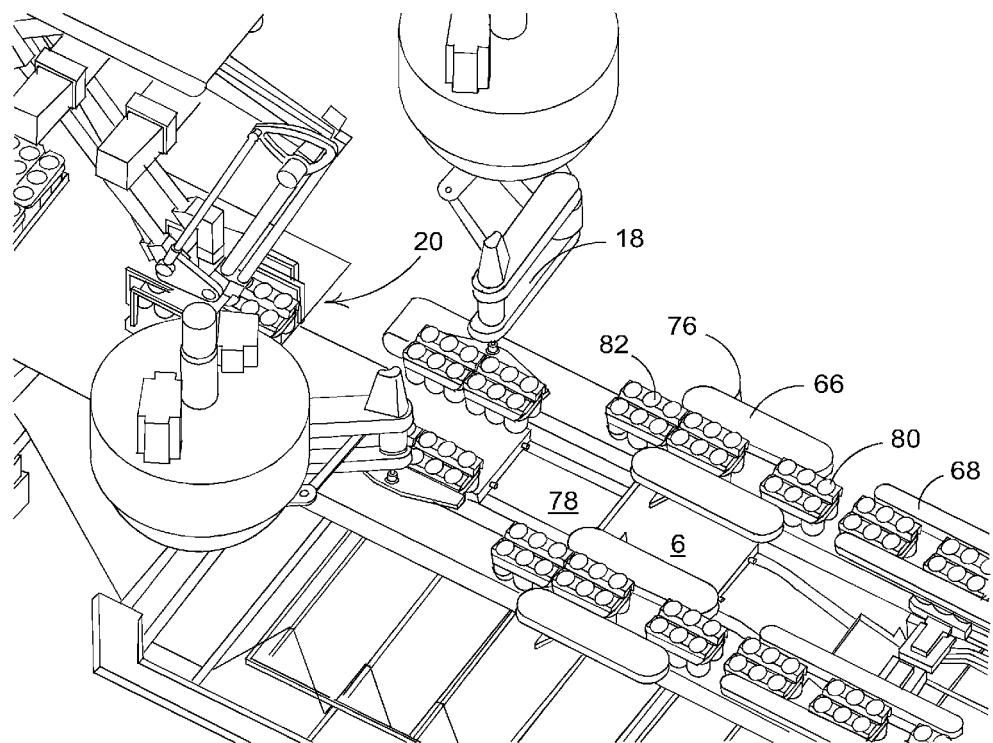


FIGURE 7



## EUROPEAN SEARCH REPORT

Application Number  
EP 12 18 1314

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
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A	-----	1	
1			TECHNICAL FIELDS SEARCHED (IPC)
1			B65B B65G B65H
<p>The present search report has been drawn up for all claims</p> <p>1</p>			
<p>Place of search</p> <p>The Hague</p>		<p>Date of completion of the search</p> <p>24 September 2012</p>	Examiner
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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 ..... &amp; : member of the same patent family, corresponding document</p>			

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24-09-2012

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